ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

Oak Orchard Service Area WWTP Expansion Program



SPDES NUMBER: NY-0030317

OOWWTP Expansion Program Basis of Design/DEC Engineering Report

FOR SPDES PERMITTING

FINAL / November 2025

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Abbreviations

Moving forward, the existing and expanded municipal wastewater treatment facilities at OOWWTP will be referred to as the Municipal Treatment Train, while the industrial wastewater treatment plant will be referred to as the Industrial Treatment Train (ITT). The term OOWWTP will be used to represent the entire site encompassing both treatment trains.

°C	degrees Celsius
°F	degrees Fahrenheit
µS/cm	microsiemens per centimeter
AACE	Association for the Advancement of Cost Engineering
AADF	annual average day flow
AAF	average annual flow
ACPH	air changes per hour
ADMMF	average daily maximum month flow
AGS	anaerobic granular sludge
Alt	alternatives
APY	annual percentage yield
ATP	advanced thermal processing
AWT	advanced water treatment
BAF	biological active filter
BFP	belt filter press
BNR	biological nutrient removal
BOD and BOD_5	biochemical oxygen demand and 5-day BOD test
BODR	basis of design report
Btu	British thermal units
Btu/hr	British thermal units per hour
BWPCP	Brewerton Water Pollution Control Plant
$CACO_3$	calcium carbonate
Carollo	Carollo Engineers, Ltd.
CAS	conventional activated sludge
cBOD and cBOD5	carbonaceous biochemical oxygen demand and 5-day cBOD test
CCT	chlorine contact tanks
CCTV	closed-circuit television
CDP	Census Designated Place
CEC	contaminants of emerging concern
CEPT	chemically enhanced primary treatment
cf/hr	cubic feet per hour
cf-d VSLR	cubic feet per day volatile solids loading rate
cfm	cubic feet per minute

cfu	colony forming unit
cfu/mL	colony forming units per milliliter
Clinton's Ditch	Clintons Ditch Cooperative Corporation
cm2	square centimeter
CR	confidence ratio
CSD	consolidated sanitary district
CT	contact time
cu ft	cubic feet
DAC	disadvantaged communities
DBP	disinfection byproduct
DEC	Department of Environmental Conservation
DO	dissolved oxygen
DR	dimension ratio
EBCT	empty bed contact time
EBRT	empty bed resistance time
EDU	equivalent dwelling unit
El.	elevation
fab	fabrication facility
FDC	final design consultant
Flowserve	Flowserve Corporation
Flygt	Xylem Flygt
FOG	fats, oils, and grease
FPFS	Facility Plan and Feasibility Study
fps	feet per second
FRP	fiberglass reinforced plastic
g $N/m^2/day$	grams nitrogen per square meter per day
g/cc	grams per cubic centimeter
gal	gallon
GBT	gravity belt thickener
gpcd	gallons per capita per day
gpd	gallons per day
gpd/lf	gallons per day per linear foot
gpd/sq ft	gallons per day per square foot
gph	gallons per hour
gpm	gallons per minute
gpm/sf	gallons per minute per square foot
H_2S	hydrogen sulfide
HDPE	high-density polyethylene
hp	horsepower

HPO	high purity oxygen
HRT	hydraulic retention time
HSW	high-strength waste
HVAC	heating, ventilation, and air conditioning
IFAS	Integrated Fixed-Film Activated Sludge
ITT	Industrial Treatment Train
IUVA	International Ultraviolet Association
IWWTP	industrial wastewater treatment plant
kV	kilovolt
lb/day	pounds per day
lb/hr	pounds per hour
lb/hr/sq ft	pounds per hour per square feet
LEL	lower explosive limit
lf	linear feet
LPHO	low-pressure, high-output
m	meter
MABR	Membrane Aerated Biofilm Reactor
MAU	make-up air unit
MBBR	moving bed bioreactor
MBR	membrane bioreactor
MG	million gallons
mg/L	milligrams per liter
Mgal	milligal
mgd	million gallons per day
mJ	megajoule
mL	milliliters
MLR	mixed liquor recycle
MLSS	mixed liquor suspended solids
mm	millimeter
MMBtu	metric million British thermal unit
MMBtu/hr	metric million British thermal units per hour
MMF	maximum monthly flow
MOPO	maintenance of plant operations
MS	municipal solids
MSWWTP	Metropolitan Syracuse Wastewater Treatment Plant
N	nitrogen
n/a	not available
NFPA	National Fire Protection Association
ng/L	nanograms per liter

NH_3	ammonia
nm	nanometer
No.	number
NOx	nitrogen oxide
NPSH	net positive suction head
NPV	net present value
NTU	Nephelometric Turbidity Unit
NWRI	National Water Research Institute
NYNHP	New York Natural Heritage Program
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
OCDWEP	Onondaga County Department of Water Environment Protection
OOS	out of service
OOWWTP	Oak Orchard Wastewater Treatment Plant
PEJA	Potential Environmental Justice Area
PFAS	per-and polyfluoroalkyl substances
pH	power of hydrogen
PHF	peak hour flow
POSS	publicly owned sewer system
ppd	pounds per day
ppm	parts per million
Program	Oak Orchard Wastewater Treatment Plant Expansion Program
PS	pump station
psi	pounds per square inch
psig	pounds per square inch gauge
PSL	primary sludge
PUB	Public Utilities Board
PVC	polyvinyl chloride
RAS	return activated sludge
RFE	ready for equipment
RFPS	return flow pump station
RNG	renewable natural gas
RO	reverse osmosis
RSC	reduced sulfur compounds
RWPS	recycled water pump station
scf/day	standard cubic feet per day
scfm	standard cubic feet per minute
sf	square feet
SOR	surface overflow rate

SPA	set point analysis
SPDES	state pollutant discharge elimination system
SRT	solids retention time
SSA	specific surface area
SVI	sludge volume index
SWD	side water depth
TDH	total dynamic head
TDS	total dissolved solids
THP	thermal hydrolysis process
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TP	total phosphorous
TPSL	thickened primary sludge
TS	total solids
TSS	total suspended solids
TWAS	thickened waste activated sludge
UF	ultrafiltration
UPW	ultra-pure water
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UV	ultraviolet light
UVT	ultraviolet transmittance
VAR	vector attraction reduction
VFD	variable frequency drive
VOC	volatile organic compounds
VS	volatile solids
VTP	vertical turbine pump
WAS	waste activated sludge
WEP	Water Environment Protection
WWTP	wastewater treatment plant

EXECUTIVE SUMMARY

The Onondaga County Department of Water Environment Protection (OCDWEP) operates the Oak Orchard Wastewater Treatment Plant (OOWWTP) in Clay, New York. OOWWTP serves the Town of Clay, Town of Cicero, and the Village of North Syracuse.

OCDWEP is upgrading and expanding the OOWWTP to accommodate flow from planned growth in the service area while replacing aging equipment and providing an operator-friendly, energy-efficient facility as part of the OOWWTP Expansion Program (Program).

An alternative analysis was performed as part of the Program to select the process upgrades to OOWWTP and to select technologies for solids processing and reuse facilities to meet the goals of the Program. The wastewater treatment process at OOWWTP is being upgraded to meet new capacity requirements and to achieve permit required quality, including higher wastewater flows associated with the new Micron semiconductor manufacturing facility's sanitary flows, and other anticipated residential, commercial, and industrial development in the OOWWTP service area. The biosolids facility is sized to process solids generated on-site, trucked-in municipal solids (MS) from the nearby Brewerton Water Pollution Control Plant (BWPCP), and some delivered high-strength waste (HSW), assumed to be pumpable fats, oils, and grease (FOG) from local grease traps or other similar liquid organic waste. Some additional digestion and post-digestion treatment capacity resulting from the improvement project will also be able to handle a portion of Onondaga County's Metropolitan Syracuse Wastewater Treatment Plant (MSWWTP) solids if an interruption at that facility requires temporary solids diversion. The reuse facility will treat effluent from the OOWWTP for use by industrial users.

SECTION 1 PROJECT BACKGROUND AND HISTORY

The OCDWEP operates the OOWWTP, state pollution discharge elimination system (SPDES) number NY-0030317, in Clay, New York. OOWWTP has a rated capacity of 10 million gallons per day (mgd) and processes on average 5.34 mgd with a maximum month of 7.19 mgd, based on plant operating data from 2020 to 2024. OCDWEP is upgrading and expanding the OOWWTP to accommodate flow from planned growth in the service area while replacing aging equipment and providing an operator-friendly, energy-efficient facility. The Program was established to expand and improve OOWWTP, provide regional solids processing, and generate recycled water for industrial users.

An alternative analysis was performed as part of the Program to select the process upgrades to the OOWWTP and to select technologies for the solids processing facility that would meet the goals of the Program. The wastewater treatment process at OOWWTP is being upgraded to meet new capacity requirements and to achieve permit required quality, including higher wastewater flows associated with the new Micron semiconductor manufacturing facility's sanitary flows, and other anticipated residential, commercial, and industrial development in the OOWWTP service area. The biosolids facility is sized to process solids generated on-site, trucked-in MS from the nearby BWPCP, and some delivered HSW, assumed to be pumpable FOG from local grease traps or other similar liquid organic waste. Some additional digestion and post-digestion treatment capacity resulting from the improvement project will also be able to handle a portion of Onondaga County's MSWWTP solids if an interruption at that facility requires temporary solids diversion.

1.1 Site Information

The site is located at 4300 Oak Orchard Road in Clay, NY in a largely rural area and covers approximately 77 acres. The site is bounded by Mud Creek to the west, Oak Orchard Rd and Oneida River to the north, and private parcels to the east and south. The northern portion of the site is occupied by a solar panel field. Under a separate project, this solar field will be demolished for construction of an industrial wastewater treatment plant (IWWTP).

A subsurface exploration was completed for the original plant construction in January 1975 by Parratt-Wolf, Inc. of Syracuse, New York. The soil profile described by the boring logs generally consists of 25 to 45 feet of loose sand and silt overlaying dense sand and gravel. Shale and limestone bedrock underlays the overburden at depths ranging from 30 to 57 feet below ground surface. Groundwater depths typically range from 10 to 15 feet below ground surface. A geotechnical investigation is being performed concurrently with preparation of the basis of design report (BODR) under the program. The results of the 1975 geotechnical investigation are included in Appendix A. The 2025 geotechnical investigation is anticipated to confirm the findings from the original 1975 borings.

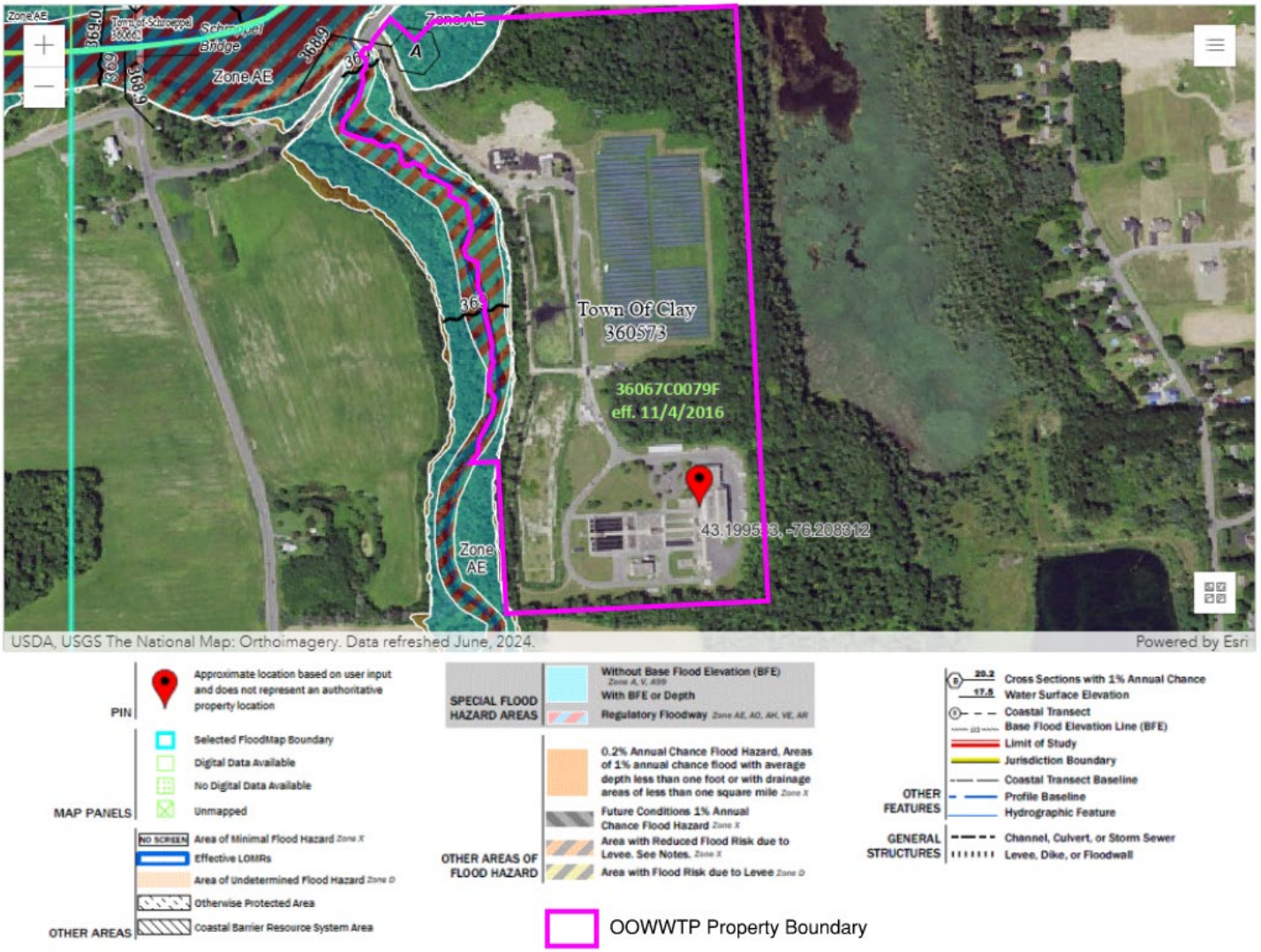
A site biological assessment was performed and identified the following:

- The New York Natural Heritage Program (NYNHP) indicated in a letter dated February 21,2025 that hairy small-leaved tick trefoil, a threatened plant, was documented in 1991 within 200 yards northeast of the Study Area. NYNHP did not identify any rare plants within the Study Area.
- NYNHP indicated in a letter dated February 21, 2025 (attached as Appendix B) that the pied-billed grebe and bald eagle, both threatened birds, and lake sturgeon, a threatened fish, have been documented in the vicinity of the Study Area. The letter also noted that the Indiana Bat, an endangered bat, has been documented within 2.5 miles of the Study Area. No bald eagle nests were identified during the March 25, 2025, site investigation. There is presence of potential suitable summer roosting habitat for Indiana bat in the forested portion of wetland 05-W001.
- United States Fish and Wildlife Service (USFWS) provided a list of threatened and endangered species, dated April 3, 2025 (attached as Appendix C). USFWS indicated there are no critical habitats with the project area but noted four endangered or threatened species that should be considered. The species include Indiana bat, Northern long-eared bat, Tri-colored bat, and Monarch butterfly.

A wetland and stream delineation was conducted by EDR in August 2024 (Appendix D). A subsequent delineation was performed under the Program to confirm findings from the 2024 report and the summary is included in the Department of Environmental Conservation (DEC) Jurisdictional Determination Request (Appendix E). Jurisdictional determinations for the wetlands have been requested from New York State Department of Environmental Conservation (NYSDEC) and United States Army Corps of Engineers (USACE). A site visit with DEC and USACE was conducted May 14, 2025. Additional mapping was requested for wetland 05-W001. Construction activities for the OOWWTP are not expected to impact jurisdictional regulated wetlands.

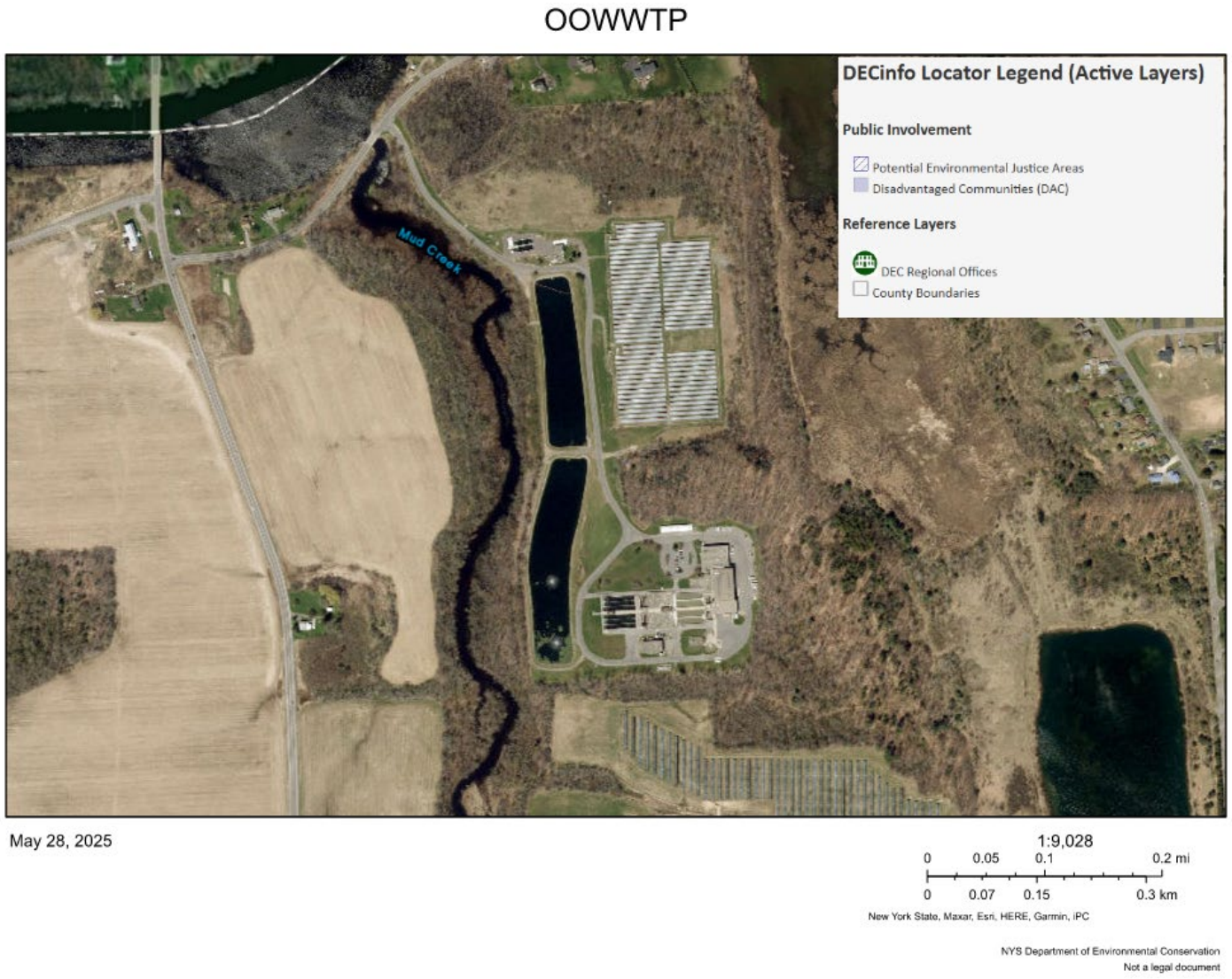
The plant and proposed expansion are located in Flood Hazard Zone X as shown in Figure 1.1 below. No specific flood resistant design elements are required.

The proposed project will not impact any Potential Environmental Justice Area(s) (PEJA) or Disadvantaged Communities (DAC). Figure 1.2 below was generated from the DEC info locator (https://www.dec.ny.gov/pubs/109457.html) and shows no PEJA or DAC areas in the project vicinity.



Source: https://msc.fema.gov/portal/search?AddressQuery=clay%2C%20nY

Figure 1.1 OOWWTP Flood Hazard Zone Map



Source: https://www.dec.ny.gov/pubs/109457.html

Figure 1.2 OOWWTP PEJA and DAC Map

1.2 Ownership and Service Area

OOWWTP is owned and operated by OCDWEP. The facility currently serves approximately 28,000 acres in the Town of Clay and the Town of Cicero as shown in Figure 1.3. Boundaries of the existing service area are assumed to remain for the projection period included in this report. OOWWTP currently serves a population of approximately 46,000 residential, commercial, and industrial users. Clintons Ditch Cooperative Corporation (Clinton's Ditch), a Pepsi product bottling and distribution facility, is the largest existing industrial contributor within the Oak Orchard service area, which has an average biochemical oxygen demand (BOD) load of approximately 2,100 pounds per day (ppd). Clinton' Ditch currently discharges approximately 0.16 mgd, but full buildout of Clinton's Ditch will result in a total flow of approximately 0.2 mgd. This increased flow and load is included in the future projections to size the OOWWTP upgrade.

The OOWWTP only receives flow from the service area with the exception of the Gaskin Road Pump Station (PS). During normal operations, the Gaskin Road PS sends wastewater to OCDWEPs Wetzel Road Wastewater Treatment Plant (WWTP). Under wet weather conditions, Gaskin Road flow is diverted to OOWWTP. The facility does not receive hauled waste however currently thickened solids are transferred to OCDWEPs Metro WWTP for dewatering.

Future development within the Oak Orchard service area will include sanitary wastewater from the new Micron campus and White Pine Pump Station, both shown in Figure 1.3 below. Other development within the Oak Orchard service area was projected based on town and county zoning. Residential development projections suggest a full buildout population increase of 16,824, primarily located in Clay. Commercial and industrial development projections suggest a full buildout increase of 1,140 acres and 1,522 acres, respectively. This analysis assumes increase in population is associated with development of vacant parcels within the service area. Connection of existing onsite wastewater treatment systems in OOWWTPs service area are not anticipated based on current town planning. Anticipated growth in the service area is described in further detail in Technical Memorandum 1: Influent Flows and Loads, included as Appendix F.

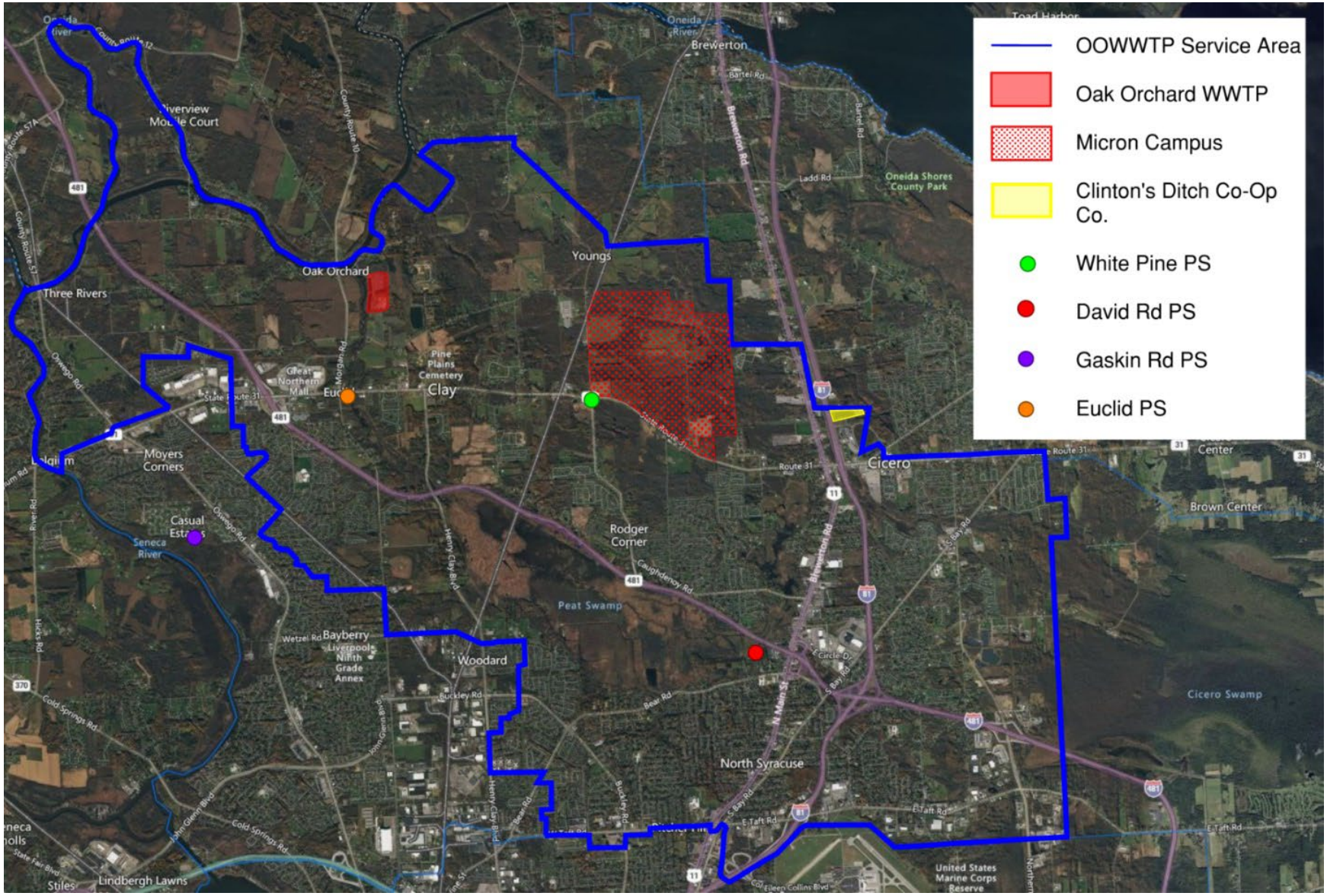


Figure 1.3 OOWWTP Service Area Map

1.3 Existing Facilities and Present Condition

The plant operates under SPDES permit number NY-0030317, included as Appendix G. There are two publicly owned sewer system (POSS) numbers associated with the OOWWTP. NYS700023 is for the Town of Clay and NYS700024 is for the Village of North Syracuse. The permit was administratively renewed in 2019. The permit sets the plant's monthly average flow at 10 mgd. Key effluent limits are summarized in Table 1.1. Documented non-compliance events within the past five years are provided in Appendix M.

Table 1.1 Summary of Key SPDES Permit Effluent Limits

Parameter	Units	Monthly Average	7 Day Average	Daily Maximum
cBOD	mg/L	25	40	
	lb/day	2,085	3,336	
TSS	mg/L	30	45	
	lb/day	2,500	3,750	
DO	mg/L			2.0
Nitrogen, Ammonia Total as NH_3	lb/day	307(1)		
Phosphorus, Total as P	mg/L	1.0		
Mercury, Total	ng/L			50

Notes:
cBOD – carbonaceous biochemical oxygen demand; DO – dissolved oxygen; lb/day – pounds per day; mg/L – milligrams per liter; ng/L – nanograms per liter; TSS – total suspended solids.
(1) Summer ammonia-nitrogen loading provided.

The plant has a typical fecal coliform limit of 200 colonies per 100 milliliters (mL) 30-day geometric mean and 400 colonies per 100 mL 7-day geometric mean. Between May 15 and October 15, the plant is required to provide seasonal disinfection, and the effluent total residual chlorine limit is 0.045 mg/L.

1.3.1 Process Train

The existing OOWWTP process flow diagram is shown in Figure 1.4 below. Influent flow enters the plant from two force mains. The force mains are combined in an influent bunker. Two parallel grit basins remove grit from the raw wastewater. De-gritted flow enters a common channel that splits flow between two mechanical bar screens and a bypass channel with a manually cleaned bar screen. The headworks building air is directed to the odor control system. Grit is manually removed from the channel for offsite disposal. Screenings are collected in bins and disposed of offsite.

Screened wastewater flows to a splitter box which directs flow into two trains, the north train and south train. Each train consists of two rectangular primary clarifiers, one aeration tank, and three rectangular secondary clarifiers.

The screened wastewater receives primary treatment in rectangular primary clarifiers. The existing primary flocculation tanks upstream of the primary clarifiers are decommissioned. Primary solids are collected and pumped to two gravity thickeners. The effluent weirs of the primary clarifiers are covered and headspace sent to the odor control.

Primary clarifier effluent is sent to the aeration basins for BOD and nutrient removal. Each aeration basin has three stages and the tanks are covered. The plant utilizes a Pure Oxygen system. Oxygen is generated onsite.

Effluent from the aeration basins is sent to secondary clarifiers to settle solids prior to discharge. The clarified effluent is typically sent through the north and south lagoons for polishing, but the lagoons can be bypassed. Lagoon effluent is sent through two parallel chlorine contact tanks and dechlorination tanks for seasonal disinfection with sodium hypochlorite and dechlorination with sodium bisulfite. Final effluent flows through the outfall pipe from the dechlorination tank north, under Oak Orchard Road, and through the outfall to Oneida River.

Return activated sludge (RAS) is pumped from the secondary clarifiers to stage 1 of the aeration basins. Waste activated sludge (WAS) is pumped to the gravity thickeners, where it is combined with the primary solids. The combined, thickened sludge from the gravity thickeners is pumped into trucks and sent to OCDWEPs Metro WWTP for further processing.

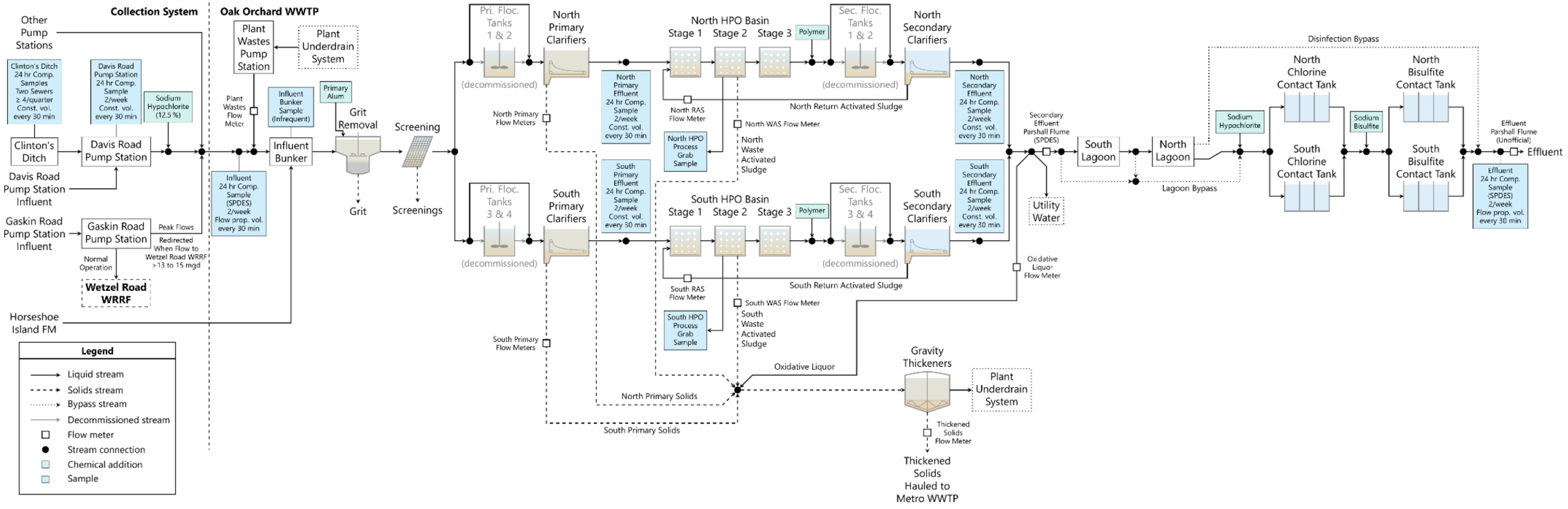


Figure 1.4 Existing OOWWTP Process Flow Diagram

1.3.2 Plant Current Conditions

There is no evidence of damage from storms or flooding. Appendix H includes photographs of key equipment. Current conditions and design criteria for the existing processes are summarized below.

Headworks: Improved odor control and grit removal are needed. Grit is manually collected and disposed of. The new process will include grit classifiers. The mechanical bar screens are in acceptable condition, but screenings are collected in dumpsters for disposal. Screening classifiers will provide drier screenings for disposal.

Primary Clarifiers: The existing primary clarifiers are in good shape; however, weir modifications will be needed to meet required weir loading modifications will be required. The primary clarifier pumps are in good shape.

Aeration Basins: The oxygen generation system for the Pure Oxygen system is outdated and difficult to maintain. If the Pure Oxygen system were to remain in place, a new oxygen generation system will be required. The biological process will not provide the required effluent quality for the proposed reuse facility and will be replaced with a membrane bioreactor (MBR) system.

Secondary Clarifiers: The secondary clarifiers are in acceptable shape. RAS and WAS pumps are outdated. The MBR process does not require secondary clarification so existing secondary clarifiers will be demolished, and the space utilized for biosolids processing.

Disinfection: The plant performs seasonal disinfection and dechlorination. The system is in good shape; however, the expanded facility will utilize ultraviolet (UV) disinfection.

Biosolids Processing: Primary solids and WAS are mixed and thickened in gravity thickeners. The gravity thickeners are original to the plant. The interiors were not inspected, but it is expected rehabilitation will be needed if the thickeners were to remain, however with the expansion new gravity thickeners will be provided. Thickened solids are trucked off-site.

Outfall: The condition of the existing outfall is under evaluation. The existing diffuser ports are assumed to be sheared off the outfall within the river, leaving only sixteen 18-inch diameter openings. Closed-circuit television (CCTV) of the outfall pipe was attempted in May 2025 and was unsuccessful due to flow conditions within the pipe. Additional CCTV inspection is recommended and will be attempted soon under low flow night conditions.

The existing administration building is in good shape and will be retained, however additional space will be required for staff and maintenance areas associated with the upgraded facility.

1.3.3 Historical Flows

Historical plant flows from 2020 to 2024 were reviewed to determine current flows and loads to the OOWWTP, which are summarized in Table 1.2 below. The annual average day flow is approximately 5.34 mgd and maximum month is 7.19 mgd, well below the rated capacity of 10 mgd. However, BOD and TSS loadings are near the design maximum values during maximum week conditions.

Table 1.2 Current OOWWTP Influent Flows and Loads Summary, 2020 to 2024

Flow Scenario	Flow (mgd)	BOD (ppd)	TSS (ppd)	NHx-N (ppd)	TKN (ppd)	TP (ppd)
Annual Average Day	5.34	9,733	6,095	920	1,306	167
Maximum Month(1)	7.19	12,663	8,984	1,090	1,510	209
Maximum Week(1)	10.29	17,163	15,554	1,306	2,106	325
Peak Day(1)	18.39	24,049	23,546	1,405	2,227	466
Peak Hour(1)	21.07	n/a	n/a	n/a	n/a	n/a
Current Design Maximum Month Limitations	10(1)	17,100(2)	16,700(3)			

Notes:
n/a – not available; TKN – total Kjeldahl nitrogen; TP – total phosphorous.
(1) Effluent flow limit from SPDES permit effective date July 1, 2014.
(2) Letter from New York State Department of Environmental Conservation dated April 26, 2016, regarding "Oak Orchard Approval for Re-Rate of BOD Influent Loading."
(3) Letter from New York State Department of Environmental Conservation date March 25, 2024, regarding "Oak Orchard WWTP 2023 Annual Flow Certification NY0027081."

1.3.4 Preliminary Treatment

The existing preliminary treatment processes include screening and grit removal facilities in the influent building. The raw wastewater first passes through two aerated grit chambers where sand, gravel, and other heavy particles are captured. Then the wastewater flows into a manually cleaned coarse bar rack with 3-inch bar spacing to capture larger debris. Aeration for the grit chambers is provided by two positive displacement blowers. Collected grit is manually removed from the grit chambers using a clam shell bucket and the bridge crane. The geometry and size of the existing grit chambers are more suited for capture of heavier grit particles. Key design criteria for the grit removal system are summarized in Table 1.3.

Table 1.3 Existing Grit Removal

Parameter	Value
Type	Aerated grit channels
Number of Channels	2
Channel Width, feet	16
Channel Length, feet	34
Channel SWD, feet	12
Total Working Volume, gal	98,000
Length:Width Ratio	2:1
Estimated Unit Capacity at 5-Minute Detention Time, mgd	14
Number of Blowers	2
Capacity per Blower, scfm	365

Notes:
gal – gallon; scfm – standard cubic feet per minute; SWD – side water depth.

After the grit chambers, wastewater passes through two mechanically cleaned climber-type bar screens. Key design criteria for the influent screens are presented in Table 1.4. Additionally, a manually cleaned bar rack with 2-inch bar spacing is located in the emergency bypass channel between the two mechanical screens to provide bypass screening in the event that the mechanical screens are out of service.

Table 1.4 Existing Screening

Parameter	Value
Type	Mechanical climber bar screen
Number of Units	2
Channel Width, feet	4
Channel Depth, feet	5
Bar Spacing, inches	½
Estimated Unit Capacity, mgd	15

The estimated total peak flow capacity of the existing grit chambers is 28 mgd based on a 5-minute detention time. The existing screens have an estimated firm capacity of 15 mgd (30 mgd with both units in service).

Current air monitoring within the headworks area includes a hydrogen sulfide meter and a lower explosive limit (LEL) meter to measure ambient atmospheric conditions The odor control system which pulls air from the influent bunker, the covered grit chambers, and grit chamber effluent weirs also has a hydrogen sulfide sensor.

1.3.5 Primary Treatment

Primary treatment at OOWWTP currently consists of chemically enhanced primary treatment (CEPT) with aluminum sulfate dosed into the grit effluent channel upstream of four rectangular primary clarifiers. The primary clarifiers were rehabilitated as part of the 2016 infrastructure project with the following modifications:

- Installed demising walls in the north and south primary clarifiers to create four primary clarifiers from the previous two.
- Replaced the effluent v-notch weirs.
- Installed new primary influent and effluent baffles.
- Installed new scum collection pipes.
- Replaced chain and flight and cross collector mechanisms.

Scum collection troughs convey scum to the scum wet well. Sludge settles and is collected at the influent end of the basins in the sludge collection channel. Rotary lobe-type pumps located in the gallery pump primary sludge to the gravity thickeners. The influent weirs and effluent launders are covered for odor and algae control. Foul air is ducted to an odor control system. Existing primary treatment design criteria is presented below in Table 1.5.

Table 1.5 Existing Primary Treatment

Process/Parameter	Units	Value
Alum Dose	mg/L	32(1)
Clarifier Shape		Rectangular
Sludge Collector Type		Chain and flight
Number of Clarifiers	quantity	4
Number of Sludge Collectors, each		1
Chain and Flight Drive, each	hp	1/2
Number of Sludge Cross Collectors, each		1
Sludge Cross Collector Drive, each	hp	3/4
Width, each	feet	28
Length, each	feet	125.83
Area, each	sf	3,523
Area, all units in service	sf	14,092
Side Water Depth	feet	10.5
Surface Overflow Rate(2)	gpd/sq ft	1,495.2
Weir Length, each	lf	162
Weir Length, all units in service	lf	648

Notes:
hp – horsepower; lf – linear feet; gpd/sq ft – gallons per day per square foot; sf – square feet.
(1) Average dose from 2021 through 2024 assuming a 1 mgd intra-plant recycle flow. Dose expressed as alum including the waters of hydration with the formula $Al_2(SO_4)_3 \cdot 14H_2O$, assuming a purity of 48 percent and a specific gravity of 1.323.
(2) Based on historical data and a peak hour flow of 21.07 mgd with four clarifiers.

Primary clarifier capacity is commonly evaluated relative to the peak day and peak hour surface overflow rates (SOR), with design values of 1,000 gpd/sq ft and 2,000 gpd/sq ft, respectively, from Ten States Standards. On this basis, the existing primary clarifiers have a peak day flow capacity of 14.1 mgd and a peak hour flow capacity of 28.2 mgd.

1.3.6 Secondary Treatment

The OOWWTP secondary treatment facilities were constructed in the late 1970s and include a high purity oxygen (HPO) treatment process. Primary effluent enters two HPO aeration tanks, each divided into three stages. Surface aerators are used to transfer oxygen from the reactor headspace to the mixed liquor, with the oxygen supplied by a pressure swing adsorption system in the oxygen generation building. Three compressors deliver oxygen, and a liquid oxygen storage tank serves as a backup.

During the summer months of June 16 through October 31, the HPO process is operated at a solids retention time (SRT) of at least 6.8 days to achieve nitrification with a suppressed power of hydrogen (pH) from the HPO process of 6.3. The wasting rates that are required to achieve these elevated SRTs result in mixed liquor suspended solids (MLSS) concentrations of around 5,000 mg/L. When influent flows exceed 10 mgd, the HPO process is operated in wet weather mode where the aerators are turned off to prevent washout of the MLSS.

Key design criteria for the HPO system are summarized in Table 1.6

Table 1.6 Existing High Purity Oxygen System

Parameter	Value
Type	HPO activated sludge
Number of Tanks	2
Stages per Tank	3
Width (each stage), feet	72
Length (each stage), feet	36
Side Water Depth (each stage), feet	9
Total Volume (both tanks), gal	1,050,000
Number of HPO Compressors	3
Total Oxygen Generation Capacity (2 operating, 1 standby), lb/day	20,000
Minimum Monthly Summer SRT, days	6.8
Historical Summer SRT, days	7.5 to 8.5(1)
Maximum Monthly Summer MLSS, mg/L	5,000
Historical Winter SRT, days	6.9 to 7.8(1)

Notes:
(1) SRT range given is the 25th and 75th percentile of values calculated from operating data from 2021-01 through 2024-09.

After treatment, mixed liquor flows to six rectangular secondary clarifiers, bypassing two out-of-service flocculation tanks. Polymer is added year-round to aid settling. The secondary clarifiers are equipped with chain-and-flight sludge collection mechanisms. They are grouped into two trains, with flow distributed via adjustable gates. Sludge is returned to the aeration tanks via RAS pumps, and WAS is pumped to the gravity sludge thickeners. Scum is collected in secondary scum pump stations and hauled to Metro with the thickened solids for treatment.

An effluent water pump and two oxidative liquor pumps are located between the clarifiers. The effluent pump provides carrier water for polymer, and the oxidative liquor pumps supply dilution water to the thickeners. Existing secondary clarifier design criteria are presented below in Table 1.7.

Table 1.7 Existing Secondary Clarifiers

Parameter	Value
Type	Rectangular, chain-and-flight
Mechanism	Chain-and-flight (one per clarifier) 3 inches x 8 inches flights at 10 feet on center. Cross collector mechanism (one per clarifier) 2 inches x 6 inches flights at 5 feet on center.
Number of Units Operating	6
Total Number of Units	6
Width (each), feet	20
Length (each), feet	140
Side Water Depth (each), feet	10
Total Surface Settling Area (6 operating), sf	16,800
Total Weir Length (6 operating), feet	648

The SWD of the secondary clarifiers is less than the minimum Ten States Standards requirement of 12 feet. As such, a 10 percent derating has been applied to the hydraulic capacity based on Ten States Standards, reducing it from 16.8 mgd at a SOR of 1,000 gpd/sq ft to 15 mgd at an SOR of 900 gpd/sq ft. The peak-hour capacity is 19.4 mgd based on a maximum weir loading rate of 30,000 gallons per day per linear foot (gpd/lf) with a peak solids loading rate of 590,000 lb/day, as outlined in the 2021 Oak Orchard WWTP Facility Plan and Feasibility Study (FPFS) (Appendix N) and Oak Orchard WWTP FPFS Site Selection Conceptual Treatment Approach (GHD, 2022) (Appendix O).

OOWWTP has two treatment lagoons, modified during the 1970s plant upgrade. Initially designed for nitrification, they were found to be inadequate for ammonia removal. As a result, the HPO process was adjusted to focus on both carbonaceous and ammonia treatment.

Effluent from the secondary clarifiers flows through a Parshall flume before entering the first lagoon. The lagoons are arranged in series, with a bypass system to divert effluent if needed. According to the 2021 FPFS (Appendix N) and Oak Orchard WWTP FPFS Site Selection Conceptual Treatment Approach (GHD, 2022) (Appendix O) Lagoon No. 1 has a normal volume of 8.4 milligal (Mgal), while Lagoon No. 2 holds 5.9 Mgal. When filled to the top of the rip-rap, Lagoon No. 1 has a volume of 10.4 Mgal, and Lagoon No. 2 can hold 7.3 Mgal. The lagoons now serve to polish secondary effluent, especially during high flows, aid in pH adjustment through aeration, and add DO before discharge. Two aerators are located in the lagoon nearest the secondary clarifiers.

While water environment protection (WEP) successfully increased the influent BOD_5 maximum month rated capacity of the OOWWTP to 17,100 ppd in 2016, the projected maximum month loads are expected to exceed this value within the planning horizon. For this reason, alternatives were evaluated to expand the OOWWTP secondary process which are summarized in Section 2.1.3.

1.3.7 Disinfection

The plant effluent undergoes disinfection at the northern end of the treatment plant before being discharged. The disinfection system consists of two chlorine contact tanks (CCT) and an adjacent chlorination building, which houses the liquid sodium hypochlorite and associated chemical feed systems. The existing CCTs are adjacent in one structure with common influent and effluent boxes. Each side has serpentine baffling with six passes. The original chlorine addition point was relocated by OCDWEP to the lagoon diversion structure upstream. The CCTs have capacity to treat up to 15 to 30 mgd, maintaining a minimum contact time of 15 minutes as recommended by Ten State Standards. Key design criteria for the disinfection system are summarized in Table 1.8.

Table 1.8 Existing Chlorination Process

Parameter	Value
Type	Chlorine contact tanks
Chemical Type	Sodium hypochlorite
Total Number of Units	2
Width, each	~21 feet
Length, each	~83 feet
Side Water Depth, each	~9 feet
Approximate Total Volume, each	117,000 gal
Approximate Total Volume	234,000 gal

In 2019, dechlorination facilities using sodium bisulfite were added to the OOWWTP. The dechlorination tanks can treat up to 38 mgd with a minimum contact time of 0.5 minutes, as recommended by Ten State Standards. Key design criteria for the dechlorination system are summarized in Table 1.9.

Table 1.9 Existing Dechlorination Criteria

Parameter	Value
Type	Chlorine contact tanks
Chemical Type	Sodium bisulfite
Total Number of Units	2
Width, each	5.2 feet
Length, each	34.5 feet
Side Water Depth, each	10 feet
Total Volume	13,334 gal

1.3.8 Outfall

Effluent is conveyed from the CCTs to the outfall at the Oneida River via a 72-inch pipe. Effluent discharges into the Oneida River through 16 18-inch diameter risers. During an April 2025 bathymetric survey of the surrounding area within the Oneida River, it was identified that the risers have sheared off of the outfall, resulting in effluent discharging through sixteen 18-inch ports at the crown of the outfall pipe. Hydraulic evaluation of the existing outfall is provided below in Figure 1.5 and results in an estimated outfall capacity of 64 mgd with negligible effect to the hydraulic grade.

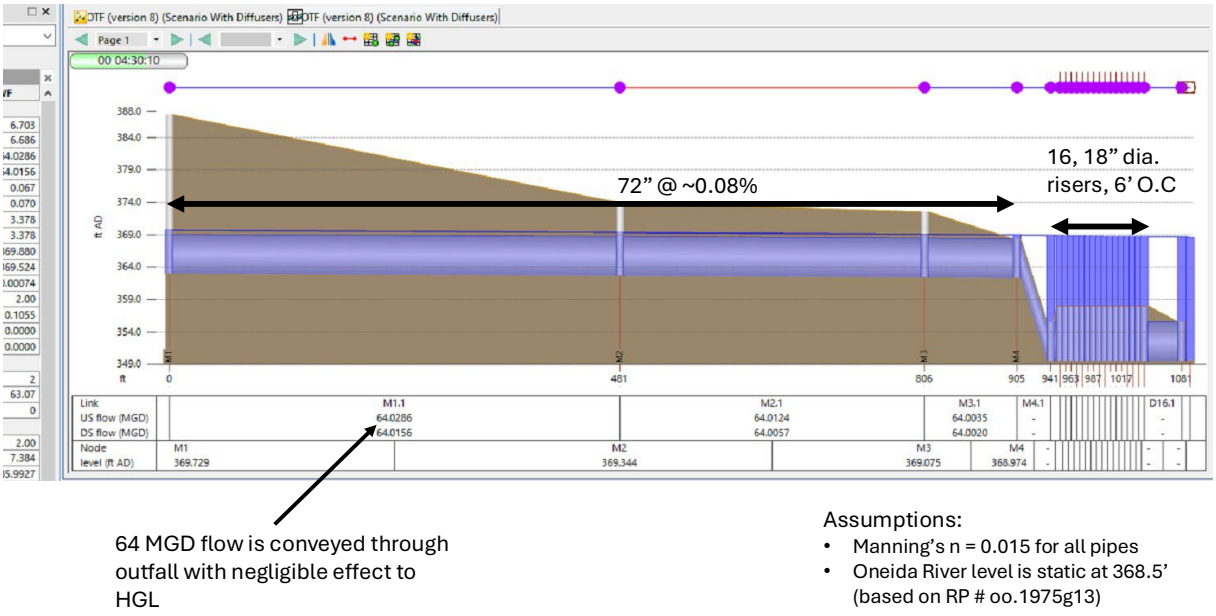


Figure 1.5 Outfall Hydraulic Capacity

Cormix modeling has been conducted to evaluate the mixing zone for the existing outfall configuration and results of this modeling are included in the SPDES modification submission. Modifications to the existing outfall may be included in a project yet to be scoped. Scoping and contracting of this work is anticipated to be completed in Q3/Q4 of 2025, with a basis of design for outfall modifications anticipated in 2026.

1.3.9 Sludge Thickening

The existing OOWWTP generates primary sludge (PSL) from the primary clarifiers and WAS from the secondary clarifiers. The PSL and WAS are combined and sent to two existing 40-foot gravity thickeners. Thickened sludge is trucked off-site to MSWWTP for dewatering. Supernatant from the gravity thickeners is returned to the head of the plant.

1.4 Definition of the Problem

1.4.1 Future Flow Projections and Needs

Due to expected residential, commercial, and industrial growth in the sewer shed, OCDWEP is progressing the Oak Orchard Expansion Program to increase plant capacity and provide a more reliable treatment process to meet the SPDES permit requirements. The upgrade will increase capacity of the liquids train and replace the Pure Oxygen system with MBR. A new biosolids campus and reuse facility will also be constructed under the program. The Program is limited to upgrades to the WWTP and does not include any sewer extensions.

Other projects at the OOWWTP site include a maintenance of plant operations (MOPO) project and the IWWTP. The MOPO project will be completed under the program and includes interim treatment to provide additional nitrogen removal. The MOPO project is needed to treat increased flow from Micron construction and startup flows and expected residential and commercial growth prior to completion of the OOWWTP upgrades. The MOPO project is also needed to meet required influent water quality parameters for the reuse facility and to maintain permit compliance in wet weather operating mode once the lagoons have been removed from service. The projected influent flows and loads for the MOPO project are summarized in Table 1.12.

For the OOWWTP upgrades, future flow and load projections were developed by applying peaking factors to the average annual flows (AAF) and loads summarized in Table 1.10 and Table 1.11. Table 1.12 summarizes the future influent flow and load projections for OOWWTP. The Full Future Buildout Projections were adopted for the OOWWTP upgrade design criteria. More information on the methodology and assumptions used to develop the projections are summarized in Appendix F: Technical Memorandum 1 Influent Flows and Loads.

Table 1.10 Historical and Projected Buildout AAF Comparison

Source	Residential, mgd	Commercial, mgd	Micron Sanitary, mgd	Clinton's Ditch, mgd	Other Industrial, mgd	Combined AAF, mgd
Current	5.178(1)	0(1)	n/a	0.158	n/a	5.336
Buildout Growth from Current	1.682(2)	1.735(3)	0.700(4)	0.040(5)	1.522(6)	5.680
Buildout	6.860	1.735	0.700	0.198	1.522	11.016

Notes:
(1) Current commercial flows were not separated from residential flows.
(2) Calculated based design per capita flow of 100 gallons per capita per day (gpcd) from Ten State Standards.
(3) Calculated assuming 1,500 gallon/acre-day based on middle of the suggested range from Metcalf and Eddy.
(4) Based on Micron's anticipated peak sanitary flow of 480 gallons per minute (gpm) per semiconductor fabrication facility (fab), and an estimated annual average 122 gpm per fab.
(5) Buildout growth from current assumes 8/7 of current loads assuming the addition of one new processing train.
(6) Calculated assuming 1,000 gallon/acre-day based on the low end of the range from Metcalf and Eddy.

Table 1.11 Historical and Buildout Average Annual Load Comparison

Source	Residential + Commercial, ppd(1)	Micron Sanitary, ppd(2)	Clinton's Ditch, ppd(3)	Other Industrial, ppd(4)	Combined Average Annual, ppd
BOD Load					
Current(5)	7,650	0	2,083	0	9,733
Buildout Growth from Current	2,860	313	298	3,809	7,279
Buildout	10,510	313	2,380	3,809	17,012
TSS Load					
Current	6,074	0	22	0	6,095
Buildout Growth from Current	3,359	368	5	4,443	8,176
Buildout	9,432	368	27	4,443	14,271
Ammonia Load					
Current	917	0	3.3	0	920
Buildout Growth from Current	286	31	0.8	355	673
Buildout	1,202	31	4.1	355	1,593
TKN Load					
Current	1,301	0	4.6	0	1,306
Buildout Growth from Current	487	53	1.2	508	1,049
Buildout	1,788	53	5.8	508	2,355
TP Load					
Current	167	0.0	0.6	0	167
Buildout Growth from Current	79	8.6	0.2	127	215
Buildout	246	8.6	0.7	127	382

Source	Residential + Commercial, ppd(1)	Micron Sanitary, ppd(2)	Clinton's Ditch, ppd(3)	Other Industrial, ppd(4)	Combined Average Annual, ppd
OP Load					
Current	83	0.0	0.3	0	84
Buildout Growth from Current	39	4.4	0.1	63	107
Buildout	123	4.4	0.4	63	191

Notes:
(1) Calculated based on design per capita load from Ten State Standards.
(2) Based on Micron's anticipated number of employees assuming 20 percent proration for full-time equivalents.
(3) Buildout growth from current assumes 8/7 of current loads, assuming the addition of one new processing train.
(4) Calculated assuming 1,000 gpd/acre based on the Onondaga County's current pretreatment regulations.
(5) Does not include Clinton's Ditch.

Table 1.12 Projected OOWWTP Influent Flows and Loads Summary

Flow/Load Scenario		Flow (mgd)	BOD (ppd)	TSS (ppd)	NHx-N (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
MOPO Design Condition	Annual Average Day	9.72	16,798	14,050	1,589	2,411	362	183
	Concentration (mg/L)		207	173	19.6	29.7	4.47	2.25
	Minimum Month	7.56	14,687	12,627	1,399	2,201	334	168
	Maximum Month	12.00	20,175	17,502	1,777	2,643	411	207
	Maximum Two Week	13.30	22,916	22,075	1,838	2,778	462	233
	Maximum Week	15.82	25,258	25,355	2,017	3,318	547	275
	Peak Day	25.81	33,658	34,908	2,127	3,455	711	358
	Peak Hour	29.11	n/a	n/a	n/a	n/a	n/a	n/a
10 Year Projections	Annual Average Day	8.16	13,521	10,183	1,256	1,831	274	137
	Concentration (mg/L)		199	149	18.4	26.9	4.02	2.01
	Minimum Month	5.74	11,425	8,629	1,057	1,606	244	122
	Maximum Month	10.73	16,994	13,957	1,456	2,077	327	164
	Maximum Two Week	12.19	20,017	18,954	1,520	2,221	383	191
	Maximum Week	15.03	22,374	22,529	1,709	2,796	474	237
	Peak Day	26.25	30,326	32,977	1,825	2,943	652	326
	Peak Hour	29.97	n/a	n/a	n/a	n/a	n/a	n/a
20 Year Projections	Annual Average Day	10.00	15,678	12,709	1,464	2,156	340	170
	Concentration (mg/L)		188	152	17.5	25.8	4.08	2.04
	Minimum Month	7.12	13,471	10,923	1,246	1,907	306	153
	Maximum Month	13.04	19,406	17,049	1,683	2,430	401	200
	Maximum Two Week	14.77	22,722	22,795	1,753	2,589	463	232
	Maximum Week	18.14	25,274	26,907	1,960	3,228	566	283
	Peak Day	31.46	33,396	38,921	2,087	3,390	768	384
	Peak Hour	35.86	n/a	n/a	n/a	n/a	n/a	n/a

Flow/Load Scenario		Flow (mgd)	BOD (ppd)	TSS (ppd)	NHx-N (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
Full Future Buildout Projections (OOWWTP Upgrade Design Condition)	Annual Average Day	10.98	17,012	14,271	1,593	2,355	382	191
	Concentration (mg/L)		186	156	17.4	25.7	4.17	2.08
	Minimum Month	7.88	14,742	12,353	1,364	2,092	345	172
	Maximum Month	14.26	20,883	18,929	1,821	2,644	446	223
	Maximum Two Week	16.13	24,364	25,099	1,895	2,812	513	256
	Maximum Week	19.76	27,027	29,513	2,112	3,487	623	311
	Peak Day	34.12	35,244	42,409	2,245	3,658	837	419
	Peak Hour	38.86	n/a	n/a	n/a	n/a	n/a	n/a

To meet the future flow and water quality effluent requirements, upgrades including modifications to the existing processes are as follows:

- A complete overhaul of the headworks facility to upgrade and expand coarse screening and grit removal, with a more automated system, including screenings handling.
- Addition of two primary clarifiers that match the four existing units. This includes proposed modifications to the effluent weirs in all six clarifiers to meet the required weir loading rates.
- Replacement of the HPO activated sludge secondary process with an MBR secondary process. New fine screens to screen the primary clarifier effluent (upstream of the bioreactors) are needed to protect the membranes.
- Replacement of the existing chlorination and dechlorination disinfection system with closed vessel UV disinfection.
- Odor control for the new headworks and primary clarifier weir/effluent channels.
- New ancillary equipment, chemical storage, flow distribution, and blower and electrical buildings.
- New administration building (design basis to be prepared separately) to house plant operators and maintenance areas required for the upgraded facility.
- Space allocation for future expansion to add 33 percent additional capacity if required (expanded headworks, two additional primary clarifiers, and an additional MBR train). Expansion is not required to treat projected growth and flow from Micron, but the space is maintained if future growth exceeds projections.
- Outfall modifications may be required depending on results of on-going modeling. Outfall modifications, if required, will be included in future submittals.
- Construction of a MOPO project to provide additional treatment capacity for expected growth prior to completion of the overall OOWWTP upgrade project.

1.4.2 OOWWTP Regional Biosolids Facility

In addition to upgrading OOWWTPs liquids treatment process and expanding plant capacity, the facility upgrade will also provide treatment for solids generated on site as well as regional biosolids. WEP currently treats all biosolids within their service areas at Metro, which could be a single point of failure for WEPs solids operations. The new OOWWTP regional biosolids facility provides added flexibility and redundancy for WEPs biosolids treatment options. The OOWWTP biosolids facility is sized to treat solids generated at OOWWTP, trucked-in MS from the nearby BWPCP, and some delivered HSW, assumed to be pumpable FOG from local grease traps or other similar liquid organic waste. All three of these sludge streams are currently trucked to Metro, so the new OOWWTP regional biosolids facility will allow for reduced truck traffic at Metro. Additionally, HSW receiving can provide an additional revenue stream for OOWWTP. Some additional digestion and post-digestion treatment capacity resulting from the improvement project will also be able to handle a portion of Metro's solids or solids from other municipal facilities if temporary solids diversion is required.

1.4.3 Reuse Facility

The OOWWTP Reuse Facility project includes treatment of effluent from OOWWTP to produce recycled water for industrial use. The primary identified user for this recycled water is Micron, whose planned fabrication facilities (fabs) will require large volumes of water for cooling and the production of ultra-pure water (UPW). UPW is used directly in the fabrication of semi-conductor chips and requires substantial additional and proprietary purification regardless of water source. The purpose of the Reuse Facility is to produce water appropriate for use as a source for further UPW treatment by Micron and as recycled water for other industrial users in the service area. Piping for the recycled water will be 316 stainless steel or plastic piping such as schedule 80 polyvinyl chloride (PVC) or high-density polyethylene (HDPE) due to corrosion concern with reverse osmosis (RO) permeate.

Micron has committed to the construction of two fabs within the OOWTP service area. As the only identified user to date, the treatment design is based on Micron's water quality and quantity needs, with the potential for expansion to additional industrial users as they are identified.

Micron's fabs are to be constructed in two phases, with Fabs 1 and 2 constructed under Phase 1 and Fabs 3 and 4 constructed under a future Phase 2. Micron's initial recycled water demand for UPW is anticipated to be 2 mgd and will increase to 8 mgd as the four fabs are built out. OOWWTP will supply Micron with up to 2 mgd of recycled water starting in March 2028. As noted above, the recycled water must meet water quality standards appropriate for UPW production, which are presumed sufficiently stringent to meet the needs of all other uses of recycled water by Micron and also presumed sufficient for future industrial users.

The long-term plan to meet Micron's full recycled water demand includes coordination between OOWWTP and the adjacent IWWTP. The goal is for OOWWTP to supply the recycled water needed for UPW production, while the IWWTP will provide water for cooling towers on Micron's campus. Due to the anticipated schedule for IWWTP startup, OOWWTP will initially provide the full 2 mgd required for both uses for Fab 1 Mod 1, which consists of 1 mgd for UPW production and 1 mgd for cooling tower use.

Micron's water demand will increase as additional fabs come online. Demand is anticipated to increase to 4 mgd by July 2029, consisting of 2 mgd for UPW production and 2 mgd for cooling tower use. If the IWWTP is operational by this time, it will provide the additional 2 mgd needed for cooling towers; otherwise, OOWWTP will continue to supply this volume. By May 2029, both Fabs 1 and 2 are anticipated to be operational, increasing the total recycled water demand to 4 mgd. To meet the full anticipated demand of 8 mgd when Fabs 3 and 4 come online, a separate analysis will be needed to determine if flow from nearby sewer service areas can be redirected to OOWWTP to meet the total demand from a single reuse facility if sanitary and commercial growth do not provide enough flow by that point. Micron has committed to construction of Fabs 1 and 2 under Phase 1 but has not provided an anticipated schedule for construction of Fabs 3 and 4 under Phase 2.

This project includes development of a Reuse Facility to provide 2 mgd of recycled water suitable for UPW production by March 2028, expanding to 4 mgd by February 2029. Physical space is reserved within the RO building layout for future expansion to 8 mgd should Micron proceed with constriction of Fabs 3 and 4. The actual volume supplied by OOWWTP will vary depending on the startup timing of the IWWTP and actual influent flow rates to OOWWTP. Recycled water will be conveyed to Micron's campus under the Recycled Water Pump Station and Force Main Project.

The water produced at the Reuse Facility is subject to water quality goals imposed by two entities: New York State DEC and Micron. There are no regulations governing water reuse in the State of New York. Nonetheless, DEC has accommodated reuse of municipal effluent in several SPDES permits, by defining a separate outfall within the permit to which water quality requirements for reuse are tied.

Based on meetings with DEC (November 22, 2024; January 22, 2025; April 1, 2023; April 23, 2025) it is likely that DEC will establish water quality targets for recycled water in this application that are less stringent than those imposed by the water quality goals provided by Micron.

The water quality goals for water to be used as a source of UPW production ("UPW source water") requested by Micron are listed in Table 1.13. Table 1.13 reflects the industry standard for municipal effluent used as a source water for UPW production established by the Singapore Public Utilities Board (PUB). NEWater program. Table 1.13 also includes one additional parameter not included in the NEWater standard, urea, for which Micron provided a stand-alone target of 0.005 mg/L. The water quality requirements for use in other industrial applications, such as cooling tower make-up have not been provided by Micron. Until informed otherwise, the project team assumes that the targets listed in Table 1.13 will be sufficient for all other uses of recycled water by Micron. Note that the treatment processes upstream of the reuse facility may meet DECs non-potable recycled water quality requirements.

Table 1.13 Requested Water Quality Targets for UPW Source Water (Provided by Micron)

Parameters	Unit	Value(1)
Escherichia coli (E. coli)	cfu/100mL	<1
Heterotrophic Plate Count	cfu/mL	<1
Color	Hazen	<5
Conductivity	µS/cm	<250
Chlorine, total	mg/L	<2
pH	Units	7.0 – 8.5
Total Dissolved Solids (TDS)	mg/L	<150
Turbidity	NTU	<5
Ammonia (as N)	mg/L	<1.0
Aluminum	mg/L	<0.1
Barium	mg/L	<0.1
Boron	mg/L	<0.5
Calcium	mg/L	<20
Chloride	mg/L	<20
Copper	mg/L	<0.05
Fluoride	mg/L	<0.5
Iron	mg/L	<0.04
Manganese	mg/L	<0.05
Nitrate (as N)	mg/L	<5
Sodium	mg/L	<20
Sulfate	mg/L	<5
Silica (as SiO2)	mg/L	<3
Strontium	mg/L	<0.1
Total Trihalomethanes Ratio(2)		<0.04
Total Organic Carbon (TOC)	mg/L	<0.5
Total Hardness (as $CaCO_3$)	mg/L	<50
Urea(3)	mg/L	<0.005
Zinc	mg/L	<0.1

Notes:
µS/cm – microsiemens per centimeter; cfu – colony forming units; cfu/mL – colony forming units per milliliter; $CaCO_3$ – calcium carbonate; N – nitrogen; NTU – Nephelometric Turbidity Units; TDS – total dissolved solids; TOC – total organic carbon.
(1) Values reflect water quality of Singapore's PUB NEWater quality.
(2) The total trihalomethanes ratio is the sum of the ratio of the concentration of each (chloroform, bromoform, dibromochloromethane, bromodichloromethane) to its respective guideline value (World Health Organization 2022. Guidelines for drinking water quality: Fourth edition incorporating the first and second addenda.
(3) The currently proposed advanced treatment process is not anticipated to provide significant urea removal. Effluent sampling data for urea, with an MRL of 0.005 mg/L or less, is required to determine whether additional treatment is needed.

SECTION 2 ALTERNATIVES ANALYSIS

2.1 Preliminary Treatment Alternatives

The purpose of preliminary treatment is to remove large inert solids such as rags and abrasive grit from the incoming raw wastewater to protect downstream processes and equipment and reduce maintenance and operational problems.

Given the plant's projected future flow, a new headworks is necessary to accommodate increased capacity, specifically for a peak hour flow of 38.38 mgd at buildout. The new headworks will incorporate fully automated and robust grit removal and screening systems, designed with the goal of improving performance and minimizing manual operations. This will include equipment that can handle the increased flow while maintaining operational efficiency. Downstream processes, such as MBR, may require fine screening to protect the membranes. For such processes, fine screens would be positioned downstream of the primary treatment for optimal efficiency. The design and equipment selection for the new headworks will prioritize robustness and ease of operation and maintenance (O&M), and the need for fine screening in downstream processes will not affect the overall headworks design.

2.1.1 Design Criteria

Table 2.1 summarizes the preliminary treatment design criteria adopted in the present analysis to determine preliminary treatment performance and capacity requirements under the projected flow and load conditions.

Table 2.1 Preliminary Treatment Design Criteria

Process/Parameter	Units	Value	Condition	Redundancy	Notes
Grit Removal					
Detention Time	minute	≥5	PHF	All units in service	Ten States Standards
Headworks Screening					
Coarse Screen Opening	inch	3/8	PHF	One unit out of service	
Fine Screen Opening for an MBR Alternative	mm	2	PHF	One unit out of service	Pretreatment required by membrane system suppliers

Notes:
PHF – peak hour flow.

2.1.2 Alternative 1: Coarse Screening and Grit Removal

For secondary treatment alternatives that do not require fine screening (Alternative 1) and those where fine screening is situated between the primary clarifiers and the MBRs (Alternative 2), the headworks will consist of mechanically cleaned coarse screens followed by vortex grit removal. Design criteria for coarse screening and grit removal facilities are provided in Table 2.2 and Table 2.3, respectively.

Table 2.2 Proposed Coarse Screening Facilities

Parameter	Value
Coarse Screens	
Type	Mechanical climber bar screen
Number of Units	2 +1 standby
Channel Width, feet	4
Downstream Water Depth, feet	3.8
Channel Depth, feet	7
Bar Spacing, inches	3/8
Unit Peak Capacity, mgd	19.2
Bypass Channel with Manual Bar Rack	
Channel Width, feet	6
Bar Spacing, inches	2
Peak Capacity, mgd	38.4
Coarse Screenings Handling	
Conveyance	Single sluice
Washer Compactor with Tipping Trough	1 + 1 standby

Table 2.3 Proposed Grit Removal Facilities

Parameter	Value
Grit Basins	
Type	Vortex, sloped bottom
Number of Units	2
Diameter, feet	18
Unit Peak Capacity, mgd	19.2

2.1.3 Alternative 2: Coarse Screening, Grit Removal, and Fine Screening

Secondary treatment Alternative 3 requires fine screening (2-millimeter [mm] perforated plate) to meet the standard membrane system supplier warranties and protect the membranes from potential damage. However, space, hydraulic, and constructability limitations may preclude adding fine screening after the existing primary clarifiers. In this instance, fine screening facilities may be located at the headworks. Coarse screening and grit removal facilities will be as described for Alternative 1. Fine screening facilities will be as described below.

2.2 Primary Treatment Alternatives

Primary treatment is the first major treatment process after preliminary treatment that redirects a portion of the influent load from liquid treatment to solids treatment. The only primary treatment alternative evaluated was centered in the expansion of the existing system rather than in the treatment technologies to be used.

2.2.1 Design Criteria

The present analysis adopted the design criteria summarized in Table 2.4.

Table 2.4 Primary Treatment Design Criteria

Process/Parameter	Units	Value	Condition	Redundancy	Notes
Alum Dose	mg/L	32	n/a	n/a	Average dose with 1 mgd intra-plant recycle flow (2021-2024).
TSS Removal	%	50	MMF	All in service	Median TSS removal in the north primary clarifiers, 2021-2024.
TSS Removal	%	55	AAF	All in service	Median TSS removal in the south primary clarifiers, 2021-2024.
Primary Solids TS Concentration	%	0.5	All		
Side Water Depth	feet	10.5	All	n/a	Match existing vertical dimension from weir crest to floor. Ten States Standard is a minimum of 10 feet.
Surface Overflow Rate	gpd/sq ft	≤1,000	AAF	All in service	Ten States Standard.
Surface Overflow Rate	gpd/sq ft	≤2,000	PHF	All in service	Ten States Standard.
Weir Loading Rate	gpd/lf	≤30,000	PHF	All in service	Ten States Standard.
Odor Control Ventilation Rate (each clarifier)	cfm	884		n/a	Area of effluent weir and effluent channel and minimum effluent water surface elevation based on 2015 record drawings at 20 ACPH.

Notes:
TS – total solids; cfm – cubic feet per minute; ACPH – air changes per hour.

2.2.2 Process Expansion

To meet the weir loading rate criteria in Table 2.4, a total of eight primary clarifiers would be required under the design condition. This would result in average and peak hour surface overflow rates of 430 gpd/sq ft and 1,350 gpd/sq ft, respectively, which are significantly lower than typical for primary clarifiers. Providing two new primary clarifiers for a total of six at the buildout condition would result in average and peak hour surface overflow rates of 580 gpd/sq ft and 1,800 gpd/sq ft, respectively. The resulting weir loading rate under peak hour flows (40,000 gpd/lf) is consistent with the recommended maxima in other design references (e.g., MOP8 and Metcalf and Eddy).

2.3 Secondary Treatment Alternatives

A range of secondary treatment technologies were screened as part of the 2021 FPFS (Appendix N) and Oak Orchard WWTP Facility Plan and Feasibility Study Site Selection Conceptual Treatment Approach Memorandum (GHD, 2022) (Appendix O). Based on the relative ranking of the alternatives, this screening advanced the following technologies to conceptual design and modeling:

- MBR.
- Conventional activated sludge with tertiary biologically active filter (CAS + BAF).
- HPO + BAF.

- HPO with tertiary moving bed biofilm reactor (HPO + MBBR).
- CAS + MBBR.

The 2021 facility plan completed conceptual design and modeling for the five secondary treatment technologies noted above for three flow and load scenarios. The current flow and load projections are generally comparable to the high flow and load alternatives evaluated in the 2021 facility plan. For those scenarios, MBR was the recommended secondary treatment technology. As such, MBR was advanced for the present evaluation and CAS + BAF, CAS + MBBR, HPO + BAF, and HPO + MBBR were not carried forward.

Five technologies were screened in addition to those advanced in the 2021 facility plan:

- CAS.
- Integrated Fixed-Film Activated Sludge (IFAS).
- HPO + MBR.
- Membrane Aerated Biofilm Reactor (MABR).
- Anaerobic Granular Sludge (AGS).

A summary of secondary treatment technologies which were considered and screened for OOWWTP are presented below in Table 2.5.

Table 2.5 Summary of Secondary Treatment Technology Screening

Technology	Carried Forward?	2021 Facility Plan Recommendation	Site Impact	Operational Complexity	Ability to Meet Treatment Goals(1)	Technology Maturity(1)
MBR	Yes	Advance	Medium	Low	Demonstrated	Mature
CAS + BAF	**No**	**Not Advanced**	Medium	Medium	Demonstrated	Mature
CAS + MBBR	**No**	**Not Advanced**	Medium	Medium	**Not demonstrated**	**Not Mature**
HPO + BAF	**No**	**Not Advanced**	Medium	Medium	**Not demonstrated**	**Not Mature**
HPO + MBBR	**No**	**Not Advanced**	Medium	Medium	**Not demonstrated**	**Not Mature**
CAS	Yes	n/a	High	Low	Demonstrated	Mature
IFAS	**No**	n/a	Medium	Low	Demonstrated	Mature
HPO + MBR	**No**	n/a	Medium	Low	**Not demonstrated**	**Not Mature**
MABR	**No**	n/a	Medium	Low	**Not demonstrated**	**Not Mature**
AGS	**No**	n/a	Low	Low	**Not demonstrated**	**Not Mature**

Notes:
(1) Technology attributes set in **bold** denoted those that precluded the technology from evaluation.

After all considerations, the team narrowed the options to three alternatives:

1. CAS with a new liquids campus and retrofit of existing HPO into a centralized solids campus.
2. MBR with a new liquids campus and retrofit of existing HPO into a centralized solids campus.
3. MBR with an addition and retrofit of the existing liquids campus with a new solids campus.

For all three selected alternatives, the incorporation of a regional biosolids campus where the secondary clarifiers are currently located was considered, as well as the incorporation of an advanced water treatment (AWT) on campus tentatively located at the current location of Lagoon 1.

2.3.1 Design Criteria

The process components were modeled using the following assumptions:

- **Temperature**: The models were developed with separate summer and winter temperature assumptions as follows:
  - **Winter**: A temperature of 10.7 degrees Celsius (°C) was assumed. This was calculated from the minimum 30-day average of the daily average calculated from the three influent temperature grab samples between November 1 and June 14 from 2021-01-01 through 2024-09-30. This temperature (11.20°C) was reduced by 0.5°C to account for the reduction in temperature due to aeration in activated sludge processes.
  - **Summer**: A temperature of 15.2°C was assumed. This was calculated from the minimum 30-day average of the daily average calculated from the three influent temperature grab samples between June 15 and October 31 from 2021-01-01 through 2024-09-30. This temperature (15.70°C) was reduced by 0.5°C to account for the reduction in temperature due to aeration in activated sludge processes.
- **Primary Clarifier Performance**: The primary clarifier TSS removal was set to 55 percent for the minimum month, and average annual model runs and to 50 percent for the maximum month model runs. These TSS removals were selected because they represent the median performance in the north and south primary clarifiers from 2021-01-01 through 2024-09-30. The modeled primary clarifier BOD removals for the maximum month and average annual model conditions were 25 percent and 29 percent, respectively.
- **Secondary Process Configuration**: The five-stage modified Bardenpho process is assumed for all three alternatives. The five-stage Bardenpho configuration enhances nutrient removal efficiency and improves the performance of downstream RO treatment, ultimately improving the quality of reuse water.
  - Importantly, the five-stage modified Bardenpho process is most suitable for facilities with sufficient influent carbon to support biological phosphorus removal and nitrogen removal. OOWWTP has a significant industrial contributor in its service area that discharges primarily soluble BOD and constitutes approximately 22 percent of the current average influent BOD load. Additionally, fermentation may be occurring in the collection system with the Davis Road pump station contributing approximately 82 percent of the influent flow in a forcemain that has a residence time of approximately 9.5 hours under average conditions. To achieve complete denitrification, an influent BOD to TKN ratio of at least four is typically recommended. The historical average influent BOD to TKN ratio is well above this threshold at 7.5. This ratio will be reduced with primary clarification; however, the primary effluent BOD to TKN ratio is expected to remain above 4. Assuming a BOD removal of 40 percent in the primary clarifiers, the primary effluent BOD to TKN ratio would be at least 4.4. Similarly, sufficient influent BOD is needed to drive biological phosphorus removal. A BOD to TP ratio of at least 25 is typically recommended for effective biological phosphorus removal. Assuming 40 percent BOD removal in the primary clarifiers, the average primary effluent BOD to TP ratio based on historical data would be 35.

Taken together, the influent has historically had sufficient carbon to drive biological nitrogen and phosphorus removal to the levels achievable with the five-stage modified Bardenpho process. It is recommended that process improvements be developed to allow for future carbon supplementation, including primary solids fermentation and supplemental carbon addition for post-anoxic denitrification, as part the BODR phase.

- **Secondary Process Redundancy**: This analysis assumes that a bioreactor can be taken out of service for maintenance during the summer period of June 16 through October 31. Additionally:
  - **Alternative 1**: Assumes that a secondary clarifier can be taken out of service during the summer period of June 16 through October 31 but not at the same time as the bioreactor.
  - **Alternatives 2 and 3**: Assumes that a membrane tank can be out of service at any time.
- **Aerobic SRT**: The aerobic SRT was set 7.3 days for the summer simulations and 10.2 days for the winter simulations. This SRT was selected by applying a nitrification safety factor of two onto the minimum SRT required for the selected minimum month summer and winter temperatures.
- **Maximum Month MLSS**: The allowable maximum month MLSS concentration was determined as follows for the three different alternatives:
  - **Alternative 1**: For the CAS alternative, the maximum allowable MLSS concentrations was determined through a state point analysis (SPA), coupling the projected peak day flow with the maximum allowable MLSS concentrations, assuming a sludge volume index (SVI) of 150 mL/g.
  - **Alternatives 2 and 3**: For the MBR alternatives, the maximum allowable MLSS concentration in the membrane tank was assumed to be 10,000 mg/L under maximum week conditions.
- **Incorporation of Recycle Flows from the AWT Facility**: These alternatives were evaluated assuming that an AWT facility will be producing 4 mgd of reuse water for Micron at startup and 8 mgd of reuse by buildout. To protect the secondary treatment process from the high TDS concentrations of the RO reject, this recycle stream will not be returned to the secondary treatment process. For Alternative 1 an ultrafiltration (UF) facility will also be required. It is assumed that the UF will operate at 90 percent recovery and that this recycle flow will be returned upstream of primary treatment. A recovery rate of 80 percent was assumed for the RO unit in the AWT facility to determine the total secondary effluent flow that would be directed to the AWT facility to achieve the reuse water targets.
- **Solids Processing**: It was assumed that the solids generated at the OOWWTP would be treated at the regional biosolids campus to be constructed at the OOWWTP site, however biosolids from the upgraded OOWWTP may be initially sent to the Metro plant if the new biosolids campus is constructed separately from the upgrade. If the full biosolids upgrade is delayed, separate thickening of PSL and WAS will maintain the current truck volume sent to the Metro WWTP through at least the five-year growth projection. WEP is evaluating upgrades required at Metro if additional solids loading exceeds current OOWWTP truck volumes. The specific design criteria adopted for solids treatment in each of the alternatives are as follows:
  - Primary solids would be thickened to 5 percent TS with a capture of 95 percent.
  - WAS would be thickened to 5 percent TS with a capture of 95 percent.
  - Thickened solids would be anaerobic digested with a 60 percent volatile solids (VS) reduction.
  - Between 7,300 (minimum month) to 13,600 (maximum month) gpd of thickened WAS at a TS concentration of approximately 5 percent from the BWPCP will be hauled to OOWWTP.

- A FOG input of 40,000 gpd was assumed for the high-strength waste. This flow was selected as it constituted approximately 35 percent of the combined VS load to the digesters, which has been demonstrated as a typical upper limit for stable operation.
- Digested solids would be dewatered to 20 percent TS with a capture of 95 percent.
- Return streams from thickening and dewatering would be returned upstream of primary treatment.

2.3.3 Alternative 1: CAS

Conventional biological nutrient removal (BNR) systems generally consist of bioreactors for biological treatment and secondary clarifiers for solids-liquids separation. The bioreactors include internal zones separated by baffles, which are equipped to function either as anaerobic, anoxic, or aerated zones. Internal recycles and wastewater feed configurations in the bioreactors are incorporated for specific objectives (e.g., nitrate return, step feed).

Figure 2.1 depicts the simplified process flow diagram for the CAS alternative. Raw wastewater passes through screening and grit removal before entering secondary treatment. Secondary treatment consists of bioreactors and secondary clarifiers. In this system, suspended bacterial growth in the bioreactors is coupled with solids-liquid separation by gravity in the secondary clarifiers. Secondary effluent is split between disinfection and the recycled water facility. As discussed in Section 2.1.4, this secondary treatment alternative will require UF in the recycled water facility to remove suspended solids from the secondary effluent before filtration with RO. Primary solids and WAS will be pumped to the regional biosolids facility for treatment. Recycle streams from the regional biosolids facility and the reject stream from the UF process at the recycled water facility will be returned to the headworks of the OOWWTP for treatment.

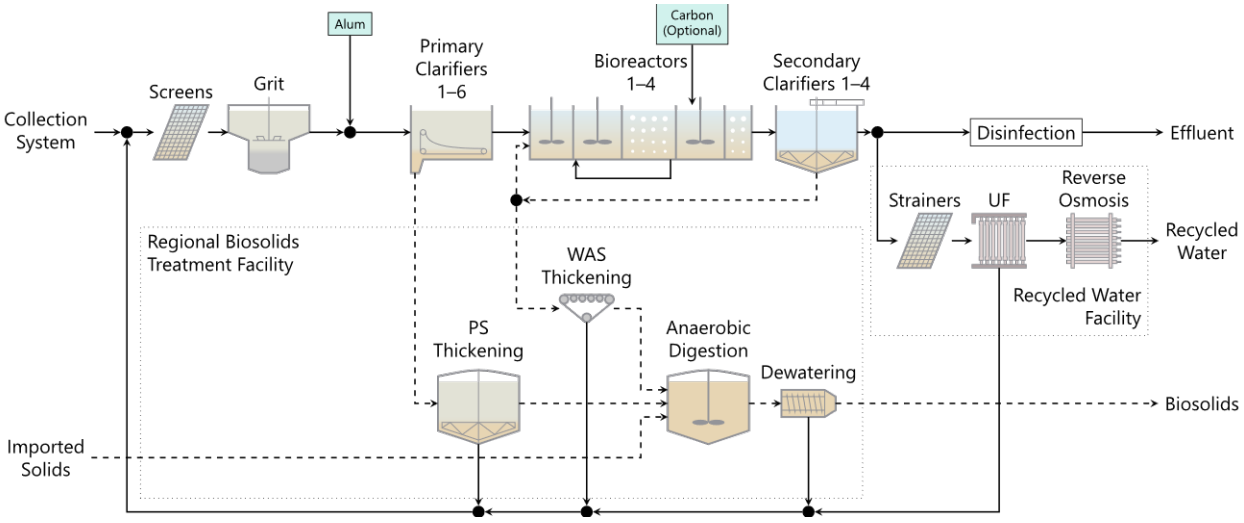


Figure 2.1 Alternative 1 Process Flow Diagram

2.3.4 Alternative 2: New MBR

MBR systems consist of bioreactors for biological treatment and membrane filtration for solids-liquid separation. The main difference between an MBR and CAS lies in the solids-liquid separation technique. In an MBR, solids are filtered through a membrane system. Since MBRs do not depend on solids settling, they can operate at higher MLSS concentrations and achieve the same treatment capacity as CAS systems with smaller bioreactor volumes.

The overall process flow schematic for the new MBR alternative is presented in Figure 2.2. Like Alternative 1, raw wastewater undergoes screening followed by grit removal, upstream of primary treatment. Fine screens (opening less than 2 mm) are required to protect the membranes and reduce fouling. The specific location of fine screens, either before or after primary treatment, will be further evaluated during the BODR phase. Secondary treatment includes the bioreactors and membrane filtration. Permeate is split between disinfection (detailed in Section 2.1.5) and the recycled water facility. This secondary treatment alternative will not require UF in the recycled water facility as the membrane filters in the MBR provide sufficient pretreatment for RO. As with Alternative 1, primary solids and WAS will be pumped to the regional biosolids facility for treatment. Recycle streams from the regional biosolids facility will be returned to the headworks of the OOWWTP for treatment.

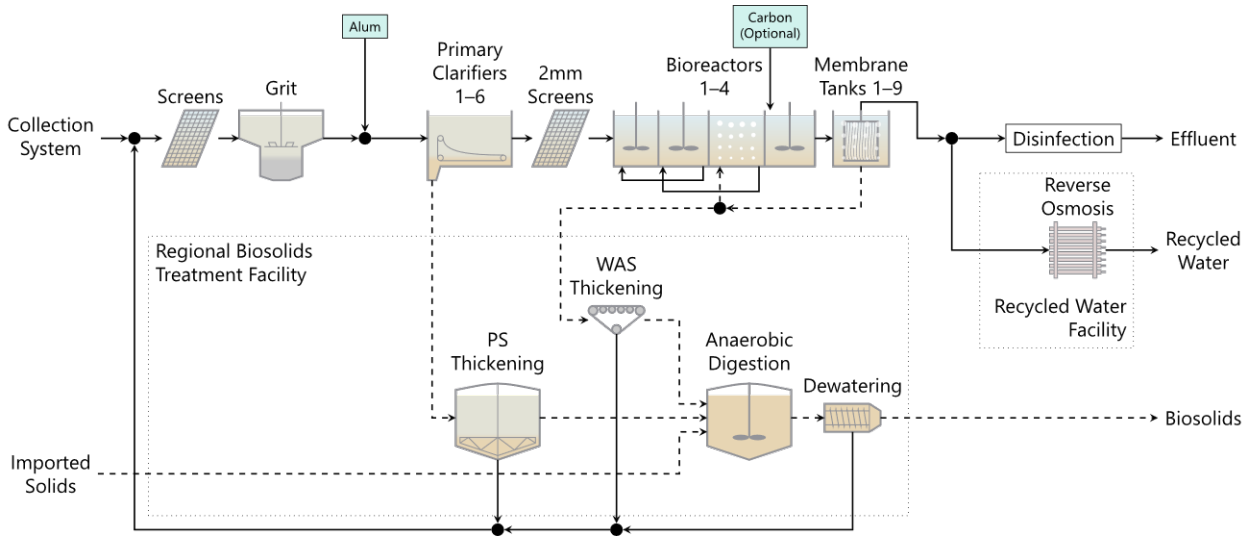


Figure 2.2 Alternative 2 Process Flow Diagram

2.3.5 Alternative 3: MBR Retrofit

The 2021 FPFS (Appendix N) and Oak Orchard WWTP Facility Plan and Feasibility Study Site Selection Conceptual Treatment Approach Memorandum (GHD, 2022) (Appendix O) proposed retrofitting the existing HPO basins to leverage existing infrastructure. This analysis repurposed the HPO basins as aerobic volume; however, the shallow SWD would make achieving efficient oxygen transfer difficult. For the present MBR retrofit alternative, the existing HPO basins would be converted into anaerobic zones. New bioreactors would be constructed to provide the pre-anoxic, aerobic, and post-anoxic zones necessary for the five-stage Bardenpho process. The simplified process flow schematic for the MBR retrofit alternative is shown in Figure 2.3.

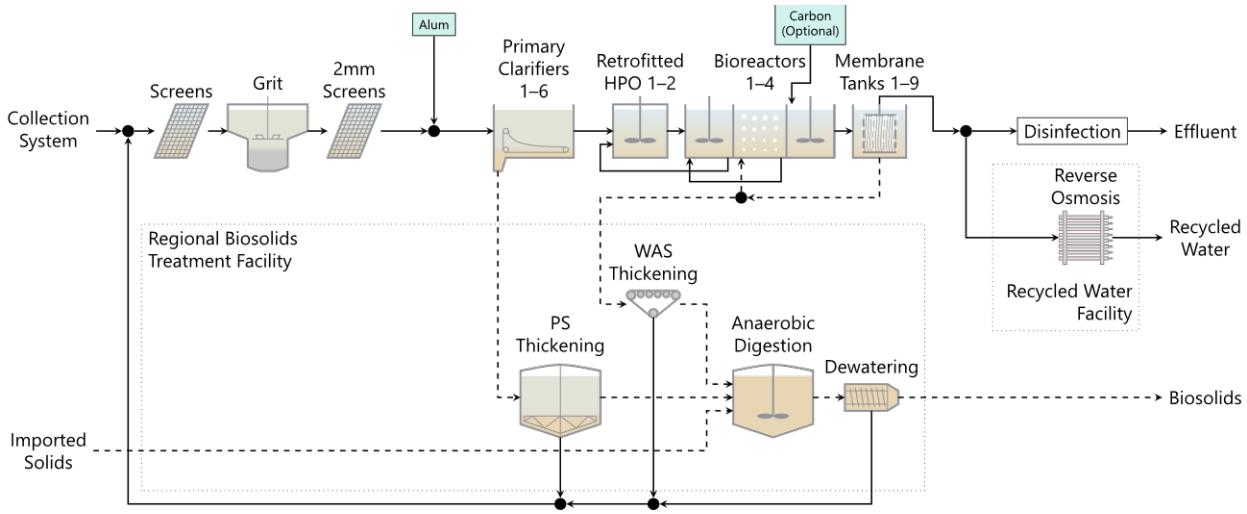


Figure 2.3 Alternative 3 Process Flow Diagram

While conceptually similar to the new MBR alternative, retrofitting the existing HPO basins would require more careful consideration of construction sequencing given that these basins are vital to the current treatment process. Given the need to maintain treatment, a phased construction and integration approach would likely be required which may significantly extend the construction timeline.

2.4 Disinfection Alternatives

To accommodate future flows, the disinfection system at OOWWTP could be expanded or replaced. The alternatives evaluated include expansion of the existing chlorination system or a new UV light disinfection system for treating up to 36.9 mgd of effluent from the OOWWTP. The MBR alternatives will provide an opportunity for more efficient disinfection with potential lower doses for chlorine, due to the better effluent as compared to BNR. The UV system would be open-channel for the BNR alternative or closed-vessel for the MBR alternative. The differences between these UV alternatives are discussed below. The disinfection alternatives need to satisfy current and possible future SPDES permit limits and meet selected evaluation criteria. The evaluation criteria used to compare the disinfection alternatives included disinfection effectiveness, reliability, disinfection byproduct (DBP) formation, toxicity, post treatment requirements, monitoring, and regulatory acceptance. It should be noted that disinfection is only required when the reuse facility is offline or for flow that bypasses the reuse facility.

2.4.1 Alternative 1 and 2: UV Disinfection

UV disinfection has become increasingly more common at wastewater plants since it does not produce DBPs nor does it exhibit toxicity to aquatic life. Another benefit is that it eliminates the need to generate, handle, transport, or store large quantities of toxic/corrosive chemicals. The UV systems evaluated include open-channel and closed-vessel low-pressure, high-output (LPHO) systems. The choice between open-channel and closed-vessel will depend on the upstream treatment processes. Open-channel UV systems are recommended for BNR effluent and closed-vessel UV systems are recommended for MBR. Open-channel UV and closed-vessel UV will be identified as Alternative 1 and 2, respectively. The discussion of these alternatives is combined in this section due to the similarities between the technologies and the sizing approach.

UV is effective at inactivating bacteria, viruses, viral indicators, and protozoa. UV light is the region of the electromagnetic spectrum that lies between visible light and x-rays from 100 to 400 nanometers (nm). Within that range there are four regions: vacuum UV (100 to 200 nm), UV-C (200 to 280 nm), UV-B (280 to 315 nm), and UV-A (315 to 400 nm). The germicidal wavelength range is from 220 to 320 nm. In this range electromagnetic radiation damages proteins and nucleic acids of the pathogens. The variations in proteins and nucleic acids between microorganisms impact the UV dose needed for the target inactivation. For this project the dose response of fecal coliform controls the sizing and design of the UV system.

Water quality parameters that can impact disinfection effectiveness include ultraviolet transmittance (UVT) and the size and number of particles (TSS). The concentration of dissolved solids and other parameters may contribute to fouling of the quartz sleeves surrounding the lamps thereby decreasing the UV output.

2.4.1.1 Design Criteria

All of the UV systems being considered for this project have gone through third party validation testing and all are capable of complying with the design criteria for this project. Table 2.6 provides a summary of the Alternative 1 Open-Channel UV design criteria for BNR effluent: flow rates, UVT, TSS, MS2 dose, redundancy, and permit limits.

Table 2.6 Alternative 1

Description	Design Criteria
Design Parameter	
Peak Design Flow Rate (mgd)	36.9
AADF Rate (mgd)	9.3
Design UVT (percent)	60
Average UVT (percent)	65
TSS (mg/L)	20
MS2 Dose (mJ/cm2)(1)	30.0
Redundancy	N+1 Channels at AADF
Permit Limit	
Fecal Coliform (based on a 30-day geometric mean)	200 CFU/100 mL
Fecal Coliform (based on a 7-day geometric mean)	400 CFU/100 mL

Notes:
AADF – annual average day flow; IUVA – International Ultraviolet Association; mJ – megajoule.
(1) The MS2 dose is based on the IUVA Uniform Protocol.

Table 2.7 provides a summary of the Alternative 2 UV design criteria for MBR effluent: flow rates, UVT, TSS, MS2 dose, redundancy, and permit limits.

Table 2.7 Alternative 2

Description	Design Criteria
Design Parameter	
Peak Design Flow Rate (mgd)	36.9
AADF Rate (mgd)	9.3
Design UVT (percent)	65
Average UVT (percent)	70
TSS (mg/L)	<5
MS2 Dose (mJ/cm2)(1)	20.0
Redundancy	N+1 Trains at AADF
Permit Limit	
Fecal Coliform (based on a 30-day geometric mean)	200 CFU/100 mL
Fecal Coliform (based on a 7-day geometric mean)	400 CFU/100 mL

Notes:
(1) The MS2 dose is based on the 2012 National Water Research Institute (NWRI) UV Guidelines with the confidence ratio (CR) set to 1.00.

2.4.2 Alternative 3: Existing Process Expansion

This alternative consists of expanding the existing sodium hypochlorite disinfection system and the dechlorination system. A condition assessment of the existing CCTs and sodium hypochlorite chemical storage and feed systems should be performed during the BODR phase if this alternative is carried forward.

2.4.2.1 Design Criteria

Expansion of the existing disinfection system would require a new CCT approximately half the size of the existing CCT. This would provide OOWWTP three CCT basins. It is not anticipated the dechlorination system would need to be expanded due to improvement of water quality from the secondary process upgrade and the resulting reduction in chlorine dose required and thus a reduction in dechlorination. It is important to note that all existing disinfection systems and ancillary components should undergo a condition assessment to confirm the true scope of this alternative.

2.4.2.2 Effectiveness and Reliability

Chlorine disinfection is a proven and widely used disinfectant for wastewater. Chlorination can be achieved through the use of free chlorine or combined chlorine (chloramines). When chlorine is added to wastewater containing ammonia, chloramines are formed. Chloramine species include monochloramine, dichloramine, and trichloramine. The distribution of these chloramine species is dependent on the water pH and temperature, contact time, and chlorine dose. Under typical wastewater conditions monochloramine and dichloramine are mainly the species that are present.

To implement free chlorine disinfection breakpoint chlorination is practiced maintaining a free chlorine residual and improve disinfection effectiveness. To achieve breakpoint chlorination chlorine is added to consume the sources of chlorine demand. Sources of chlorine demand can include ammonia, organic

nitrogen, organic matter, etc. Depending on the water quality using breakpoint chlorination may form unacceptable DBPs.

Chlorination is controlled as a function of CT (chlorine residual multiplied by the contact time). Depending on the type of chlorination that is implemented the residual will be free chlorine or total chlorine (combined chlorine-chloramines). Free chlorine is effective at low CTs whereas chloramines require high CTs. For chlorine disinfection, contact time is achieved in baffled basins or pipelines.

Chlorine is a strong oxidant that reacts with cellular material to inactivate bacteria and viruses. Free chlorine is very effective and reliable at inactivating bacteria, viruses, and viral indicators (coliphages). However, it is not as effective at inactivating *Giardia and Cryptosporidium*.

If the wastewater contains ammonia the chlorine will react to form chloramines. Chloramines can be a reliable disinfectant for bacteria but are not as effective at disinfecting other types of organisms (e.g., viruses). Additionally, chloramines require much longer contact times than free chlorine. It is possible that viral indicators could potentially be included in a future discharge permit.

Secondary water quality has a large impact on chlorine demand and disinfection efficacy. Water quality parameters that affect chlorine speciation and disinfection effectiveness include particles, pH, temperature, ammonia, and organic nitrogen.

Particles can shield microorganisms and increase chlorine demand. The pH impacts the inactivation efficiency of free chlorine as well as the efficacy of chloramination by altering the chloramine speciation. The ammonia concentration increases the chlorine demand and the formation of chloramines.

2.5 Biosolids Facility Alternatives

The new OOWWTP regional biosolids facility will be designed to produce Class A biosolids. Mesophilic digestion is very well established and produces Class B biosolids per the 40 CFR Part 503 requirements. While thermophilic digestion, in some configurations, can produce Class A biosolids and has higher reaction rates than mesophilic digestion, it is more complex, requires more energy to operate, and would be redundant with downstream drying. Thermal hydrolysis process (THP) is not recommended for the OOWWTP for similar reasons. The Cambi THP utilizes pressurized steam and heat to lyse cells through a batch process that includes three reactor stages. Parallel trains of reactors can be used to make the process continuous. The ultimate dewatered Class A biosolids can be cured or mixed with mulch and soil to produce an attractive soil amendment. However, the process requires sludge screening, pre-dewatering, steam boilers, post-dewatering, and a series of cake pumps and dilution systems, all of which add significant complexity to the process. Furthermore, mesophilic digestion, thermophilic digestion and THP may transform some per-and polyfluoroalkyl substances (PFAS) to other PFAS, but they do not destroy PFAS. The proposed biosolids process will reduce overall quantity of material and set the plant up for future advanced thermal processes like gasification or pyrolysis which may be required for PFAS destruction in the future. As noted in Figure 2.4, space is allocated for future biosolids processing if needed for PFAS destruction.

The potential for regulatory PFAS limits in biosolids may necessitate certain advanced thermal processes like pyrolysis or gasification downstream of dewatering, and drying is a necessary part of those processes. Drying produces Class A material and significantly reduces the quantity of material requiring management. Hence, including drying enables the WEP to produced Class A biosolids, reduce biosolids quantity, and set itself up for those potential regulatory changes and associated thermal processes,

making the production of Class A biosolids from digestion redundant. A solids treatment train that comprises mesophilic digestion to produce Class B biosolids that are then dewatered and dried to produce Class A biosolids is well-established, familiar to WEP, and relatively easy to operate and maintain.

Treatment technology alternatives for sludge screening, thickening, digester mixing, digester cover, digester and receiving station heat exchangers, dewatering, polymer, and drying processes were all considered and detailed below.

The following solids treatment technology alternatives were evaluated against each other for their respective processes:

- Sludge screening:
  - Pressurized Inline.
  - Step Screen.
- Thickening:
  - Gravity Belt.
  - Rotary Drum.
- Digester Mixing:
  - Pump Mixing.
  - Gas Mixing.
  - Submersible Mixer.
  - Linear Motion Mixer.
  - Draft Tube Mixer.
- Digester Cover:
  - Fixed Steel.
  - Concrete.
  - Floating.
  - Membrane.
- Digester and Receiving Station Heat Exchangers:
  - Tubular.
  - Spiral.
- Dewatering:
  - Belt Filter Press.
  - Centrifuge.
  - Screw Press.
- Polymer:
  - Emulsion.
  - Dry.
- Drying:
  - Belt Dryer.
  - Rotary Drum Dryer.
  - Paddle Dryer.

Where multiple viable technologies were identified, the technologies were rated and scored based on the established weighting, and the technologies and processes that were selected are presented in Table 2.8. The associated process flow diagram is presented in Figure 2.4.

Table 2.8 Recommended for Solids Treatment Processes and Technologies

Process	Technology	Reasons
Sludge Screening	Pressurized Inline Sludge Screening	More efficient at debris removal, take up less space, proven, and enable adaptation to processes required for changing regulations compared to alternatives.
Primary Sludge Thickening	Gravity Thickening	Familiar technology to County staff; most efficient technology for primary solids thickening. May be possible to reuse existing gravity thickeners if condition and location allow it within the constraints and overall layout of the full treatment process.
WAS Thickening	Gravity Belt Thickener	Familiar technology to County staff; simple to operate and provides the best thickener performance relative to thickened sludge concentration and polymer consumption.
Digestion/Stabilization	Mesophilic Anaerobic Digestion	Stable, well-known process that offers Class B biosolids product and produces gas for beneficial use.
Digester Mixing	Mixing Pumps	Digester mixing pumps are a common and reliable technology that provides good mixing.
Dewatering	Centrifuge	Produces drier cake than screw press and belt filter presses; sets up the plant best for drying and subsequent advanced thermal treatment if needed.
Class A Biosolids Treatment	Biosolids Belt Dryer	Familiar technology to County staff can be customized to produce a medium or high quality Class A product depending on desired end use; sets up plant for advanced thermal treatment if needed.
PFAS Destruction	Pyrolysis	PFAS destruction technologies are still being analyzed, but currently the pyrolysis process has the most systems constructed though not necessarily operational.
Solids Receiving Facilities	n/a	Solids receiving facilities are recommended to provide dedicated storage for each feedstock type (high strength waste or municipal solids) and necessary storage time to dampen the impact of these variable feedstock streams on the process.
Biogas Utilization	Process Heating/Fueling	With a dryer and anaerobic digestion, the biogas produced onsite will be needed internally to heat the digesters and fuel the dryers. A biogas treatment system is included in the recommendation to condition the gas ahead of the dryer/ boilers. If sufficient funding becomes available for a different use of the biogas (cogeneration, RNG) that changes the economic evaluation, biogas could be utilized for those other purposes with the addition of necessary infrastructure.
Sludge Pumping (Positive Displacement)	Rotary Lobe; Progressing Cavity in Difficult Applications	Rotary Lobe pumps are preferred by County staff. Progressing cavity pumps are recommended in thickened WAS and thickened primary sludge applications.

Notes:
RNG – renewable natural gas.

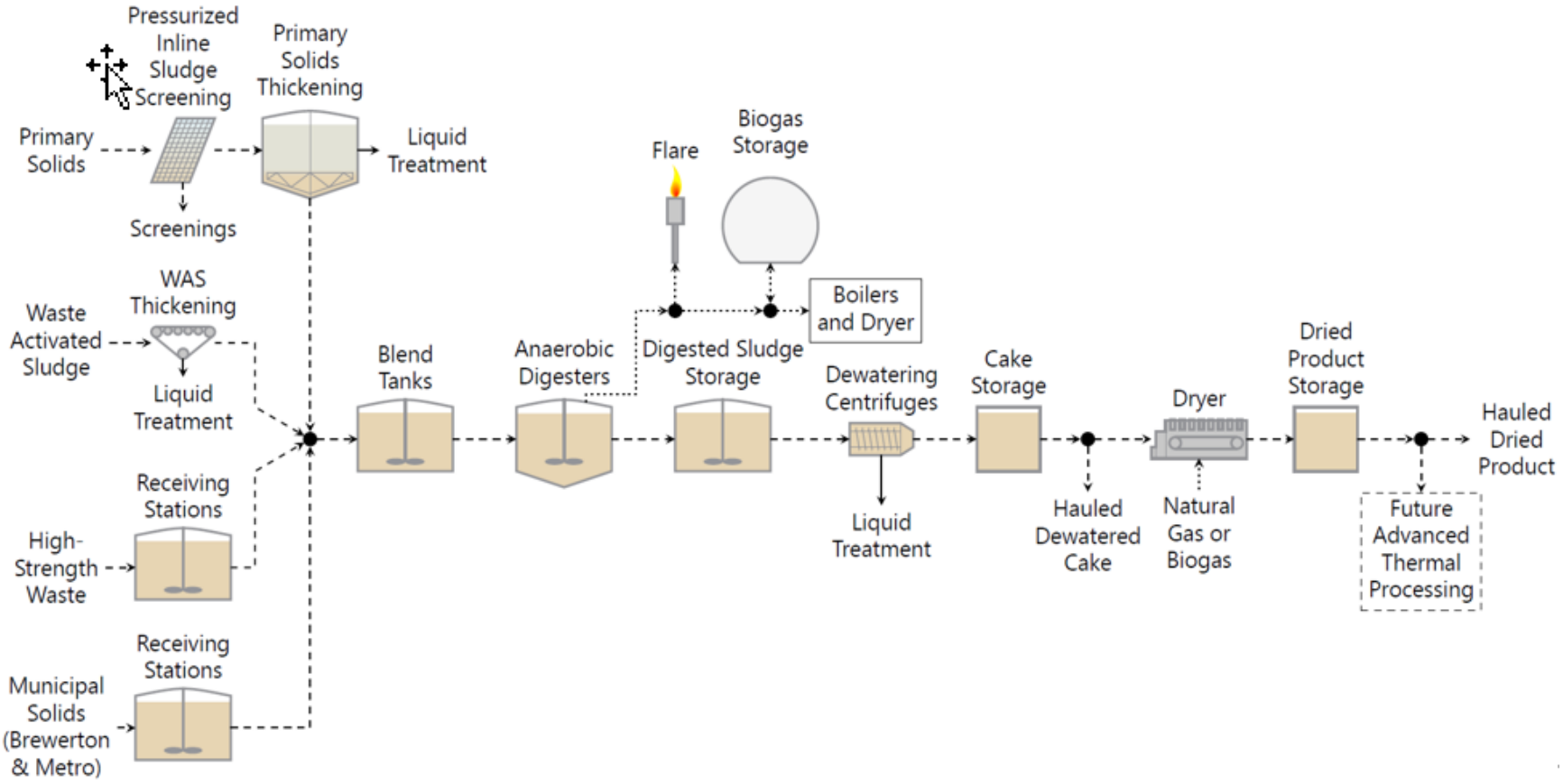


Figure 2.4 Process Flow Diagram for Recommended Processes

2.6 Reuse Upgrade Alternatives

The alternatives evaluated for reuse differ according to the two potential source water qualities provided to the reuse treatment train, which are BNR effluent, which would require pre-treatment with UF, or MBR effluent, which can be sent directly to an RO system. BNR and MBR are the two wastewater treatment alternatives as described in Section 2.3 above.

The process descriptions presented below are common for both alternatives. Both alternatives are in compliance with the United States Environmental Protection Agency's (USEPA's) 2012 Guidelines for Water Reuse. A summary of the treatment processes is contained in Table 2.9.

Table 2.9 Treatment Process Descriptions and Requirements

Process	Description
UF	▪ Reduces turbidity in filtrate. ▪ Removes pathogens via size exclusion through membranes. ▪ Provides necessary pretreatment upstream of RO and UV.
RO	▪ Reduces TOC to meet water quality requirement <0.5 mg/L. ▪ Reduces TDS to meet water quality requirement <150 mg/L. ▪ Decreases level of all chemicals with high molecular weights and charged chemicals with low molecular weights. ▪ Removes pathogens via size exclusion. ▪ Effectively removes many contaminants of emerging concern.
UV	▪ Provides pathogen disinfection to meet water quality requirements for *Escherichia coli* and Heterotrophic bacteria.
Stabilization	▪ Provides corrosion control. ▪ Needed for water treated by RO.
Chloramination	▪ Provides residual to reduce biofilms in the distribution system.

2.6.1 Alternative 1: Biological Nutrient Removal

This alternative assumes that a BNR process will be constructed at OOWWTP. BNR effluent will flow to a UF feed tank for equalization and storage. From the UF feed tank the BNR effluent will flow through automatic backwashing strainers as pretreatment to protect the membranes from particulate matter that can damage the membrane fibers. After filtration the UF membrane filtrate will flow to a UF filtrate/RO feed tank. The UF filtrate/RO feed tank will provide a backwash supply for the UF system and feed flow for the RO system. The RO permeate will be disinfected with UV light. UV effluent will then be stabilized and flow to the recycled water pump station. Chloramines will be added after stabilization to provide a residual in the distribution system. Whether a recycled water storage tank will be needed prior to the pump station will be determined during the BODR phase. The process flow diagram for Alternative 1 is presented in Figure 2.5.

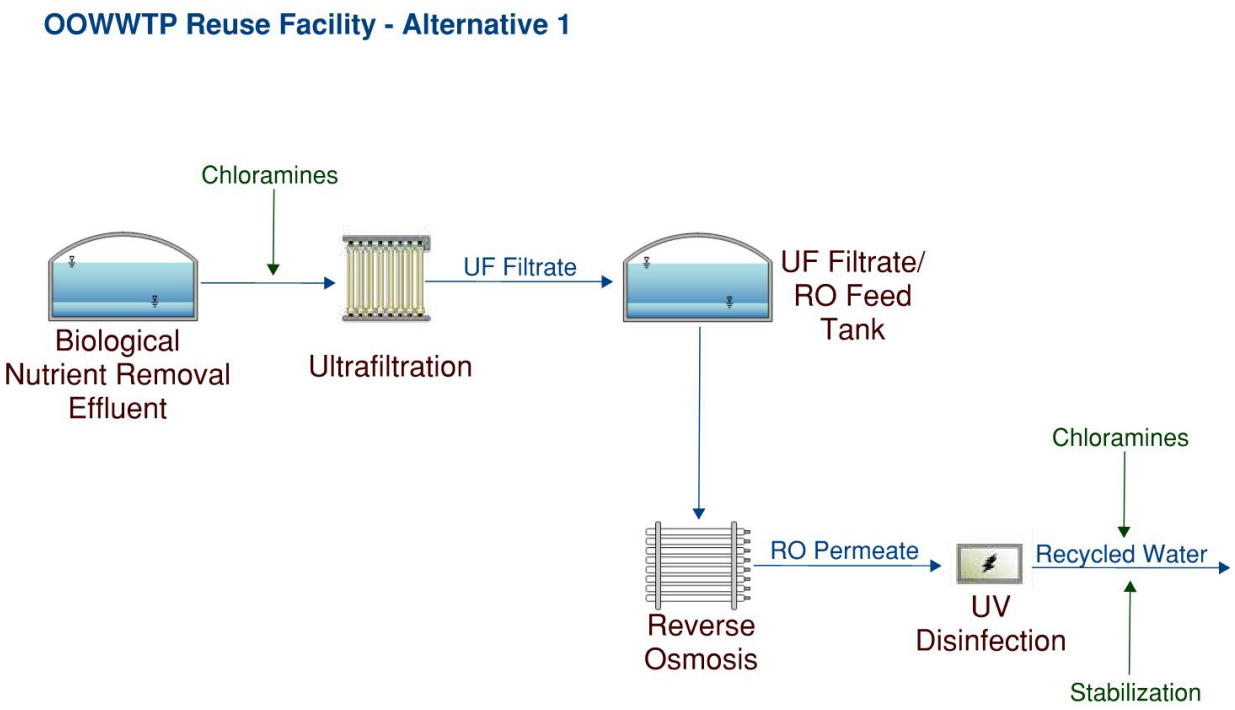


Figure 2.5 Alternative 1 Reuse Upgrade Process Flow Diagram

2.6.2 Alternative 2: Membrane Bioreactors

This alternative assumes that an MBR will be constructed at OOWWTP. UF will not be needed as the MBR will provide membrane filtration. MBR effluent will flow to a RO feed tank for equalization and storage. From the RO feed tank the MBR effluent will flow through cartridge filters as pretreatment to protect the membranes from particulate matter that can damage the membrane fibers. The RO permeate will be disinfected with UV light. UV effluent will then be stabilized and flow to the reuse pump station. Chloramines will be added after stabilization to provide a residual in the distribution system. Whether a reuse storage tank will be needed prior to the pump station will be determined during the BODR phase. The process flow diagram for Alternative 2 is presented in Figure 2.6.

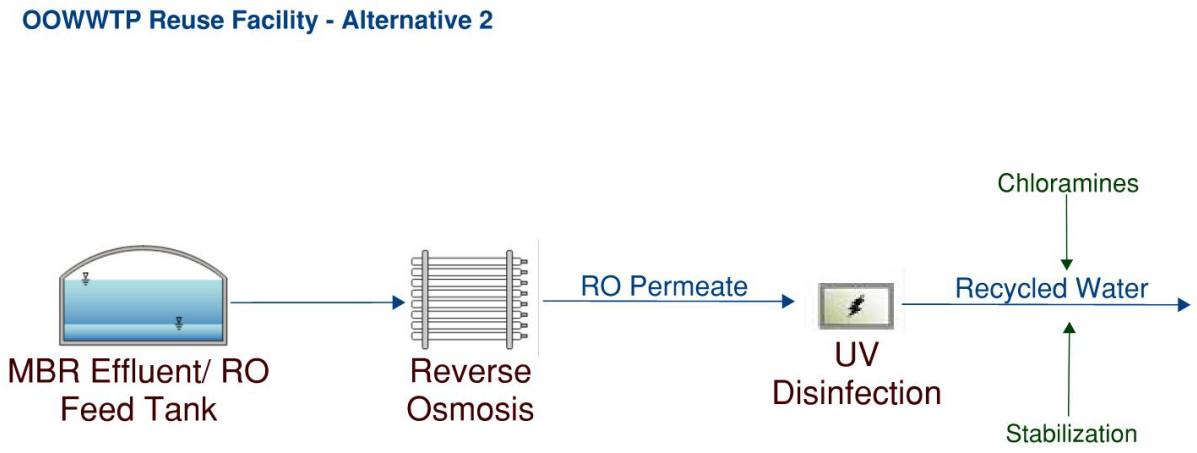


Figure 2.6 Alternative 2 Reuse Upgrade Process Flow Diagram

2.7 Recycled Water Pump Station Alternatives

Three pump types were considered for the recycled water pump station: vertical turbine, dry-pit submersible pumps, and horizontal split case pumps. It should be noted that wet-pit submersible pumps were initially considered for this project due to their reliability but were not chosen for evaluation due to water quality concerns for UPW, and access for maintenance and repairs would require complete removal of the pump from the wet well.

2.7.1 Alternative 1 – Vertical Turbine Pumps

Alternative 1 includes the installation of vertical turbine pumps (VTPs) within the PS. VTPs operate by using centrifugal force to transport liquids vertically through the use of internal impellers. VTPs consist of a bowl assembly submerged in the liquid and a connected vertical hollow-shaft motor typically mounted above the ground floor within the pump station.

For this application, we anticipate a canned enclosure to be installed around the VTPs to facilitate pressurized flow directly from the storage tanks. This system will consist of a metallic can structure buried beneath the pump station, which surrounds the bowl to maintain pressurized flow. This configuration will maintain the pressure provided by the tanks, which will be utilized by the pumping system.

2.7.2 Alternative 2 – Dry-Pit Submersible Pumps

Alternative 2 includes the installation of dry-pit submersible pumps within the PS. Dry-pit submersible pumps consist of a single sealed assembly containing all components of the pump and motor. These pumps are typically installed within a dry-well pit adjacent to the wet well in a PS. However, the pumps are waterproof and can handle full submersion if the dry pit were to flood.

2.7.3 Alternative 3 – Horizontal Split Case Pumps

Alternative 3 includes the installation of split case pumps within the PS. Split case pumps contain two casing chambers that handle discharge and suction separately, while fully enclosing the impeller. These

pumps are installed on a concrete slab located on the ground floor of the PS. For this evaluation, horizontal split case pumps are being considered as their configuration will allow for the easiest access to components.

2.8 MOPO Project Alternatives

Interim capacity is needed to meet the treatment objectives and program goals when Micron construction and blowdown wastewater are generated and increased residential and commercial flows are sent to OOWTP for treatment. Two general approaches were considered to provide interim capacity through a MOPO project:

1. Build a portion of the secondary treatment upgrades early.
2. Build temporary additional secondary treatment facilities.

Alternatives were developed for these two approaches and evaluated relative to the following goals:

- Allow for rapid construction for early operation prior to 2028.
- Minimize initial capital investment and early cashflow needs.
- Reuse as much of the temporary infrastructure as possible as part of long-term upgrades.
- Optimize constructability and logistics with the future parallel IWWTP construction and OOWWTP upgrade projects.

2.8.1 Alternative 1 – Build a Portion of the Secondary Treatment Upgrades Early

Alternative 1 was developed to leverage infrastructure that would otherwise be constructed as part of the OOWWTP upgrade project. This approach identified early construction and operation of select facilities by 2028 that could be used to provide additional capacity while the remainder of the project was still being constructed. Potential early completion elements were identified based on the new MBR secondary treatment facility.

Two major secondary treatment elements were identified for potential early construction and operation. These are:

1. Bioreactors.
2. Membrane Solids Separation Building.

2.8.1.1 Fast Track Bioreactor Construction

Additional secondary treatment capacity could be achieved by constructing one or more bioreactors to operate in parallel with the existing HPO system. Depending upon the requirement for year-round nitrification either two or four new bioreactors would be required early. The evaluated alternative assumed four new bioreactors, bioreactor splitter box, and blower building. Interfacing these bioreactors with the existing HPO systems would require the following connections:

- Primary effluent conveyed from the primary clarifiers to the bioreactor splitter box. Modifications to the existing primary effluent channels and construction of a primary effluent pipe are planned for the final upgrade. However, these improvements assume the HPO basins will be decommissioned.

Operating the HPO basins and the bioreactors would require flow to be split between the two parallel processes.

- Mixed liquor will need to be conveyed from the new bioreactors to the existing secondary clarifier influent channels. This would require temporary piping and pumping.
- RAS would need to be conveyed from the existing secondary clarifiers to the new bioreactors. This would require temporary piping and pumping to draw RAS from the recycle pits on the north and south secondary clarifiers.
- Temporary aeration systems installed in the unaerated zones of the bioreactors.

Table 2.10 summarizes the average MLSS concentrations in all bioreactors (new and existing HPO) required for two or four new basins. As shown, the fast-tracked construction of four bioreactors is required for year-round nitrification while maintaining MLSS concentration below WEPs maximum of 5,000 mg/L to 5,500 mg/L.

Although the operating MLSS conditions of the bioreactors are acceptable, the ability to construct, startup and commission the required facilities by 2028 is challenging. In addition, operational access to the new aeration basins and blower building with extensive construction adjacent to and surrounding the new facilities will be difficult. As such, this alternative is considered largely infeasible.

Table 2.10 MLSS Concentration with Additional Fast-Tracked Bioreactor Construction

Number of Bioreactors Fast-Tracked	MLSS Concentration with Seasonal Nitrification (mg/L)(1)	MLSS Concentration with Year-Round Nitrification (mg/L)(1)
2	*5,100*	**6,900**
4	3,300	4,400

Notes:
(1) Values set in **bold** exceed WEPs maximum MLSS operating criterion. Values set in *blue italic* are at the maximum operating criterion.

2.8.1.2 Fast Track Membrane Facility Construction

Additional secondary treatment capacity could be achieved by constructing the membrane facility to provide additional solids separation. Interfacing the membranes with the existing HPO reactors and secondary clarifiers would require the following:

- Primary effluent conveyed from the primary clarifiers to fine screening. Modifications to the existing primary effluent channels and construction of a primary effluent pipe are planned for the final upgrade.
- Fine screening of the primary effluent to protect the membranes. Given the final location of the fine screening facilities, this would require temporary pumping of fine screened primary effluent back to the HPO basins.
- Temporary piping and pumping to split mixed liquor flow between the existing secondary clarifiers and the new membrane facility.
- Temporary piping to return RAS from the membrane facility to the HPO basins.

The MLSS required for seasonal nitrification and year-round nitrification is 11,000 mg/L and 16,000 mg/L, respectively. These MLSS concentrations exceed the maximum allowable MLSS concentrations required by

the membrane suppliers (10,000 mg/L). As such, fast tracking construction of the membrane facility is not considered a feasible alternative to provide interim treatment capacity.

2.8.2 Alternative 2 – Build Temporary Additional Secondary Treatment

Alternative 2 provides additional treatment capacity that is separate from the existing HPO system. Two approaches were considered:

- Provide treatment capacity in parallel to the existing HPO facility. For year-round nitrification with the Micron Ready for Equipment (RFE) wastewater, the required parallel treatment capacity is approximately 4.8 mgd. This will offload the existing HPO system and allow it to nitrify within WEPs MLSS, clarifier solids loading and maintain reasonable wet weather mode frequencies.
  - » Please note since the time of initial alternatives evaluation, Micron has refined flow and load estimates and confirmed a 1-year delay in RFE flows. As a result of this delay, the IWWTP will now be responsible for treating RFE flows.
- Temporary package activated sludge plants were considered for the parallel operation alternative.
- Provide treatment capacity in series with the existing HPO facility. This alternative would provide post HPO nitrification for the entire ammonia load and return the existing HPO system to a lower SRT and MLSS concentration for BOD_5 and TSS removal only. By shifting nitrification to a temporary post HPO process, the existing plant can be operated at a 2 to 3 day SRT and MLSS concentrations less than 5,000 mg/L.
- Temporary moving bed bioreactors (MBBRs) were considered for the post HPO nitrification series operation alternative.

2.8.2.1 Temporary Parallel Package Plants

Self-contained activated sludge treatment systems are available from several manufacturers. These modular systems can be sized and configured for BOD, TSS, and ammonia removal. Larger package systems can treat flows from 0.05 mgd to 0.5 mgd with incremental treatment capacity achieved by installing multiple parallel units. Two types of package plant are available. The smaller capacity units are typically the size of sea containers and are shipped to the site and rolled off with minimal construction. Larger capacity units are constructed of factory fabricated components that are shipped to the job and field erected onsite. Each package would require the following to interface with the existing HPO system:

- Temporary piping and pumping of primary effluent to each unit.
- Temporary piping for secondary effluent from each unit to a suitable tie-in point on the effluent piping.

Smith and Loveless' ADDIGEST system was adopted as a representative roll-off package plant and Evoqua's DAVCO system was adopted as a representative field-erected package plant. The approximate capacity and number of units required for both systems are summarized in Table 2.11. Due to the smaller capacity nearly 100 ADDIGEST units would be required for 4.8 mgd capacity. This was considered infeasible. Ten larger capacity field-erected DAVCO units would be required and may fit in the space on the north side of the existing facility. While these units may fit, this would reduce the space available for construction and would conflict with the regional biosolids and administration maintenance buildings currently planned for these areas.

Table 2.11 Package Plant Capacity and Units Required

Package Plant	Capacity per Unit (gpd)	Units Required
Roll-Off (ADDIGEST)	50,000	96
Field-Erected (DAVCO)	500,000	10

2.8.2.2 Temporary Post HPO Moving Bed Biofilm Reactors

MBBRs are a submerged attached growth process that use engineered plastic carrier media suspended in a reactor to encourage high concentration biogrowth. MBBRs are particularly suited for post-secondary ammonia removal due to the ability to sustain nitrifier biomass growth in the absence of BOD_5 and TSS. Perforated screens at the reactor outlet enable liquid to pass through the reactor while retaining the media. The high surface area to volume ratio of the media combined with fill percent ranging between 30 percent and 60 percent, allow MBBRs to sustain nitrifiers without the high MLSS concentrations and solids separation systems needed for suspended growth processes. MBBRs have been successfully installed downstream of HPO and other secondary treatment processes to provide post-secondary ammonia removal.

For this alternative, the existing HPO process would be operated at an SRT of approximately two days with a projected maximum month MLSS concentration of 4,200 mg/L. HPO will provide no nitrification. With complete nitrification required year-round with the Micron RFE wastewater, all the secondary effluent from the existing HPO process would pass through a nitrifying MBBR. Given the high influent TKN load with the Micron RFE wastewater, two MBBR stages will be required to reach an effluent NH_x-N concentration less than 1 mg/L. Provisions for supplemental alkalinity are necessary. Please note since the time of initial alternatives evaluation, Micron has refined flow and load estimates and confirmed a one-year delay in RFE flows. As a result of this delay, the IWWTP will now be responsible for treating RFE flows. The fully nitrified effluent from the MBBR is to be disinfected for discharge or fed to the recycled water facility through a temporary denitrification process.

MBBR is a fully aerobic process where limited denitrification is anticipated. Therefore, effluent NO_3-N concentrations will exceed the recycled water quality criteria of 5 mg/L for Micron. As such, a temporary denitrifying process will be needed for the production of recycled water. This will also require supplemental carbon feed to drive denitrification.

MBBRs do not recycle settled solids, so the effluent suspended solids concentration is limited to the influent suspended solids and a small amount of solids sloughed from the biofilm. Initial process sizing and modeling indicates that effluent TSS from the second stage MBBR reactor should be less than 15 mg/L. Therefore, we do not anticipate the need for solids separation downstream of the second MBBR stage. If necessary, a solids separation process like dissolved air flotation may be added for additional protection against TSS excursions. MBBRs have been successfully applied for ammonia oxidation with more than 20 years of experience for tertiary nitrification in the United States. Specifically related to OOWWTP, MBBRs have been installed downstream of cold-weather HPO systems to provide nitrogen removal, including at the Moorhead Wastewater Treatment Facility in Moorhead, MN. This facility consists of an HPO secondary treatment system with a single stage nitrifying MBBR with pre- and post-polishing lagoons. The facility has been in operation since 2003 and achieves reliable nitrification year-round.

Repurposing the North Lagoon as Temporary MBBR

Figure 2.7 depicts a site layout developed for the MBBR alternative at the OOWWTP based on the Moorhead, MN installation. This conceptual layout was developed from earlier MBBR sizing and divides the lagoon into three zones. This creates pre- and post-polishing lagoons, with the northeast zone being converted to the MBBR. While this alternative would reuse some existing infrastructure, the modifications of the lagoon represent a non-recoverable sunk cost that does not provide added value to the long term OOWWTP upgrade and is largely discarded. In addition, the lagoon based MBBR would occupy the entire north lagoon which will be required for staging during the construction of the IWWTP and OOWWTP upgrades. As such, an alternative MBBR system was developed with new steel tank MBBR reactors constructed near disinfection but outside of the north lagoon.

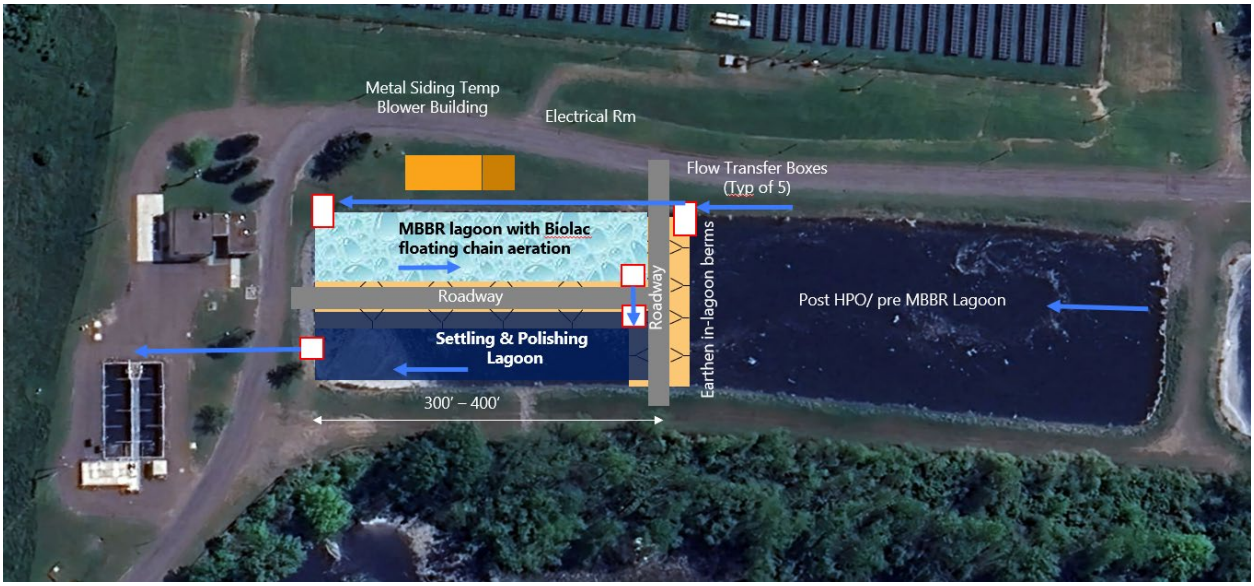


Figure 2.7 Conceptual Site Layout for the MBBR in the Repurposed North Lagoon Alternative

Steel Tank Temporary MBBR Alternative

Constructing new tankage for the MBBRs provides an opportunity to reduce the non-recoverable sunk cost for the bridging project by leveraging the tanks as recycled water storage as part of the reuse project systems. With this approach, steel tanks would be erected and initially used as MBBR reactors to provide interim treatment capacity. Once the OOWWTP upgrade project is completed and interim treatment capacity is no longer needed, the tanks would be cleaned and repurposed for storage of recycled water from the recycled water facility. A new blower/recycled water PS building would be constructed with the MBBR facility and initially designed to house aeration blowers and electrical gear. Upon completion of the OOWWTP upgrades the blowers would be removed and recycled water pumps installed in their place. The piping headers for the recycled water storage tanks would be configured for reuse storage and used for temporary feed and withdrawal from the MBBR tanks. It is possible that the MBBR aeration blowers could be sized and relocated to the Membrane building and used as air scour blowers.

This approach limits the major sunk cost non-recoverable investment for the MOPO project to MBBR media (which could be resold), temporary aeration diffuser grids, and media retention screens.

A preliminary MBBR sizing to achieve an effluent NH_x-N concentration less than 1 mg/L is summarized in Table 2.12. 3.2 Mgal of MBBR steel tank volume will be required based on a media fill fraction of 50 percent. The steel tanks will be configured in two parallel trains with two MBBR stages in series. The MBBR tanks will use medium bubble diffusers for mixing and oxygen transfer.

Table 2.12 Preliminary MBBR Sizing Criteria

Parameter	Units	Value
MBBR Tanks		4 at 83 feet diameter, 20 feet SWD
MBBR Tank Volume, each	Mgal	0.8
MBBR Volume, Stage 1	Mgal	1.6
MBBR Volume, Stage 2	Mgal	1.6
Media SSA	m2/m3	800
Media Fill Fraction	%	50
DO Concentration	mg/L	4
Supplemental Alkalinity, 50% NaOH	gpd	2,000 (maximum month)
Peak Air Flow Rate	scfm	10,500
Blowers		4 at 2,600 scfm, 150 hp
Specific Ammonia Loading Rate	g N/m^2/day	0.6

Notes:
g N/m^2/day – grams nitrogen per square meter per day; SSA – specific surface area.

SECTION 3 SUMMARY AND COMPARISON OF ALTERNATIVES

3.1 Preliminary and Primary Treatment

Evaluation of the preliminary and primary treatment alternatives are centered in the physical configuration and location of these processes rather than in the treatment technology to be used, as is the case for the secondary treatment and disinfection.

For the preliminary treatment, the use of a new screening facility using screens for the BNR Alternative (Alternative 1) will be recommended for consideration, that requires minimal O&M, according to feedback previously provided by WEP operations. The use of fine screens will be recommended for the MBR Alternatives (Alternatives 2 and 3).

The only primary treatment alternative evaluated was centered in the expansion of the existing system rather than in the treatment technologies to be used.

3.2 Secondary Treatment

Evaluation categories were identified for comparing alternatives based on project objectives and priorities. Each of the evaluation categories was given a weighting based on how critical the category is to project success and implementation. The weighting scale ranges from 1 to 5, with 1 being the lowest weighting and 5 being the highest and is converted to a percentage of the total sum of all eight category weights. The category weightings are shown in Table 3.1.

Table 3.1 Category Weightings

Category	Weighting (1-5)	Weighting (%)
Schedule	5	16%
Compliance, Reliability, and Resilience	2	6%
Ease of Operations	3	10%
Energy Efficiency	4	13%
Constructability	4	13%
Permitting/Regulatory Requirements	4	13%
Scalability	2	6%
Community Impact	3	10%
Effluent Quality as a Source for Reuse	4	13%

The alternatives are evaluated by assigning scores to each of the categories for each alternative. The scores also range from 1 to 5, with 1 being the lowest and 5 being the highest. Each category has specific criteria for each score, and the alternative's category is scored based on which criteria are met by the alternative. The category's score is multiplied by the category weighting to determine a weighted score, and all the weighted scores are added to determine the alternative's total weighted score.

A summary of the score evaluation for each secondary treatment alternative is presented in Table 3.2. Advantages and disadvantages of each alternative are further detailed in Sections 3.2.1, 3.2.2, and 3.2.3.

Table 3.2 Summary of Scores for the Secondary Treatment Alternatives

Alternatives	Schedule	Compliance, Reliability, and Resilience	Ease of Operation	Energy Efficiency	Constructability	Permitting/ Regulatory Requirements	Scalability	Community Impacts	Effluent Quality as a Source for Reuse	
	Category Weights									
	15%	**6%**	**9%**	**12%**	**15%**	**12%**	**12%**	**9%**	**12%**	
	Category Scores									**Total**
Alt. 1 New BNR	0.47	0.25	0.36	0.50	0.49	0.52	0.44	0.31	0.34	3.69
Alt. 2 New MBR	0.56	0.24	0.27	0.29	0.60	0.44	0.56	0.32	0.52	3.81
Alt. 3 Retrofit MBR	0.29	0.20	0.25	0.29	0.36	0.39	0.38	0.29	0.50	2.94

Notes:
Alt - alternatives.

3.2.1 Alternative 1: Advantages and Disadvantages

The conventional BNR approach described for Alternative 1 provides a proven and effective technology for achieving the effluent requirements outlined in Section 1.4.1. While this technology typically has a larger footprint requirement than more advanced technologies such as MBR, Alternative 1 will fit on the site and allow space for future expansion. Although conventional BNR approaches typically have lower capital and operating costs than more advanced technologies such as MBR, an additional tertiary process (UF) will be required to pre-treat the secondary effluent from this process prior to RO. Table 3.3 summarizes the advantages and challenges of Alternative 1.

Table 3.3 Advantages and Challenges of Alternative 1

Advantages	Challenges
Widely used and established technology.	Larger space requirements compared to more advanced technologies.
Proven effectiveness for nutrient removal.	UF required downstream of the secondary clarifiers to pre-treat the effluent prior to RO.
Can be adapted for various wastewater treatment capacities.	
Suitable for large-scale wastewater treatment.	
Typically lower capital and operating costs than MBR.	
Does not require fine (2-mm) screens.	
Does not require intermediate pumping.	
Flow can continue even during a power outage.	

3.2.2 Alternative 2: Advantages and Disadvantages

The new MBR approach described for Alternative 2 provides a proven and effective technology for achieving the effluent requirements outlined in Section 1.4.1. This technology typically has a smaller footprint requirement than would be anticipated for conventional treatment processes and is projected to fit on the site and allow space for future expansion. Typically, MBR processes have higher capital and operating costs than CAS processes and require additional pre-treatment through fine screening. Table 3.4 summarizes the advantages and challenges of Alternative 2.

Table 3.4 Advantages and Challenges of Alternative 2

Advantages	Challenges
Significant footprint reduction compared to CAS and doesn't require secondary clarifiers nor additional filters.	Higher operational costs due to membrane replacement (10- to 15-year intervals), membrane maintenance cleaning, membrane air scour and increased pumping requirements.
Efficient at solids/liquid separation.	Additional chemicals (citric and hypo) for membrane maintenance.
Can achieve advanced treatment and high-quality effluent.	High energy consumption for aeration due to higher MLSS in bioreactor and air scouring.
Can provide ultrafiltration quality water compatible with potable reuse goals, removing need for UF in the reuse facility and associated energy demand of UF.	More reliance on instruments and controls to operate the facilities.
	Requires fine screening.

3.2.3 Alternative 3: Advantages and Disadvantages

The retrofit MBR BNR approach described for Alternative 3 provides a proven and effective technology for achieving the effluent requirements outlined in Section 1.4.1. Similar to Alternative 2, the MBR technology typically has a smaller footprint requirement than would be anticipated for conventional treatment processes. By retrofitting the existing HPO basins to serve as the anaerobic zones for the BNR process, Alternative 3 provides the smallest footprint of the three alternatives. Typically, MBR processes have higher capital and operating costs than more conventional processes and require additional pre-treatment through fine screening. Table 3.5 summarizes the advantages and challenges of Alternative 3.

Table 3.5 Advantages and Challenges of Alternative 3

Advantages	Challenges
Retrofit of existing tanks provides the smallest footprint of the three alternatives.	Phasing of work can be challenging to keep the facility operational during retrofit, result in longer construction period, and increase construction costs.
Efficient at solids/liquid separation.	Existing infrastructure may be old and require extensive upgrades.
Can achieve advanced treatment and high-quality effluent.	Higher operational costs due to need for membrane replacement (10- to 15-year intervals), membrane cleaning, membrane air scour and increased pumping requirements.
Can provide ultrafiltration quality water compatible with potable reuse goals, removing need for UF in the reuse facility and associated energy demand of UF.	Additional chemicals (citric and hypo) for membrane maintenance.
	High energy consumption, especially for aeration and membrane filtration.
	More reliance on instruments and controls to operate the facilities.
	Requires fine screening.

3.3 Disinfection

The Disinfection Alternative Evaluation considered both sodium hypochlorite and UV technologies. UV disinfection and sodium hypochlorite are both effective disinfection methods. The UV alternatives do have the advantage of a smaller footprint than the chlorination system and will not impact the discharge effluent chlorine residual, pH, DBPs, and TDS.

Table 3.6 provides a qualitative comparison of UV and sodium hypochlorite.

Table 3.6 Qualitative Comparison of Sodium Hypochlorite and UV

Criteria	Sodium Hypochlorite	UV
Impacted by Water Quality	▪ Ammonia reacts with hypochlorite to form chloramines, which have reduced disinfection effectiveness but have longer staying power as a residual. Excess ammonia is anticipated to be present at all times, resulting in chloramination not free chlorination. ▪ Nitrite reacts with hypochlorite and results in a combined chlorine with little disinfection effectiveness. ▪ Solids shield bacteria from disinfection. Oxidants with longer staying power have the potential to penetrate the solids to provide a measure of disinfection. ▪ Dissolved organics, often measured as TOC, exert a chlorine demand.	▪ Solids shield bacteria from disinfection. ▪ Dissolved organics, as measured by UVT, reduce the efficiency of UV disinfection, but not the efficacy of UV disinfection.
Bacteria Compliance	▪ High Solids Water can be disinfected by both total chlorine (e.g., chloramines) and free chlorine depending upon the permit level and the amount of contact time to allow penetration inside the solids. ▪ Low Solids Water will readily disinfect by both total chlorine (e.g., chloramines) and free chlorine. ▪ Bacterial Loads-Bench-Scale testing will document the performance of chloramines and determine the dose and contact time to meet permit compliance.	▪ High Solids Water is not well disinfected by UV. ▪ Low Solids Water will be readily disinfected by UV. ▪ Bacterial Loads Bench-Scale collimated beam testing will provide information on the UV dose to reliably meet permit compliance.
Pathogen Disinfection	▪ Solids discussion above applies here. ▪ Viral Pathogens are not well disinfected by chlorine and chloramines. ▪ Protozoa Pathogens are not well disinfected by chlorine and chloramines.	▪ Solids discussion above applies here. ▪ Viral Pathogens are well disinfected by UV. ▪ Protozoa Pathogens are well disinfected by UV.
Oxidant Residual and Toxicity	▪ Quenching required to minimize chlorine concentrations and resulting toxicity. Dosing of sodium bisulfite to provide quenching can have pH impacts and TDS in the effluent.	▪ Quenching not required for UV.
Applications in Secondary Effluent	Proven.	Proven.

Table 3.7 contains a summary of the two alternatives.

Table 3.7 Comparison of Disinfection Technologies

Criteria	UV Disinfection	Sodium Hypochlorite
Bacterial Compliance	Reliable	Reliable
Pathogen Disinfection (virus)	Robust	Good
Formation Potential of Regulated DBPs	None(1)	High
Potential for Increasing Effluent Toxicity(2)	None	High
Post-Treatment Required	None	Dechlorination
Proven Accepted Monitoring Methods	Proven	Proven
Reliable Supply of Chemical/Parts	Yes	Yes
Applications in Secondary Effluent	Proven	Proven
Broad Regulatory Acceptance	Yes	Yes

Notes:
(1) Very low levels of DBPs reported in the literature.
(2) Toxicity can be managed with post treatment chemical addition.

3.4 Biosolids Facility

Biosolids technology alternatives were evaluated based on a series of evaluation categories. The category weightings are shown in Table 3.8.

Table 3.8 Category Weightings

Category	Weighting (1-5)	Weighting (%)
Proven Full-Scale Installations	5	20
Mitigation of Regulatory Changes	4	16
Footprint	2	8
Performance	4	16
Ease of Maintenance	3	12
Ease of Operations	3	12
Community Impacts	2	8
Compliance, Reliability, and Resilience	2	8

The alternatives are evaluated by assigning raw scores to all the categories for each and then applying the weights described above. Raw scores range from 1 to 5, with 1 being the lowest and 5 being the highest. The category's score is multiplied by the category weighting to determine a weighted score, and all the weighted scores are added together to determine that alternative's total weighted score.

The details of the comparisons, including raw scoring, category weighting, and total weighted score, are summarized in Table 3.9.

Table 3.9 Weighted Comparison of Alternative Technologies

Alternatives	Proven Full-Scale Installations	Mitigation of Regulatory Changes	Footprint	Performance	Ease of Maintenance	Ease of Operations	Community Impacts	Compliance, Reliability, and Resilience	Weighted Total
Category Weights									
	20%	16%	8%	16%	12%	12%	8%	8%	
Category Scores									
Sludge Screening									
Pressurized Inline	5	4	4	4	4	5	4	4	4.32
Step Screen	5	3	3	3	3	4	3	4	3.60
Thickening									
Gravity Belt	5	4	5	3	3	3	3	3	3.72
Rotary Drum	5	3	4	2	2	5	5	3	3.60
Digester Mixing									
Pump Mixing	5	3	2	5	3	3	3	3	3.64
Gas Mixing	5	3	2	2	2	2	3	2	2.84
Submersible Mixer	2	3	3	5	4	4	3	3	3.36
Linear Motion Mixer	3	3	3	3	2	5	3	1	2.96
Draft Tube Mixer	5	3	1	3	3	4	3	3	3.36
Digester Cover									
Fixed Steel	5	3	3	3	3	5	3	3	3.64
Concrete	5	3	3	4	5	5	3	3	4.04
Floating	5	3	3	4	2	3	3	3	3.44
Membrane	4	3	3	5	1	1	3	2	2.96
Digester and Receiving Station Heat Exchangers									
Tubular	5	3	2	2	3	3	3	3	3.16
Spiral	5	3	3	3	2	2	3	3	3.28
Dewatering									
Belt Filter Press	5	2	4	2	3	3	1	3	3.00
Centrifuge	5	5	5	5	1	3	3	2	3.88
Screw Press	3	4	2	4	2	4	4	2	3.24
Polymer									
Emulsion	5	3	4	3	3	3	3	3	3.48
Dry	5	3	3	3	2	2	3	2	3.08
Drying									
Belt Dryer	5	3	2	4	3	4	3	3	3.60
Rotary Drum Dryer	5	3	3	5	2	3	2	3	3.52
Paddle Dryer	4	3	5	1	2	2	5	1	2.8

3.5 Reuse Upgrade

Reuse alternatives were evaluated based on a series of evaluation categories. The alternatives are evaluated by assigning raw scores to all the categories for each and then applying the weights described above. Raw scores range from 1 to 5, with 1 being the lowest and 5 being the highest. The category's score is multiplied by the category weighting to determine a weighted score, and all the weighted scores are added together to determine that alternative's total weighted score.

The alternatives considered only differ by one treatment process step: Alternative 1 has UF membranes and Alterative 2 does not. Both alternatives are suitable for OOWWTP to provide high quality recycled water to Micron. The minor differences between alternatives should not materially influence upstream design decisions for upgrades at OOWWTP. However, the cost benefits of Alternative 2 should be considered as an advantage to the MBR alternative. Once the secondary process upgrade is selected (BNR or MBR) the reuse alternative will thus be set. Table 3.10 contains a comparison of the alternative scoring.

Table 3.10 Comparison of Alternatives

Category	Weighting (1-5)	Weighting (%)	Alternative 1 – BNR/ UF/ RO/ UV			Alternative 2 – MBR/ RO/ UV		
			Attributes	Score (1-5)	Weighted Score	Attributes	Score (1-5)	Weighted Score
Schedule	5	16	No impact to overall project schedule. The reuse upgrade can be constructed earlier than the OOWWTP upgrades to provide recycled water to Micron by 2028. There is an opportunity to fast track the reuse upgrade by accelerating the design phase and using prepurchase or preselection equipment procurement methods.	4	0.65	No impact to overall project schedule. The reuse upgrade can be constructed earlier than the OOWWTP upgrades to provide recycled water to Micron by 2028, provided a temporary rental UF system is included to pretreat existing OOWWTP effluent. There is an opportunity to fast track the reuse upgrade by accelerating the design phase and using prepurchase or preselection equipment procurement methods.	4	0.65
Compliance, Reliability, and Resilience	4	13	Each technology in the Alternative 1 treatment train has built in redundancy and can be repaired while operating. Spare parts can be maintained on site and operators can be trained in repair and maintenance procedures.	3	0.39	Each technology in the Alternative 2 treatment train has built in redundancy and can be repaired while operating. Spare parts can be maintained on site and operators can be trained in repair and maintenance procedures.	3	0.39
Ease of Operations	3	10	Membranes and UV disinfection require specialized training and safety. The systems are automatically controlled and alarmed.	2	0.19	Membranes and UV disinfection require specialized training and safety. The systems are automatically controlled and alarmed. Operating a temporary rental UF system to pretreat existing OOWWTP effluent would involve additional operational complexity.	1	0.10
Energy Efficiency	4	13	The reuse upgrade is a new system and cannot be compared to the existing facility energy use. A score of three was given to Alternative 1 to allow comparison to Alternative 2.	3	0.39	The reuse upgrade is a new system and cannot be compared to the existing facility energy use. In comparison to Alternative 1 this alternative will use less energy since UF is not needed.	4	0.52
Constructability	4	13	The reuse facility can be constructed separately from OOWWTP upgrades. Minimal shutdowns to connect secondary effluent to feed tank.	4	0.52	The reuse facility can be constructed separately from OOWWTP upgrades. Minimal shutdowns to connect secondary effluent to feed tank.	4	0.52
Permitting/Regulatory Requirements	5	16	Reuse applications and level of treatment will require complex and non-standard permits.	1	0.16	Reuse applications and level of treatment will require complex and non-standard permits.	1	0.16
Scalability	2	6	The reuse system components are expandable to the 2030 projected flows.	4	0.26	The reuse system components are expandable to the 2030 projected flows.	4	0.26
Community Impact	2	6	The reuse facility has the opportunity to have a positive impact on the community through public outreach and awareness of recycled water.	3	0.19	The reuse facility has the opportunity to have a positive impact on the community through public outreach and awareness of recycled water.	3	0.19
Side Stream Treatment Impacts	2	6	Waste streams from membrane processes could impact total dissolved solids and salts loading in the river.	1	0.06	Waste streams from membrane processes could impact TDS and salts loading in the river.	1	0.06
TOTAL					**2.81**			**2.84**

3.6 Recycled Water Pump Station

Utilizing the evaluation criteria categories of (1) Schedule; (2) Compliance, Reliability, and Resilience; (3) Ease of Operations; (4) Energy Efficiency; (5) Constructability; and (6) Scalability, scores were calculated for each pump station alternative. See Table 3.11 for a summary of scores.

Table 3.11 Alternatives Comparison

Category	Weighting (1-5)	Weighting (%)	Alternative 1 – Vertical Turbine			Alternative 2 – Dry-Pit Submersible			Alternative 3 – Split Case Pumps		
			Attributes	Score (1-5)	Weighted Score	Attributes	Score (1-5)	Weighted Score	Attributes	Score (1-5)	Weighted Score
Schedule	3	16%	No impact on schedule.	3	0.47	No impact on schedule.	3	0.47	No impact on schedule.	3	0.47
Compliance, Reliability, and Resilience	2	11%	Reliable, motor easy to repair, potential flooding risk.	3	0.32	Reliable and easy to repair, full access to all components, withstands flooding.	4	0.42	Reliable, full access to all components, potential flood risk.	4	0.42
Ease of Operations	4	21%	No routine training beyond startup, additional maintenance required for lubrication system, no access to pump cans; access to bowl assembly requires pump removal.	2	0.42	No routine training beyond start-up.	4	0.84	No routine training beyond start-up, additional maintenance required for lubrication system.	3	0.63
Energy Efficiency	4	21%	Utilizes pressure flow. Highest energy efficiency.	5	1.05	Requires breaking head for gravity flow into wet well.	2	0.42	Utilizes pressure flow.	4	1.05
Constructability	4	21%	Relatively small footprint; some deep excavation required.	3	0.63	Relatively small footprint, larger excavation required.	2	0.42	Medium footprint, limited excavation.	4	0.84
Scalability	2	11%	Adaptable to variations in head, additional pumps can be added later.	4	0.42	Additional pumps can be added later. Requires installing pumps in lower level.	3	0.32	Adaptable to variations in head and flow, Additional pumps can be added later.	4	0.42
		Total	**3.32**			**2.89**			**3.63**		

3.7 MOPO Project

The advantages and disadvantages of each interim treatment capacity alternative are summarized in Table 3.12. As shown, fast-tracking construction of the planned secondary treatment capacity would leverage spending already part of the OOWWTP upgrades but it may not be feasible to have the capacity online by the March 2028 deadline. Field-erected package plants may provide the necessary treatment capacity in time but at a higher, sunk cost. The post-secondary steel tank MBBR alternative has several significant advantages and no disqualifying factors. This alternative was selected for the following reasons:

- There are similar full-scale installations (post HPO + MBBR in cold weather climates) with long-term successful operation.
- The steel tanks and the blower building can be repurposed for recycled water storage and pumping after the OOWWTP upgrades are completed. This reduces the sunk cost to provide interim treatment capacity.
- It is expected that this alternative will provide a relatively low-cost solution and allow for a faster construction schedule.

Table 3.12 MOPO Project Alternatives

Alternative	Sufficient Capacity(1)	Advantages	Challenges(1)
Fast Track Bioreactors	Yes	▪ Spending for infrastructure already part of the OOWWTP upgrades. ▪ Lowest operations labor requirement of the interim treatment alternatives considered.	▪ Fast-tracking may impose additional costs and increase construction complexity for OOWWTP upgrades. ▪ Integration with the existing HPO process would be difficult. ▪ Operational access during construction will be challenging. ▪ **Unlikely capacity could be delivered by March 2028.**
Fast Track Membrane Facility	**No**	▪ Spending on infrastructure is already part of the OOWWTP upgrades.	▪ **Unable to meet performance and operating criteria.**
Roll-Off Package Plants	Yes	▪ Short construction window. ▪ Operation and performance independent of existing HPO system.	▪ **Number of units required is infeasible.** ▪ **Substantial additional labor required to operate parallel treatment plants.** ▪ Substantial lead time anticipated given quantity of units required. ▪ Anticipated higher cost for treatment capacity. ▪ **High non-recoverable sunk cost.**
Field-Erected Package Plants	Yes	▪ Short construction window. ▪ Operation and performance independent of existing HPO system.	▪ Located in congested OOWWTP upgrade construction space. ▪ Additional labor required to operate parallel treatment plants. ▪ Will occupy space allocated for regional biosolids facility and admin/maintenance building. ▪ Anticipated higher cost for treatment capacity. ▪ **High non-recoverable sunk cost.**
Post-Secondary Lagoon MBBR	Yes	▪ May proceed semi-independently of OOWWTP upgrade. ▪ Short construction window. ▪ Anticipated lower cost for treatment capacity. ▪ Repurposed lagoons provided downstream polishing. ▪ Reliable process with long-running, full-scale installations at cold-weather HPO facilities. ▪ Sunk cost limited to MBBR media, course bubble aeration system, and appurtenances.	▪ **Will occupy north lagoon during construction, which may otherwise be used for the IWWTP or OOWWTP upgrade construction staging.** ▪ Additional labor required to operate MBBR facilities.
Post-Secondary Steel Tank MBBR	Yes	▪ May proceed semi-independently of OOWWTP upgrade. ▪ Located away from the congested construction areas. ▪ Short construction window. ▪ Anticipated lower cost for treatment capacity. ▪ Steel tanks may be repurposed for recycled water storage. ▪ Reliable process with long-running, full-scale installations at cold-weather HPO facilities. ▪ Sunk cost limited to MBBR media, course bubble aeration system, and appurtenances.	▪ Additional labor required to operate MBBR facilities. ▪ May require downstream solids separation.

Notes:
(1) Factors that disqualify an alternative from further consideration are set in **bold**.

SECTION 4 RECOMMENDED ALTERNATIVE

4.1 Preliminary Treatment/ Headworks (Coarse Screening and Grit Removal)

The purpose of headworks is to remove large inert solids such as rags and abrasive grit from the incoming raw wastewater to protect downstream processes and equipment and reduce O&M problems.

The new headworks shall be designed to accommodate a PHF of 38.38 mgd. The new headworks shall incorporate fully automated and robust screening and grit removal systems designed with the goal of improved performance, greater capture, producing a cleaner and drier product for disposal, and minimizing manual operations. This will include equipment that can handle the increased flow while maintaining operational efficiency. The design and equipment selection for the new headworks will prioritize robustness and ease of O&M. The headworks shall consist of mechanically cleaned coarse bar screens followed by vortex grit removal.

Table 4.1 summarizes the preliminary treatment design criteria for the proposed headworks.

Table 4.1 Preliminary Treatment Design Criteria

Process	Units	Value	Condition	Redundancy
Coarse Screening	mgd	38.38	PHF	One unit out of service
Grit Removal	mgd	38.38	PHF	All units in service

4.1.1 Coarse Screening

The coarse screening facility will include coarse screens, screenings handling, and bypass channel with a manual bar rack. Coarse bar screen options include climber type bar screens and multi-rake bar screens. OOWWTP have experience with climber type bar screens and expressed a preference to maintain the same screening technology for the new headworks. Climber type bar screens are robust, all moving parts remain above the water during operation, and all maintenance can be performed from above the operating deck without channel entry. Multi-rake bar screens are also robust and offer benefits of a shorter height above the operating deck resulting in a shorter building height, multiple rakes and two speeds that can clean the screen faster, and most maintenance can be completed from above the operating deck. However, bottom sprockets require channel entry for inspection and maintenance. The headworks concept shall be based on climber type bar screens with 3/8-inch bar spacing.

The screenings handling system shall consist of a sluice to convey material discharged by the bar screens to screenings washer compactors. Other conveyance options include belt conveyors and shaftless screw conveyors. Sluice water conveyance is preferred because it is very clean and does not require additional mechanical equipment, just a reliable plant water system.

Screenings washer compactors produce a cleaner and dryer product, with reduced volume, weight and odors, for transport and disposal. The screenings washer compactors discharge to a roll-off bin for storage and hauling. To allow completely filling the roll-off bin and reduce the frequency of hauling, a tipping trough can be attached to the discharge of each compactor. This eliminates the need to move the bin or knock-off screenings piles to distribute screenings within the bin.

Preliminary design criteria for the coarse screening facility are provided in Table 4.2.

Table 4.2 Design Criteria – Coarse Screening

Parameter	Value
Coarse Screens	
Type	Mechanical climber bar screen
Number	2 +1 standby
Channel Width, feet	4
Downstream Water Depth, feet	3.8
Channel Depth, feet	7
Bar Spacing, inches	3/8
Unit Peak Capacity, mgd	19.2
Bypass Channel with Manual Bar Rack	
Channel Width, feet	6
Channel Depth, feet	7
Bar Spacing, inches	2
Peak Capacity, mgd	38.4
Coarse Screenings Handling	
Conveyance	Single sluice
Washer Compactor with Tipping Trough	1 + 1 standby

4.1.2 Grit Removal

The grit removal facility will include vortex grit basins and grit handling. Grit removal options include vortex grit basins and stacked tray type. Vortex grit basins provide good removal of medium to coarse grit with intermittent pumping. Stacked tray type grit basins can remove very fine grit but require continuous pumping, have higher headloss and require additional O&M considerations. The existing grit capture system is not able to capture fine grit but provides satisfactory grit removal performance at OOWWTP. Therefore, it is assumed that fine grit does not represent a significant percentage of grit at OOWWTP, so stacked tray type grit basins are not warranted. Therefore, the headworks concept shall be based on sloped bottom vortex basins.

The grit handling system shall consist of a grit pumping system to pump grit slurry collected in the grit basin hopper to grit washing dewatering equipment. The preferred grit washing dewatering equipment is manufactured by Huber Technology, Model Coanda RoSF3, because it produces a cleaner and drier product than other grit dewatering equipment options, reducing odor generation and hauling cost.

Preliminary design criteria for the grit removal facility are provided in Table 4.3.

Table 4.3 Design Criteria – Proposed Grit Removal

Parameter	Value
Grit Basins	
Type	Vortex, sloped bottom
Number	2
Diameter, feet	18
Unit Peak Capacity, mgd	19.2
Grit Slurry Pumping	
Number of Pumps per Basin	1
Standby Pumps	1 shelf spare
Unit Capacity, gpm	250
Grit Washing/Dewatering	
Number	2
Type	High-efficiency washer Huber Coanda
Size	RoSF3 Size 2
Unit Capacity, gpm	250
Performance, product	<5% organics <10% water
Grit Storage/Transport	
Type	Roll-off bin
Number	1
Size, current year	15

4.1.3 Heating, Ventilation, and Air Conditioning (HVAC) and Odor Control

The Headworks will be ventilated at a minimum 12 ACPH in accordance with Ten States Standards and National Fire Protection Association (NFPA) 820 with forced supply and exhaust ventilation. A steam-heated make-up air unit (MAU) will serve the headworks building to provide 100 percent outside air and maintain building pressurization. The unit is sized to offset exhaust airflows and maintain a minimum supply air temperature of 60 degrees Fahrenheit (°F) during winter design conditions.

The MAU includes a steam heating coil designed for low pressure steam, capable of heating outside air to the desired discharge temperature. Freeze protection is provided via a low-limit thermostat interlocked with the building automation system to shut down outside air and exhaust fans upon detection of low discharge temperatures.

The unit will be constructed with corrosion-resistant materials and components suitable for the harsh environment typical of headworks operations. Electrical components will be rated for Class I, Division 1 hazardous locations (explosion proof) in accordance with NFPA 820.

Air monitoring equipment will comply with all applicable regulations.

4.1.3.1 Design Criteria

The Headworks Area Odor Control summary table of foul air sources and the total foul air flow adding up to 35,000 cfm. See below tabulation of foul-air flow rates shown below.

Table 4.4 Foul Air Flow Rates

Headworks Structure	Volume at Low Flow (feet^3)	Surface Area (sf)	Headspace Height (feet)	NFPA 820 Code	Area Class	ACH	Total CFM
Influent Diversion Box	710	78	9.10	5.2.2-1a-A	Div 1	6	70
Influent Splitter	4,990	810	6.16	5.2.2-1a-A	Div 1	6	500
Screen Channel 1	1,090	192	5.68	5.2.2-1a-A	Div 1	12	220
Screen Channel 2	990	176	5.63	5.2.2-1a-A	Div 1	12	200
Screen Channel 3	1,060	187	5.67	5.2.2-1a-A	Div 1	12	210
Screen Bypass Channel	1,080	191	5.65	5.2.2-1a-A	Div 1	12	220
Screening Effluent Channel	2,090	221	9.46	5.2.2-1a-A	Div 1	12	420
Grit Channels	7,000	1,377	5.08	5.2.2-5a-A	Div 1	6	700
Grit Effluent Channels	2,500	332	7.53	5.2.2-5a-A	Div 1	6	250
Effluent Splitter Box	2,000	625	3.20	5.2.2-5a-A	Div 1	6	200
Headworks Bar Screen Room	36,251	1,494	24.26	5.2.2-2a-B	Div 1	12	7,250
Screening Handling Building	35,946	1,036	34.70	5.2.2-2a-B	Div 1	20	11,980
Grit Dumpster Room	37,364	1,077	34.69	5.2.2-5a-A	Div 1	20	12,460
						Total	**34,680**

Based on the above table, approximately 35,000 cfm would require odor treatment. Furthermore, it is recommended that all of the 35,000 cfm foul air receive single-stage activated carbon treatment for the following reasons:

- Majority of the flow, as a combined total, from the new headworks is expected to have 'low' concentrations of hydrogen sulfide (H_2S) when considering its average over the year. The plant currently utilizes sodium hypochlorite to manage H_2S generation within the forcemain. The current plan is to continue dosing at Davis Road to maintain H_2S concentrations at the levels specified in the design.
- With advances in activated carbon media technology, yearly averages at or below 15 parts per million (ppm) favor activated carbon as a viable alternative.
- Single-stage carbon adsorption offers a lower upfront cost, reduced footprint, lower energy usage and lower O&M costs than chemical or biological alternatives.

The proposed carbon absorption odor control facility consists of three 17,500-cfm-rated radial carbon adsorbers in parallel for a two-duty, one-standby system configuration to treat the total foul airflow rate of 35,000 cfm.

The total capacity of the odor control facility will be met by two 17,500 cfm radial carbon adsorber vessels, at 3.5 seconds empty bed residence time (EBRT) and their associated fans and mist eliminators. A standby fan, demister, and radial carbon adsorber will be available for any maintenance related or carbon media replacement downtime. The ductwork conveyance system for the odor control system will be made of fiberglass reinforced plastic (FRP) that is corrosion resistant to foul air odor constituents.

Table 4.5 shows the design criteria for the headworks odor control facility.

Table 4.5 Design Criteria – Headworks Odor Control Facility

Description	Unit	Carbon Scrubber
Carbon Scrubbers		
Vessel Materials of Construction		FRP
Empty Bed Residence Time	seconds	3.5
Estimated Inlet H_2S Average	ppm	15
H_2S Removal Efficiency		99.0 percent or 0.25 ppm whichever is least stringent
Mist/ Grease Eliminators		
Number of Mist Eliminators		3 (2 duty, 1 standby)
Rated Air Capacity, each unit	cfm	17,500
Material of Construction		FRP
Fans		
Number of Fans		3 (2 duty, 1 standby)
Type		Centrifugal
Materials of Construction		FRP
Rated Air Flow, each fan	cfm	17,500
Rated Horsepower, each fan	hp	50
Ductwork		
Materials of Construction		FRP

Notes:
ppm – pounds per minute.

Activated carbon media vessels may be installed outdoors and can be insulated from freezing conditions which can also help reduce the negative effects of excess moisture from condensation. Outdoor installation is preferred for the following reasons:

- Ease of access and maintenance.
- Improved removal/installation of new carbon with unlimited overhead height.
- Insulation provides protection from loss of carbon bed life due to excess moisture.
- Carbon media bed-life is estimated at more than one year.

4.1.3.2 Odor Control Area Drains

All ductwork, fans, mist eliminator, and carbon vessel drains are comprised of 2-inch diameter schedule 80 PVC and drain by gravity to the return pump station building. P-traps are provided with sufficient depth to limit the release of foul air to the atmosphere.

4.1.3.3 Activated Carbon Media

Carbon media by Norit, Calgon, Purafil is comprised of 4-mm diameter pelletized high-capacity media derived from coal or coconut shell. Carbon shall be 4-mm diameter pelletized for reduced pressure loss and energy consumption, H_2S capacity shall be minimum of 0.3 grams per cubic centimeter (g/cc).

4.2 Primary Clarifiers

Flow will be split downstream of grit removal to each of the three pairs of primary clarifiers. Primary clarifiers remove solids and BOD upstream of secondary treatment. Primary sludge collected in the clarifiers is pumped to the solids processing facilities.

As part of the buildout plan, two new primary clarifiers will be added, bringing the total to six. This configuration results in average and peak hour surface overflow rates of 521 gpd/sq ft and 1,873 gpd/sq ft, respectively. The existing weir configuration, if it remains, will result in a peak hour weir loading rate of approximately 40,400 (gpd/lf), which exceeds the Ten States Standards criteria of 30,000 gpd/lf. The design engineer may request an exemption during the detailed design for higher weir loading rates when surface loading rates are met, however, for planning purposes, this BODR includes provisions to modify the weirs to increase weir length to meet the Ten State Standard weir loading rate without exception. The present analysis adopted the design criteria summarized in Table 4.6.

Table 4.6 Primary Treatment Design Criteria

Process/Parameter	Units	Value	Condition	Redundancy	Notes
Alum Dose	mg/L	32	n/a	n/a	Average dose with 1 mgd intra-plant recycle flow (2021-2024).
TSS Removal	%	50	MMF	All in service	Estimated TSS removal based on historical performance data from 2020–2024. This assumption should be verified during final design.
TSS Removal	%	55	AAF	All in service	Estimated TSS removal based on historical performance data from 2020–2024. This assumption should be verified during final design.
Primary Solids TS Concentration	%	1	All		WEP has historically operated the primary clarifiers without blankets and with primary solids TS concentrations generally less than 1 percent. It was assumed that a primary solids TS concentration of 1 percent could be maintained without primary clarifier performance deterioration. This assumption should be verified during final design.
Surface Overflow Rate	gpd/sq ft	521	AAF	All in service	≤1,000 Ten States Standard.

Process/Parameter	Units	Value	Condition	Redundancy	Notes
Surface Overflow Rate	gpd/sq ft	1,873	PHF	All in service	≤2,000 Ten States Standard.
Weir Length, per Clarifier	lf	215	n/a		
Clarifier Length, per Clarifier	lf	125.83			Interior length according to record drawings.
Clarifier Width, per Clarifier	lf	28			Interior width according to record drawings.
Surface Area, per Clarifier	sf	3,523			
SWD	lf	10.5			Based on record drawings.
Sludge Collector	Stainless steel chain and flight sludge collector				
Cross Collector	Stainless steel chain and flight				

Notes:
MMF – maximum monthly flow.

Odor control will be required for the covered effluent weirs. Due to the primary clarifiers proximity to the solids odor control system, the foul air ventilation of the primary clarifier effluent weirs will be treated in the solids handling odor control facility.

4.3 Fine Screens

The preliminary design includes construct of a new fine screen facility with three screening channels with screening, washing and compacting, a screenings screw conveyor, storage bin and loadout bay to remove remaining screenings from the primary effluent to protect the MBR membranes.

A fine screening facility processes the primary effluent prior to introduction into the proposed MBR facilities. The fine screen facility has been sized to either utilize an in-channel drum screen or a center flow band screen. These two options were selected for the preliminary design as they are the typical technologies used in MBR facilities. The Huber in-channel drum screen with integral washing and compacting was selected as the basis of design. However, during subsequent design phases a more detailed evaluation of the two options can be conducted.

To meet guidelines for membrane filtration plants, screens will have a 2 mm perforated plate opening and should have no ability to bypass. In addition to influent flow metering, flow metering of primary effluent to the new facilities provides enhanced control of the MBR system. During the final design phase, addition of primary effluent flow metering should be further evaluated.

The fine screen facility will be constructed with three parallel channels. The screens will be operated as lead/lag/standby through the instantaneous peak flow. The channels will be designed to handle the range of anticipated flows without exceeding wash-through velocities of 4 feet per second (fps). The screens will all discharge washed and compacted screenings into a common screw/auger conveyor that will transport the screenings to a dumpster in a truck bay to facilitate disposal. Table 4.7 summarizes the fine screen design criteria.

Table 4.7 Fine Screen Design Criteria

Manufacturer	Huber	Enviro-Care
Model	DSL-STAR	Flo-Drum MBR
Type	In-Channel Rotary Drum Screen	In-Channel Rotary Drum Screen
Screen Size (mm)	2	2
Material	Type 316 SS	Type 316 SS
Total Screens Required (duty + standby)	2 + 1	2 + 1
Average Flow Rate (mgd, w/OOS)	11	11
Peak Hour Flow Rate (mgd, w/OOS)	39	39
Headloss at Design Flow Rate (inches)	18	21
Screenings Dewatering Type	Integral Washer-Compactor	Integral Washer-Compactor
Dewatering Manufacturers	Not Required (Integral to Unit)	Not Required (Integral to Unit)
Odor Control Approach	Enclosed Screen and Conveyance Trough	Enclosed Screen and Conveyance Trough
Drive Motor Electrical Requirements	480 V	480 V

Notes:
OOS – out of service.

Each fine screen channel will be designed with influent and effluent gates for isolation. Each screen channel will consist of an adequate straight length upstream and downstream and will be sized to provide a minimum velocity of 1 fps at low flows and a maximum velocity of 4 fps at peak flows. Each channel will also include a drain pipe with a valve so they can be drained for cleaning and maintenance.

4.3.1 HVAC and Odor Control

Design elements include:

- The fine screening facility will be enclosed to protect the equipment from the elements. In addition, the fine screen channels should be coated to protect against corrosion, covered, and ventilated to an odor control system.
- The fine screen channels shall be covered and ventilated per NFPA 820A (most recent code). The screening equipment should be enclosed and the space outside the containment should be ventilated and conditioned to provide good working conditions for operators.
- The Fine Screens room will be classified as Class I Division 1 and ventilated using an explosion proof MAU with steam heating coil in accordance with NFPA 820 Table 5.2.2. Row 2b. No cooling is provided. Equipment is corrosion resistant and constructed for service in process environments.

The fine screen facility will also include an odor control system using a carbon adsorber system to treat ventilated air from both the screenings facility and screenings room. The ductwork conveyance system for the odor control system will be made of FRP that is corrosion resistant to foul air odor constituents.

4.3.1.1 Design Criteria

The Fine Screening Facility Odor Control summary table of foul air sources and the totals adding up to 8,200 cfm is shown below in Table 4.8.

Table 4.8 Foul Air Flow Rates

Area	# of Units	Air Changes/Hour	NFPA 820 Classification	Volume (feet^3)	Total, cfm
Fine Screen Building	1	12	Division 1	20,064	4,013
Fine Screening Truck Loading Bay	1	12	Division 1	11,486	2,297
Fine Screen Channels	3	12		3,375	675
Fine Screen Inlet Channel	1	12		3,065	613
Fine Screen Outlet Channel	1	12		3,000	600
Totals					**8,198**(1)

Notes:
(1) Use 8,200 cfm.

Based on the above calculated foul air flows, Table 4.9 shows the design criteria for the fine screens foul air carbon scrubber odor treatment system:

Table 4.9 Design Criteria – Fine Screens Odor Control Facility

Description	Unit	Carbon Scrubber
Carbon Scrubbers		
Number of Units		2 (1 duty, 1 standby)
Rated Air Capacity (each scrubber)	cfm	8,200
Unit Diameter	feet	10
Vessel Type		Radial or Dual Bed
Empty Bed Residence Time	seconds	3.3
Estimated Inlet H_2S	ppm	10
H_2S Removal Efficiency		99.0 percent or 0.5 ppm whichever is the greatest
Mist/ Grease Eliminators		
Number of Mist Eliminators		2 (1 duty, 1 standby)
Rated Air Capacity (each unit)	cfm	8,200
Materials of construction		FRP
Fans		
Number of Fans		2 (1 duty, 1 standby)
Type		Centrifugal
Materials of Construction		FRP
Rated Air Flow (each fan)	cfm	8,200
Ductwork		
Materials of Construction		FRP

Fine screens and the fine screen truck loading bay odor control system shall be operated continuously during normal operation for improved odor removal performance and to limit fugitive odor emissions.

Carbon media volume provides for 3.30 seconds EBRT which benefits removal performance for a wide variety of odorous compounds, e.g. H_2S, reduced sulfur compounds (RSCs), as well as volatile organic compounds (VOCs).

Dual bed or radial bed carbon adsorber may be foam insulated to protect from freezing conditions. An insulated FRP enclosure is recommended for the fan and mist/grease eliminator. Air sample tubing and drain piping/valves shall be insulated and heat traced.

Activated carbon media vessels may be installed outdoors and can be insulated from freezing conditions which can also help reduce the negative effects of excess moisture from condensation. Outdoor installation is preferred for the following reasons:

- Ease of access and maintenance.
- Improved removal/installation of new carbon with unlimited overhead height.
- Insulation provides protection from loss of carbon bed life due to excess moisture.
- Carbon media bed-life is estimated at more than one year.

4.3.1.2 Odor Control Area Drains

All ductwork, fans, mist eliminator, and carbon vessel drains are comprised of 2-inch diameter schedule 80 PVC and drain by gravity to the return pump station building. P-traps are provided with sufficient depth to limit the release of foul air to the atmosphere.

4.3.1.3 Activated Carbon Media

Carbon media by Norit, Calgon, Purafil is comprised of 4-mm diameter pelletized high-capacity media derived from coal or coconut shell. Carbon shall be 4-mm diameter pelletized for reduced pressure loss and energy consumption, H_2S capacity shall be minimum of 0.3 g/cc.

4.4 Secondary Treatment: Bioreactors

MBR was selected for secondary treatment due to its smaller footprint compared to conventional BNR systems and improved secondary effluent quality for reuse. An MBR system combines suspended growth biological treatment with membrane filtration for solids-liquid separation in lieu of secondary clarifiers. Membrane filtration allows for higher MLSS concentrations in the bioreactors, reducing the required bioreactor volume. As a result, the system is more space-efficient and produces higher-quality effluent, making it well-suited for OOWWTP program goals.

An MBR system consists of bioreactors where biological treatment occurs and membrane filtration where the recovered water is separated from the biomass. This section details the preliminary bioreactor design including the primary effluent routing, bioreactor configuration, mixing, aeration, process control, mixed liquor recycle pumping, and bioreactor effluent routing. MBR startup considerations are also identified.

The preliminary design incorporates the following proposed modifications:

- Construct four new two-pass bioreactors to provide five-stage BNR treatment (with the membrane tanks providing the fifth stage) on the site currently occupied by the South Lagoon, also referred to as Lagoon 1. Each bioreactor will include:
  - Mixed liquor recycle (MLR) pumping system to send the nitrified mixed liquor from the aerobic zone back to the pre-anoxic zone.
  - MLR pumping system to send mixed liquor from the pre-anoxic zone to the anaerobic zone.
  - Fine bubble aeration in each aerated and swing zone including fine bubble diffusers, diffuser grid and drop legs, air flow meters and flow control valves for each zone, and air distribution piping from the blower building with a total bioreactor air flow meter and shut off valve.
  - Large bubble mixing nozzles in each unaerated or swing zone, including large bubble air distribution nozzles, air distribution headers, flow control valves, and air piping from the receiver.
  - Online instrumentation needed for process monitoring and control.
- Construct a new blower building that will house the aeration blowers, large bubble mixing system compressors and receiver, as well as electrical, instrumentation, and controls for the bioreactors.
- Upon completion of startup of the new MBR facility, demolish the existing HPO basins, secondary flocculation tanks, secondary clarifiers, and the oxygen generation building.

4.4.1 Bioreactor Design Criteria Summary

Preliminary sizing of bioreactor components is summarized in Table 4.10. Reactor configuration and sizing were developed using the BioWin™ process simulation software.

Mechanical equipment was initially sized based on estimated process requirements. Preliminary blower sizing was conducted to ensure firm capacity under peak airflow conditions, assuming the use of fine bubble disc diffusers in the bioreactors. Instrumentation and controls will include DO probes in the aerobic zones and flow control valves to allow the system to maintain an operator-specified DO set point in the aerated zones. Alarms will be included to notify operators of high and low DO conditions in the aerobic zones.

All equipment sizes are preliminary, and the final design consultant (FDC) should evaluate and adjust during detailed design based on the final equipment selection, manufacturer specifications, and refined design analysis.

Table 4.10 Bioreactor Design Criteria

Component	Units	Design Value at Buildout ADMMF
Bioreactors		
Number of Trains	quantity	4 (new)
Number of Passes	quantity	2
Side Water Depth	feet	17
Pass Width	feet	26
Configuration, each train(1)		
Zones 1 – 6, 8, and 9, each	Mgal (% total)	0.086 (8.2%)
Zone 7	Mgal (% total)	0.359 (34.3%)

Component	Units	Design Value at Buildout ADMMF
Anaerobic Zones	Mgal (% total)	0.172 (16%) – 0.258 (25%)
Pre-Anoxic Zones	Mgal (% total)	0.172 (16%) – 0.344 (33%)
Aerobic Zones	Mgal (% total)	0.359 (34%) – 0.531 (51%)
Post-Anoxic Zones	Mgal (% total)	0.086 (8.2%) – 0.258 (25%)
Total	Mgal	1.046
Solids Retention Time(2)		
Aerobic	d	10.2
Total	d	16.0
Hydraulic Retention Time(3)		
Anoxic	hour	3.5
Aerobic	hour	4.2
Total	hour	7.6
MLSS Concentration(4)	mg/L	6800
Food to Microorganism Ratio(4)	ppd/lb	0.07
Influent Alkalinity	mg $CaCO_3$/L	200 to 290(5)
MLR Pumping (AX→AN)		
Flow Set Point		200% of maximum month flow 100% of peak hour flow
Number of Units	quantity	8 + 1 (shelf spare)
Size (each)	gpm	3,750
Size (each)	hp	12
MLR Pumping (AE→AX)		
Flow Set Point		300% of maximum month flow 150% of peak hour flow
Number of Units	quantity	8 + 1 (shelf spare)
Size, each	gpm	5,500
Size, each	hp	18
Process Blowers		
Number of Units	quantity	3 + 1
Blower Discharge Pressure	psig	9.1
Size, each	scfm	3,330
Size, each	hp	200

Notes:
ADMMF – average daily maximum month flow; psig – pounds per square inch gauge.
(1) Volume percentages were calculated excluding the membrane tanks.
(2) Solids retention time under maximum month wet weather conditions.
(3) Hydraulic retention time with all units in service, 55 percent aerobic volume, and excluding internal recycle flows at the maximum month design flow.
(4) Bioreactor MLSS concentration and F/M ratio under the maximum month design condition.
(5) Influent alkalinity based on sampling in 2014.

4.5 Secondary Treatment: Membrane Facility

The preliminary design incorporates the following proposed modifications:

- Construct a new immersed membrane facility for liquid solids separation that is the fifth stage of the secondary treatment processes containing:
  - Submerged membrane filtration tanks (nine duty, one future).
  - Permeate pumps.
  - Membrane air scour blowers.
  - Membrane cleaning chemical storage and feed facilities (sodium hypochlorite and citric acid).
  - RAS, WAS, and surfacing wasting pump stations.

In an MBR process, the membrane filtration combines the solids separation and filtration into one process, replacing secondary clarifiers and tertiary filters. Because the process incorporates a membrane barrier, it produces a low turbidity effluent that is not affected by quality changes in the feed water. To prevent solids from building up near the membrane surface and reducing the flow of water through the membranes, agitation air will be introduced to scour the membrane surface. This air will be provided in addition to the biological process's air requirements with separate air scour blowers.

The membrane filtration systems will consist of either a flat plate membrane or hollow-fiber membrane strands. In a hollow fiber system, the fibers are grouped to create a unit whose terminology differs between manufacturers. These units are most commonly referred to as modules, cassettes, or racks. A series of these larger units are installed into tanks to create one filtration train.

Each manufacturer's membranes have different flux rates, so the membrane area required varies for the same design flows. Additionally, the varying flux rates result in different cassette/rack designs and dimensions, so the installation of the units in one train will have different spatial requirements. The design criteria summarized in this section and below in Table 4.11 are for Veolia's ZeeWeed's MBR system, which are meant to provide clarity and are not meant as bias for this manufacturer. Other hollow fiber membrane suppliers such as Dupont/Memcor should be considered to provide equipment competition. In addition, consideration can also be made for flat plate membrane technology such as offered by Kubota. Once the specific membrane system supplier is selected, the design of the MBR facility can be refined.

4.5.1 Membrane Facility Design Criteria Summary

Preliminary component sizing for the membrane facility is summarized in Table 4.11. Mechanical equipment was preliminarily sized based on estimated process requirements. Equipment sizes are preliminary and subject to change depending on the type of equipment ultimately selected, manufacturer, and the detailed design analysis.

Table 4.11 Membrane Facility Design Criteria

Component	Units	Value
Membrane Tanks		
Number of Trains	quantity	8 + 1
Side Water Depth	feet	10
Width	feet	9
Length	feet	69
Installed Surface Area	sf	2,600,000
Membrane Tank Volume (total)	MG	0.42
Peak Flux at 10°C	gfd	17.0(1)
MLSS Concentration	mg/L	8,500
Chemical Cleaning System		
Storage Duration	days	30
Sodium Hypochlorite		
Concentration	%	12.5
Number of Tanks	quantity	1
Size of Tank	gal	6,000
Citric Acid		
Concentration	%	50
Number of Totes	quantity	3
Size of Totes	gal	300
Backwash/CIP Pumps		
Number of Units	quantity	1 + 1
Size (each)	gpm	3,000
Size (each)	hp	50
Drain Pumps		
Number of Units	quantity	1 + 1
Size (each)	gpm	1,750
Size (each)	hp	25
Permeate Pumping		
Number of Units	quantity	8 + 1 (matched to the membrane tanks)
Size (each)	gpm	3,500
Size (each)	hp	50
RAS Pumping		
Number of Units	quantity	5 + 1
Size (each)	gpm	11,250
Size (each)	hp	100

Component	Units	Value
WAS Pumping		
Number of Units	quantity	2 + 1
Size (each)	gpm	115
Size (each)	hp	15
Air Scour Blowers		
Number of Units	quantity	4 + 1
Size (each)	scfm	3,600
Size (each)	hp	135

Notes:
MG - million gallons.
(1) Sizing is based upon 17 gfd at peak hour at 10°C. 10°C corresponds to the 0.01st percentile of influent daily average temperatures measured from 2020 through 2024. The actual flux rate will need to be guaranteed by the selected membrane supplier.

4.6 Disinfection

Oak Orchard WWTP currently uses chlorine/dechlorination to seasonally disinfect the plant effluent. During the plant upgrade, the disinfection system will be replaced with an UV disinfection system utilizing closed-vessel reactors. Disinfection will be located within the membrane building.

4.6.1 Disinfection Design Criteria Summary

The critical parameters used to size a UV disinfection system include flow, UV dose, UVT, UV equipment design factors (quartz sleeve fouling and end of lamp life), hydraulic and level control considerations, and redundancy.

All UV systems being considered for this project have gone through third-party validation testing and all can comply with the design criteria for this project. Table 4.12 provides a summary of the UV design criteria: flow rates, UVT, TSS, T1, and MS2 RED, redundancy, and permit limits.

Table 4.12 UV System Design Criteria

Description	Design Criteria
Design Parameter	
PHF (mgd)(1)	38.59
ADF (mgd)	9.04
Design UVT (%)	65
Estimated average UVT (%)	70
TSS (mg/L)	<5.0
T1 RED (mJ/cm^2), per IUVA Protocol	15.0
MS2 RED (mJ/cm^2), per 2012 NWRI with Confidence Ratio = 1.00	20.0
Hydraulics	
Maximum headloss across UV Reactors (feet)	6.0
Redundancy	
No. of trains at ADF	N + 1
Permit Limit	
Fecal Coliform, based on a 30-day geometric mean (CFU/100 mL)	200
Fecal Coliform, based on a 7-day geometric mean (CFU/100 mL)	400

Notes:
cm^2 – square centimeter.
(1) Peak hour flow per train is 19.30 mgd.

4.7 Biosolids Facility

4.7.1 Primary Sludge Screening and Thickening

The existing OOWWTP thickens combined WAS and PSL in two gravity thickeners. After the proposed upgrades, primary sludge from the primary clarifiers will be screened and separately thickened. Through primary sludge screening, fibrous debris (hair, rags, etc.) can be removed from the sludge stream, which can improve ultimate dewatered and dried solids quality and reduce maintenance for mechanical equipment and debris accumulation in the digesters. Gravity thickening is a robust technology especially suited for thickening of primary sludge and familiar to plant staff. For these reasons, primary sludge gravity thickeners are recommended for the future facility.

4.7.1.1 Primary Sludge Screening Design Criteria

PSL from OOWWTPs primary clarifiers will be screened using inline-sludge screens upstream of the primary sludge thickening process. Thin primary sludge will be pumped through the screens and screened sludge will discharge into the gravity thickeners.

In-line sludge screens separate debris and fibers from the sludge, allowing the sludge to pass through the mesh or perforated screen while the debris is conveyed with an internal screw towards the screenings discharge port. A pneumatic cone at the screenings discharge port allows for some dewatering of the screenings before discharge. Removing debris from the sludge improves operational efficiency and the quality of produced biosolids and reduces maintenance associated with ragged up pumps and mixers and

accumulated debris in digesters. In-line sludge screens keep the pumped sludge pressurized within the unit until screened sludge is discharged to the downstream gravity thickeners.

The PSL screens will be installed in a building located between two new gravity thickeners discussed later in this section. The screening process will include two in-line sludge screens – one duty, one standby – located on a platform, with a screening receiving bin on the ground floor of the building for storage of the removed screenings. The screened sludge will be sent to the primary sludge thickeners. The screenings receiving bin shall be covered and odor control will be provided for the screens and receiving bin room. Thickened primary sludge pumps are located below grade.

The design criteria for the sludge screening process are shown in Table 4.13. The process includes one duty and one standby sludge screen with a capacity of 300 gpm at 1 percent TS feed.

Table 4.13 Sludge Screening Design Criteria

Item	Units	Pressurized Sludge Screen
Governing Condition		Peak day – hydraulic load(1)
Number of Units		1 duty, 1 standby
Capacity of Standard Unit	gpm	300
Screen Opening Diameter	mm	3
Drive	kW	3
Length	feet	12
Width	feet	2.5
Height	feet	3.5

Notes:
(1) Assumed to be approximately 300 gpm or less.

4.7.1.2 Primary Sludge Thickening Design Criteria

Screened PSL will be thickened using new gravity thickeners, where solids settle to the bottom and liquid rises to the surface and is removed as an overflow. The thickened sludge is collected from the bottom of the thickener and pumped to solids processing. The existing gravity thickeners will be demolished.

Although there are many methods for sludge thickening, gravity thickening was selected for this facility because of lower operational complexity, costs, and energy consumption, minimal chemical requirements, and straightforward installation. Additionally, gravity thickening is a widely used and well-established process in wastewater treatment, providing a high level of certainty in the process's performance.

Screened PSL discharged from OOWWTPs sludge screens will be thickened in one of two, covered gravity thickening tanks located on either side of the sludge screening building. The thickened sludge will be pumped to the blend tanks while the overflow will go to the plant drain. Gravity thickeners shall be covered and provided with odor control. Elutriation water shall be provided with the gravity thickeners to increase the hydraulic loading rate as necessary.

The recommended design criteria for gravity thickeners are shown in Table 4.14. The process includes one duty and one standby gravity thickener and is designed to process the maximum week hydraulic load under continuous operation.

Table 4.14 Primary Sludge Gravity Thickening Design Criteria

Item	Units	Value
Governing Condition		Maximum week – hydraulic load.
Number of Rehabilitated Thickeners		1 duty, 1 standby
Thickener Diameter	feet	35
Surface Area per Thickener	sf	960
Operating Days per Week	days	7
Operating Hours per Day	hours	24
Volumetric Feed	gpm	160
Thickener Hydraulic Loading Rate	gpd/sq ft	240(1)
Solids Load	lb/hr	760
Thickener Solids Loading Rate	lb/hr/sq ft	0.8(2)
Thickened Sludge TS	%	4 to 6

Notes:
lb/hr – pounds per hour; lb/hr/ sq ft – pounds per hour per square foot.
(1) Per duty unit. Per *Design of Water Resource Recovery Facilities, Manual of Practice No. 8.* 6th ed. 2018, maximum allowable hydraulic loading rates for gravity thickeners range from 380 to 760 gpd/sq ft (not including polymer feed).
(2) Per duty unit. Per *Design of Water Resource Recovery Facilities, Manual of Practice No. 8.* 6th ed. 2018, the maximum allowable solids loading rate for gravity thickeners ranges from 0.8 to 1.2 lb/hr/sq ft (not including polymer feed).

4.7.2 Waste Activated Sludge Thickening

The existing OOWWTP facility co-thickens WAS and primary sludge in two gravity thickeners. Gravity thickening of WAS is not as efficient or effective as using mechanical thickeners. Following the proposed upgrades, WAS at OOWWTP will be separately thickened prior to mixing with the thickened primary sludge in the blend tanks. Gravity belt thickeners (GBTs) were selected for WAS mechanical thickening due to familiarity of the process with County staff at Metro, and the flexibility and robustness of the technology.

OOWWTP's WAS will be thickened using GBTs. Each GBT is equipped with an integral inlet box or feed tank. Feed sludge is conditioned with polymer upstream of the GBT, and the conditioned sludge is fed into the feed tank. The tank allows for sludge flocculation and provides even feed distribution across the porous belt through a feed chute. Once sludge has been distributed along the belt, it will travel with the belt horizontally across the thickener where multiple sets of plows help separate water out of the flocculated sludge. The belt, powered by a drive motor, moves continuously while the unit is in service. After thickening, the belt is cleaned with a high-pressure spray system, typically requiring a booster pump.

WAS from the MBR facility will be thickened in one of two GBTs located in the thickening and dewatering building on the south side of the site. Each GBT will also have a wash water system with a booster pump and a polymer dosing feed system. The thickened WAS will be pumped to the blend tanks while the water removed from the sludge will be drained to the head of the plant.

The design criteria for the GBT process are shown in Table 4.15. The process includes two units – one duty, one standby - and is governed by the maximum week hydraulic flow.

Table 4.15 WAS Thickener Design Criteria

Item	Units	Gravity Belt
Governing Condition		maximum week – hydraulic
Number of Units		1 duty + 1 standby
Belt Width	m	1
Solids Flow, each	gpm	170
Hydraulic Capacity, each	gpm	200(1)
Solids Capacity, each	lb/hr	940(1)
Wash Water Flow	gpm	20-40(2)
Wash Water Pressure	psi	40(2)
Belt Motor	hp	2
Floc Mixer Motor	hp	
Wash Water Booster Pump Motor	hp	5
Thickened Solids	%	4 to 6
Polymer Dosage	active pound polymer/dry ton sludge.	5 to 10(3)

Notes:
m – meter; psi – pounds per square inch.
(1) Values are derated from manufacturer-claimed values for this size unit based on operational input from other facilities for maintaining desired performance.
(2) For Andritz 1.0-meter GBT. Required wash water flow and pressure may differ per GBT manufacturer.
(3) Varies by sludge characteristics, polymer type, polymer activation, polymer dose, and injection location.

4.7.3 High Strength Waste Receiving

High strength waste receiving stations receive liquid, pumpable external organic waste with high COD concentrations like FOG from the surrounding community. County staff have familiarity with this process because there are receiving stations at the Metro facility. High strength waste delivered to OOWWTP needs to be quickly transferred from the delivery trucks to storage tanks, measured and ticketed to receive tipping fees, and mixed and heated to homogenize the product and avoid clogging. The receiving station will be designed with appropriate containment area per NYSDEC requirements.

The HSW receiving station will receive and store HSW before sending it to the facility's blending and co-digestion processes. HSW can be comprised of various materials, but it is assumed that the material delivered to the OOWWTP will have characteristics typical of grease-trap sourced FOG in terms of pumpability, pH, versus content, and digester loading limitations. The receiving station is comprised of three receiving tanks, each equipped with a Flo-Beast (rotary drum) screen to remove larger solids. Each tank has a recirculation pump and heat exchanger system to keep the tanks mixed and heated, reducing the potential for clogging or stratification. Heat for the heat exchanger is sourced from the primary hot water loop. This mixing and heating system is typically sized to heat each truckload within 60 minutes, after which the tank's contents are sent downstream for treatment. Each tank's contents are pumped with a progressing cavity pump and monitored with a magnetic flow meter. HSW is odorous, so an individual odor control canister or a connection to the plant odor control system is critical to managing odors and minimizing complaints.

The design criteria for OOWWTPs HSW receiving station are shown in Table 4.16. The process includes three duty insulated fiberglass tanks, with a screen, grinder, heat exchanger system with centrifugal pump, and HSW transfer pump (progressing cavity) for each. The screen wash water must be heated.

Table 4.16 HSW Receiving Station Design Criteria

Parameter	Units	HSW Receiving Tanks	
Governing Condition		maximum week – hydraulic	average annual – hydraulic
Number of Units		3 duty	3 duty
Volume, each tank	gal	20,000	20,000
Diameter, each tank	feet	15	15
Side Water Depth, each tank(1)	feet	18	18
HRT(2)	hours	24	12
Mixing Pump Flow, each	gpm	330	330
Mixing, tank turnover rate	hours	1	1
Blend Tank Feed Pump Flow, each	gpm	30	30
Screen Capacity	gpm	660	660
Tanker Drain Pump Capacity, each(3)	gpm	350	350
Target HSW Temperature	°F	100	100
Heat Exchanger Capacity, each(4)	Btu/hr	1,096,900	1,096,900
Hot Water Pump Flow, each	gpm	150	150

Notes:
Btu/hr - British thermal units per hour.
(1) Effective height is 15 feet.
(2) Normal operation should aim to empty the tank over 24 hours to avoid overloading the digesters.
(3) Capacity set to pump 5,000 gallons (assumed tanker volume) within 15 minutes.
(4) Assumed conditions are as follows:
Sludge Temperature (winter): 54°F.
Air Temperature (winter): 4.1°F.
Soil Temperature (winter): 28.0°F.
Volume to be heated in 1 hour: 2,500 gallons per tank.

4.7.4 Municipal Solids Receiving Station

The MS receiving station will be designed to receive and store WWTP sludge streams from BWPCP and Metro. Like the HSW receiving station, the MS receiving station allows for the offloading of trucked solids and provides some equalization to the digester feed through the blend tanks. The MS station has nearly identical equipment and operation to HSW receiving but does not require a Flo-Beast screening unit and is mixed with a vertical shaft mixer instead of a pump. The receiving station will be designed with appropriate containment area per NYSDEC requirements.

The MS delivered to OOWWTPs MS receiving station will be pumped through a macerator or grinder prior to entering the receiving tanks. It is assumed that solids received from BWPCP and Metro are equivalent to thickened waste activated sludge (TWAS). The MS will be mixed with an impeller mixer and sludge recirculated through a grinder and heat exchanger to keep content heated. A rotary lobe pump with grinder assembly pumps the sludge to the blend tanks. Sludge to the blend tanks shall be monitored with

a magnetic flow meter. The process equipment for the MS tanks will be located alongside the blend tank process equipment in a common MS and blend tank process building adjacent to the tanks.

The design criteria for OOWWTP's MS receiving station are shown in Table 4.17. The process includes two duty insulated fiberglass tanks, with grinders, a heat exchanger system, and a municipal solids transfer pump for each tank.

Table 4.17 MS Receiving Station Design Criteria

Parameter	Units	Municipal Solids Receiving Tanks	
Governing Condition		maximum week – hydraulic	average annual – hydraulic
Number of Units		2 duty	2 duty
Volume, each tank(1)	gal	12,000	12,000
Diameter, each tank	feet	13	13
SWD, each tank(2)	feet	15	15
HRT(3)	hours	24	12
Mixing, tank turnover rate	hours	1	1
Blend Tank Feed Pump Flow, each	gpm	200	200
Tanker Drain Pump Capacity, each(4)	gpm	350	350
Target MS Temperature	°F	100	100
Heat Exchanger Capacity, each(5)	Btu/hr	1,968,300	1,968,300
Hot Water Pump Flow, each	gpm	270	270
Sludge Recirculation Pump Flow, each	gpm	400	400

Notes:
HRT – hydraulic retention time; Btu – British thermal unit.
(1) Volume is based on receiving a maximum of one tanker truck (up to 12,000 gallons) every 2 hours per tank.
(2) Effective SWD is 12 feet.
(3) Normal operation should aim to recirculate tank contents for 30 minutes to an hour and then empty the tank over the next hour if necessary to provide space for additional trucks.
(4) Capacity set to pump 5,000 gallons (assumed tanker volume) within 15 minutes.
(5) Assumed conditions are as follows:
Sludge Temperature (winter): 54°F.
Air Temperature (winter): 4.1°F.
Soil Temperature (winter): 28.0°F.
Volume to be heated in 1 hour: 4,580 gallons per tank.

4.7.5 Blend Tanks

OOWWTPs blend tanks will receive TWAS, thickened primary sludge (TPSL), and solids from the MS and HSW receiving stations and convey them to the anaerobic digesters. Blend tanks are used to provide consistent feed to digesters by equalizing fluctuations in various sludge flows and are typically sized to provide 6 to 12 hours of storage to allow for equalization of flows. Blend tank systems consist of storage tanks, influent and effluent flow meters, level monitoring instruments, vertical shaft mixer, pump and grinder for recirculation through heat exchanger, pump and grinder for conveyance of sludge to digesters. Tanks will include odor control. At least two tanks are recommended to allow for cleaning and maintenance activities without significantly impacting digester feeding operations. Heating provisions are

also included to heat the thickened sludge fed to the blend tanks and mitigate the potential for cooling and coagulation of the HSW.

OOWTPs TWAS and thickened primary sludge, as well as the MS and HSW solids being trucked on site will be combined and fed to the digesters through two insulated blend tanks located adjacent to the MS receiving station. The blend tanks' process equipment, including pumps, grinders, and heating equipment will be housed in a process building shared with the MS receiving station, with the two storage tanks sitting outside. The blended sludge will be pumped at a consistent feed rate to the facility's digesters.

The design criteria for OOWWTPs blend tanks are shown in Table 4.18. The process includes two 20-foot diameter storage tanks that can either operate as two duty if governed by maximum week hydraulic condition or one duty and one standby for an average annual hydraulic condition.

Table 4.18 Blend Tanks Design Criteria

Parameter	Units	Blend Tanks	
Governing Condition		maximum week – hydraulic	average annual – hydraulic
Number of Units		2 duty	1 duty + 1 standby
Volume, each tank	gal	35,000	35,000
Diameter, each tank	feet	20	20
SWD, each tank(1)	feet	18	18
HRT	hours	11	8
Mixing, tank turnover rate	hours	1-2	1-2
Digester Feed Pump Flow, each	gpm	100	100
Target Blended Feed Temperature	°F	100	100
Heat Exchanger Capacity, each(2)	Btu/hr	762,400	762,400
Hot Water Pump Flow, each	gpm	110	110
Sludge Recirculation Pump Flow, each	gpm	150	150

Notes:
(1) Effective height is 15 feet.
(2) Assumed conditions are as follows:
Sludge Temperature (winter): 54°F.
Air Temperature (winter): 4.1°F.
Soil Temperature (winter): 28.0°F.
Volume to be heated in 1 hour: 1,670 gallons per tank.
pH: 4 to 6.5 assumed.

4.7.6 Digestion

Digestion of solids reduces the organic matter within the solids stream, reducing the amount of solids that needs to be disposed of and, typically, produces a Class B or better biosolids product. OOWWTP does not currently digest their solids, but the County does utilize anaerobic digesters at Metro. The digesters at Metro are mesophilic anaerobic digesters that produce a Class B biosolids and biogas for beneficial use. A similar approach is recommended at OOWWTP for the future facility.

4.7.6.1 Mesophilic Anaerobic Digestion

Anaerobic digestion requires enclosed tanks, mixing, heating, and biogas systems. To meet Class B requirements and enable land application of the biosolids, the digesters must meet USEPA requirements for pathogen reduction, vector attraction reduction (VAR), and pollutants (metals) concentration. Anaerobic digesters can achieve pathogen reduction through operation with a minimum SRT of 15 days at temperatures between 35 and 55°C. VAR is demonstrated through operation with at least 38 percent VS reduction. Most non-industrially impacted biosolids are well within the acceptable metals concentrations and digestion does not reduce metals. Monitoring and reporting of operating parameters, volatile solids reduction, and metals concentrations are required by the USEPA.

The recommended design criteria for the facility's primary digester are shown in Table 4.19.

Table 4.19 Digester and Digested Sludge Storage Design Criteria

Parameter	Units	Primary Digesters(4)	Digested Sludge Storage Tank
Number of Units		3	1
Diameter	feet	60	60
SWD	feet	53	53
Nominal Volume	MG	1.11	1.11
Effective Volume(1)	MG	1.0	1.0(3)
Hydraulic Capacity, 15-day SRT(2)	gpd	133,300	
Hydraulic Capacity, 20 day SRT	gpd	150,000	
Solids Loading Rate, 0.16 lb VS/cf-d VSLR(2)	lb VS/day	42,800	
Solids Loading Rate, 0.12 lb VS/cf-d VSLR	lb VS/day	48,100	

Notes:
cf-d VSLR – cubic feet per day volatile solids loading rate.
(1) Assumes 90 percent active digester volume and 10 percent of the volume taken up by scum and grit.
(2) Assumes one digester is out of service.
(3) Approximately ten days of storage at max month flows.
(4) Primary digester temperature is maintained at 95 to 105°F.

4.7.6.2 Digester Mixing

The goal of digester mixing is to help achieve uniform distribution of solids, active biomass, and heat within the digester, as well as to prevent the settling of solids or the formation of scum layers. Effective mixing supports the breakdown of organic materials by microorganisms, enhances biological reaction rates, and improves overall system performance.

There are several alternatives for digester mixing, including gas, submersible mixers, vertical shaft mixers, linear motion mixers, and pump mixing. Pump mixing was selected for the OOWWTP facility because pump mixing is a well proven method for fully mixing a digester, is compatible with any type of cover, and conservatively takes up the most footprint of any of the technologies for this conceptual design. Pump mixing is also a flexible technology that allows for energy-competitive mixing and helps break up the scum layer within the digester if operated and set up properly.

The proposed design criteria for a pump mixing system are shown in Table 4.20. If WEP agrees to use a different mixing technology during final design, linear motion mixing may be a viable alternative to the recommended approach for the primary digesters.

Table 4.20 Digester Mixing Design Criteria

Item	Units	Pump Mixing
Number of Units, per digester		1-duty(1)
Unit Type		pump
Tank Mixing Rate	hours/turnover	3
Pump Flow	gpm	5,600

Notes:
(1) Provide at least one shelf spare pump.

4.7.6.3 Digester Cover

Each digester tank will have a domed, concrete cover that can accommodate any mixing system, and allows for scum layer management, robust level measurement, and a port for nitrogen purging when necessary. An insulated, fixed steel cover may be a viable alternative if agreed upon by WEP during final design.

4.7.6.4 Heating Systems

Anaerobic digesters are heated using hot water systems, which provide the necessary warmth to maintain mesophilic (95 to 105°F) conditions. These systems use heat exchangers to transfer heat to the sludge without directly mixing it with the hot water.

Spiral heat exchangers are assumed for digester heating due to compactness, efficiency, and familiarity for operations staff. Primary sludge screens will aid in minimizing rags that could clog spiral heat exchangers.

Digester contents are recirculated through a dedicated recirculation pump and heat exchanger combination. This sludge heating equipment is located in the digester complex next to each respective primary digester but not assumed for the sludge storage tank. Target temperature for the sludge leaving the heat exchangers is no more than 105°F to maintain digester temperature. Heat exchangers for each primary digester are sized for 15-day solids residence time at winter conditions to allow staff to remove a digester from service. Boilers are sized to meet two conditions: average annual loadings during the summer conditions and the winter 20-day solids residence time condition to allow for feed from Metro.

Proposed design criteria for digester spiral heat exchangers are provided below in Table 4.21.

Table 4.21 Design Criteria - Digester Heat Exchangers

Parameter	Units	Value
Number of Units, per primary digester		1 duty
Heating Capacity, winter at 15-day HRT	Btu/hr	1,725,300
Heating Capacity, average annual	Btu/hr	399,100
Sludge Recirculation Pump Flow, each	gpm	350
Hot Water Recirculation Pump Flow, each	gpm	240

Proposed design criteria for boilers are provided below in Table 4.22.

Table 4.22 Design Criteria - Boilers

Parameter	Units	Value
Number of Units		2 duty, 1 standby
Type		Firetube, Hot Water
Boiler Output, each	Boiler Horsepower	150
Boiler Output, each	MMBTU/hr	5.0
Boiler Output Minimum, each	MMBTU/hr	1.3
Fuel Type		Dual Fuel: Biogas and Natural Gas
Boiler Recirculation Pump Flow, each	gpm	520
Primary Loop Pumps Flow, each	gpm	960

Notes:
MMBTU/hr – metric million British thermal unit.
(1) Heat loads for boiler sizing assume the following:
HSW 1 and 2 Receiving Stations (each): 1.1 MMBTU/hr.
HSW 3 Receiving Station (account for losses): 0.042 MMBTU/hr.
MS Receiving Station (each): 1.97 MMBTU/hr.
Blend Tanks (each): 0.76 MMBTU/hr.
Digesters (each, account for losses only): 0.55 MMBTU/hr.

4.7.7 Dewatering

Digested sludge will be dewatered using centrifuges housed in the thickening and dewatering building. Dewatering is a process used to reduce the amount of water in sludge, making it easier to handle and reducing its volume for further processing, transport, or disposal. The most widespread methods of dewatering anaerobic digester sludge include belt filter presses (BFPs), screw presses, and centrifuges. Centrifuges were selected for OOWWTPs dewatering facility because they produce the driest cake of the three methods, have significantly more throughput per footprint, and are an enclosed system that allows for simpler and more effective odor control. Centrifuge dewatering is also less burdensome on plant staff, because the system's instrumentation and controls allow for remote monitoring after system startup. As the dewatered cake from centrifuges is typically the driest of the three most common dewatering approaches, this technology generally reduces costs for hauling and size requirements for downstream systems.

OOWWTPs digested sludge will be pumped from the digested sludge storage tank to dewatering centrifuges housed in the thickening and dewatering building on the south side of the site. Dewatered cake will be held in cake storage hoppers that allow Class B cake to be loaded onto trucks and hauled off site or feed conveyors that transfer cake to the dryers to produce Class A biosolids. Centrate removed from the solids will be returned to the plant drain.

The proposed design criteria for centrifuge dewatering are presented in Table 4.23. The dewatering system shall be sized to match the capacity and performance of the dryer. Matching both capacity and operation duration for those two processes allows for minimal sizing for the cake storage and handling components.

Table 4.23 Centrifuge Dewatering Design Criteria

Item	Units	Centrifuge
Number of Units		1 duty + 2 standby(1)
Unit Size		22-inch
Hydraulic Capacity, each	gpm	130(2)
Solids Capacity, each	lb/hr	1,300(2)
Operation Weekly, average annual(2)		4 days, 24 hours
Operation Weekly, maximum 2 week(2)		5 days, 24 hours
Estimated Cake Dryness	%	18 to 21
Wash Water Flow Required	gpm	50(3)
Wash Water Pressure Required	psi	40-60
Bowl Motor	hp	60
Scroll Motor	hp	45
Polymer Dosage	active lb polymer/dry ton sludge	35-55

Notes:
(1) County prefers two standby units for centrifuges to allow for long lead time spare parts and to ensure outside maintenance is well accounted for.
(2) Values are derated from manufacturer-claimed values for this size unit based on operational experience and input from other facilities for maintaining desired performance and for relatively difficult to dewater sludge from a biological phosphorous removal process. If these loading rates are exceeded then performance may drop off.
(3) Not continuous.

4.7.8 Cake Storage and Cake Handling

Dewatered cake storage is often used at WWTPs to facilitate cake loading into trucks and provide a wide spot in the system to decouple dewatering from truck loading schedules. At OOWWTP, cake hauling is not the primary purpose for the cake storage and handling system; rather, cake storage and conveyance is needed to feed the drying process from the dewatering process. However, the cake storage system will also allow loadout into trucks to allow hauling off of Class B cake if necessary.

Cake storage is necessary at OOWWTP to decouple the drying process from the dewatering process. The startup and shutdown requirements differ for these units and interruptions in one process can affect the other process. A minimum of 8 hours of cake storage is necessary to allow for decoupling of these processes. To meet that minimum storage requirement, the dewatering and drying system need to be operated and sized similarly such that when drying is operating then so is dewatering.

To allow for hopper maintenance, a distribution conveyor will receive cake from the centrifuges and deposit it in the duty cake hopper. Live bottom augers on each hopper will offload the cake either into the cake handling system feeding the drying process, or to an opening that will offload into a truck. Hoppers shall be enclosed and have odor control.

Cake handling can be handled with a multitude of equipment, from screw conveyors to cake handling pumps. For OOWWTP we recommend a belt conveyor system, similar to the Serpentix system used at Metro, because it is a familiar product and allows for more flexibility in routing. Final conveyance equipment is highly dependent on plant layout.

The truck bay will be a single bay and will be shared with the dried product offloading. The truck-trailer assumed is a truck with 48 ft end dump trailer. Truck contents should be monitored with a scale system, either axle scales or a truck scale.

The proposed design criteria for cake storage and handling systems are presented in Table 4.24.

Table 4.24 Cake Storage and Handling System Design Criteria

Item	Units	Dewatering
Number of Cake Hoppers		1 duty + 1 standby
Unit Type		Stainless steel hopper with live bottom augers
Cake Hopper Volume, as air	cu ft	2,500
Cake Hopper Volume, effective(1)	cu ft	1,800
Cake Storage Residence, each hopper(2)	hours	16
Distribution Conveyor Capacity	cf/hr	110
Number of Live Bottom Augers, each hopper		2
Live Bottom Auger Capacity, combined	cf/hr	110(3)
Dryer Feed Belt Capacity	cf/hr	110

Notes:
cu ft – cubic feet; cf/hr – cubic feet per hour.
(1) A deration of 70 percent of hopper volume, "as air" is used to determine effective cake volume.
(2) Dewatering unit performance feed.
(3) A 48-foot trailer will fill in approximately 6-7 hours at this rate.

4.7.9 Chemical Feed Systems

Chemical feed systems are used to support the treatment processes at a WWTP. At OOWWTP, the solids treatment process requires two systems for polymer and ferric chloride. A polymer storage, makedown, and delivery system will aid in the thickening and dewatering processes, and a ferric chloride dosing system will allow the facility to reduce hydrogen sulfide within the digesters and mitigate struvite formation within the centrifuges and centrate system. Ferric chloride can also sometimes reduce dewatering polymer demand, though this depends on the biosolids characteristics.

4.7.9.1 Polymer Systems Design Criteria

Polymer is used for conditioning sludge to improve the separation of solids from water during the thickening and dewatering processes. Polymer systems use various types of polymers, typically cationic (positively charged), with different molecular weights and active contents to optimize sludge treatment. The polymer system involves the activation of either emulsion or dry polymer through mixing and dilution with water to create a polymer solution, which is then fed into the sludge lines upstream of the thickening and dewatering units. The system is designed to be separate for both thickening and dewatering to optimize performance, with each unit having its own storage, feed, and dilution system. Potable or non-potable utility water can be used for dilution as long as the dilution water characteristics are suitable relative to hardness, chlorides, and suspended solids. The polymer solution must be produced on-site since diluted polymer has a limited shelf life (4 to 8 hours).

The proposed design criteria for polymer systems are presented in Table 4.25.

Table 4.25 Polymer System Design Criteria

Item	Units	Thickening	Dewatering
Number of Blenders		1 duty + 1 standby	1 duty + 2 standby
Unit Type		Mechanically or hybrid hydraulic/mechanically mixed emulsion polymer blender	Mechanically or hybrid hydraulic/mechanically mixed emulsion polymer blender
Neat Polymer Flow	gph	0.25 – 2.5	1.5 to 15
Neat Polymer Pump Type		Progressing cavity	Progressing cavity
Dilution Water Flow(5)	gph	30 to 300	240 to 2400
Polymer Solution Concentration	percent, active lb/water lb	0.15 – 0.50	0.15 – 0.50
Polymer Use, weekly	gal	90 – 180	140 – 1,260
Polymer Totes, weekly(4)		0.3 – 0.7	0.5 – 4.5
Polymer Storage Tank Volume(1)	gal		6,000(2)
Polymer Storage Mixing	hours/turnover		8
Polymer Aging Tank Volume(1)	gal		1,000
Polymer Aging Tank HRT	minutes		15-30(3)
Number of Polymer Solution Pumps			1 duty + 1 standby
Polymer Solution Pump Type			Progressing cavity
Polymer Solution Pump Flow	gpm		40
Polymer Solution Pump Driver			Variable frequency
Blender Manufacturer		Velodyne Polyblend	Velodyne Polyblend

Notes:
(1) Recommend FRP tanks are constructed with cone bottoms to eliminate dead zones.
(2) Delivery truck volume assumed at 4,000 gallons.
(3) Minimum hydraulic residence time.
(4) Tote volume is 275 gallons.
(5) Where dilution water is less than 40°F, provide heating to temper the water.

4.7.9.2 Ferric Chloride System Design Criteria

Ferric chloride has a variety of uses at a treatment plant, including within the solids processes. The iron salt binds with sulfide in solution, which reduces the formation of H_2S in downstream systems like digesters and the biogas produced from the digestion process. Biogas utilization systems require H_2S reduction so minimizing H_2S formation within the digester gas can reduce the required capacity and media volumes in biogas conditioning systems. Ferric chloride also binds with orthophosphates which reduces the phosphorus available for struvite formation. While some facilities have used ferric chloride for struvite control within the digesters, it is typically cost-prohibitive due to the potentially high orthophosphate concentrations and the need to meet sulfide demand before iron binds with orthophosphate. However, the sulfide demand within digesters can be met with lower doses of iron so the addition of an iron salt is commonly practiced for H_2S control within the biogas.

Struvite can be controlled within dewatering equipment and in downstream centrate lines with iron salt injection. Should water chemistry favor struvite formation, dewatering equipment and centrate lines generally tend to be the most impacted by struvite. Hence, point source control at these locations can be provided more cost effectively than injection into the digester itself for struvite control. Struvite levels or issues within the digesters should be monitored and may warrant additional control in the future if the solids stream characteristics prove highly susceptible to struvite formation.

The proposed design criteria for ferric chloride system are presented in Table 4.26.

Table 4.26 Ferric Chloride Design Criteria

Item	Units	
Number of Tanks		1
Tank Type		FRP
Tank Volume	gal	6,000(1)
Ferric Chloride Pump Number		1 duty digester feed + 1 duty dewatering feed + 1 duty centrate feed + 1 common standby
Ferric Chloride Pump Type		Peristaltic or diaphragm
Ferric Chloride Pump Flow	gph	0.25-25(2)
Pump Manufacturer		Peristaltic: Blue-White, Watson Marlow Diaphragm: Milton Roy, Pulsafeeder; Blue-White

Notes:
gph – gallons per hour.
(1) Delivery truck volume assumed at 4,000 gallons.
(2) 45 percent ferric chloride solution strength.

4.7.10 Drying

Dewatered cake produced by OOWWTPs dewatering process will undergo drying for Class A biosolids production. Dryers function by applying heat to biosolids directly through heated air or indirectly through heated components to evaporate water from the biosolids. The dried product out of the dryers varies in dryness, but to definitively meet Class A biosolids under all conditions, dryers are typically operated to achieve at least 90 percent total solids concentration.

While there are a multitude of technologies on the market that can be used, including paddle dryers and rotary drums, belt drying is the recommended technology for OOWWTP. Belt dryers are footprint competitive with rotary drum dryers for small to medium plants like OOWWTP and allow for flexibility in source heat, produce less dust than other dryers, and are familiar to WEP staff.

The dryers will be fed dewatered cake conveyed from the cake storage hoppers to the dryer feed zone with belt conveyors. The cake will be dried to a minimum of 90 percent TS to meet Class A biosolids requirements. The dried Class A biosolids will be conveyed from the dryers through an enclosed process, preferably a tubular drag conveyor or a similar enclosed process that minimally agitates the product, and stored in a dried product storage hopper from which they will be hauled off site. The dried product hopper will share a truck bay with the cake offloading.

Exhaust air through the dryer shall be conveyed to a dryer-manufacturer provided condenser to remove particulates and cool the exhaust air prior to treatment in the odor control system. Air within the dried product handling system shall be sent to a dust control system such as a Donaldson Torit dust collection system. Particulates are a potential source of rapid pressure expansion in the air piping, similar to a grain elevator, and therefore an explosion prevention system should be installed.

The dryer heating system is recommended to be a boiler and heat exchanger system to avoid carbon monoxide and dioxide issues as observed at MSWWTP with the direct fire burner system. If a direct fire burner is used, air changes in the room will need to prevent any accumulation of carbon monoxide or carbon dioxide.

If future regulations require additional biosolids treatment prior to disposal or land application, and OOWWTP installs an advanced thermal processing (ATP) system in response, dried product will be diverted to ATP prior to being hauled offsite. In the event of ATP, process redundancy for the drying system will be critical and it is recommended a second dryer be installed at that time.

The proposed sizing for the belt drying process is shown in Table 4.27.

Table 4.27 Belt Dryers Design Criteria

Item	Units	Value
Number of Dryers(1)		1 duty
Dryer Type		Belt dryer
Dryer Size		BT22 (Huber)(2)
Evaporation Capacity, each	lb water evaporative/hr	5,500
Solids Capacity, each	wet lb/hr	6,900
Operation, annual average		4 days, 24 hours
Operation, maximum 2-week		5 days, 24 hours
Product Dryness	%	92
Number of Product Hoppers		1 duty
Product Density, effective	lb/cf	40
Hopper Volume	cu ft	4,800
Hopper Storage Time	days	6(3)

Notes:
(1) Dryer building should be sized for two dryers to allow installation of a redundant unit in the future.
(2) In sizing the dryer, Huber assumed heat source was 284°F water.
(3) Days of storage are days of 24 hour dryer process time.

4.7.10.1 Fire Suppression System

The sludge drying and dried sludge conveyance system presents elevated fire risk due to the high operating temperatures, presence of combustible biosolids, potential for dust accumulation, and enclosed processing equipment. In accordance with NFPA 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities, this area requires a combination of automatic fire suppression systems to protect both the enclosed mechanical equipment and the surrounding process room.

To address these risks, two coordinated systems shall be provided:

1. A Nitrogen Clean Agent Suppression System for protection of enclosed sludge dryers and dried solids conveyance equipment.
2. A Wet-Pipe Automatic Sprinkler System for general area protection of the sludge drying room and associated equipment area.

Nitrogen Clean Agent Fire Suppression System

A total flooding nitrogen (IG-100) clean agent system shall be provided for enclosed sludge dryers and dried solids conveyance equipment, where water-based systems would risk equipment damage or process disruption. This system suppresses fires by oxygen displacement and is clean, non-reactive, and residue-free.

Table 4.28 Nitrogen Clean Agent Design Criteria

Design Parameter	Value/Description
Protected Equipment	Sludge dryer internal volume, dried biosolids conveyor housing
Hazard Classification	Class A (solids/dust), Class B (vapors)
Clean Agent Type	Nitrogen (IG-100)
System Type	Pre-engineered total flooding
Discharge Time	≤60 seconds
Agent Concentration	Inerting concentration to reduce oxygen below 15 percent (approximately 43 percent nitrogen)
Detection Method	Smoke and heat detectors, with control panel integration
Activation	Automatic and manual electric actuation
Ventilation Interlocks	Automatic fan and damper shutdown before discharge
Safety Provisions	Pre-discharge alarms, time delay (≥30 seconds), warning signs, egress lighting

Wet-Pipe Automatic Sprinkler System

A conventional wet-pipe sprinkler system shall be provided to protect the sludge drying process area (room enclosure). The system provides area-wide coverage to suppress fire originating from the exterior of the equipment, overhead utilities, dust accumulation, or general combustibles.

Table 4.29 Wet-Pipe System Design Criteria

Design Parameter	Value/Description
Protected Area	Sludge drying process room
System Type	Wet-pipe automatic sprinkler system
Hazard Classification	Ordinary Hazard Group 2 (per NFPA 13)
Design Density	0.20 gpm/sf over 1,500 sf (typical)
Water Supply	Municipal or on-site fire water loop
Temperature Rating	Quick-response sprinklers rated per ambient and process conditions
Supervision	Flow switch and tamper switch for alarm and monitoring
Clearance	Sprinkler head locations coordinated with dryer exhaust and ductwork

Notes:
gpm/sf – gallons per minute per square feet.

4.7.11 Return Flow Pump Station

The filtrate, centrate, dryer condensate, and miscellaneous washdown drainage throughout the southern half of the plant will flow into the return flow pump station (RFPS). The RFPS is designed to collect these liquid byproducts and pump them back into the main liquid treatment train for further processing.

The RFPS is a wet well with submersible centrifugal pumps and a buried valve vault. The wet well will be coated with a high solids (100 percent) epoxy liner to prevent degradation of the concrete through generation of sulfuric acid. Odors from the wet well will be treated by the nearby odor control system. An above grade structure to house the electrical and control equipment for the RFPS will be located adjacent to the wet well. Design criteria for the RFPS are presented below in Table 4.30.

Table 4.30 Return Flow Pump Station Design Criteria

Item	Units	Return Water Pumping
Pump Station Flow	gpm	1,700
TDH	feet	60
Number of Units		2 duty + 1 standby
Pump Type		Submersible Centrifugal
Drive		Variable Speed
Horsepower	hp	20

Notes:
TDH – total dynamic head.
Flow numbers assumes the following are in use:
1x Centrifuge.
2x Dryers (condensate).
1x Gravity Belt Thickener.
1 Odor control (irrigation and humidification water).
8 Hose Bibbs (at 40 gpm each).
1x Sludge Tank Overflow (130 gpm).

4.7.12 Biogas Handing, Treatment, and Utilization

Biogas produced by the anaerobic digesters will be cleaned of impurities via a conditioning system and utilized on site at OOWWTP as fuel for the boilers and potentially drying. In the future, the County can revisit alternative productive biogas uses like cogeneration and renewable natural gas conversion and evaluate whether the adjacent IWWTP can utilize biogas. The biogas will be stored in a slab-mounted, dual-membrane holder system similar to that at Metro prior to entering the conditioning system. A waste gas flare will be required to fully combust any biogas not productively utilized onsite.

4.7.12.1 Conditioning System

The conditioning system will remove impurities from the biogas to protect downstream end-use equipment (i.e., the boilers). It will consist of hydrogen sulfide removal via media vessels, moisture removal via heat exchange with a chilled glycol solution, and pressurization via duty/standby blowers. Most of the conditioning system equipment will be located inside a building for weather protection. The hydrogen sulfide vessels will be located outdoors, just outside the building to allow truck access for media changeouts.

Biosolids dryer manufacturers have required natural gas level quality to feed the dryer heating system. The final designed conditioning system should include the cost-benefit analysis of feeding the dryer system with conditioned biogas.

4.7.12.2 Biogas Storage System

The gas storage system, located upstream of the gas conditioning system, will be a slab-mounted, dual-membrane holder system similar to that at Metro. The outer membrane will be inflated by duty/standby air blowers to a fixed position and will set the entire digester gas system operating pressure via an air pressure control valve. The inner membrane will be flexible and store and release biogas as it is produced.

4.7.12.3 Flare

Any biogas produced by OOWWTP that is not beneficially utilized needs to be fully combusted using a gas flare. There are different types of flares, including open combustion flares, low-emission enclosed combustion flares, and ultra-low-emission enclosed combustion flares. Open combustion flares are simple systems that burn waste gas in an open flame without additional control mechanisms, making them reliable but less efficient in controlling emissions. Low-emission enclosed combustion flares feature an enclosed combustion zone that allows for better control over the air/fuel ratio and combustion temperature, helping to meet stricter emissions standards. Ultra-low-emission enclosed combustion flares are the most advanced, using precise control systems such as variable frequency drive (VFD) blowers and specialized burners to achieve minimal emissions, especially nitrogen oxides (NOx). These systems require additional equipment and higher gas pressure but offer the cleanest combustion and best environmental performance. The selected flare technology is typically dictated by local air permitting requirements. Onsite natural gas will be provided to the flare.

4.7.12.4 Design Criteria

The anticipated biogas flows for OOWWTP are shown in Table 4.31.

Table 4.31 Biogas Flows

Parameter	Units	Startup	Design			
		Minimum Month	Average Annual	Maximum Month	Maximum Week	Instantaneous Peak
OOWWTP Gas Production	scf/day	98,000	113,000	134,000	167,000	217,000
BWPCP Gas Production	scf/day	20,000	25,000	36,000	50,000	65,000
Total Gas Production without FOG	**scf/day**	**118,000**	**138,000**	**170,000**	**217,000**	**282,000**
	scfm	**82**	**96**	**118**	**151**	**196**
FOG Gas Production	scf/day	121,000	121,000	121,000	121,000	157,000
Total Gas Production with FOG	**scf/day**	**239,000**	**259,000**	**291,000**	**338,000**	**439,000**
	scfm	**166**	**180**	**202**	**235**	**305**

Notes:
scf/day – standard cubic feet per day.

Design capacities for the biogas storage system and flare are summarized in Table 4.32.

Table 4.32 Biogas Storage System and Flare Capacities

Equipment	Units	Capacity
Biogas Storage System	days	1(1)
Flare	scfm	235(2)

Notes:
(1) Based on design maximum month flow rate, 202 scfm.
(2) Based on design maximum week flow rate.

4.7.13 Solids Handling Area Odor Control

4.7.13.1 Humidification Chamber/Acid Scrubber

The FRP foul air fans convey foul air from the solids handling areas, gravity thickening area and the primary clarifier weir covers into the solids odor control facility. The first stage of treatment is handled by a 10-foot diameter FRP wet-packed scrubbing tower intended to humidify and remove ammonia before reaching the second stage of odor treatment. The Humidification/NH3 scrubbing tower may be operated as a water-only humidification tower or using a 1-gph feed of 93 percent sulfuric acid to strip ammonia concentrations (up to 50 ppm) by more than 99 percent.

A single humidification/scrubber stage shall be designed with ducting bypass around the scrubber/humidifier to keep the odor control system online while scrubber maintenance is being performed.

Biofilter design criteria are listed in Table 4.33.

Table 4.33 Humidifier/Scrubber Design Criteria

Humidification/NH3 Scrubber	
Number of Duty Units	1
Redundancy Provided for Scrubber (duty, standby)	1+0
Total Foul Air Flow Treated, cfm	48,000
Scrubber Diameter, feet	10
Scrubber Media Depth, feet	10
Empty Bed Contact Time, seconds	1.5
NH3 removal efficiency, %	>99.5%

Notes:
NH_3 - ammonia.

4.7.13.2 Biofilter Second Stage

Three biofilter bays shall be online during normal operation for improved odor removal performance and system reliability. The biofilters are designed with above-grade or partially buried epoxy-lined concrete structures which contain a lower plenum that serves two purposes, distributing foul air underneath the biofilter media and allowing liquid leachate to drain from the media layers. A HDPE air/liquid permeable flooring system suspends the bio-media above the lined concrete plenum structure and is heavy-equipment accessible. Biofilter media is removed and replaced through south facing stop-log gates fabricated from 316 stainless steel and using neoprene gasket materials for leak-free operation. The stop-log gates can be removed and a front loader driven into the biofilter for media removal and placement. Biofilter media volume provides for 45 seconds EBRT which provides increased performance for a wide variety of odorous compounds, e.g., H_2S, RSCs, as well as VOCs.

The biofilter design allows for 2+1 redundancy to be used if one biofilter is brought offline for maintenance, the remaining two biofilters may operate temporarily with one-unit offline at a reduced but still effective 30 seconds EBRT.

Freeze protection will be considered for all exterior piping/valves in the form of insulation and heat tracing but not for the biofilter cells, even during winter, foul air flows warmed by wastewater process and fan-induced heat will pass upwards through the biofilter media and prevent snow collection. Biofilter design criteria are as follows:

Table 4.34 Biofilter Design Criteria

Concrete Biofilters	
Number of Duty Units	3
Redundancy Provided for Biofilters (duty, standby)	2 + 1
Design Capacity of each Biofilter, cfm (normal)	16,000
Maximum Capacity of each Biofilter, cfm (maximum)	24,000
Total foul Air Flow Treated, cfm	48,000
Size of Each Biofilter, feet	33.5 W x 42 L
Biofilter Media Depth, feet	8.35
EBCT with 3 Units Online, seconds	45
EBCT with 2 Units Online, seconds	30

Notes:
EBCT – empty bed contact time.

4.7.14 Solids Processing During Construction

The future biosolids processing facility will be constructed where the existing OOWWTP aeration basins and secondary clarifiers are located. Since these processes cannot be demolished until the OOWWTP liquid train construction is complete, interim biosolids processing will be required during construction. During this period, mixed primary solids and WAS will be co-thickened in the new gravity thickeners and the thickened solids sent to Metro for further processing, similar to current operations. There will be an increase in the number of trucks sent to Metro during the interim period. The impact on Metro's biosolids processing train is being evaluated and will be updated in subsequent submittals.

4.8 Reuse Facility

OOWWTP effluent that is UV-disinfected MBR permeate will flow to a RO feed tank for equalization and to provide a constant feed to the Reuse Facility's RO process. From the recycled water storage tank, the MBR permeate will flow through cartridge filters as pretreatment to protect the RO membranes from particulate matter that can damage the membrane fibers. Sodium hypochlorite and ammonia will be added for chloramine production to protect the RO system from fouling. The RO permeate will then be stabilized with caustic soda and flow to the recycled water pump station. Sodium hypochlorite will be added after stabilization to provide a residual in the distribution system. Figure 4.1 contains the process flow diagram.

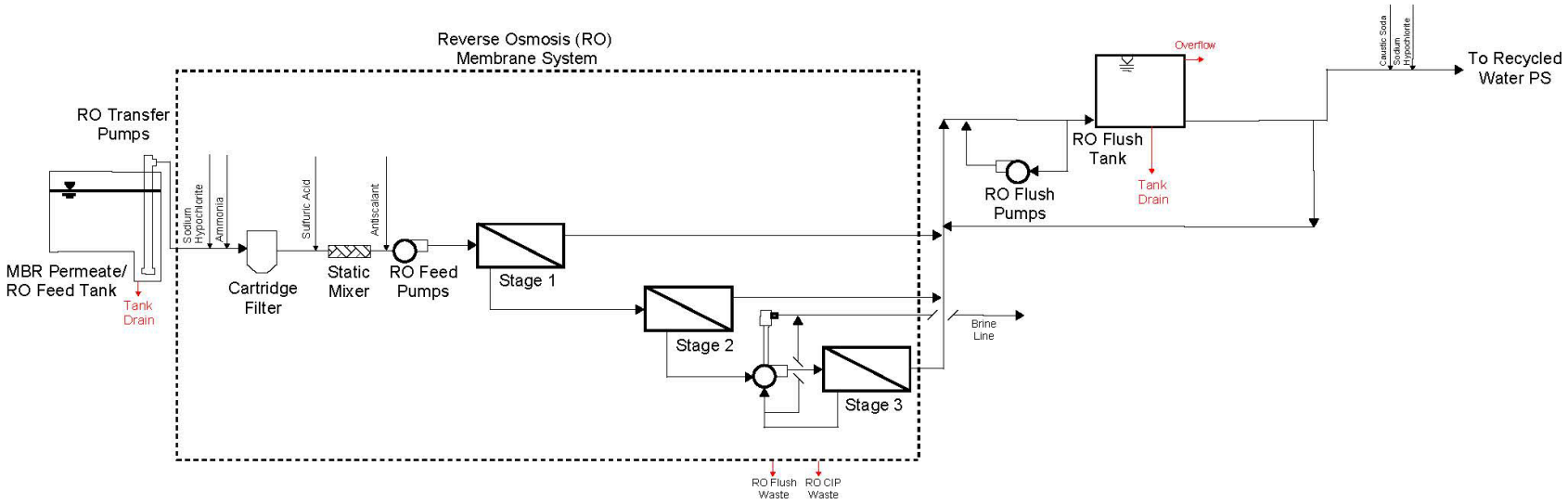


Figure 4.1 Reuse Process Flow Diagram

The RO process uses semi-permeable membranes and a driving force of hydraulic pressure to remove dissolved contaminants, making it a physical separation process that can reject constituents as small as 0.0001 micrometer. The basic unit of the RO system is the spiral-wound RO element, which consists of several layers of RO membranes wound around a central permeate collection tube and enclosed in a cylindrical housing. The membranes separate the feed flow into treated water (permeate) and a waste stream (concentrate). As feedwater flows along the length of the element, permeate passes through the membrane leaving behind most dissolved constituents, resulting in a progressively decreasing flow (concentrate) to carry the same mass of dissolved constituents. The ratio of permeate production to feed flow is known as the RO system recovery.

The permeate is composed of low salinity, high quality water. Some salts, neutrally charged chemicals, and gasses will pass through the RO membrane into the permeate. This will vary based on feed water quality, pH and system flux. The concentrate stream contains the remaining constituents that were trapped on the feed side. The concentrate stream would be combined with the OOWWTP effluent discharge. Since the ions being removed are further concentrated as the water passes through the system, there is potential for scaling and foulants to form on the membrane surface that can decrease the efficiency of the system. Scaling and fouling are prevented by the addition of sulfuric acid and chemical scale inhibitor (antiscalant) upstream of the RO process, which keep scale forming compounds in solution. Metering pumps will inject sulfuric acid and antiscalant downstream of the cartridge filter prior to the RO feed pumps with a static mixer in between. Refer to the chemical storage and feed section for additional information.

From the cartridge filters, RO feed pumps will send flow through the RO trains. Targeting 85 percent recovery, the RO trains will have a three-stage 20:10:5 array with six elements per vessel. The RO system design will include flux balancing features to prevent unbalanced production with most production occurring in the first stage. Flux rates will naturally regulate due to increased fouling of the first stages, but without active flux balancing, the system will require higher average feed pressures and produce degraded permeate quality. RO train operating data will also be more difficult for operations staff to interpret without flux balancing. Therefore, to reduce fouling potential on the first stage, to improve permeate water quality, and to make RO train operating data easier for operations staff to interpret, interstage booster pumps will be located between the RO stages. These pumps will balance the flow produced from each stage by targeting individual stage permeate flow rate setpoints.

Table 4.35 summarizes the design criteria for the RO feed pumps, interstage pumps, and RO trains.

Table 4.35 Reverse Osmosis Design Criteria

Parameter	Unit	Value
RO Feed Pumps		
Type		Vertical Multistage Centrifugal
RO Pumps	No.	5
Capacity (each)	gpm	817
Membrane Feed Pressure		
Low TDS (Year 0)	psig	170
High TDS (Year 5)	psig	210
Clean Filter Pressure Drop	psig	1
Dirty Filter Pressure Drop	psig	15

Parameter	Unit	Value
Piping Losses + Permeate Backpressure	psi	10
Safety Factor	psi	20
Suction Pressure	psi	20
Head Required Minimum	feet	235
Head Required Maximum	feet	156
TDH	feet	543
Motor Size	hp	200
Drive	type	VFD
Interstage Boost Pumps		
Type		Vertical Multistage Centrifugal
Boost Pumps (between Stage 2 and Stage 3)	No.	5
Capacity (per pump)	gpm	220
TDH	feet	85
Motor Size	hp	15
Drive	type	VFD
RO System		
Average Feed Flowrate	gpm	817
Recovery	%	85
Average Permeate Flowrate	gpm	694
Average Concentrate Flowrate	gpm	123
Number of Trains	No.	5
Train Feed Flow	gpm	817
Train Concentrate Flow	gpm	123
Train Permeate Flow	gpm	694
Staging of RO Trains		
1st Stage		
Pressure Vessels per Train	No.	20
Elements per Pressure Vessel	No.	6
2nd Stage		
Pressure Vessels per Train	No.	10
Elements per Pressure Vessel	No.	6
3rd Stage		
Pressure Vessels per Train	No.	5
Elements per Pressure Vessel	No.	6
Number of Elements		
Per Train	No.	210
Total (in-service)	No.	1,050

Parameter	Unit	Value
Membrane Area		
Per Element	sf	400
Total (In-service)	sf	420,000
Average Flux Rate	gpd/sq ft	11.9

Notes:
No. – number.

4.9 Recycled Water Pump Station

The Recycled Water Pump Station (RWPS) is expected to initially convey flows ranging from 2 to 4 mgd, with a potential buildout flow of up to 8 mgd. This buildout flow would require increased OOWWTP recycled water treatment capacity. Prior to entering the RWPS, effluent from the Reuse Facility will be stored within four storage tanks that are approximately 84-feet diameter and 24-feet tall, including 4 feet of freeboard. The nominal capacity of each tank is approximately 829,000 gallons, for a total of 3.3 MG. The tanks will be located just north of the RWPS, adjacent to the existing OOWWTP disinfection facilities. During initial startup and operation of the RWPS when the MOPO project is still in operation, recycled water from the Reuse Facility will flow into a temporary standpipe that will be 12-foot diameter and 24-feet tall, located near the RWPS building. The standpipe water surface elevation will match the water surface elevation in the permanent storage tanks. This will accommodate the switchover from the standpipes to the tanks without affecting pump operations or efficiency.

Vertical turbine pumps installed in pressure cans are a viable option that provide the best hydraulic characteristics and a more compact pump station footprint. However, WEP expressed concerns with cavitation resulting from previous experiences with other vertical turbine pumps in the collection system. Horizontal split-case pumps were selected because excavation will be minimal and all pump components can be easily inspected and maintained on the ground floor of the pump station.

4.9.1 Hydraulics

A system curve was developed to represent flow between the OOWWTP storage tanks and the Micron site storage tanks. Flow conditions representing varying water levels in both the upstream (OOWWTP) and downstream (Micron) storage tanks were considered. There is an interim high point at the west end of the 99-foot utility corridor. Figure 4.2 provides four TDH conditions:

- Case 1: High static head condition: pumping from half-full OOWWTP tank (elevation [El.] 408 feet) to full Micron tank (El. 433 feet), High pipe friction (Hazen Williams, C=130).
- Case 2: Low static head condition: pumping from half-full OOWWTP tank (El. 408 feet) to empty Micron tank (El. 388 feet), Low pipe friction (Hazen Williams, C=150).
- Case 3: Average static head condition: pumping from half-full OOWWTP tank (El. 408 feet) to half-full Micron tank (El. 403 feet), Medium pipe friction (Hazen Williams, C=140).
- Case 4: High point in the system (El. 419 feet) with half-full OOWWTP tank (El. 408 feet), High pipe friction (Hazen Williams, C=130).

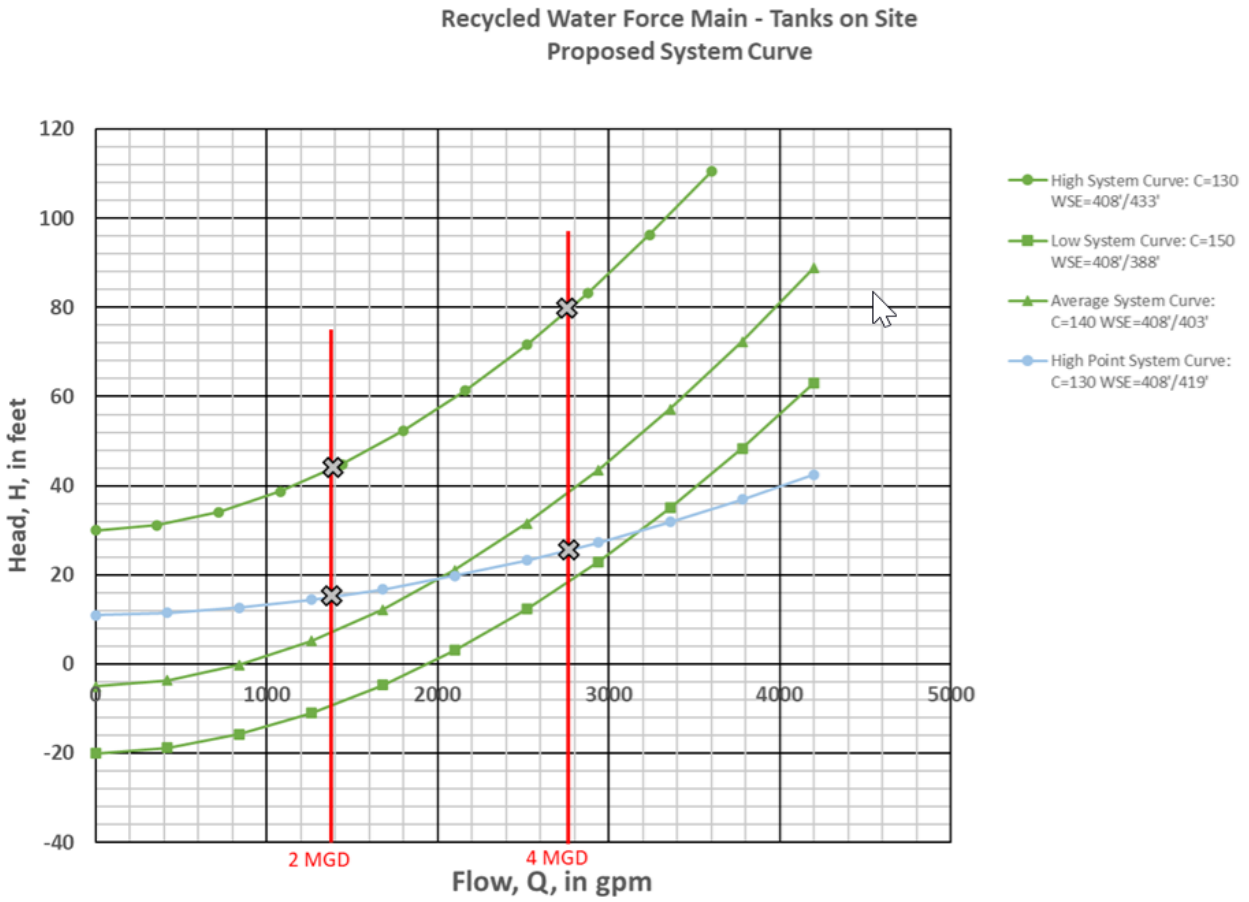


Figure 4.2 Proposed System Curves

These conditions provide the maximum, minimum, and average expected head values for the anticipated pumping scenarios. The vertical lines in Figure 4.2 indicate the expected minimum and maximum flow conditions of 2 mgd and 4 mgd, respectively, for the initial flow scenario. The high point scenario will govern over the low system curve at flows up to approximately 3,200 gpm. The pumps will need to be specified to accommodate this scenario.

For the initial flow case, the following critical design points were identified to accommodate the anticipated flow and head scenarios:

- Rated Condition: 2,777 gpm at 80 feet (full speed, two pump operation).
- Required Condition: 2,777 gpm at 26 feet (reduced speed or one pump).
- Required Condition: 1,388 gpm at 44 feet (reduced speed or one pump).

Preliminary horizontal split case centrifugal pump recommendations from Flowserve Corporation (Flowserve) provide an operating point of approximately 1,400 gpm at 80 feet TDH. The preliminary pump performance curve is shown in Figure 4.3. It is anticipated that pressurized flows will enter the RWPS directly from the recycled water storage tanks, maintaining the static head provided by the water level in the storage tank.

Initial pump curves associated with suitable Flowserve horizontal split case pumps have been included for reference – the final pump selection should be made by the FDC depending on the final storage tank elevations at the OOWWTP and Micron sites, and the diameter, material and routing of the force main within the utility corridor.

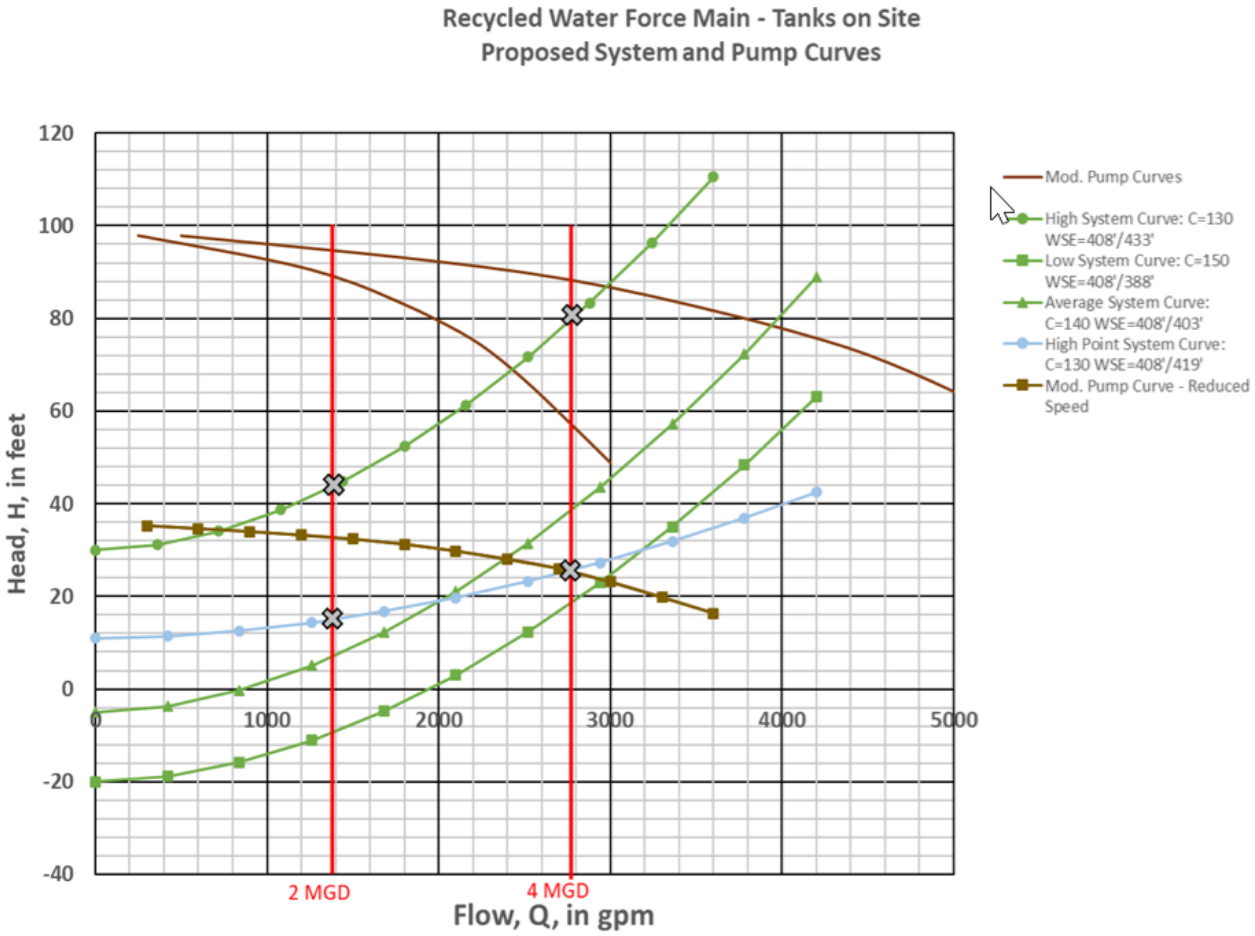


Figure 4.3 Proposed System and Pump Curves

Two duty pumps and one standby pump will be installed in a parallel configuration to meet initial project flows. Space for two additional pumps, including the associated pads and piping, will be allocated within the station to accommodate the future buildout scenario flow. A blind flange will be installed on the influent and force main piping to facilitate future piping modifications within the station to accommodate the additional pumps. Pump speeds will be modulated using VFDs to meet fluctuating demands and water levels in the onsite and offsite tanks.

4.10 MOPO Project

The MOPO project will amend the existing treatment process to include post-secondary MBBR treatment. Raw wastewater will first pass through the existing headworks, including grit removal and bar screens. Degritted and screened wastewater will then pass through the existing primary clarifiers. Depending on construction sequencing for the OOWWTP upgrade project, the new headworks and new primary clarifiers may be installed while the MOPO project online. Primary effluent will then pass through the existing HPO activated sludge process followed by secondary clarification for carbonaceous 5-day biochemical oxygen demand test ($cBOD_5$) and TSS removal. The secondary effluent will then be split between discharge and the MBBR. The existing lagoons will be decommissioned during construction of the OOWWTP upgrade project, and it was assumed they would be offline for the duration of the MOPO project. The secondary effluent portion directed to the MBBR facility will be pumped via the temporary MBBR feed PS. The MBBR facility will consist of two above ground steel tanks configured to operate in series, a blower building to house the blowers and supporting infrastructure. The nitrified MBBR effluent will be split, with a portion going to the recycled water facility. The balance will combine with the remaining secondary effluent and pass through disinfection (depending on the time of year) prior to discharge through the outfall to the Oneida River.

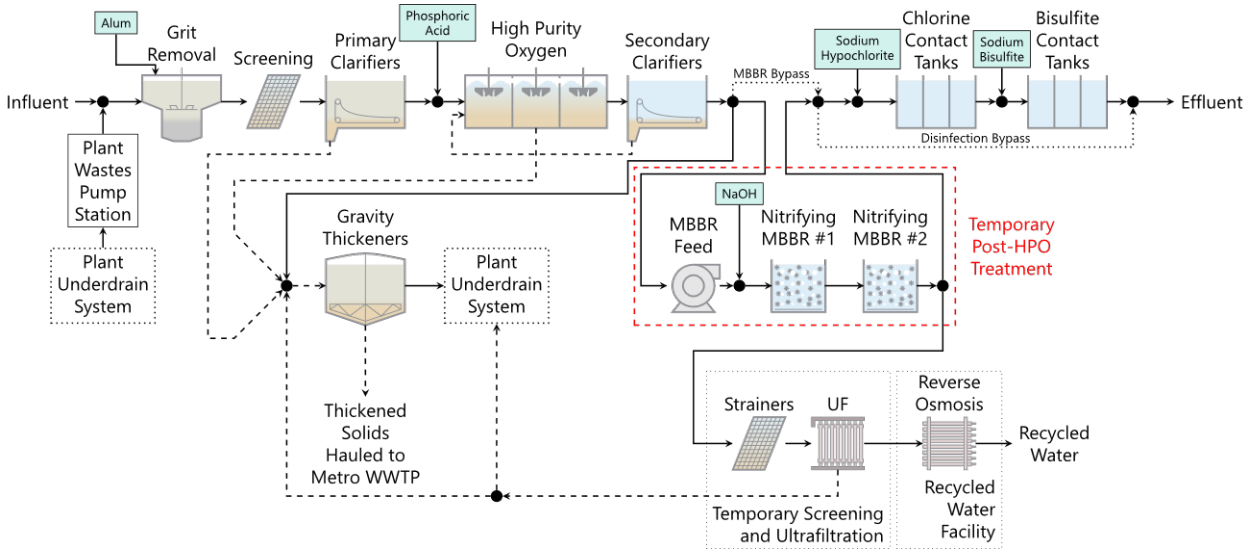


Figure 4.4 MOPO Project Process Flow Diagram

4.10.1 MBBR Feed Pump Station

The MBBR feed PS will consist of a manhole wet well structure, an underground valve vault and an underground meter vault. It is anticipated that three total pumps – two duty and one standby – will be installed in a parallel configuration within the wet well. A new pipeline will be needed to convey flows from the clarifier effluent channel to the wet well. Discharge piping from the pumps, and associated valves and fittings will be located within the valve vault.

Power and controls for the pumps and ancillary equipment will be located in a separate electrical building adjacent to the wet well, valve vault and meter vault. Pump speeds will be modulated using VFDs to meet fluctuating demands and water levels in the secondary clarifiers and MBBR reactor tank. Power will be supplied to the pump station via new service from National Grid that will also serve blower building on the north end of the site. Refer to the Electrical Section of this BODR for more information.

The pumps will convey flow to the MBBR reactor tank located on the northern end of the OOWWTP site via an approximately 1,600 lf and 24-inch diameter HDPE force main. The force main alignment should be located within roadways where possible and be buried to safeguard against freezing and to minimize disturbance to other construction activities on site.

Refer to Appendix L for the site plan, the preliminary mechanical plan, and section drawings for the PS.

4.10.1.1 MBBR Feed Pump Station Hydraulics

A system curve was developed to represent head loss across the range of flow rates from the secondary clarifiers to the MBBR reactor tank. For initial planning purposes, a 24-inch diameter HDPE pipeline with a dimension ratio (DR) of outside diameter to minimum pipe wall thickness of 17 (DR17) was assumed for the pump hydraulic calculations. HDPE piping is recommended for the force main due to its durability, resistance against corrosion, and leak-free fused joints.

Preliminary calculations indicated a velocity of 2.00 fps corresponding to a flow of 3.6 mgd, and 5.56 fps corresponding to a flow of 10 mgd. All hydraulic parameters described in this report should be confirmed by the FDC and coordinated with the design of other components of the plant upgrades.

The following system parameters should be used to establish hydraulic requirements for the force main:

- Minimum and maximum flow: 3.6 mgd – 10 mgd.
- Maximum velocity: 8 fps, in accordance with Ten States Standards – Section 49.1.
- Air release valves should be located at high points to remove air accumulations, in accordance with 10 States Standards – Section 8.5.

The following hydraulic boundary conditions define the range of static head as reflected on the system curves provided in Figure 2.1 and Figure 2.2:

- Hydraulic grade elevation at secondary clarifiers: 393 feet.
- Hydraulic grade elevation at MBBR tank: 418 feet to 423 feet.

Varying water levels in the upstream (secondary clarifiers) and downstream (MBBR reactor tank) facilities were considered. Figure 4.5 provides two TDH conditions:

- Case 1: High static head condition: pumping from clarifier water surface (El. 393 feet) to full MBBR tank (El. 423 feet), High pipe friction (Hazen Williams, C=130).
- Case 2: Low static head condition: pumping from clarifier water surface (El. 393 feet) to half-full MBBR tank (El. 418 feet), Low pipe friction (Hazen Williams, C=150).

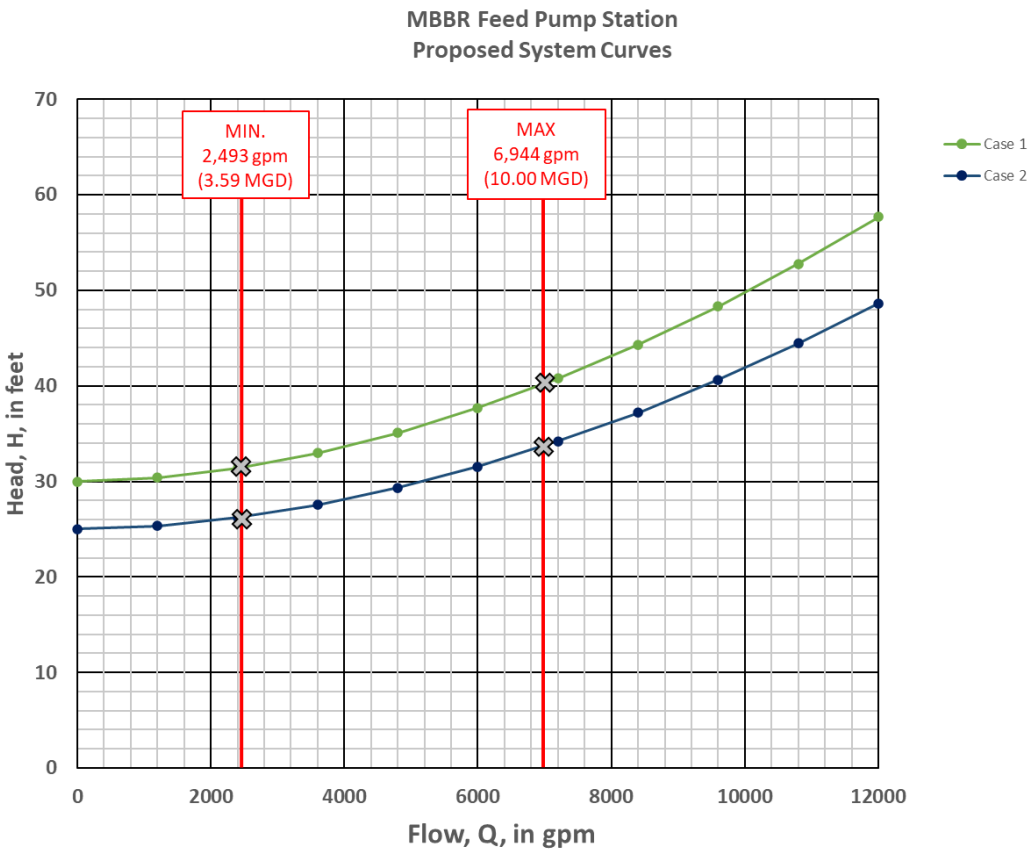


Figure 4.5 Proposed System Curves

These conditions provide the maximum and minimum expected head values for the anticipated pumping scenarios. The vertical lines in Figure 4.5 indicated the expected minimum and maximum flow conditions of 3.6 mgd and 10 mgd, respectively, for the flow scenario.

For the initial flow case, the following critical design points were identified to accommodate the anticipated flow and head scenarios:

- Rated Condition: 10.00 mgd at 40 feet (full speed, two-pump operation).
- Required Condition: 3.6 mgd at 31 feet.
- Required Condition: 3.6 mgd at 26 feet.

The duty conditions listed above are approximate and are used to estimate power requirements for the electrical distribution system. Ultimately, rated conditions for the pumps should be determined by the FDC after the related process piping is designed.

The following design guidelines should be utilized by the FDC for selection of the MBBR feed pumps:

- Pump style: Submersible solids-handling pump designed for wastewater use.
- Mounting requirements: Guiderail assembly.

- Minimum submergence is the greater of:
  - 6 inches above top of motor enclosure; and
  - 3 feet above the pump inlet.
- Net positive suction head (NPSH) available must be at least 6 feet greater than the NPSH required by the pumping within the entire operating range, in accordance with TR-16 Guides for the Design of Wastewater Treatment Works – Section 3.2.3.

Preliminary wet-pit submersible pump recommendations from Xylem Flygt (Flygt) provide an operating point of approximately 3,500 gpm at 40 feet TDH. The preliminary pump performance curve is shown in Figure 4.6. Two duty pumps and one standby pump will be installed in a parallel configuration to convey the expected project flows.

Pump speeds will be modulated using VFDs to meet fluctuating demands and water levels in the secondary clarifiers and MBBR reactor tank. Storage within the pump station wet well will remain at a constant level and be determined by the downstream level in the MBBR tanks. Operation should be automatically alternated between pumps to prolong life and balance wear, in accordance with TR-16 – Section 3.2.7.2.

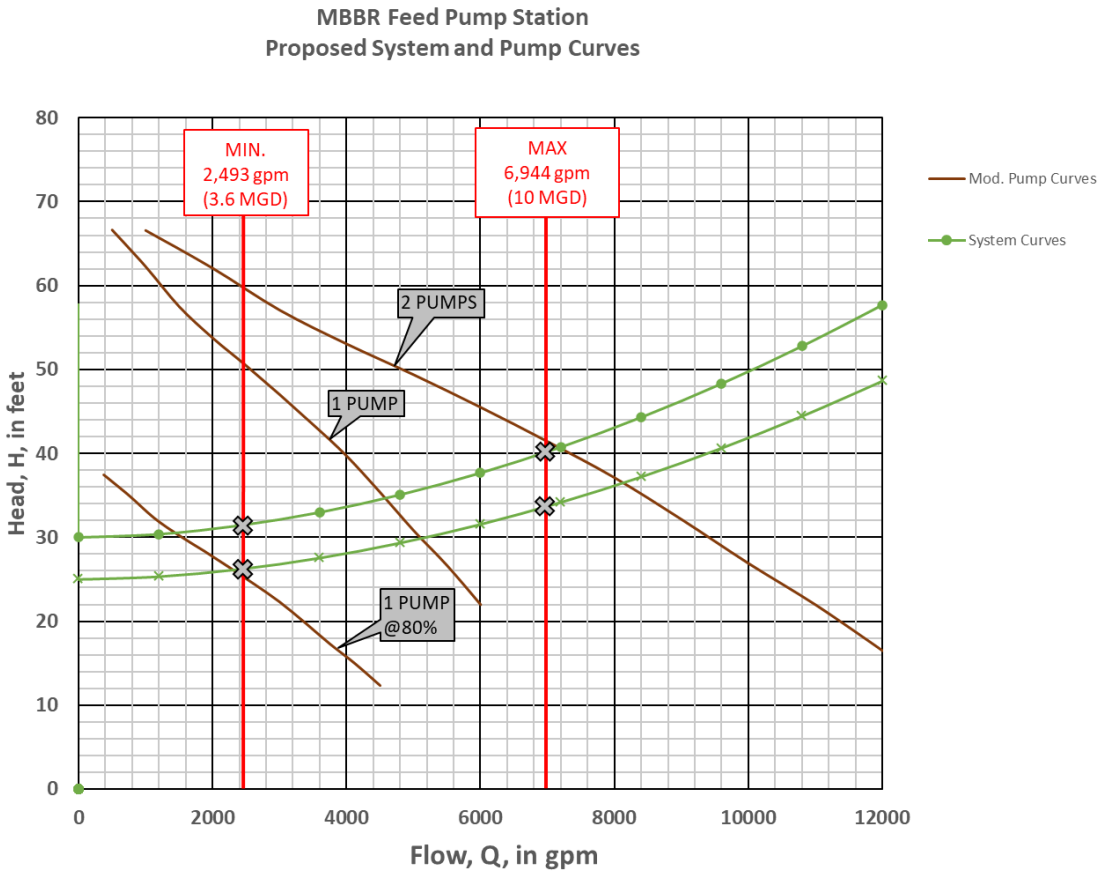


Figure 4.6 Proposed System and Pump Curve

4.10.2 MBBR Facility

The proposed MBBR design will include two stages of nitrification in tanks configured in series. Each tank will function as a fully mixed, aerated biofilm reactor. Effluent from Stage1 will flow directly into Stage 2, allowing for sequential treatment and polishing. The use of two tanks in series will enhance treatment stability and enable maintenance flexibility by allowing either tank to be taken offline if needed. The system will be designed to achieve effluent ammonia concentrations below 1 mg/L under average flow conditions. Medium bubble diffusers will provide aeration and mixing, and media retention screens will keep the biofilm carriers in place. Supplemental alkalinity will be added to support complete nitrification.

The preliminary design incorporates the following proposed modifications:

- Construct a new two-stage post-secondary nitrifying MBBR system downstream of the existing HPO process to provide complete ammonia removal to meet permit requirements. The MBBR system will consist of two steel tanks and will include:
  - Installation of engineered plastic media carriers with 45 percent fill fraction to promote attached nitrifier growth without high suspended solids concentrations.
  - Medium bubble diffusers for oxygen transfer and mixing.
  - Perforated media retention screens at each tank outlet to retain media while allowing effluent to pass through.
  - Online instrumentation and controls for process monitoring.
  - Supplemental alkalinity addition to maintain stable nitrification.
- Construct a new blower and chemical feed building to house the aeration blowers, chemical feed system, and electrical equipment required for MBBR operation. Upon completion of the full OOWWTP upgrade project, this facility will be repurposed for storage, and MBBR aeration blowers may be relocated and reused as air scour blowers in the membrane building.
- Repurpose the MBBR tanks as recycled water storage tanks once the interim treatment capacity is no longer needed. Temporary MBBR-specific elements such as media, aeration grids, and retention screens will be removed.

Table 4.36 provides a summary of key design criteria for the major components of the MBBR facility, including the MBBR tanks, aeration blowers, and chemical feed pumps. These criteria reflect the basis of design established during preliminary engineering and will guide equipment sizing, procurement, and system performance expectations during detailed design and implementation by the FDC.

Table 4.36 MBBR Facility Design Criteria

MBBR System	Units	Design	Recommended Standard
MBBR Basin			
Tank Quantity		2	
Tank Type		Glass-lined bolted steel	
Tank Diameter	feet	57	
Tank Sidewater Depth	feet	20	
Tank Operating Volume, each	gal	374,000	
Media Fill Fraction	%	45	30-60

MBBR System	Units	Design	Recommended Standard
Media Type		K5	
Screen Quantity, each Tank		12	
Screen Type		Perforated plate	
Screen Size (Diameter x Length)		24 inches x 60 inches	
Aeration System Type		Course Air	
Actual Oxygen Requirements	ppd	4,100	
Dissolved Oxygen Concentration	mg/L	4	
Minimum Retention Time	hours	1.8	
Media Ammonia Loading	g N/m^2/d	0.6	
Ammonia Removal	%	>93	90
Blowers			
Number (Duty/Standby)		3/1	
Type		Provided by Veolia	
Nominal Capacity, each	scfm	1,600	
Motor Size, each	hp	150	
Discharge Pressure	psig	10.7	
Chemical Feed			
Supplemental Alkalinity, 50% NaOH	gpd	200 (maximum month)	
Chemical Feed Pumps			
Number (Duty/Standby)		2/1	
Type		Peristaltic	
Nominal Capacity, each	gpm	TBD by FDC based on MBBR vendor's design	

Notes:
(1) Water Environment Federation, Design of Municipal Wastewater Treatment Plants (MOP8).

4.11 Power Supply

The upgrades at OOWWTP, including the addition of the dedicated IWWTP, will result in significant increased power demand for the site. Based on the size of the anticipated demand, the existing service voltage of 13.2 kilovolt (kV) is insufficient, so National Grid has indicated that new 115 kV feed(s) will need to be brought into the OOWWTP site to serve the expected load and to meet DECs requirements for emergency power.

As a POTW, New York State DEC requires OOWWTP to have redundant power sources. This is based on the Ten State Standards: Recommended Standards for Wastewater Facilities. Under Section 56.1 of the Ten State Standards, WWTPs are required to provide "an alternate source of electric power or pumping capability to allow continuity of operation during power failures" with one suggested method of alternate power sources being "the connection of at least two independent power sources such as substations able to supply power without interruption."

OOWWTP does not include main sewage pumping, as sanitary flow is conveyed to the site via forcemain from offsite pumping stations. As such, alternate pumping capability is not required. Regardless, redundant power is recommended to supply the critical OOWWTP Expansion loads, as well as the IWWTP loads. Given the large demand at OOWWTP, onsite power generators would be an impractical redundant power solution. Space on the site and natural gas are both limited for the area, making physical siting of standby power generators or diesel fuel storage impractical. Additionally, OCDWEP has an operational preference to avoid on-site emergency power generators when possible. Based on these drivers, the proposed approach for meeting power redundancy requirements is to incorporate a dual feed.

National Grid is proposing to provide two independent overhead 115 kV lines to serve the new OOWWTP and IWWTP anticipated loads in order to meet the redundant supply requirements. A memorandum summarizing this approach is included in Appendix P. A single line diagram and plan for the on-site power receiving substation are included in Appendix Q.

4.12 Program Schedule

Figure 4.7 shows a preliminary roadmap schedule for the OOWWTP Expansion program. In addition to the program milestones included on roadmap schedule, the following permitting milestones are expected for the program as listed in Table 4.37.

Table 4.37 Permitting Milestones

Permit	Application to be Submitted	Expected Agency Review Completion
SPDES	June 2025	December 2025
SEQRA Type I Action	August 2025	October 2025
Air Permitting (to be completed under IWWTP project)	November 2025	December 2026
NYSDEC/USACE JPA: OOWWTP Site Application	August 2025	January 2026
NYSDEC/ USACE JPA: Outfall Application	April 2026	September 2026

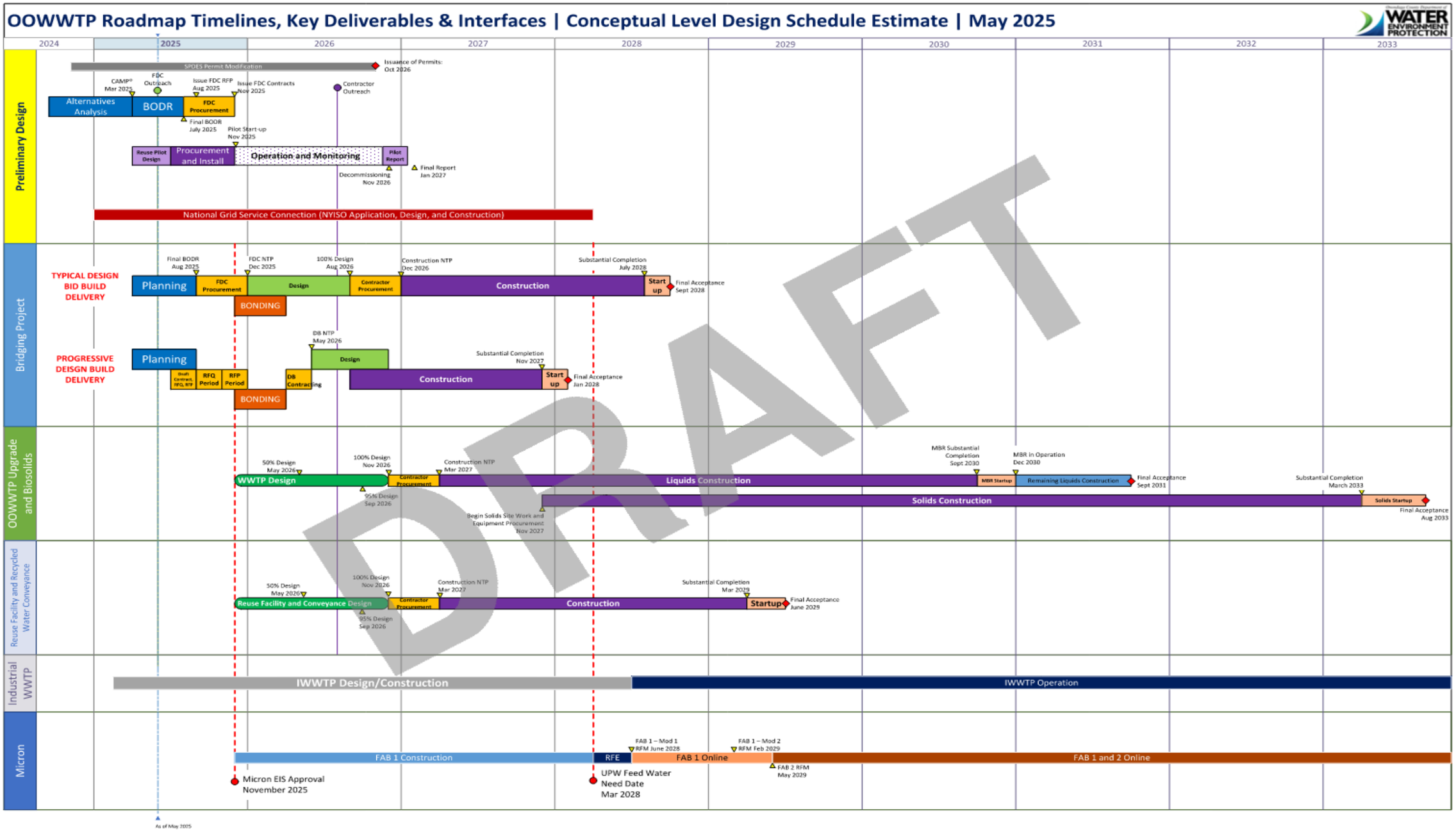


Figure 4.7 Roadmap Schedule

4.13 Next Steps

Next steps for the Program include:

1. Finalize design details for the MOPO project.
2. Determine packaging of the final design contracts. It is expected that there will be three packages:
   a. OOWWTP upgrade and biosolids facility.
   b. Reuse facility and recycled water conveyance.
   c. MOPO project, site prep, and outfall modifications (if required).
3. Finalize project delivery method. Typical design-bid-build is expected, although design-build may be used for the MOPO project given the short time frame before the facility must be online.
4. Develop the EIS and complete the SEQR process for the OOWWTP upgrade.

SECTION 5 MAPS AND FIGURES

Figure 5.1 includes a map of the service area. Design drawings at a 25 percent design level of detail are included in Appendices J, K, and L.

Oak Orchard Wastewater Treatment Plant Service Area

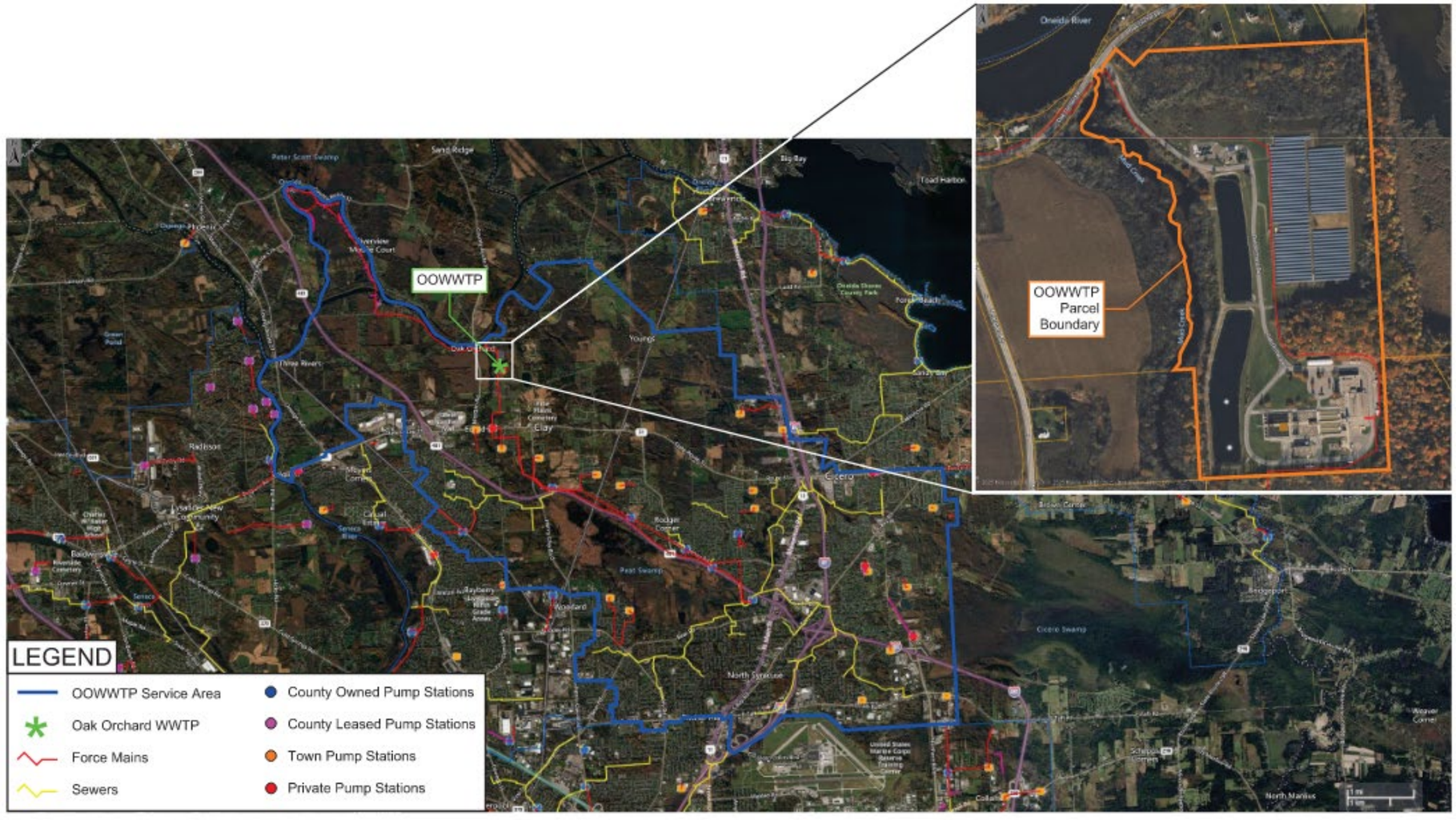


Figure 5.1 Service Area Map

Onondaga County Department of WATER ENVIRONMENT PROTECTION

Figure 5.1 Service Area Map

APPENDIX A

1975 GEOTECHNICAL REPORT

Subsurface Investigation

NOT A PART OF THE CONTRACT

C-36-731 Oak Orchard Water Pollution Control Plant

Contract IX A-General
Contract IX B-Electrical
Contract IX C-Heating & Ventilating
Contract IX D-Plumbing
Contract IX E-Oxygen Generation & Dissolution System
Contract IX F-Sludge Treatment Process

County of Onondaga, New York
Department of Drainage & Sanitation
Clay Sanitary District
January, 1978

AS ADV



O'BRIEN & GERE ENGINEERS, INC.

GA-1 OPEN 4/6/78
GEN OPEN 3/30/78

parratt wolff inc
FISHER RD., EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

January 7, 1975

O'Brien & Gere Engineers, Inc.
1304 Buckley Road
Syracuse, New York 13202

Attention: Mr. Raj Maniktala

Re: 74130
Oak Orchard Treatment Plant
Clay, New York

Gentlemen:

Enclosed are the logs of nine test borings made for you for the above project.

Samples from these borings have been delivered to your office this date under separate cover.

The borings were made at points located in the field by you and were drilled in accordance with standard ASTM methods for split-barrel sampling in soils and coring in rock.

A soil profile at the site consists generally of twenty-five to forty-five feet of loose sand and silt overylaying a dense sand and gravel. Below this granular material is the bedrock, an interbedded shale and limestone. The rock was found at depths below existing ground surface ranging from thirty feet to fifty-seven feet. The rock was cored in each test boring.

Ground water depths are noted on the boring logs.

Very truly yours,

PARRATT-WOLFF, INC.

Steffen Wolff

Steffen Wolff
SW/jw
Enclosures

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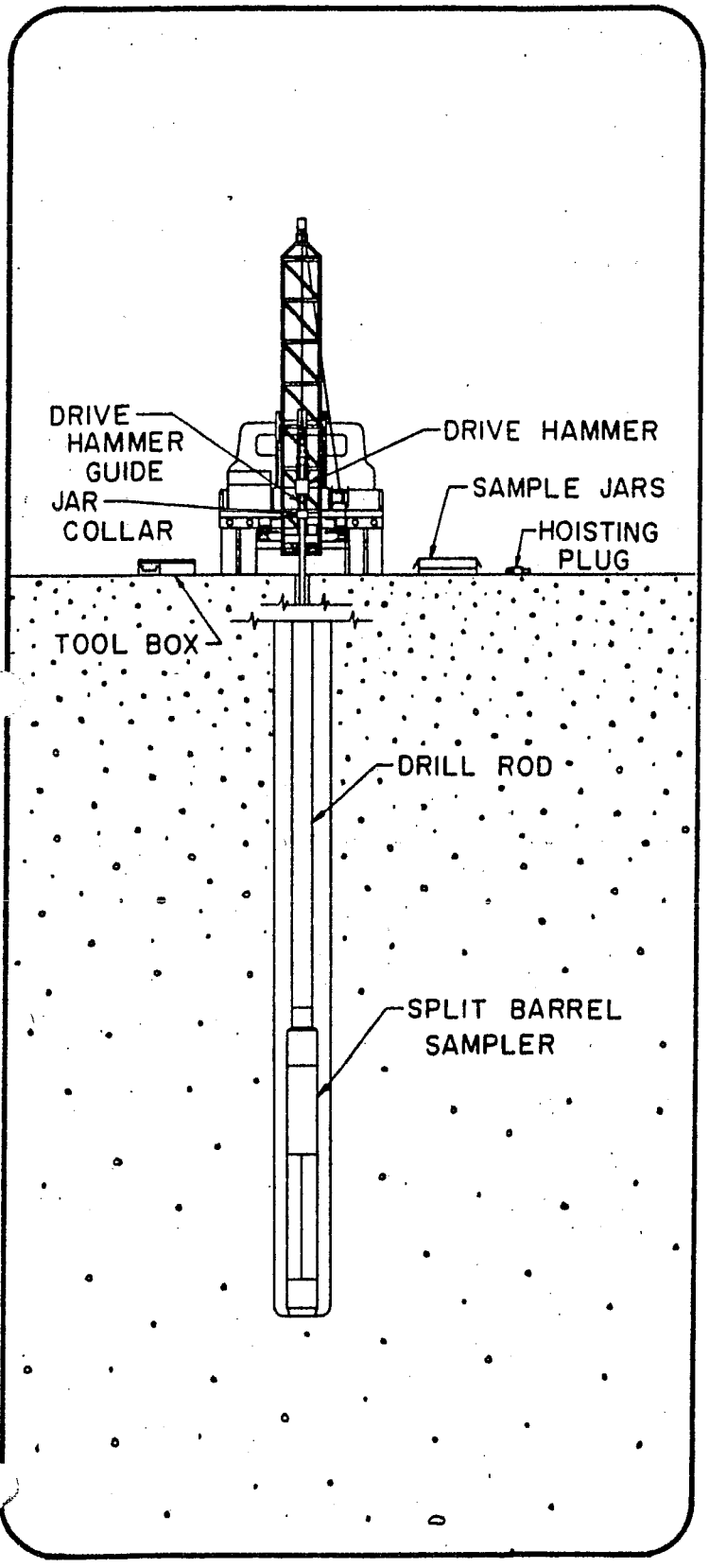
TELEPHONE AREA CODE 315/437-1429

SOIL SAMPLING-METHODS



Split barrel sampling

The following excerpts are from "Standard Method for penetration test and split-barrel sampling of soils."[1] (ASTM designation: D-1586-67 AASHO Designation: T-206-70.)

1. Scope

1.1 This method describes a procedure for using a split-barrel sampler to obtain respresentative samples of soil for identification purposes and other laboratory tests, and to obtain a measure of the resistance of the soil to penetration of the sampler.

2. Apparatus

2.1 Drilling Equipment – Any drilling equipment shall be acceptable that provides a reasonably clean hole before insertion of the sampler to ensure that the penetration test is performed on undisturbed soil, and that will permit the driving of the sampler to obtain the sample and penetration record in accordance with the procedure described in 3. Procedure. To avoid "whips" under the blows of the hammer, it is recommended that the drill rod have stiffness equal to or greater than the A-rod. An "A" rod is a hollow drill rod or "steel" having an outside diameter of 1-5/8 in. or 41.2 mm and an inside diameter of 1-1/8 in. or 28.5 mm, through which the rotary motion of drilling is transferred from the drilling motor to the cutting bit. A stiffer drill rod is suggested for holes deeper than 50 ft (15m). The hole shall be limited in diameter to between 2-1/4 and 6 in. (57.2 and 152mm).

2.2 Split-Barrel Sampler – The sampler shall be constructed with the dimensions indicated (in Fig. 1.) The drive shoe shall be of hardened steel and shall be replaced or repaired when it becomes dented or distorted. The coupling head shall have four 1/2-in. (12.7-mm) (minimum diameter) vent ports and shall contain a ball check valve. If sizes other than the 2-in. (50.8-mm) sampler are permitted, the size shall be conspicuously noted on all penetration records.

2.3 Drive Weight Assembly – The assembly shall consist of a 140-lb (63.5-kg) weight, a driving head, and a guide permitting a free fall of 30 in. (0.76 m). Special precautions shall be taken to ensure that the energy of the falling weight is not reduced by friction between the drive weight and the guides.

2.4 Accessory Equipment – Labels, data sheets, sample jars, paraffin, and other necessary supplies should accompany the sampling equipment.

SOIL SAMPLING - METHODS

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TELEPHONE AREA CODE 315/437-1429

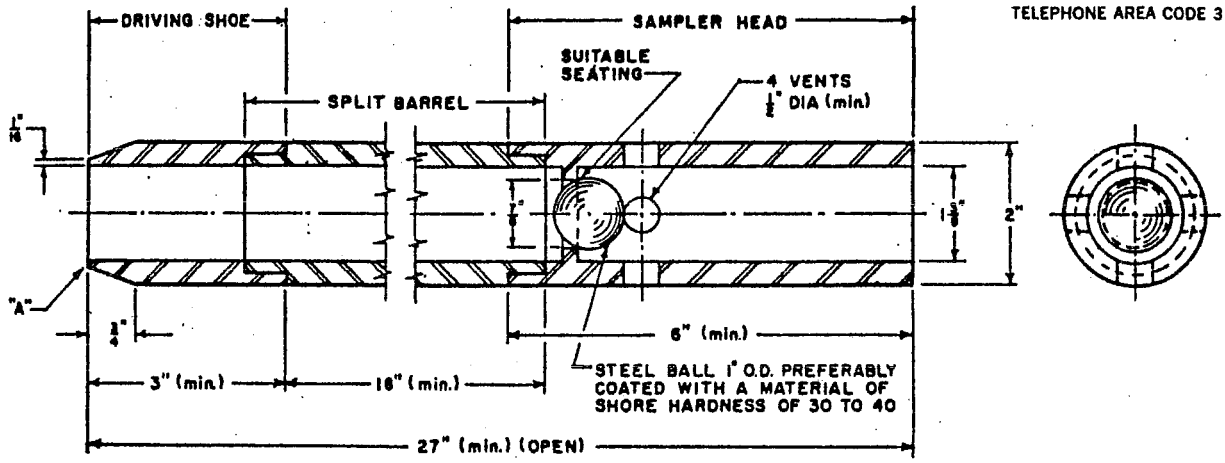

Fig. 1 — Standard Split Barrel Sampler Assembly

Note 1 — Split barrel may be 1-1/2 in. inside diameter provided it contains a liner of 16-gage wall thickness.

Note 2 — Core retainers in the driving shoe to prevent loss of sample are permitted.

Note 3 — The corners at A may be slightly rounded.

Table of Metric Equivalents.

In.	Mm	Cm	In.	Mm	Cm
1/16 (16 gage)	1.5	...	2	...	5.08
1/2	12.7	...	3	...	7.62
3/4	19.0	1.90	6	...	15.24
7/8	22.2	2.22	18	...	45.72
1-3/8	34.9	3.49	27	68.58	
1-1/2	38.1	3.81			

3. Procedure

3.1 Clear out the hole to sampling elevation using equipment that will ensure that the material to be sampled is not disturbed by the operation. In saturated sands and silts withdraw the drill bit slowly to prevent loosening of the soil around the hole. Maintain the water level in the hole at or above ground water level.

3.2 In no case shall a bottom-discharge bit be permitted. (Side-discharge bits are permissible.) The process of jetting through an open-tube sampler and then sampling when the desired depth is reached shall not be permitted. Where casing is used, it may not be driven below sampling elevation. Record any loss of circulation or excess pressure in drilling fluid during advancing of holes.

3.3 With the sampler resting on the bottom of the hole, drive the sampler with blows from the 140-lb (63.5 kg) hammer falling 30 in. (0.76 m) until either 18 in. (0.45 m) have been penetrated or 100 blows have been applied.

3.4 Repeat this operation at intervals not longer than 5 ft (1.5 m) in homogeneous strata and at every change of strata.

3.5 Record the number of blows required to effect each 6 in. (0.15 m) of penetration or fractions thereof. The first 6 in. (0.15 m) is considered to be a seating drive. The number of blows required for the second and third 6 in. (0.15 m) of penetration added is termed the penetration resistance, N. If the sampler is driven less than 18 in. (0.45 m), the penetration resistance is that for the last 1 ft (0.30 m) of penetration (if less than 1 ft (0.30 m) is penetrated, the logs shall state the number of blows and the fraction of 1 ft (0.30 m) penetrated).

3.6 Bring the sampler to the surface and open. Describe carefully typical samples of soils recovered as to composition, structure, consistency, color, and condition; then put into jars without ramming. Seal them with wax or hermetically seal to prevent evaporation of the soil moisture. Affix labels to the jar or make notations on the covers (or both) bearing job designation, boring number, sample number, depth penetration record, and length of recovery. Protect samples against extreme temperature changes.

4. Report

4.1 Data obtained in borings shall be recorded in the field and shall include the following:

4.1.1 Name and location of job,
4.1.2 Date of boring — start, finish,
4.1.3 Boring number and coordinate, if available,
4.1.4 Surface elevation, if available,
4.1.5 Sample number and depth,
4.1.6 Method of advancing sampler, penetration and recovery lengths,
4.1.7 Type and size of sampler,
4.1.8 Description of soil,
4.1.9 Thickness of layer,
4.1.10 Depth to water surface; to loss of water; to artesian head; time at which reading was made,
4.1.11 Type and make of machine,
4.1.12 Size of casing, depth of cased hole,
4.1.13 Number of blows per 6 in. (0.15 m),
4.1.14 Names of crewmen, and
4.1.15 Weather, remarks.

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[1]Under the standardization procedure of the Society, this method is under the jurisdiction of the ASTM Committee D-18 on Soil and Rock for Engineering Purposes. A list of members may be found in the ASTM Year Book.

Current edition accepted October 20, 1967. Originally issued, 1958. Replaces D-1586-64T.

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TELEPHONE AREA CODE 315/437-1429

GENERAL NOTES

1. The soil logs, notes and other test data shown are the result of interpretations made by representatives of Parratt-Wolff Inc. from personal observations made during the exploration period of samples of subsurface materials recovered during exploration and records of exploration as prepared by the drill operator.

2. Explanation of the classifications and terms:

a. Bedrock - Natural solid mineral matter occurring in great thickness and extent in its natural location. It is classified according to geological type and structure (joints, bedding, etc.) and described as solid, weathered, broken, fragmented or decomposed depending on its condition.

b. Soils - Sediments or other unconsolidated accumulations of particles produced by the physical and chemical disintegration of rocks and which may or may not contain organic matter.

PENETRATION RESISTANCE

COHESIONLESS SOILS

Blows per Ft.	Relative Density
0 to 4	Very Loose
4 to 10	Loose
10 to 30	Medium
30 to 50	Dense
Over 50	Very Dense

COHESIVE SOILS

Blows per Ft.	Consistency
0 to 2	Very Soft
2 to 4	Soft
4 to 8	Medium
8 to 15	Stiff
15 to 30	Very Stiff
Over 30	Hard

Size Component Terms

Boulder	larger than 8 inches
Cobble or Small Stone	8 inches to 3 inches
Gravel - course	3 inches to 3/4 inch
medium	3/4 inch to 4.76 mm
Sand - coarse	4.76 mm to 2.00 mm (#10 sieve)
medium	2.00 mm to 0.42 mm (#40 sieve)
fine	0.42 mm to 0.074 mm (#200 sieve)
Silt and Clay	finer than 0.074 mm

Proportion Terms by Weight

Major component is shown with all letters capitalized.

Minor component percentage terms of total sample are:

and	40 to 50 percent
some	20 to 40 percent
little	10 to 20 percent
trace	1 to 10 percent

c. Gradation Terms - The terms coarse, medium and fine are used to describe gradation of Sands and Gravel.

d. The terms used to describe the various soil components and proportions are arrived at by visual estimates of the recovered soil samples. Other terms are used when the recovered samples are not truly representative of the natural materials, such as, soil containing numerous cobbles and boulders which cannot be sampled, thinly stratified soils, organic soils, and fills.

e. Ground Water - The measurement was made during exploration work or immediately after completion, unless otherwise noted. The depth recorded is influenced by exploration methods, the soil type and weather conditions during exploration. Where no water was found it is so indicated. It is anticipated that the ground water will rise during periods of wet weather. In addition, perched ground water above the water levels indicated (or above the bottom of the hole where no ground water is indicated) may be encountered at changes in soil strata or top of rock.

parratt wolff inc

15 DEANE LANE CAZENOVIA, N.Y. 13035

TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

HOLE NO. 11-36-73-605

LOCATION N 1,167,550 - E 598, 800

SURF. ELEV. 385

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Depth on completion 5'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					Brown moist fine sandy SILT to sandy CLAY
5'0"					
			1	8'-10'	
10'0"					10'0"
			2	10'-12'	Brown moist clayey SILT to silty CLAY, trace fine sand
15'0"					
					18'0"
			3	18'-20'	Gray moist SILT, trace fine sand
20'0"					
					Bottom of boring 20'0"

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EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

HOLE NO. 12-37-73-606

LOCATION N 1,167,300 - E 599,100

SURF. ELEV. 380

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Depth on completion 10'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
5'0"				8'-10'	Brown moist fine sandy SILT
					8'0"
10'0"			1		Brown moist clayey SILT to silty CLAY, trace fine sand 11'0"
15'0"					Gray wet SILT, trace fine sand
					Bottom of boring 15'0"

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TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

HOLE NO. 13-38-73-607

LOCATION N 1,166,800 - E 599,200

SURF. ELEV. 375

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Depth on completion 10'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					Brown moist to wet clayey SILT to silty CLAY, trace fine sand
5'0"					
					8'2"
10'0"					Gray wet SILT, trace fine sand
					Bottom of boring 10'0"

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EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

HOLE NO. 14-39-73-608

LOCATION N 1,166,000 - E 599,050

SURF. ELEV. 370

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Dry on completion

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
5'0"					Brown moist clayey SILT to silty CLAY, trace fine sand
					Bottom of boring 5'0"

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FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

LOCATION N 1,167,500 - E 599,250

HOLE NO. 15-40-73-609

SURF. ELEV. 390

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Depth on completion 11'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
			1	1'0"-2'6"	Brown dry to wet clayey SILT to silty CLAY, trace fine sand
5'0"					
10'0"					
15'0"			2	13'0"-15'0	
					18'0"
20'0"					Gray wet SILT, trace fine sand
25'0"					
					Bottom of boring 25'0"

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FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

HOLE NO. 16-41-73-610

LOCATION N 1,167,000 - E 599,500

SURF. ELEV. 395

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Depth after 3 hours 30'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					Brown moist fine sandy SILT
					4'0"
5'0"					
					Brown moist clayey SILT to silty CLAY, trace fine sand
10'0"					
					12'6"
15'0"					Gray wet SILT, trace fine sand
20'0"					
25'0"					
30'0"					
					30'0"
					Bottom of boring 30'0"

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FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

LOCATION N 1,166,500 - E 599,500

HOLE NO. 17-42-73-611

SURF. ELEV. 385

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Depth on completion 13'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					Brown moist fine sandy SILT
5'0"					4'6"
					Brown moist clayey SILT to silty CLAY, trace fine sand
10'0"					
					13'0"
15'0"					Gray moist SILT, trace fine sand
20'0"					
					Bottom of boring 20'0"

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FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

LOCATION N 1,166,125 - E 599,375

HOLE NO. 18-43-73-612

SURF. ELEV. 390

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Depth on completion 22'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
5'0"					Brown dry to moist clayey SILT to silty CLAY, trace fine sand
10'0"					
15'0"					14'0"
20'0"					Gray moist SILT, trace fine sand
25'0"					
					Bottom of boring 25'0"

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FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Jankowski Site
Clay, New York

HOLE NO. 19-44-73-613

LOCATION N 1,165,750 - E 599,250

SURF. ELEV. 390

DATE STARTED 7/27/73 COMPLETED 7/27/73

JOB NO. 7384

GROUND WATER Depth on completion 22'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

AUGER BORING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
5'0"					Brown dry to moist clayey SILT to silty CLAY, trace fine sand
10'0"					
15'0"					13'6"
20'0"					Gray wet SILT, trace fine sand 18'2"
25'0"					Gray coarse to fine SAND and coarse to fine gravel, some silt 20'0"
					Gray wet SILT, trace fine sand 22'6"
		12/16	1	25'-27'	Gray coarse to fine SAND and coarse to fine GRAVEL, some silt
		16/30			
					Bottom of boring 27'0"

perratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 30-74-524

LOCATION Clay, New York — SURF. ELEV. 383.2

DATE STARTED 12/18/74 COMPLETED 12/19/74 — JOB NO. 74130

GROUND WATER Depth after 14 hours 7'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		1/15	1	0'0"	Brown moist soft SILT and CLAY, trace tree roots and fine sand
		2/1		2'0"	
		3/3	2	2'-3'	
		6/9	3	3'-4'	
5'0"		6/6	4	4'0"-6'0"	
		6/6			Brown moist stiff SILT, trace clay, fine sand and organic matter 6'0"
▽ W.L.		4/4	5	6'-7'	
		4/3	6	7'-8'	Brown wet medium stiff SILT, little clay and fine sand 9'0"
		2/2	7	8'-9'	
10'0"		4/3	8	9'-10'	
		1/1	9	10'-11'	Brown gray wet medium stiff SILT and CLAY 10'0"
		1/2	10	11'-12'	
		1/2	11	12'-13'	Gray wet very soft SILT, little clay, trace fine sand
		3/7	12	13'-14'	
15'0"		2/1	13	14'0"-16'0"	
		2/1			
		3/2	14	16'0"-18'0"	
		1/1			
		1/2	15	18'-19'	
20'0"		3/3	16	19'-20'	20'0"
		4/4	17	20'0"-21'6"	Gray wet loose SILT and fine SAND
		5			
					24'0"
25'0"					
		4/9	18A	25'-26'	Gray wet stiff SILT, little clay 26'0"
		22	18B	26'0"-26'6"	Gray moist dense fine to coarse SAND and fine to medium GRAVEL, some silt, trace clay 28'0"
30'0"					
		20/22	19	30'0"-31'2"	Black moist very dense silty sandy weathered SHALE
		50			
		2"			
35'0"					Top of rock 35'0"
					Run #1, 35'0" - 40'0" Rec. 20" - 33% Gray thin bedded weathered SHALE

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

LOCATION Clay, New York

DATE STARTED 12/18/74 COMPLETED 12/19/74

GROUND WATER Depth after 14 hours 7'6"

HOLE NO. 30

SURF. ELEV. 383.2

JOB NO. 74130

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					NOTE: Coring time in rock 4 minutes per foot; no water loss.

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 31-74-525

LOCATION Clay, New York

SURF. ELEV. 385.5

DATE STARTED 12/17/74 COMPLETED 12/17/74

JOB NO. 74130

GROUND WATER Depth on completion 9'3"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		1/5	1	0'0"-	Brown moist stiff to very
		4/5		2'0"	stiff SILT, trace fine sand,
		4/6	2	2'0"-	clay and topsoil
		8/12		4'0"	
5'0"		4/4	3	4'0"-	4'6"
		6/4		6'0"	Brown moist stiff SILT,
W.L. ▽		4/4	4	6'0"-	trace fine sand
		3/4		8'0"	
		4/4	5	8'0"-	
10'0"		3/4		10'0"	
		4/4	6	10'0"-	10'6"
		5/4		12'0"	Gray wet stiff to soft SILT,
		3/2	7	12'0"-	trace fine sand
		3/3		14'0"	
15'0"		2/3	8	14'0"-	
		3/2		16'0"-	
		3/3	9	16'0"-	
		2/3		18'0"	
		2/2	10	18'0"-	
20'0"		2/2		20'0"	20'6"
		2/7	11	20'0"-	Brown wet medium dense fine
		9		21'6"	SAND and fine to medium
					GRAVEL, little silt
25'0"					
		6/12	12	25'0"-	
		20		26'6"	
30'0"					29'0"
		19/24	13	30'0"-	Black moist very dense silty
		34		31'6"	weathered SHALE
					Top of rock 34'0"
35'0"					Run #1, 34'0" - 39'0"
					Rec. 14" - 23%
					Gray thin bedded weathered
					SHALE
40'0"					39'0"

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 31

LOCATION Clay, New York — SURF. ELEV. 386.5

DATE STARTED 12/17/74 COMPLETED 12/17/74 — JOB NO. 74130

GROUND WATER Depth on completion 9'3"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
45'0"					Run #2, 39'0" - 44'0" Rec. 50" - 83% Gray weathered SHALE and LIMESTONE
50'0"					Bottom of boring 44'0" NOTE: Coring time in Run #1-3-4 minutes per foot; Run #2-6-7 minutes per foot; no water loss.

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 32-74-526

LOCATION Clay, New York — SURF. ELEV. 403.1

DATE STARTED 12/18/74 COMPLETED 12/19/74 — JOB NO. 74130

GROUND WATER Depth on completion 25'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		5/7	1	0'0"-	Brown-black moist stiff to
		8		1'6"	very stiff SILT, trace fine
					sand, clay and topsoil
5'0"					
		6/7	2	5'0"-	
		10		6'6"	
10'0"					
		4/6	3	10'0"-	
		6/8		12'0"	
		3/6	4	12'0"-	
		9/11		14'0"	
15'0"		5/7	5	14'0"-	
		10/14		16'0"	
		10/8	6	16'0"-	
		11/14		18'0"	
		12/10	7	18'0"-	
20'0"		8/7		20'0"	19'6"
		6/7	8	20'0"-	Brown moist very stiff to
		9/8		22'0"	medium stiff SILT, little
		7/7	9	22'0"-	fine sand
		8/7		24'0"	
25'0" ▽		2/3	10	24'0"-	
		2/2		26'0"	
W.L.		2/2	11	26'0"-	
		3/2		28'0"	
		3/3	12	28'0"-	
30'0"		3/2		30'0"	
		3/3	13	30'0"-	
		2/3		32'0"	
35'0"					
		1/2	14	35'0"-	
		4		36'6"	
40'0"					

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 32-74-526

LOCATION Clay, New York — SURF. ELEV. 403.1

DATE STARTED 12/18/74 COMPLETED 12/19/74 — JOB NO. 74130

GROUND WATER Depth on completion 25'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		9/8	15	40'0"-	Brown wet medium dense medium
		11		41'6"	to fine SAND, trace fine
					gravel
45'0"					45'6"
		4/16	16	45'0"-	Black moist dense SILT and
		18		46'6"	weathered SHALE
50'0"					50'0"
		17/22	17	50'0"-	Black dry very dense silty
		60		51'6"	weathered SHALE
55'0"					
		75	18	55'0"-	
		2"		55'2"	Top of rock 57'4"
				No Rec.	Run #1, 57'4" - 62'4"
60'0"					Rec. 37" - 62%
					Gray weathered SHALE and
					LIMESTONE
65'0"					Bottom of boring 62'4"

NOTE: Coring time in rock 5-6 minutes per foot; no water loss.

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 33-74-527

LOCATION Clay, New York — SURF. ELEV. 392.8

DATE STARTED 12/17/74 COMPLETED 12/18/74 — JOB NO. 74130

GROUND WATER Depth on completion 13'7"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		1/1	1	0'0"-	Brown moist stiff to hard
		5/8		2'0"	SILT, trace fine sand, clay
		8/10	2	2'0"-	and topsoil
		15/18		4'0"	
5'0"		9/9	3	4'0"-	
		9/9		6'0"	6'0"
		8/8	4	6'0"-	Brown moist very stiff to
		10/9		8'0"	stiff SILT, little fine sand
		8/6	5	8'0"-	9'6"
10'0"		5/5		10'0"	
		4/5	6	10'0"-	Gray moist stiff to medium
W.L. ▽		4/4		12'0"	stiff SILT, little fine sand
		4/4	7	12'0"-	
		5/4		14'0"	
15'0"		5/4	8	14'0"-	
		4/2		16'0"	
		2/2	9	16'0"-	
		2/2		18'0"	
		3/2	10	18'0"-	
20'0"		3/3		20'0"	
		3/7	11	20'0"-	20'6"
		8		21'6"	Gray-brown wet medium dense
					fine SAND, some silt
					24'0"
25'0"					
		5/1	12	25'0"-	Brown wet very loose to
		1		26'6"	medium dense fine SAND, trace
					silt
30'0"					
		7/6	13	30'0"-	
		13		31'6"	
35'0"					
		3/6	14	35'0"-	
		7		36'6"	
				No Rec.	
40'0"					

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 33-74-527

LOCATION Clay, New York — SURF. ELEV. 392.8

DATE STARTED 12/17/74 COMPLETED 12/18/74 — JOB NO. 74130

GROUND WATER Depth on completion 13'7"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		4/4	15	40'0"- 41'6"	Brown wet very loose to medium dense fine SAND, trace silt
		5			
45'0"					46'0"
		9/17	6	45'0"- 46'3"	Black moist very dense silty weathered SHALE
		50			
		3"			Top of rock 49'6"
50'0"					Run #1, 49'6" - 54'6" Rec. 35" - 58% Gray weathered SHALE and LIMESTONE
55'0"					Bottom of boring 54'6"
					NOTE: Coring time in rock 5 minutes per foot; no water loss.

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

LOCATION Clay, New York

DATE STARTED 1/2/75 COMPLETED 1/3/75

GROUND WATER Depth on completion 8'6"

HOLE NO. 34-74-528

SURF. ELEV. 392.4

JOB NO. 74130

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

SHEET 1 OF 1

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		2/2	1	0'0"-	Brown wet medium stiff to
		4/4		2'0"	stiff SILT, some fine sand
		3/3	2	2'0"-	and clay
		5/5		4'0"	
5'0"		3/4	3	4'0"-	
		5/6		6'0"	
WL		6/7	4	6'0"-	
▽		5/5		8'0"	
		2/2	5	8'0"-	Gray wet soft SILT and CLAY
10'0"		2/2		10'0"	
		1/2	6	10'0"-	
		2/1		12'0"	
		2/1	7	12'0"-	
		1/3		14'0"	14'0"
15'0"		1/3	8	14'0"-	Gray wet loose SILT, trace
		3/3		16'0"	clay
		3/3	9	16'0"-	
		2/5		18'0"	18'0"
		6/11	10	18'0"-	Gray wet dense fine SAND,
20'0"		19/17		20'0"	some silt
		12/13	11	20'0"-	
		16		21'6"	
25'0"					25'0"
		8/10	12	25'0"-	Black moist medium dense
		13		26'6"	fine SAND and fine to coarse
					GRAVEL, little silt 28'0"
30'0"					Black moist dense SILT with
		13/20	13	30'0"-	embedded shale gravel and
		25		31'6"	fine sand
					Top of rock 30'4"
					Run #1, 30'4" - 35'4"
35'0"					Rec. 38" - 63%
		50	14	30'0"	Gray weathered SHALE, some
		0"			limestone
					Bottom of boring 35'4"
40'0"					NOTE: Coring time in rock 4 minutes per foot; no water loss

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 35-74-529

LOCATION Clay, New York — SURF. ELEV. 394.0

DATE STARTED 12/24/74 COMPLETED 12/31/74 — JOB NO. 74130

GROUND WATER Depth after 72 hours 16'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		1/1	1	0'0"-	Brown moist loose SILT,
		2/4		2'0"	trace fine sand 2'0"
		4/4	2	2'0"-	Brown wet stiff SILT,
		5/5		4'0"	little clay, trace fine
5'0"		4/9	3	4'0"-	sand
		8/8		6'0"	
		5/4	4	6'0"-	
		5/5		8'0"	8'0"
		2/2	5	8'0"-	Brown wet medium stiff
10'0"		3/2		10'0"	SILT, some fine sand 10'0"
		1/3	6	10'0"-	Gray wet medium stiff SILT,
		2/3		12'0"	little clay and fine sand
		2/2	7	12'0"-	
		2/2		14'0"	
15'0"		3/3	8	14'0"-	15'0"
▽		5/6	9	15'0"	Gray wet medium dense fine
WL		6/5	10	15'0"-	SAND and SILT
		6/7		16'0"	18'0"
		5/4	11	16'0"-	Gray wet loose fine SAND,
20'0"		3/3		18'0"	some silt
		4/1	12	18'0"-	
		2		20'0"	
				20'0"-	
				21'6"	
25'0"					
		6/5	13	25'0"-	
		5		26'6"	
30'0"					
		3/3	14	30'0"-	
		3		31'6"	
35'0"					
		6/5	15	35'0"-	36'0"
		5		36'6"	Black wet loose coarse to
					fine GRAVEL and coarse to
					fine SAND, little silt
40'0"					

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 35-74-529

LOCATION Clay, New York — SURF. ELEV. 394.0

DATE STARTED 12/24/74 COMPLETED 12/31/74 — JOB NO. 74130

GROUND WATER Depth after 72 hours 16'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		10/13	16	40'0"-	Black wet medium dense coarse
		14		41'6"	to fine GRAVEL and coarse to
					fine SAND, little silt 43'0"
45'0"					Black moist very dense fine
		50/50	17	45'0"-	SAND, some fine to coarse
		3"		45'9"	gravel, trace silt
					Top of rock 49'0"
50'0"					Run #1, 49'0" - 54'0"
					Rec. 36" - 60%
					Gray-black weathered SHALE
55'0"					and LIMESTONE
					Bottom of boring 54'0"
					NOTE: Coring time in rock 4 minutes per foot; no water loss.

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 36-74-530

LOCATION Clay, New York — SURF. ELEV. 393.2

DATE STARTED 12/23/74 — COMPLETED 12/23/74 — JOB NO. 74130

GROUND WATER Struck water @ 4'0" while drilling-depth after 16 hours 16'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		1/1	1	0'-1'	Brown wet very soft TOPSOIL 1'0"
		2/3	2	1'-2'	Brown moist medium stiff to stiff SILT and CLAY
		3/5	3	2'-3'	
		8/8	4	3'-4'	4'0"
5'0"		2/3	5	4'0"-6'0"	Brown wet loose SILT, little fine sand
		1/1			7'0"
		4/3	6	6'-7'	Brown moist medium stiff SILT and CLAY
		2/3	7	7'-8'	
		2/3	8	8'-9'	
10'0"		4/4	9	9'-10'	11'0"
		1/2	10	10'-11'	Gray wet very loose SILT, trace fine sand
		1/2	11	11'-12'	
		2/2	12	12'-13'	
		2/1	13	13'-14'	
15'0"		1/3	14	14'-15'	15'0"
▽		6/8	15	15'-16'	Gray moist to wet medium dense fine SAND
W.L.		6/10	16	16'0"-18'0"	18'0"
		9/10			Gray wet loose to medium dense fine SAND and SILT
		3/3	17	18'0"-20'0"	
20'0"		4/4			
		3/3	18	20'0"-21'6"	
		3			
25'0"					
		5/6	19	25'0"-26'6"	
		7			
30'0"					
		4/5	20	30'0"-31'6"	
		6			
35'0"					
		3/5	21	35'0"-36'6"	
		6			
					38'0"
40'0"					

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 36-74-530

LOCATION Clay, New York — SURF. ELEV. 393.2

DATE STARTED 12/23/74 COMPLETED 12/23/74 — JOB NO. 74130

GROUND WATER Struck water @ 4'0" while drilling-depth after 16 hours 16'0"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 2 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		10/18	22	40'0"-	Black wet dense to very dense
		16		41'6"	coarse to fine GRAVEL and
					coarse to fine SAND, some silt
45'0"					
		28/50	23	45'0"-	
				46'0"	
50'0"					Top of rock 49'3"
					Run #1, 49'3" - 54'3"
					Rec. 17" - 28%
55'0"					Gray weathered SHALE and LIMESTONE
					Bottom of boring 54'3"
60'0"					NOTE: Coring time in rock 4 minutes per foot; no water loss.

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

LOCATION Clay, New York

DATE STARTED 12/17/74 COMPLETED 12/18/74

GROUND WATER Depth after 12 hours 6'3"

HOLE NO. 37-74-531

SURF. ELEV. 396.7

JOB NO. 74130

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		1/2	1	0'-1'	Brown moist soft SILT and TOPSOIL 1'0"
		2/5	2	1'-2'	
		5/4	3	2'0"-	Brown moist to wet stiff to soft SILT, trace fine sand
		5/5		4'0"	
5'0"		2/2	4	4'-5'	
▽ W.L.		4/6	5	5'-6'	
		4/4	6	6'-7'	
		3/4	7	7'-8'	
		3/3	8	8'-9'	
10'0"		4/5	9	9'-10'	
		2/3	10	10'-11'	
		4/5	11	11'-12'	
		2/2	12	12'0"	12'0"
		1/2		14'0"-	Gray wet soft SILT, little clay, trace fine sand
15'0"		2/2	13	14'-15'	
		2/6	14	15'-16'	16'0"
		6/8	15	16'0"-	Brown moist medium dense fine SAND, some silt 18'0"
		10/13		18'0"	
		12/14	16	18'0"-	Gray wet medium dense to loose fine SAND, trace silt
20'0"		13/13		20'0"	
		9/8	17	20'0"-	
		6		21'6"	
25'0"					
		6/5	18	25'0"-	
		3		26'6"	
30'0"					
		5/6	19	30'0"-	
		6		31'6"	
35'0"					
		3/3	20	35'0"-	
		3		36'6"	
40'0"					

perratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 37-74-531

LOCATION Clay, New York

SURF. ELEV. 396.7

DATE STARTED 12/17/74 COMPLETED 12/18/74

JOB NO. 74130

GROUND WATER . Depth after 12 hours 6'3"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		3/2	21	40'0"-	Gray wet loose to medium
		3		41'6"	dense fine SAND, trace silt
45'0"					
		6/5	22	45'0"-	
		6		46'6"	
50'0"					
		4/5	23	50'0"-	
		6		51'6"	
55'0"					52'0"
					Black moist hard silty weathered SHALE
					Top of rock 53'6"
					Run #1, 53'6" - 58'6"
					Rec. 31" - 52%
					Gray weathered SHALE and LIMESTONE
					Bottom of boring 58'6"
					NOTE: Coring time in rock 4 minutes per foot; no water loss.

perratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 38-74-532

LOCATION Clay, New York

SURF. ELEV. 391.4

DATE STARTED 12/20/74 COMPLETED 12/20/74

JOB NO. 74130

GROUND WATER Depth after 16 hours 4'3"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

SHEET 1 OF 2

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		2/2	1	0'0"-	Brown moist stiff SILT and
		4/5		2'0"	CLAY
W.L		4/5	2	2'0"-	
▽		6/8		4'0"	4'0"
5'0"		5/8	3	4'-5'	Brown wet stiff to very
		8/10	4	5'-6'	stiff SILT, little clay
		5/8	5	6'0"-	
		8/7		8'0"	8'0"
		2/3	6	8'-9'	Brown wet soft CLAY and
10'0"		3/3	7	9'-10'	SILT 9'0"
		1/1	8	10'-11'	Gray wet medium stiff soft
		1/2	9	11'-12'	to medium stiff SILT, some
		2/2	10	12'-13'	clay, trace fine sand
		3/2	11	13'-14'	
15'0"		1/2	12	14'-15'	
		2/1	13	15'-16'	
		2/1	14	16'-17'	
		1/2	15	17'-18'	
		1/2	16	18'-19'	
20'0"		3/5	17	19'-20'	20'0"
		3/2	18	20'0"-	Gray wet loose SILT, trace
		2		21'6"	fine sand
25'0"					
		3/4	19	25'0"-	
		6		26'6"	
30'0"					
		2/3	20	30'0"-	
		2		31'6"	
35'0"					35'0"
		5/6	21	35'0"-	Black wet medium dense fine
		7		36'6"	to coarse GRAVEL and fine to
40'0"					coarse SAND, some silt

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 38

LOCATION Clay, New York — SURF. ELEV. 74-532

DATE STARTED 12/20/74 COMPLETED 12/20/74 — JOB NO. 74130

GROUND WATER Depth after 16 hours 4'3"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 2 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		10/24	22	40'0"-	Black moist very dense fine
		45		41'6"	to coarse SHALE GRAVEL, fine
					SAND and SILT
45'0"					
		75		45'0"	
		0"			
					Top of rock 48'3"
50'0"					Run #1, 48'3" - 53'3"
					Rec. 30" - 50%
					Gray weathered SHALE, some
					limestone
55'0"					Bottom of boring 53'3"
					NOTE: Coring time in rock 3-4
					minutes per foot; no
					water loss.

perratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 39-74-533

LOCATION Clay, New York — SURF. ELEV. 390.9

DATE STARTED 2/10/75 — COMPLETED 2/10/75 — JOB NO. 74130

GROUND WATER Depth on completion 25'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					Dark brown saturated medium dense SILT, little fine sand and roots 3'0"
		6/7	1	1'0"- 2'6"	
		7			
5'0"					Brown wet medium dense SILT, little fine sand
		5/8	2	5'0"- 6'6"	
		9			
					9'0"
10'0"					Gray wet loose SILT, little fine sand, trace clay
		3/2	3	10'0"- 11'6"	
		2			
15'0"					
		2/2	4	15'0"- 16'6"	
		2			
20'0"					
		2/4	5	20'0"- 21'6"	21'0"
		4			Gray saturated loose fine SAND, some silt
25'0" ▽					
WL		4/4	6	25'0"- 26'6"	
		3			
30'0"					
		3/2	7	30'0"- 31'6"	
		3			
35'0"					
		2/2	8	35'0"- 36'6"	
		2			
40'0"					37'6"

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 39-74-533

LOCATION Clay, New York — SURF. ELEV. 390.9

DATE STARTED 2/10/75 COMPLETED 2/10/75 — JOB NO. 74130

GROUND WATER Depth on completion 25'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 2 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		9/11	9	40'0"-	Gray wet dense coarse to fine
		35		41'6"	GRAVEL, some coarse to fine
					sand, trace silt 43'0"
45'0"					Dark brown wet very dense
		44/32	10	45'0"-	coarse to fine GRAVEL, some
		73		46'6"	coarse to fine sand, some silt
		75	11	48'0"-	Top of rock 48'1"
		1"		48'1"	Run #1, 48'1" - 53'1"
50'0"				No Rec.	Rec. 36" - 60%
					Gray weathered SHALE and
					LIMESTONE
55'0"					Bottom of boring 53'1"
					NOTE: Coring time in rock 4 minutes per foot; no water loss.

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 40-74-534

LOCATION Clay, New York

SURF. ELEV. 395.4

DATE STARTED 2/11/75 COMPLETED 2/11/75

JOB NO. 74130

GROUND WATER Depth after 12 hours 9'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		6/5	1	1'0"-2'6"	Brown moist loose SILT, trace fine sand and roots
		5			2'6"
5'0"					Brown wet medium dense SILT, some fine sand
		7/8	2	5'0"-6'6"	
		9			
10'0" WL					
		4/2	3	10'0"-11'6"	10'6"
		2			Brown wet soft SILT, trace fine sand and clay
15'0"					15'6"
		1/6	4	15'0"-16'6"	Brown saturated medium dense fine SAND, trace silt
		8			
20'0"					
		5/7	5	20'0"-21'6"	
		7			
25'0"					
		5/5	6	25'0"-26'6"	
		5			
30'0"					
		6/8	7	30'0"-31'6"	
		9			
35'0"					
		6/9	8	35'0"-36'6"	
		14			
40'0"					

perratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 40-74-534

LOCATION Clay, New York

SURF. ELEV. 395.4

DATE STARTED 2/11/75 COMPLETED 2/11/75

JOB NO. 74130

GROUND WATER Depth after 12 hours 9'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

SHEET 2 OF 2

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		5/4	9	40'0"-	Brown saturated medium dense
		4		41'6"	fine SAND, trace silt
					42'6"
45'0"					Brown gray wet medium dense to very dense coarse to fine
		7/8	10	45'0"-	GRAVEL, some medium to fine
		10		46'6"	sand, little silt
50'0"					
		33/46	11	50'0"-	
		75/4"		51'4"	
		75/0"			51'0"
55'0"					Gray-black wet very dense SILT, some coarse to medium gravel, trace sand
					Top of rock 53'0"
					Run #1, 53'0" - 58'0"
					Rec. 44" - 73%
60'0"					Gray weathered SHALE and LIMESTONE
					Bottom of boring 58'0"
					NOTE: Coring time in rock 3-4 minutes per foot; no water loss.

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FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 41-74-535

LOCATION Clay, New York — SURF. ELEV. 390.3

DATE STARTED 2/12/75 — COMPLETED 2/12/75 — JOB NO. 74130

GROUND WATER See note

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		5/7	1	1'0"- 2'6"	Brown wet medium dense to very loose SILT, some fine sand, trace clay
		6			
5'0" WL		5/8	2	5'0"- 6'6"	
		9			
10'0"		2/1	3	10'0"- 11'6"	
		2			
15'0"		1/1	4	15'0"- 16'6"	
		3			17'0"
20'0"		5/5	5	20'0"- 21'6"	Brown saturated loose fine SAND, little silt
		4			
25'0"		3/4	6	25'0"- 26'6"	
		4			
30'0"		3/2	7	30'0"- 31'6"	
		3			34'0"
35'0"		9/13	8	35'0"- 36'6"	Gray-black wet medium dense SILT and coarse to medium GRAVEL, little fine sand
		12			
40'0"					

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 41-74-535

LOCATION Clay, New York — SURF. ELEV. 390.3

DATE STARTED 2/12/75 — COMPLETED 2/12/75 — JOB NO. 74130

GROUND WATER See note

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		23/29	9	40'0"-	
		37		41'6"	41'4"
					Dark gray wet very dense silty weathered SHALE
45'0"					
		34/45	10	45'0"-	
		76		46'6"	Top of rock 46'6"
					Run #1, 46'6" - 51'6"
					Rec. 46" - 77%
50'0"					Gray weathered SHALE and LIMESTONE
					Bottom of boring 51'6"
55'0"					NOTE: Coring time in rock 4 minutes per foot; no water loss.
					Water depth with boring complete and cased to 46'6" @ 13'4" water depth after pulling casing 5'6".

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 42-74-536

LOCATION Clay, New York

SURF. ELEV. 389.8

DATE STARTED 2/12/75 COMPLETED 2/12/75

JOB NO. 74130

GROUND WATER Depth on completion 12'4"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		9/7	1	1'0"-2'6"	Brown wet medium dense SILT, little fine sand and roots 2'0"
		8			Brown wet medium dense SILT, trace fine sand
5'0"					
		6/7	2	5'0"-6'6"	
		7			8'0"
10'0"					Gray-brown wet soft clayey SILT, trace fine sand
		1/2	3	10'0"-11'6"	
▽ WL		2			
15'0"					15'8"
		1/1	4	15'0"-16'6"	Brown saturated loose to medium dense fine SAND, little silt
		1			
20'0"					
		4/3	5	20'0"-21'6"	
		3			
25'0"					
		6/9	6	25'0"-26'6"	
		7			
30'0"					
		2/2	7	30'0"-31'6"	
		2			
35'0"					
		6/7	8	35'0"-36'6"	36'9"
		9			Gray wet medium dense medium to fine SAND and coarse to medium GRAVEL, trace silt
40'0"					

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 42-74-536

LOCATION Clay, New York

SURF. ELEV. 389.8

DATE STARTED 2/12/75 COMPLETED 2/12/75

JOB NO. 74130

GROUND WATER Depth on completion 12'4"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		12/13	9	40'0"-	
		10		41'6"	42'0"
					Dark gray wet very dense silty weathered SHALE
45'0"					
		26/45	10	45'0"-	
		80		46'3"	Top of rock 47'0"
		3"			Run #1, 47'0" - 52'0"
					Rec. 34" - 57%
50'0"					Gray weathered SHALE and LIMESTONE
					Bottom of boring 52'0"
55'0"					NOTE: Coring time in rock 3-4 minutes per foot; no water loss.

perratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 43-74-537

LOCATION Clay, New York — SURF. ELEV. 389.0

DATE STARTED 2/19/75 COMPLETED 2/19/75 — JOB NO. 74130

GROUND WATER Depth on completion 8'5"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		5/6	1	1'0"-	Brown moist medium dense to very loose SILT
		8		2'6"	
5'0"					
		4/5	2	5'0"-	
WL ▽		5		6'6"	
10'0"					
		1/1	3	10'0"-	
		2		11'6"	
15'0"					14'0"
		4/4	4	15'0"-	Gray wet loose fine SAND, little silt
		5		16'6"	17'6"
20'0"					Gray wet loose SILT and fine SAND
		3/4	5	20'0"-	
		5		21'6"	
25'0"					
		4/4	6	25'0"-	
		5		26'6"	
30'0"					
		2/3	7	30'0"-	
		2		31'6"	
35'0"					
		4/5	8	35'0"-	
		5		36'6"	
40'0"					37'6"

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 43-74-537

LOCATION Clay, New York

SURF. ELEV. 389.0

DATE STARTED 2/19/75 COMPLETED 2/19/75

JOB NO. 74130

GROUND WATER Depth on completion 8'5"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		7/9	9	40'0"-	Gray wet medium dense coarse
		13		41'6"	to medium GRAVEL, some medium
					to fine sand and silt 43'0"
45'0"					Gray-black moist very dense
		26/55	10	45'0"-	SILT and medium to fine
				46'0"	embedded GRAVEL
					Top of rock 46'0"
50'0"					Run #1, 46'0" - 51'0"
					Rec. 30" - 50%
					Gray weathered SHALE and
					LIMESTONE
55'0"					Bottom of boring 51'0"
					NOTE: Coring time in rock 4-5 minutes per foot; no water loss.

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant
HOLE NO. 44-74-538

LOCATION Clay, New York
SURF. ELEV. 389.4

DATE STARTED 2/20/75 COMPLETED 2/21/75
JOB NO. 74130

GROUND WATER Struck water @ 6'0" while drilling

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		4/7	1	1'0"- 2'6"	Brown moist medium dense SILT, little fine sand
		7			
5'0" WL		5/6	2	5'0"- 6'6"	
		7			
10'0"					9'0"
		2/2	3	10'0"- 11'6"	Gray wet soft SILT, trace fine sand
		2			
15'0"					
		1/2	4	15'0"- 16'6"	
		1			
20'0"					
		1/1	5	20'0"- 21'6"	
		1			
25'0"					24'0"
		5/10	6	25'0"- 26'6"	Gray wet medium dense to loose fine SAND, some silt
		8			
30'0"					
		4/4	7	30'0"- 31'6"	
		4			
35'0"					35'0"
		5/5	8	35'0"- 36'6"	Black wet medium dense medium to fine SAND and fine to coarse GRAVEL, little silt
		5			
40'0"					

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 44-74-538

LOCATION Clay, New York — SURF. ELEV. 389.4

DATE STARTED 2/20/75 — COMPLETED 2/21/75 — JOB NO. 74130

GROUND WATER Struck water @ 6'0" while drilling

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 2 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		15/25	9	40'0"-	Black moist very dense SILT
		36		41'6"	and fine to coarse GRAVEL,
					trace fine sand 43'4"
45'0"					BOULDER
					Top of rock 44'4"
					Run #1, 44'4" - 49'4"
					Rec. 25" - 60%
					Gray weathered SHALE and
50'0"					LIMESTONE
					Bottom of boring 49'4"
55'0"					NOTE: Coring time in rock 5 minutes per foot; no water loss.

perratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 45-74-539

LOCATION Clay, New York — SURF. ELEV. 388.3

DATE STARTED 2/20/75 COMPLETED 2/20/75 — JOB NO. 74130

GROUND WATER Struck water @ 8'0" while drilling

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		5/8	1	1'0"-	Brown moist medium dense SILT, trace fine sand
		10		2'6"	
5'0"					
		5/6	2	5'0"-	
		5		6'6"	
▼ WL					
10'0"					8'0"
		1/1	3	10'0"-	Gray wet very loose SILT, trace fine sand
		1		11'6"	
15'0"					
		1/1	4	15'0"-	
		1		16'6"	
20'0"					
		1/1	5	20'0"-	
		1		21'6"	
25'0"					
		5/3	6	25'0"-	
		3		26'6"	
30'0"					27'0"
					Gray wet loose fine to medium SAND, trace fine gravel and silt
		2/4	7	30'0"-	
		5		31'6"	
					32'9"
		50/1"	8	33'7"-	Black moist very dense SILT, little medium to fine GRAVEL
35'0"				33'8"	Top of rock 33'8"
					Run #1, 33'8" - 38'8"
					Rec. 42" - 70%
40'0"					Gray weathered SHALE and LIMESTONE

perratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 45-74-539

LOCATION Clay, New York

SURF. ELEV. 388.3

DATE STARTED 2/20/75 COMPLETED 2/20/75

JOB NO. 74130

GROUND WATER Struck water @ 8'0" while drilling

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					NOTE: Coring time in rock 4 minutes per foot; lost drill water in open seam from 36'8" - 37'2".

perratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 46-74-540

LOCATION Clay, New York

SURF. ELEV. 391.4

DATE STARTED 2/18/75 COMPLETED 2/19/75

JOB NO. 74130

GROUND WATER Depth on completion 16'2"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		4/9	1	1'0"-	Brown-black moist medium dense SILT, trace roots and fine
		11		2'6"	sand
5'0"					
		4/8	2	5'0"-	
		11		6'6"	
					8'0"
10'0"					Brown moist loose fine SAND and SILT
		5/5	3	10'0"-	
		5		11'6"	
					13'6"
15'0"					Brown wet loose SILT, trace fine sand
▼ WL		2/2	4	15'0"-	
		3		16'6"	
20'0"					
		2/2	5	20'0"-	
		2		21'6"	
25'0"					
		3/4	6	25'0"-	
		4		26'6"	
					29'0"
30'0"					Brown saturated loose SILT and fine SAND
		4/4	7	30'0"-	
		4		31'6"	
35'0"					
		4/4	8	35'0"-	Brown wet loose SILT, trace fine sand
		5		36'6"	37'4"
40'0"					Gray wet very dense SILT and medium to fine embedded GRAVEL,

perratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 46-74-540

LOCATION Clay, New York

SURF. ELEV. 391.4

DATE STARTED 2/18/75 COMPLETED 2/19/75

JOB NO. 74130

GROUND WATER Depth on completion 16'2"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		10/17	9	40'0"-41'4"	trace fine sand
		75			Top of rock 41'8"
		4"			Run #1, 41'8" - 46'8"
45'0"					Rec. 17" - 28%
					Gray fractured weathered SHALE 46'8"
					Ran quarry bit from 46'8" - 47'0" 47'0"
50'0"					Run #2, 47'0" - 52'0"
					Rec. 36" - 60%
					Gray weathered SHALE and LIMESTONE
55'0"					Bottom of boring 52'0"

NOTE: Coring time in rock on Run #1/ 5-6 minutes per foot, Run #2/ 4 minutes per foot; no water loss.

perratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 47-74-541

LOCATION Clay, New York — SURF. ELEV. 396.8

DATE STARTED 2/17/75 COMPLETED 2/18/75 — JOB NO. 74130

GROUND WATER Depth on completion 16'10"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		6/7	1	1'0"- 2'6"	Brown wet medium dense SILT, little roots
		9			3'0"
5'0"					Brown moist medium dense SILT, trace wood
		6/11	2	5'0"- 6'6"	6'0"
		15			Brown moist loose to medium dense SILT, little fine sand
10'0"					
		3/4	3	10'0"- 11'6"	
		5			
15'0"					
▽ WL		7/7	4	15'0"- 16'6"	
		6			
20'0"					19'0"
		1/2	5	20'0"- 21'6"	Gray wet loose to medium dense SILT, little fine sand
		2			
25'0"					
		1/6	6	25'0"- 26'6"	
		7			
30'0"					
		2/3	7	30'0"- 31'6"	
		3			
35'0"					34'6"
		2/4	8	35'0"- 36'6"	Gray wet loose fine SAND, little silt
		4			
40'0"					40'0"

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 47-74-541

LOCATION Clay, New York

SURF. ELEV. 396.8

DATE STARTED 2/18/75 COMPLETED 2/19/75

JOB NO. 74130

GROUND WATER Depth on completion 16'10"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		4/6	9	40'0"-	Gray wet medium dense SILT
		7		41'6"	and fine SAND
45'0"					
		7/6	10	45'0"-	
		7		46'6"	
					47'6"
50'0"					Gray wet medium dense SILT and medium to fine GRAVEL, little medium to fine sand
		7/6	11	50'0"-	
		10		51'6"	
					52'6"
55'0"					Gray wet very dense silty weathered medium to fine GRAVEL
		75	12	55'0"-	Top of rock 55'4"
		4"		55'4"	
60'0"					Run #1, 55'4" - 60'4" Rec. 35" - 58% Gray weathered SHALE and LIMESTONE
					Bottom of boring 60'4"
65'0"					NOTE: Coring time in rock 4 minutes per foot; no water loss.

perratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 48-74-542

LOCATION Clay, New York — SURF. ELEV. 387.8

DATE STARTED 2/21/75 — COMPLETED 2/21/75 — JOB NO. 74130

GROUND WATER Struck water @ 6'0" while drilling

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		3/4	1	1'0"-	Brown moist loose SILT
		5		2'6"	
5'0"					4'6"
WL		4/5	2	5'0"-	Brown wet medium dense SILT, some fine sand
		6		6'6"	8'0"
10'0"					Brown wet very loose SILT, trace fine sand
		3/2	3	10'0"-	12'0"
		2		11'6"	Gray wet very loose SILT, trace fine sand
15'0"					
		1/1	4	15'0"-	
		1		16'6"	
20'0"					
		1/2	5	20'0"-	
		2		21'6"	
25'0"					24'0"
		5/5	6	25'0"-	Gray wet medium dense SILT and fine SAND, little fine to coarse embedded gravel
		8		26'6"	
30'0"					
		5/13	7	30'0"-	
		6		31'6"	
35'0"					34'0"
		11/19	8	35'0"-	Black moist dense SILT and fine to coarse GRAVEL, some medium to fine sand
		26		36'6"	
40'0"					

perratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 48-74-542

LOCATION Clay, New York — SURF. ELEV. 387.8

DATE STARTED 2/21/75 COMPLETED 2/21/75 — JOB NO. 74130

GROUND WATER Struck water @ 6'0" while drilling

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 2 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		31/50 3"	9	40'0"- 40'9"	Black moist very dense SILT, some fine to coarse gravel, trace weathered shale and fine sand
45'0"					Top of rock 43'6"
					Run #1, 43'6" - 48'6" Rec. 39" - 65% Gray weathered SHALE and LIMESTONE
50'0"					Bottom of boring 48'6"
55'0"					NOTE: Coring time in rock 4 minutes per foot; no water loss.

perratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 49-74-543

LOCATION Clay, New York — SURF. ELEV. 387.0

DATE STARTED 2/13/75 COMPLETED 2/14/75 — JOB NO. 74130

GROUND WATER Depth on completion 12'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		4/4	1	1'0"-	Brown moist loose SILT,
		5		2'6"	trace fine sand
5'0"					
		6/7	2	5'0"-	
		9		6'6"	
					8'0"
10'0"					Gray wet loose SILT, trace
		3/3	3	10'0"-	fine sand
▼ WL		3		11'6"	
15'0"					
		1/2	4	15'0"-	
		1		16'6"	
20'0"					
		1/2	5	20'0"-	
		3		21'6"	
					24'0"
25'0"					Gray wet loose to medium
		2/4	6	25'0"-	dense fine SAND, some silt,
		4		26'6"	trace fine embedded gravel
30'0"					
		7/8	7	30'0"-	
		9		31'6"	
35'0"					
		4/5	8	35'0"-	
		5		36'6"	
					37'0"
40'0"					Gray wet very dense coarse to medium GRAVEL, some silt, little medium to fine sand

perratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 49-74-543

LOCATION Clay, New York

SURF. ELEV. 387.0

DATE STARTED 2/13/75 COMPLETED 2/14/75

JOB NO. 74130

GROUND WATER Depth on completion 12'6"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		14/75 2"	9	40'0"- 40'8"	Gray wet very dense coarse to medium GRAVEL, some silt, little medium to fine sand
45'0"		75 2"	10	43'0"- 43'2"	Top of rock 45'0"
50'0"					Run #1, 45'0" - 50'0" Rec. 36" - 60% Gray weathered SHALE and LIMESTONE
					Bottom of boring 50'0" NOTE: Coring time in rock 3-4 minutes per foot; no water loss.

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 50-74-544

LOCATION Clay, New York — SURF. ELEV. 390.5

DATE STARTED 2/25/75 COMPLETED 2/25/75 — JOB NO. 74130

GROUND WATER Depth on completion 11'3"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		14/16	1	1'0"-	Brown wet dense coarse to
		18		2'6"	fine GRAVEL, little coarse
					to fine sand, little silt 3'0"
5'0"					Brown wet loose SILT, trace
		6/4	2	5'0"-	fine sand
		3		6'6"	
10'0"					
▼		3/2	3	10'0"-	
WL		3		11'6"	
					14'0"
15'0"					Brown wet loose SILT with
		2/3	4	15'0"-	thin layers fine sand
		2		16'6"	
20'0"					20'0"
		1/1	5	20'0"-	Gray-brown wet loose fine
		3		21'6"	SAND and SILT
25'0"					24'0"
		6/9	6	25'0"-	Gray-brown saturated medium
		9		26'6"	dense SILT, little fine sand
30'0"					
		5/7	7	30'0"-	
		12		31'6"	
35'0"					
		6/15	8	35'0"-	
		12		36'6"	
40'0"					

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant

HOLE NO. 50-74-544

LOCATION Clay, New York

SURF. ELEV. 390.5

DATE STARTED 2/25/75 COMPLETED 2/25/75

JOB NO. 74130

GROUND WATER Depth on completion 11'3"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 2 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		15/18	9	40'0"-	Gray-brown saturated medium
		21		41'6"	dense SILT, little fine sand
45'0"					47'0"
		8/11	10	45'0"-	Gray wet medium dense coarse
		15		46'6"	to fine GRAVEL, some coarse
50'0"		150	11	49'6"-	to fine sand, little silt
				50'0"	Top of rock 50'0"
55'0"					Run #1, 50'0" - 55'0" Rec. 46" - 77% Gray weathered SHALE and LIMESTONE
					Bottom of boring 55'0"
					NOTE: Coring time in rock 3-4 minutes per foot; partial water loss.

parratt wolff inc

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 51-74-545

LOCATION Clay, New York — SURF. ELEV. 390.3

DATE STARTED 2/25/75 COMPLETED 2/25/75 — JOB NO. 74130

GROUND WATER Depth on completion 16'8"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					Brown wet dense coarse to fine GRAVEL and SILT, little medium to fine sand — 2'6"
		12/15	1	1'0"- 2'6"	
		18			
5'0"					Brown moist medium dense SILT, trace fine sand
		3/4	2	5'0"- 6'6"	
		5			
10'0"					
		5/7	3	10'0"- 11'6"	
		4			
					14'0"
15'0"					Brown wet loose fine SAND, trace silt
▼ WL		5/3	4	15'0"- 16'6"	
		5			
					19'0"
20'0"					Gray-brown wet very loose SILT, little fine sand
		1/1	5	20'0"- 21'6"	
		3			
25'0"					
		3/1	6	25'0"- 26'6"	
		2			
30'0"					
		4/7	7	30'0"- 31'6"	
		8			
35'0"					
		4/7	8	35'0"- 36'6"	
		8			
40'0"					

parratt wolff inc
FISHER ROAD
EAST SYRACUSE, N.Y. 13057

TEST BORING LOG

PROJECT Oak Orchard Treatment Plant — HOLE NO. 51-[illegible]-545

LOCATION Clay, New York — SURF. ELEV. 390.3

DATE STARTED 2/25/75 COMPLETED 2/25/75 — JOB NO. 74130

GROUND WATER Depth on completion 16'8"

N= NO. OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C= NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C	N.	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		8/13	9	40'0"-	Gray-brown wet very loose SILT, little fine sand
		12		41'4"	43'0"
45'0"					Gray moist medium dense fine SAND and SILT, trace fine gravel 46'0"
		8/13	10A	45'0"-	
		12	10B	46'0"	
				46'0"-	Dark gray moist very dense coarse to fine GRAVEL and SILT
				46'6"	Top of rock 50'8"
50'0"					
		75	11	50'0"-	Run #1, 50'8" - 55'8"
		3"		50'3"	Rec. 32" - 53%
					Gray weathered SHALE and LIMESTONE
55'0"					
					Bottom of boring 55'8"
60'0"					NOTE: Coring time in rock 4 minutes per foot; lost all water @ 51'0".

APPENDIX B

NEW YORK NATURAL HERITAGE PROGRAM FEBRUARY 21, 2025, LETTER

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Fish and Wildlife, New York Natural Heritage Program
625 Broadway, Fifth Floor, Albany, NY 12233-4757
P: (518) 402-8935 | F: (518) 402-8925
www.dec.ny.gov

February 21, 2025

John Greaves
CHA Consulting
3 Winners Circle
Albany, NY 12205

Re: Oak Orchard wastewater treatment plant
County: Onondaga Town/City: Clay

Dear John Greaves:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to the above project.

Enclosed is a report of rare or state-listed animals and plants, and significant natural communities that our database indicates occur in the vicinity of the project site.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our database. We cannot provide a definitive statement as to the presence or absence of all rare or state-listed species or significant natural communities. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

The presence of the plants and animals identified in the enclosed report may result in this project requiring additional review or permit conditions. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the NYS DEC Region 7 Office, Division of Environmental Permits, at dep.r7@dec.ny.gov.

Sincerely,

Heidi Krahling
Environmental Review Specialist
New York Natural Heritage Program

The following state-listed animals have been documented in the vicinity of the project site.

The following list includes animals that are listed by NYS as Endangered, Threatened, or Special Concern; and/or that are federally listed.

For information about any permit considerations for the project, contact the NYSDEC Region 7 Office, Division of Environmental Permits, at dep.r7@dec.ny.gov, 315-426-7438.

The following species have been documented in the vicinity of the project site.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*FEDERAL LISTING*	
Birds				
Pied-billed Grebe *Breeding*	*Podilymbus podiceps*	Threatened		12551
Bald Eagle *Breeding*	*Haliaeetus leucocephalus*	Threatened		14908
Fish				
Lake Sturgeon	*Acipenser fulvescens*	Threatened		11143

The following species have been documented within 2.5 miles of the project site. Individual animals may travel 2.5 miles from documented locations. The main impact of concern is the cutting or removal of potential roost trees.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*FEDERAL LISTING*	
Mammals				
Indiana Bat *Maternity colony*	*Myotis sodalis*	Endangered	Endangered	13852

This report only includes records from the NY Natural Heritage database.

Information about many of the listed animals in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, and from NYSDEC at www.dec.ny.gov/animals/7494.html.

The following rare plants, rare animals, and significant natural communities have been documented at the project site, or in its vicinity.

We recommend that potential impacts of the proposed project on these species or communities be addressed as part of any environmental assessment or review conducted as part of the planning, permitting and approval process, such as reviews conducted under SEQR. Field surveys of the project site may be necessary to determine the status of a species at the site, particularly for sites that are currently undeveloped and may contain suitable habitat. Final requirements of the project to avoid, minimize, or mitigate potential impacts are determined by the lead permitting agency or the government body approving the project.

The following plants are listed as Endangered or Threatened by New York State, and/or are considered rare by the New York Natural Heritage Program, and are a vulnerable natural resource of conservation concern.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*HERITAGE CONSERVATION STATUS*
Vascular Plants			
Hairy Small-leaved Tick Trefoil	*Desmodium ciliare*	Threatened	Imperiled in NYS

Documented within 200 yards northeast of the project site. 1991-06-27: A small sand hill next to Oak Orchard Road. Isolated with trails throughout with some trash piles. 6828

This report only includes records from the NY Natural Heritage database. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org.

APPENDIX C

US FISH AND WILDLIFE SERVICE APRIL 3, 2025, LETTER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New York Ecological Services Field Office
3817 Luker Road
Cortland, NY 13045-9385
Phone: (607) 753-9334 Fax: (607) 753-9699
Email Address: fw5es_nyfo@fws.gov

In Reply Refer To: 04/03/2025 18:00:59 UTC
Project Code: 2025-0038158
Project Name: Oak Orchard WWTP

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. **Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.**

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New York Ecological Services Field Office
3817 Luker Road
Cortland, NY 13045-9385
(607) 753-9334

PROJECT SUMMARY

Project Code: 2025-0038158
Project Name: Oak Orchard WWTP
Project Type: Wastewater Facility - Maintenance / Modification
Project Description: Upgrades to an existing wastewater treatment facility.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@43.202070899999995,-76.20999498679305,14z



Counties: Onondaga County, New York

ENDANGERED SPECIES ACT SPECIES

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: County of Onondaga
Name: John Greaves
Address: III Winners Circle
City: Albany
State: NY
Zip: 12205
Email jgreaves@chacompanies.com
Phone: 5184538251

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Army Corps of Engineers

APPENDIX D

AUGUST 16, 2024, WETLAND AND STREAM DELINEATION MEMORANDUM

EDR

Memorandum

To:	Onondaga County Department of Water Environment Protection 650 Hiawatha Blvd. West Syracuse, NY 13204
From:	Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C.
Date:	August 16, 2024
Reference:	Wetland and Stream Delineation Memorandum Oak Orchard Project Town of Clay, Onondaga County, New York
EDR Project No:	24293

At the request of the Onondaga County Department of Water Environment Protection, Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) conducted a wetland and stream delineation on an approximately 76.7-acre Study Area on July 30 and 31, 2024. The Study Area is located in the Town of Clay, Onondaga County, New York, and is loosely bound by the Oneida River to the north, Henry Clay Boulevard to the east, Verplank Road to the south and Mud Creek to the west (Figure 1; all figures are in Appendix A).

Review of Background Data

EDR's review of NWI mapping indicates the presence of five water resources within the Study Area. The mapped water resources include two riverine features (R2UBH), which correspond with the Oneida River and Mud Creek; two freshwater pond features (PUBHx), which correspond with wastewater treatment lagoons; and one freshwater pond feature (PAB/UBHh) that corresponds with a portion of Mud Creek. New York State (NYS) Freshwater Wetlands mapping indicates that there is one state mapped wetland within the Study Area. The mapped NYS Freshwater Wetland, BRE-17, is a Class 1 wetland that corresponds with the riparian area along Mud Creek. Based on available NYSDEC stream classification mapping, the Study Area includes two Class C streams and one Class B stream. The Class C streams include Mud Creek and an unnamed tributary of Mud Creek; the Class B stream is the Oneida River, which is designated as a U.S. Army Corps of Engineers (USACE) traditional navigable water (TNW) and a state protected stream under Article 15 of the Environmental Conservation Law (Figure 2).

A review of the Study Area on U.S. Department of Agriculture (USDA) Web Soil Survey maps identified six distinct mapping units. Table 1 lists the mapping units within the Study Area, along with their slope, drainage class, hydric rating, and hydric classification. Although soil mapping units may have a hydric rating in the online databases indicating hydric, non-hydric or potentially non-hydric conditions, this is for general use and does not supersede specific conditions documented in the field.

Table 1. Study Area Soil Mapping Units

Mapping Unit Symbol	Mapping Unit	Percent of Study Area	Slope	Drainage[1]	Hydric Rating[2]	Hydric Classification[3]
ChB	Collamer silt loam	32.5%	4%	MWD	0%	Non-hydric
DuC	Dunkirk silt loam, rolling	24.7%	9%	WD	0%	Non-hydric
NgA	Niagara silt loam	21.6%	2%	SPD	7%	Predominantly non-hydric
SA	Saprists and Fluvaquents, ponded	10.5%	2%	VPD	100%	Hydric
W	Water	8.4%	--	--	--	--
PpA	Phelps gravelly loam	2.2%	2%	MWD	5%	Predominantly non-hydric

[1] WD = well drained, MWD = moderately well drained, SPD = somewhat poorly drained, and VPD = very poorly drained.

[2] Map units are composed of one or more component soil types, each of which is individually rated as hydric or not hydric. The hydric rating, as provided in the USDA Web Soil Survey, indicates the percentage of the map unit that meets hydric criteria.

[3] Hydric classification categories are based on the total percentage of hydric soils in the map unit. as listed on the USDA Web Soil Survey. Hydric = 100% of map unit components rated as hydric. Predominantly hydric = 66%–99% of map unit components rated as hydric. Partially hydric = 33%–66% of map unit components rated as hydric. Predominantly non-hydric = up to 33% of map unit components rated as hydric. Non-hydric = 0% of map unit components rated as hydric.

Field Visit and Methodology

On July 30 and 31, 2024, an EDR Ecological Resources Specialist and an EDR Field Technician visited the site to delineate any wetlands and/or streams present within the Study Area.

The identification of wetland boundaries was based on the methodology described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987). Determination of wetland boundaries was also guided by the methodologies presented in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0* (Regional Supplement) (USACE, 2012) and *New York State Freshwater Wetland Delineation Manual* (NYSDEC, 1995). Attention was given to the size of the wetland (including portions that may extend outside the Study Area), evidence of disturbance, and the identification of potential hydrologic connections between wetlands and other waters, as these factors could influence jurisdictional status. Wetland boundaries were defined in the field with sequentially numbered pink surveyor's flagging and mapped using a GPS unit with reported sub-meter accuracy.

Delineated features were characterized according to the wetlands and deepwater habitats classification system used in NWI mapping (Cowardin et al., 1979). Data were collected from sample plots in representative wetland cover types and recorded on USACE Routine Wetland Determination forms (see Appendix B). The data collected at each delineated wetland included dominant vegetation, hydrology indicators, and soil characteristics. Data to confirm upland areas were also collected adjacent to wetland boundaries and in areas where aerial photograph signatures or existing wetland mapping suggested potential wet conditions. Upland data were also documented and recorded on USACE Routine Wetland Determination forms (Appendix B)

Wetland hydrology was evaluated based on the presence of primary and secondary indicators. The Regional Supplement lists the following primary indicators of wetland hydrology: (A1) surface water, (A2) high water table, (A3) soil saturation, (B1) water marks, (B2) sediment deposits, (B3) drift deposits, (B4) algal mat or crust, (B5) iron deposits, (B7) inundation visible on aerial imagery, (B8) sparsely vegetated concave surface, (B9) water-stained leaves, (B13) aquatic fauna, (B15) marl deposits, (C1) hydrogen sulfide odor, (C3) oxidized rhizospheres on living roots, (C4) presence of reduced iron, (C6) recent iron reduction in tilled soils, and (C7) thick muck surface. Per the Regional Supplement, the presence of any one of these primary indicators is sufficient evidence that wetland hydrology is present. In addition, the Regional Supplement identifies the following secondary indicators, which were also used by EDR to determine wetland hydrology: (B6) surface soil cracks, (B10) drainage patterns, (B16) moss trim lines, (C2) dry-season water table, (C8) crayfish burrows, (C9) saturation visible on aerial imagery, (D1) stunted or stressed plants, (D2) geomorphic position, (D3) shallow aquitard, (D4) microtopographic relief, and (D5) results of the FAC-neutral test. In accordance with the Regional Supplement, in the absence of a primary indicator, the presence of any two secondary indicators is considered a suitable indication of wetland hydrology.

Wetland vegetation is indicated by a dominance of hydrophytic plant species, or species that have adapted to grow in areas of inundation and saturation. Assessment of vegetation focused on the identification of dominant plant species in four categories: trees (greater than or equal to 3 inches diameter at breast height [DBH]), saplings/shrubs (less than 3 inches DBH and greater than 3.2 feet tall), herbs (all vegetation less than 3.2 feet tall), and woody vines. Dominance was determined by visually estimating those species having the greatest absolute percent cover within each stratum. Vascular plant nomenclature and wetland indicator status for dominant plant species were determined by the Wildnote field data collection application, which refers to the USDA PLANTS Database (USDA NRCS, 2021) and the National Wetland Plant List, an interagency effort compiled by the USACE (2020). The indicator status represents a plant's likelihood of occurring in wetlands. The five indicator statuses and their probability of being observed in a wetland are as follows:

- Obligate (OBL): Plants occur within wetlands more than 99% of the time
- Facultative Wetland (FACW): Plants occur within wetlands 67 to 99% of the time
- Facultative (FAC): Plants occur within wetlands 33 to 67% of the time
- Facultative Upland (FACU): Plants occur within wetlands 1 to 33% of the time
- Upland (UPL): Plants occur within wetlands less than 1% of the time

Those plant species that are not assigned an indicator status in the National Wetland Plant List are assumed to always be found in uplands and assigned an indicator status of UPL. Wetlands are indicated by a dominance and/or prevalence of hydrophytic plant species (i.e., those assigned an indicator status of OBL, FACW, or FAC).

Hydric soils are those that are poorly drained and are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part of the soil layer. The presence of hydric soils is indicative of the possible presence of wetlands (Environmental Laboratory, 1987). Hydric soil conditions were determined in the field through observation of soil composition, color, and morphology. Soils data were collected by using a Dutch auger and tiling spade to examine the soil profile. Soil colors were determined using Munsell Soil Charts (Munsell Color, 2009). Information concerning soil series, color, texture, and matrix and concentration color was recorded at each sample location and used to determine whether the soils displayed hydric characteristics.

Streams were identified according to the Cowardin et al. (1979) classification system, and stream boundaries were determined based on the presence of ordinary high water mark (OHWM) characteristics, including a "clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris" (33 CFR 329.11). Stream boundaries were defined and mapped in the field using the same method as described above for wetlands. The OHWM, if present, was determined through evaluation of hydrologic, geomorphic, and biological characteristics in accordance with the *USACE National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams: Interim Version* (David et al., 2022). Data regarding stream morphology, stream bank and channel width, water depth, stream bed substrate, in-stream cover, and biological indicators were collected and recorded on OHWM data forms (Appendix B).

Photographs were taken of each wetland and stream delineated within the Study Area (Appendix C).

Findings

Five wetlands (05-W001, 05-W002, 05-W003, 05-W004, and 05-W005) and five streams (05-ST001, 05-ST002, 05-ST003, 05-ST004, and 05-ST005), totaling 6.95 acres and 2,837 linear feet, respectively, were delineated within the Study Area (Figure 3). Two constructed wastewater treatment lagoons were located within the Study Area. The boundaries of these features were digitized based on arial imagery and verified in the field. The wastewater lagoons are presumed to be non-jurisdictional features as wastewater treatment facilities are specifically listed by the USACE as exclusions from Waters of the United States (WOTUS). (Figure 3, Photograph 1 in Appendix C). Detailed descriptions of the wetlands, their associated uplands, and the streams delineated on site are provided below.

<u>Wetland 05-W001 (Photographs 2 through 5 in Appendix C)</u>
Wetland 05-W001 is a palustrine forested and palustrine emergent wetland complex totaling 1.52 acres within the Study Area. It is located south of an existing solar panel array and drains west to its lowest point at a stormwater drop culvert. The drop culvert is situated approximately 1 to 2 feet above the existing grade of the wetland (Photograph 3 in Appendix C). There was no observable connection to any other surface water within the Study Area. The boundary of wetland 05-W001 continues approximately 40 feet east of the Study Area, where it is surrounded by upland forest and does not appear to continue further or connect to another body of water based on aerial imagery and on-site observations (Photograph 4 in Appendix C).

The forested portion of Wetland 05-W001 totaled 1.39 acres within the Study Area. The canopy was dominated by red maple (*Acer rubrum*) and tuliptree (*Liriodendron tulipifera*) and the herbaceous understory was dominated by eastern poison ivy (*Toxicodendron radicans*), spotted jewelweed (*Impatiens capensis*), green ash saplings (*Fraxinus pennsylvanica*), and northern spicebush saplings (*Lindera benzoin*). The wetland exhibited strong pit and mound microtopography with the mounds hosting localized upland vegetation such as tuliptree. The indicators of wetland hydrology included water-stained leaves (B9), drainage patterns (B10), and microtopographic relief (D4). Soils in this portion of the wetland were composed of two layers. In the top layer, which occurred at a depth of 0 to 8 inches, soils were very dark gray (10YR 3/1) with a fine sandy loam texture. In the lower layer, which occurred at a depth of 8 to 18 inches, soils were grayish brown (10YR 5/2) with 20% yellowish brown (10YR 5/8) redox concentrations in the matrix and a fine sandy loam texture. This soil profile satisfies the hydric soil indicator of depleted matrix (F3). The wetland/upland

transition varied, but was typically abrupt and followed site topography along the northern boundary of the wetland compared to a more gradual transition that followed a change in vegetation along the southern boundary of the wetland. The adjacent upland was forested with a canopy dominated by American beech (*Fagus grandifolia*) and an understory dominated by American beech saplings and eastern poison ivy. Photograph 6 in Appendix C illustrates conditions in this upland area.

The palustrine emergent portion of Wetland 05-W001 totaled 0.13 acres within the Study Area. Dominant herbaceous vegetation included smooth goldenrod (*Solidago gigantea*), common reed (*Phragmites australis*), common boneset (*Eupatorium perfoliatum*), green bulrush (*Scirpus atrovirens*), and purple loosestrife (*Lythrum salicaria*). Indicators of wetland hydrology included oxidized rhizospheres on living roots (C3) and results of the FAC-neutral test (D5). Soils in the emergent portion of the wetland were composed of two layers. In the top layer, which occurred at a depth of 0 to 12 inches, soils were very dark grayish brown (10YR 3/2) with 10% yellowish brown (10YR 5/6) redox concentrations in the pore lining and matrix and a clay loam texture. In the lower layer, which occurred at a depth of 12 to 18 inches, soils were brown (10YR 5/3) with 30% yellowish brown (10YR 5/8) redox concentrations in the matrix and a sand texture. This soil profile satisfies the hydric soil indicator of redox dark surface (F6). The wetland/upland transition was abrupt and followed both the local topography and a change in vegetation. The adjacent upland was dominated by herbaceous vegetation including brownray knapweed (*Centaurea jacea*), American bird's foot trefoil (*Lotus unifoliolatus*), and common timothy (*Phleum pratense*). Photograph 7 in Appendix C illustrates conditions in this upland area.

Wetland 05-W002 (Photograph 8 in Appendix C)

Wetland 05-W002 is a 0.02-acre palustrine emergent wetland located in the southeastern corner of the Study Area. It extends beyond the southern boundary of the Study Area into an upland deciduous forest. Herbaceous vegetation within the wetland included common spike rush (*Eleocharis palustris*), slender rush (*Juncus tenuis*), and redtop (*Agrostis stolonifera*). Indicators of wetland hydrology included oxidized rhizospheres on living roots (C3) and results of the FAC-neutral test (D5). Soils in Wetland 05-W002 were composed of two layers. In the top layer, which occurred at a depth of 0 to 5 inches, soils were dark grayish brown (10YR 4/2) with 5% brown (7.5YR 4/4) redox concentrations in the pore linings and matrix and a clay loam texture. In the lower layer, which occurred at a depth of 5 to 18 inches, soils were dark gray (2.5Y 4/1) with 10% yellowish brown (10YR 5/8) redox concentrations in the pore lining and matrix and a clay loam texture. This soil profile satisfies the hydric soil indicator of a depleted matrix (F3). The wetland/upland transition was gradual and generally followed the local topography. The adjacent uplands included a scrub-shrub area dominated by autumn olive (*Elaeagnus umbellata*), Morrow's honeysuckle (*Lonicera morrowii*), and European buckthorn (*Rhamnus cathartica*) and a maintained field dominated by common dandelion (*Taraxacum officinale*), English plantain (*Plantago lanceolata*), common plantain (*Plantago major*), and self heal (*Prunella vulgaris*). Photograph 9 in Appendix C illustrates conditions in this upland area.

Wetland 05-W003 (Photograph 10 in Appendix C)

Wetland 05-W003 is a 0.79-acre palustrine scrub-shrub wetland located in the northeastern corner of the Study Area. The wetland does not extend beyond the Study Area; however, it drains into an intermittent stream (05-ST002) that exits the Study Area to the east. The canopy cover in this wetland was sparse and consists entirely of green ash (both dead and alive). Dominant shrub species included gray dogwood (*Cornus racemosa*) and green ash saplings. Herbaceous vegetation within the wetland included wrinkle-leaf goldenrod (*Solidago rugosa*), slender rush, aster (*Symphyotrichum* sp.), spotted jewelweed, and rough avens (*Geum laciniatum*). Indicators of wetland hydrology included drainage patterns (B10), microtopographic

relief (D4), and results of the FAC-neutral test (D5). Within 18 inches of the surface, soils in Wetland 05-W003 were composed of a single layer. These soils were dark grayish brown (10YR 4/2) with 10% brown (7.5YR 4/4) redox concentrations in the matrix and a clay loam texture. This soil profile satisfies the hydric soil indicator of a depleted matrix (F3). The wetland/upland transition was gradual and generally followed the local topography. The adjacent upland was forested with a canopy dominated by red maple, red pine (*Pinus resinosa*), and dead or dying green ash. Dominant shrub species included European buckthorn and black walnut (*Juglans nigra*) saplings. Herbaceous vegetation was dominated by Virginia creeper (*Parthenocissus quinquefolia*), green ash seedlings, European buckthorn seedlings, jumpseed (*Persicaria virginiana*), and multiflora rose (*Rosa multiflora*). Photograph 11 in Appendix C illustrates conditions in this upland area.

Wetland 05-W004 (Photograph 12 in Appendix C)

Wetland 05-W004 is a 2.45-acre palustrine forested wetland located in the northwestern corner of the Study Area and extending north beyond the Study Area boundary. A portion of this wetland overlaps NYSDEC-mapped Wetland BRE-17. Dominant canopy species included red maple and green ash; dominant shrub species included green ash saplings and European buckthorn; and dominant herbaceous vegetation included lizard's-tail (*Saururus cernuus*) and sensitive fern (*Onoclea sensibilis*). Indicators of wetland hydrology included surface water (A1), high water table (A2), soil saturation (A3), geomorphic position (D2), and results of the FAC-neutral test (D5). Within 18 inches of the surface, soils in Wetland 05-W004 were composed of a single layer. These soils were dark gray (10YR 4/1) with 5% yellowish brown (10YR 5/6) redox concentrations in the matrix and a clay loam texture. This soil profile satisfies the hydric soil indicator of a depleted matrix (F3). The wetland/upland transition was abrupt and generally followed a distinct change in topography. The adjacent upland was forested with a canopy dominated by black walnut and green ash. Understory shrubs species included Morrow's honeysuckle and sparse green ash saplings . Dominant herbaceous understory species included jumpseed and Allegheny blackberry (*Rubus allegheniensis*). Photograph 13 in Appendix C illustrates conditions in this upland area.

Wetland 05-W005 (Photographs 14 and 15 in Appendix C)

Wetland 05-W005 is a mixed palustrine forested and emergent wetland totaling 2.16 acres within the Study Area. It is located along (and extends beyond) the western border of the Study Area in the riparian area associated with Mud Creek (05-ST004) and corresponds with NYSDEC-mapped Wetland BRE-17. Portions of this wetland were inaccessible at the time of delineation due to the water level of Mud Creek. Delineations for these areas are based on satellite imagery and wetland flags are absent as shown in Figure 3.

The forested portion of Wetland 05-W005 totaled 0.92 acres within the Study Area. Dominant species in the canopy included American elm (*Ulmus americana*) and red maple; dominant shrub species included multiflora rose, American hornbeam (*Carpinus caroliniana*), and swamp white oak (*Quercus bicolor*); and dominant herbaceous species included lizard's tail and Virginia creeper. Indicators of wetland hydrology included geomorphic position (D2) and results of the FAC-neutral test (D5). Soils in the forested portion of this wetland were composed of one layer. From 0 to 18 inches, soils were very dark gray (3/N) with 10% dark gray (5Y 4/1) redox depletions in the matrix and 5% dark yellowish brown (10YR 4/6) redox concentrations in the matrix with a clay loam texture. This soil profile satisfies the hydric soil indicator of loamy gleyed matrix (F2). The wetland/upland transition was abrupt and occurred at the base of a slope. The adjacent upland was disturbed, with soils containing crushed rock fill. The sparse canopy was dominated by chokecherry (*Prunus virginiana*) and eastern cottonwood (*Populus deltoides*) and European buckthorn was the only understory shrub species. Herbaceous vegetation included Virginia creeper, river-bank grape

(*Vitis riparia*), and eastern poison ivy. Photographs 16 and 17 in Appendix C illustrate conditions in this upland area.

The emergent portion of Wetland 05-W005 totaled 1.24 acres within the Study Area. Dominant herbaceous vegetation included green arrow arum (*Peltandra virginica*), narrow leaf cattail (*Typha angustifolia*), and sensitive fern. Indicators of wetland hydrology included surface water (A1), high water table (A2), soil saturation (A3), oxidized rhizospheres on living roots (C3), and results of the FAC-neutral test (D5). Soils in the emergent portion of the wetland were composed of two layers. In the top layer, which occurred at a depth of 0 to 8 inches, soils were very dark gray (10YR 3/1) with 10% yellowish red (5YR 4/6) redox concentrations in the pore linings and matrix and a clay loam texture. In the lower layer, which occurred at a depth of 8 to 18 inches, soils were gray (7.5YR 5/1) with a clay loam texture. This soil profile satisfies the hydric soil indicators of redox dark surface (F6) and depleted matrix (F3). Within the Study Area, this emergent community occurred between the forested portion of the wetland and the adjacent stream, and no wetland/upland transition was observed.

Stream 05-ST001 (Photograph 18 in Appendix C)
Stream 05-ST001 is a 167-linear foot ephemeral stream segment located in the southeast corner of the Study Area. The stream begins in an upland forest and continues beyond the southern border of the Study Area. The stream appears to only convey water in direct response to precipitation and no water was present in the stream channel at the time of delineation. Stream width averaged from 4 to 6 feet based on OHWMs on opposing banks and the stream was characterized by a gentle gradient, absence of vegetation in the stream channel, and a substrate consisting of sand, silt, and clay. Indicators used to define the OHWM included a break in slope and a change in vegetation. The stream was classified as ephemeral due to lack of biological indicators, absence of water in the stream channel, and overland sheet flow from precipitation as the sole source of water.

Stream 05-ST002 (Photograph 19 in Appendix C)
Stream 05-ST002 is a 94-linear foot intermittent stream segment located in the northeast corner of the Study Area. It begins where Wetland 05-W003 channelizes and exits the Study Area to the east toward NYSDEC-mapped Wetland BRE-13. Stream width was 4 feet based on OHWMs on opposing banks and the stream was characterized by a well-developed bed and banks, gentle gradient, and a substrate consisting of sand, silt, and clay. Indicators used to define the OHWM included a break in slope, a change in vegetation, and the presence of large wood in the stream channel. The stream was classified as intermittent because it receives water from Wetland 05-W003, but water was absent from the stream channel at the time of survey.

Stream 05-ST003 (Photograph 20 in Appendix C)
Stream 05-ST003 is a 49-linear foot intermittent stream segment located in the southwest corner of the Study Area. The stream begins at the outlet of a culvert and flows southwest to where it connects with NYSDEC-mapped Wetland BRE-17 and Mud Creek outside the Study Area. Stream width was 3 feet based on OHWMs on opposing banks and it had a water depth of 2 inches at the time of the survey. Stream 05-ST003 was characterized by well-developed banks, a gentle gradient, and a substrate consisting of cobble, gravel, sand, silt, and clay. Indicators used to define the OHWM included a break in slope and a change in vegetation. The stream was classified as intermittent due to the presence of water in the channel and its source at a culvert outlet, but a lack of biological indicators that would suggest a perennial flow regime.

Stream 05-ST004 (Photograph 21 in Appendix C)
Stream 05-ST004 is a perennial stream corresponding with Mud Creek, a NYSDEC Class C mapped stream. The delineated reach included 2,330 linear feet along the western boundary of the Study Area and was bordered by a forested and emergent wetland complex on both sides of the stream. Portions of this stream were inaccessible at the time of delineation due to the water level. Delineations for these areas are based on satellite imagery and stream flags are absent as shown in Figure 3. The stream enters the Study Area from the south, passes under Oak Orchard Road, and flows into the Oneida River (Stream 05-ST005) in the northwest corner of the Study Area. Stream 05-ST004 was characterized by a wide, well-developed channel; continuous banks; gentle gradient; and a substrate consisting of gravel, sand, silt, and clay. Indicators used to define the OHWM included a break in slope and a change in vegetation, both of which were consistent throughout the entire delineated reach of stream. The stream was classified as perennial due to its substantial size, the presence of aquatic vegetation in the stream channel, and a water depth greater than 24 inches at the time of survey.

Stream 05-ST005 (Photograph 22 in Appendix C)
Stream segment 05-ST005 is a small portion of the Oneida Rived, a NYSDEC Class B mapped stream and USACE traditional navigable water. The delineated reach of the stream includes approximately 197 linear feet and is located in the northwest corner of the Study Area along Oak Orchard Road. The stream was characterized by its large size, well-developed banks, gentle gradient, and substrate consisting of cobble, gravel, sand, silt, and clay. Indicators used to define the OHWM included a break in slope and a change in vegetation, which both persisted throughout the entire delineated reach of stream. Based on aerial imagery, the stream had an average width of approximately 425 feet. A water depth greater than 24 inches was recorded along the bank of the stream.

Conclusion

Within the Study Area, EDR identified five wetlands (05-W001, 05-W002, 05-W003, 05-W004, and 05-W005) totaling 6.95 acres, and five streams (05-ST001, 05-ST002, 05-ST003, 05-ST004, and 05-ST005) totaling 2,837 linear feet.

Wetland 05-W001 appears to be an isolated feature with no relatively permanent surface connection to WOTUS; therefore, it is not anticipated to fall under federal jurisdiction. Additionally, it is not anticipated to fall under NYSDEC jurisdiction because it does not exceed 12.4 acres and is not connected to a NYSDEC-mapped wetland. Wetlands 05-W002 and 05-W003 are both anticipated to fall under federal jurisdiction due to potential off-site connections to WOTUS, but are not anticipated to fall under NYSDEC jurisdiction because they do not exceed 12.4 acres and are not connected to any NYSDEC-mapped wetlands. Wetlands 05-W004 and 05-W005 are anticipated to fall under both federal and NYSDEC jurisdictions due to connections to WOTUS and correlation with NYSDEC-mapped wetland BRE-17, respectively.

Stream 05-ST001 is not anticipated to fall under federal or NYSDEC jurisdiction. It is not anticipated to fall under federal jurisdiction because it is ephemeral (i.e., a temporary drainage feature flowing only in direct response to precipitation events) and it is not anticipated to fall under NYSDEC jurisdiction because it does not meet the criteria for protection based on classification or navigability. Streams 05-ST002 and 05-ST003 are both anticipated to fall under federal jurisdiction due to potential connections to WOTUS beyond the Study Area. However, neither are anticipated to fall under NYSDEC jurisdiction because they do not meet the criteria for protection based on classification or navigability. Streams 05-ST004 and 05-ST005 are

anticipated to fall under both federal and NYSDEC jurisdictions. Stream 05-ST004 is expected to fall under federal jurisdiction because it connects to the Oneida River, which is a TNW, and is expected to fall under NYSDEC jurisdiction because it is a potential state-navigable water. Stream 05-ST005 corresponds with a small portion of the Oneida River and is anticipated to fall under federal jurisdiction because it is a TNW. It is anticipated to be NYSDEC jurisdictional based on both its probable classification as a state-navigable water and its Class B designation. However, final determination of jurisdictional status of all wetland and streams delineated within the Study Area must be made by the USACE and NYSDEC.

List of Appendices

Appendix A. Figures

Figure 1: Regional Project Location

Figure 2: Mapped Wetlands and Streams

Figure 3. Delineated Wetlands and Streams

Appendix B. Routine Wetland Determination Data Sheets and OHWM Data Forms

Appendix C. Photo Documentation

References

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Appendix A

Figures

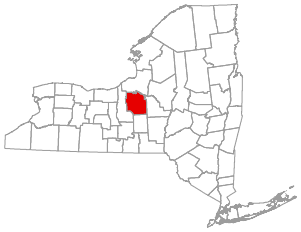
Figure 1. Regional Project Location



Oak Orchard Project

Town of Clay, Onondaga County, New York

Wetland and Stream Delineation Memorandum



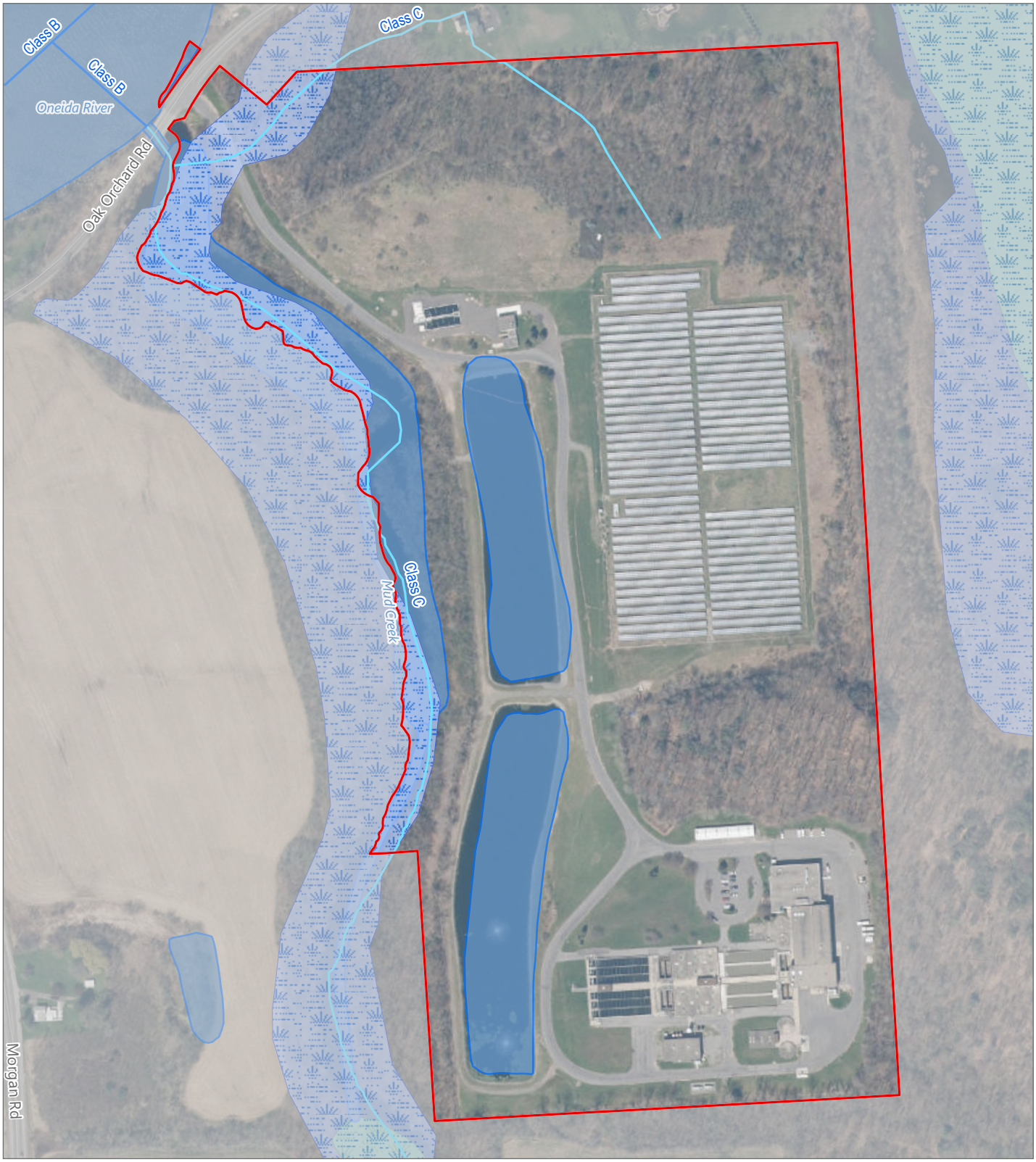
0 2.5 5 10

Miles

Prepared August 13, 2024

Basemap: Esri "World Street Map" map service

Figure 2. Mapped Wetlands and Streams



Oak Orchard Project

Town of Clay, Onondaga County, New York

Wetland and Stream Delineation Memorandum

NYSDEC Stream Classification
- Class A, B, C(TS), or C(T) Stream
- Class C or D Stream
- NYSDEC Mapped Wetland
- NWI Mapped Wetland
- NWI Mapped Pond/Lake/Riverine
- Study Area

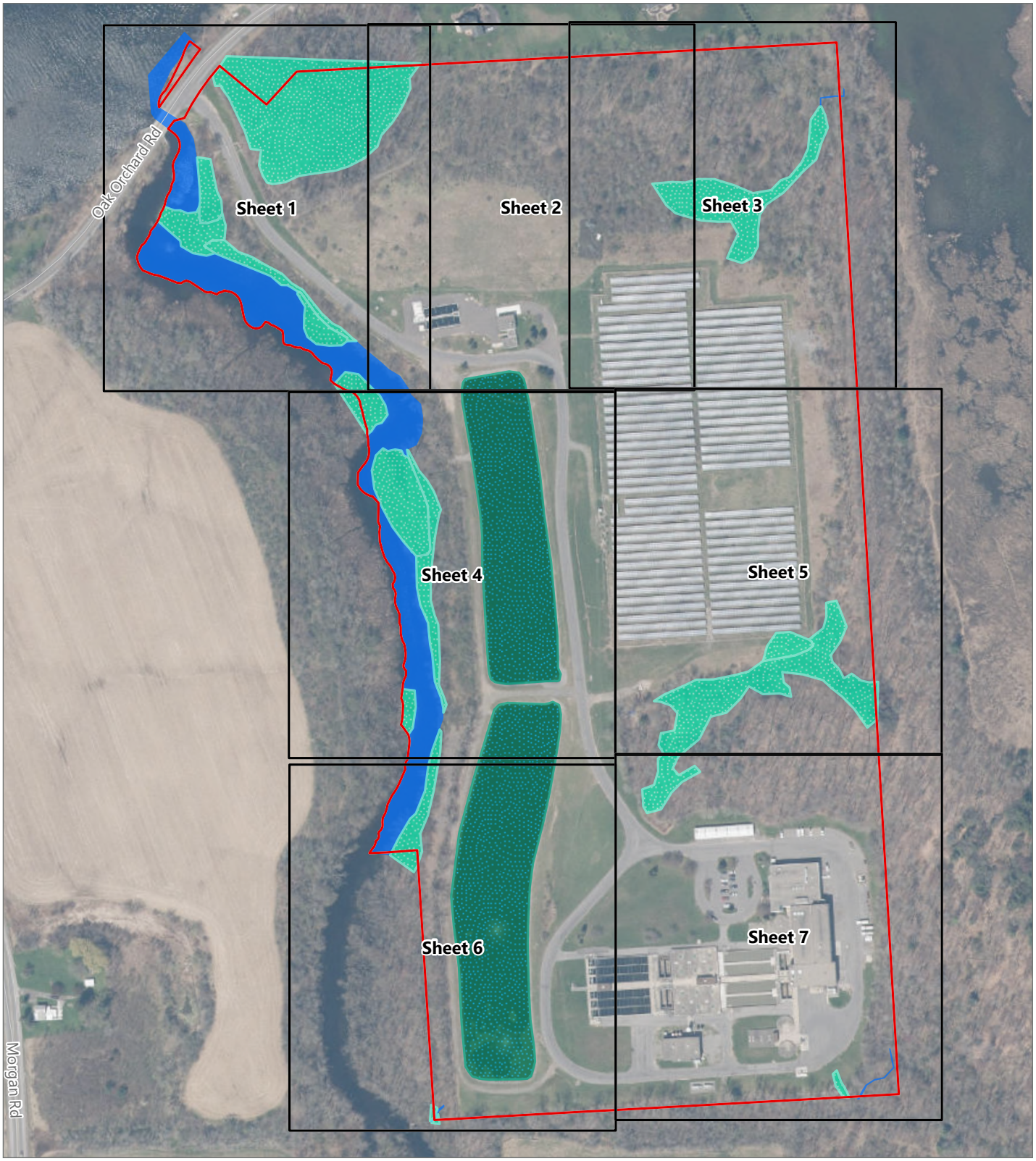
0 100 200 400
Feet

Prepared August 13, 2024
Basemap: NYSDOP "2022" orthoimagery map service

EDR

Figure 3. Delineated Wetlands and Streams

Index



Oak Orchard Project

Town of Clay, Onondaga County, New York

Wetland and Stream Delineation Memorandum

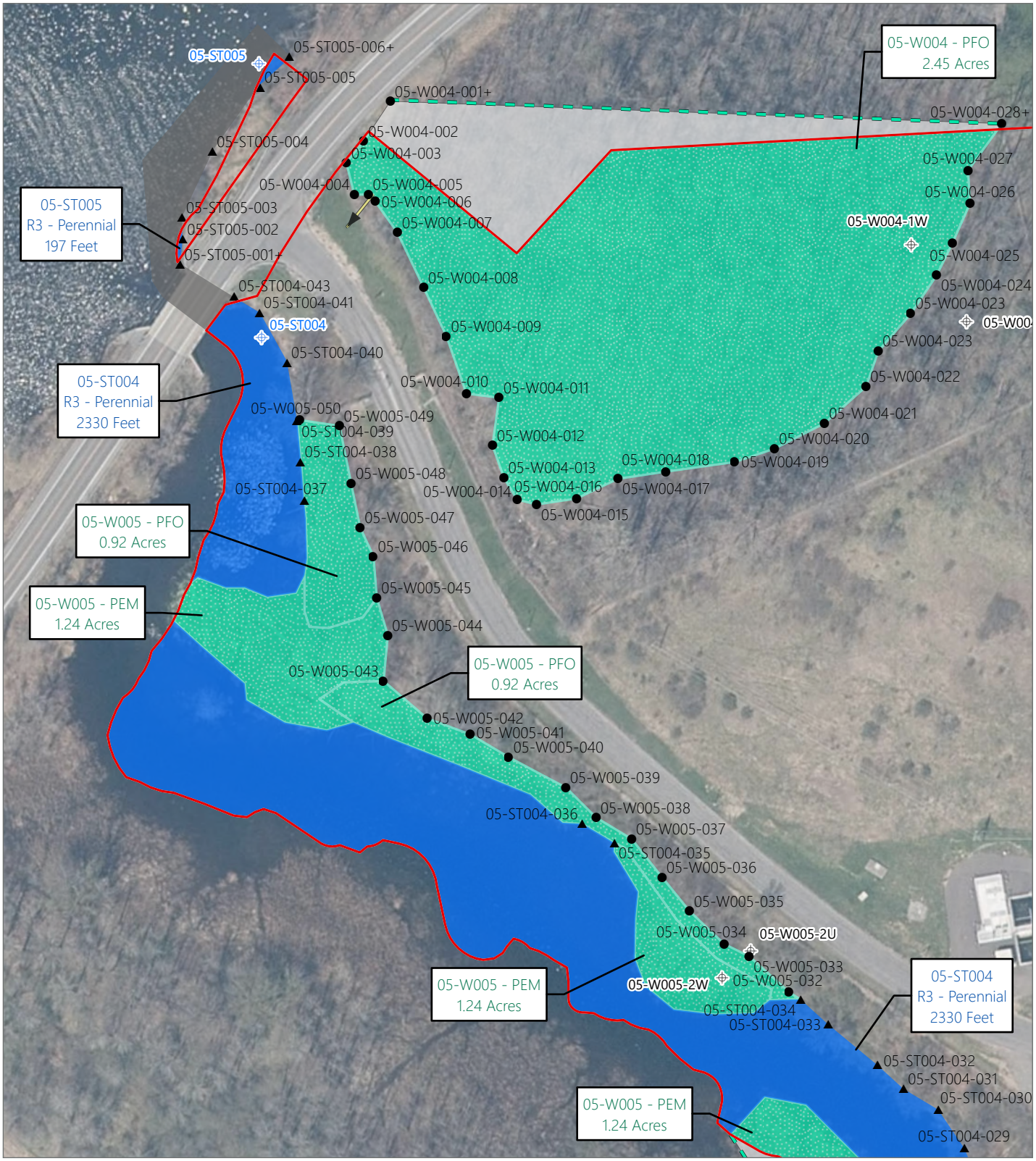
Delineated Stream
Delineated Wetland
Wastewater Treatment Lagoon
Study Area

0 100 200 400
Feet

Prepared August 14, 2024
Basemap: NYSDOP "2022" orthoimagery map service

EDR

Figure 3. Delineated Wetlands and Streams



Oak Orchard Project

Town of Clay, Onondaga County, New York

Wetland and Stream Delineation Memorandum

- Stream Flag
- Wetland Flag
- Datapoint Stream
- Datapoint Wetland
- Culvert
- Wetland Continues
- Delineated Stream inside Study Area
- Delineated Stream outside Study Area
- Delineated Wetland inside Study Area
- Delineated Wetland outside Study Area
- Study Area

0 50 100 200

Feet

Prepared August 14, 2024

Basemap: NYSDOP "2022" orthoimagery map service

EDR

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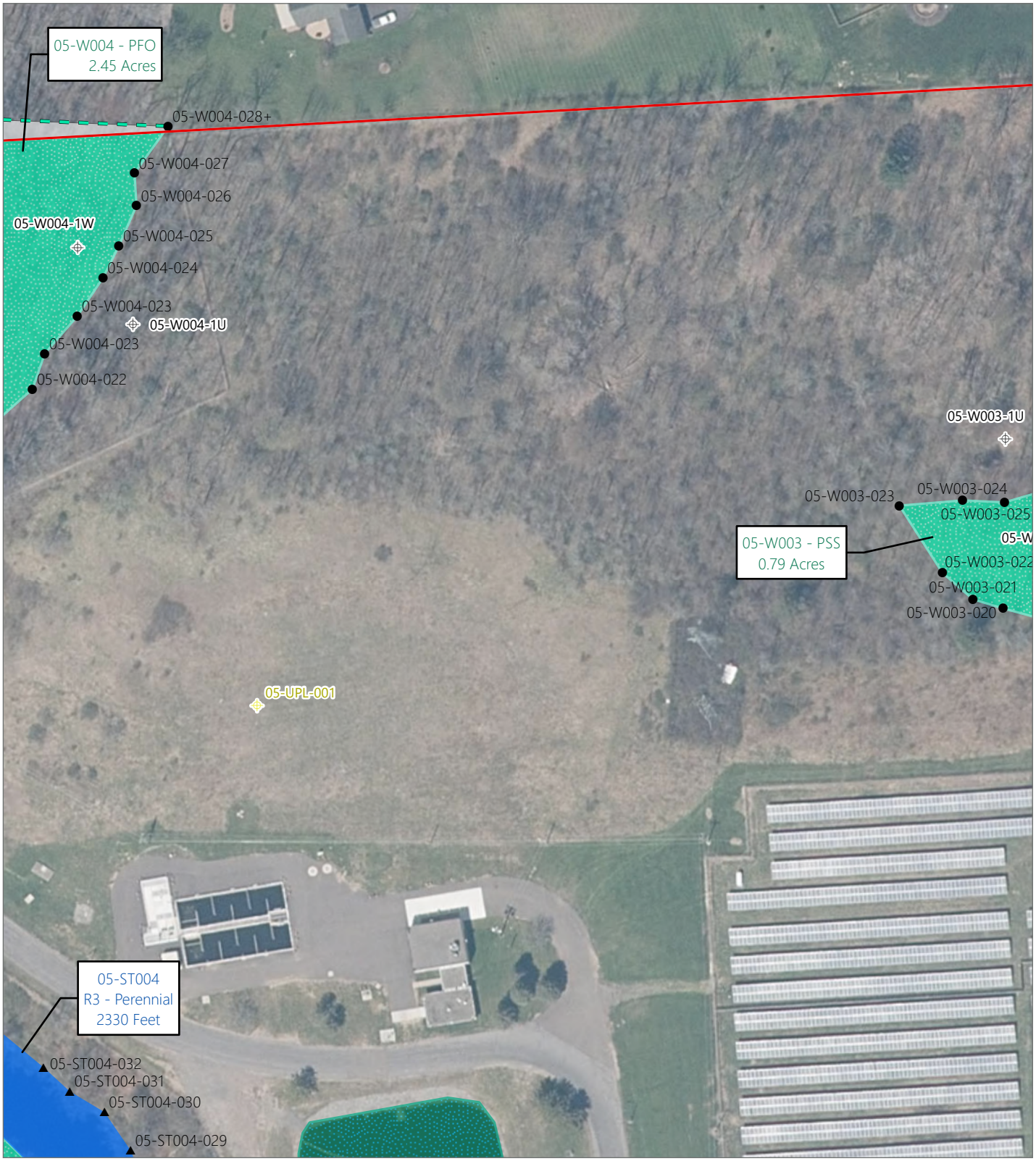

Oak Orchard Project

Town of Clay, Onondaga County, New York

Wetland and Stream Delineation Memorandum

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Feet

Prepared August 14, 2024

Basemap: NYSDOP "2022" orthoimagery map service

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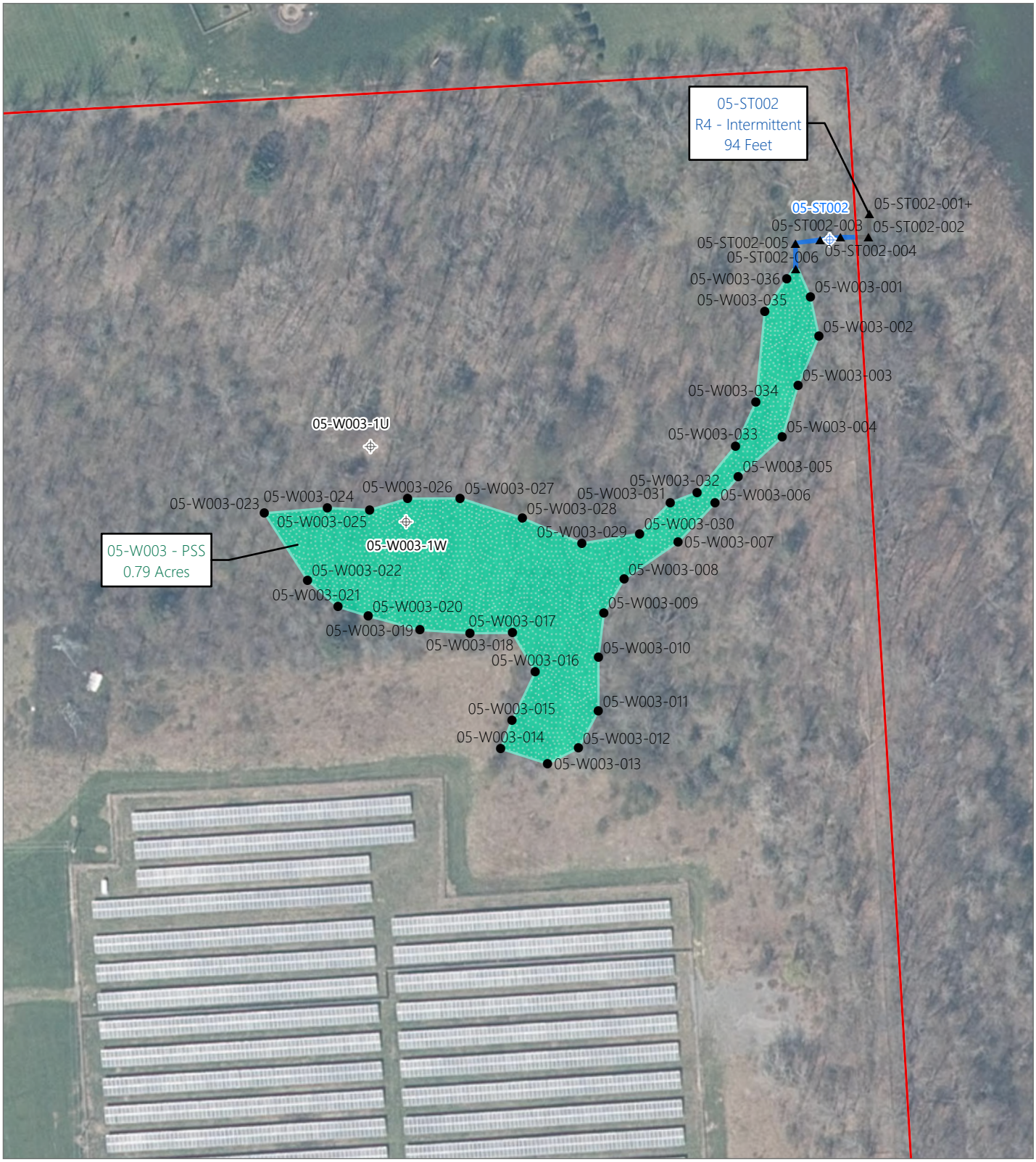

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Prepared August 14, 2024

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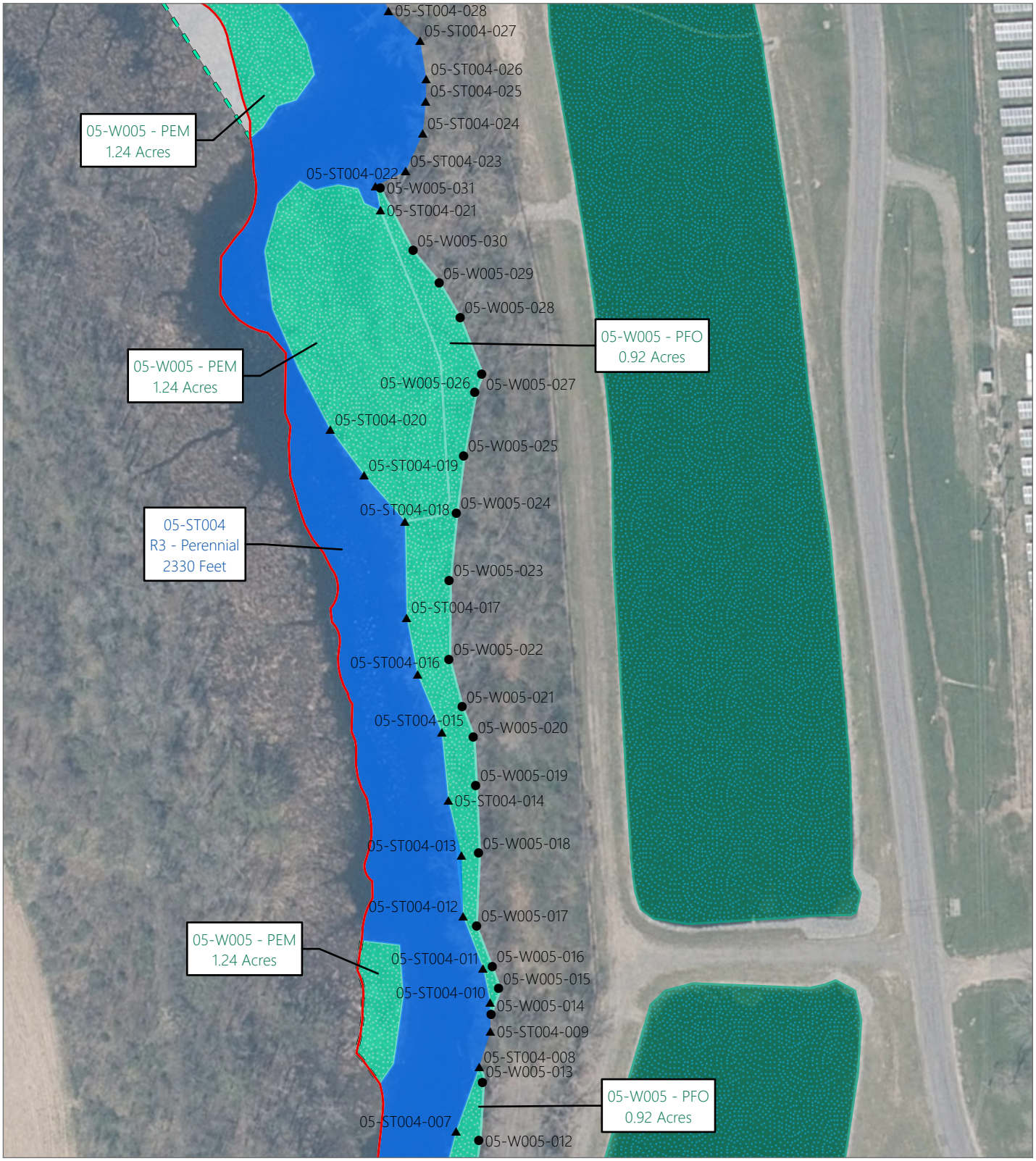

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Town of Clay, Onondaga County, New York

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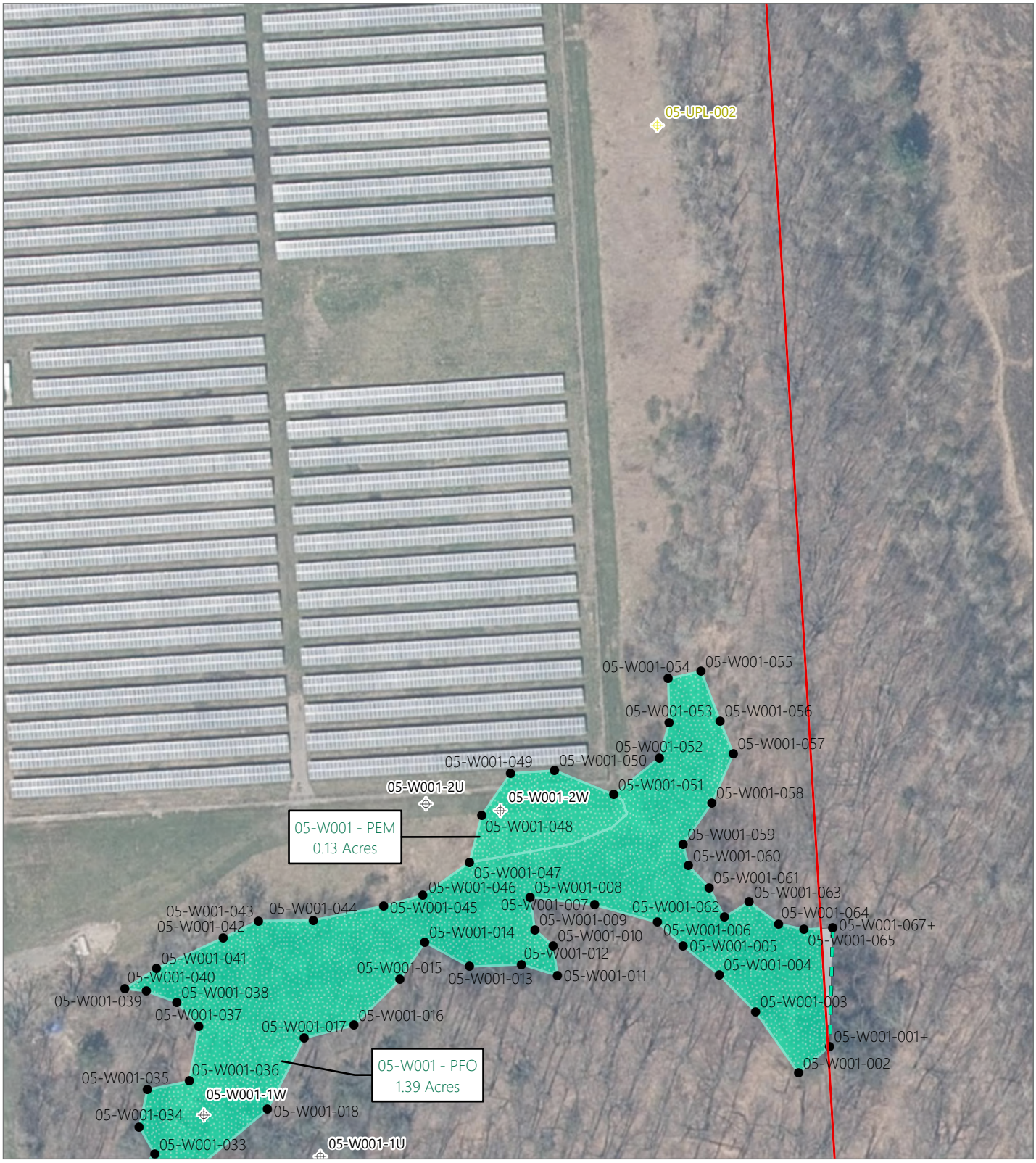

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Town of Clay, Onondaga County, New York

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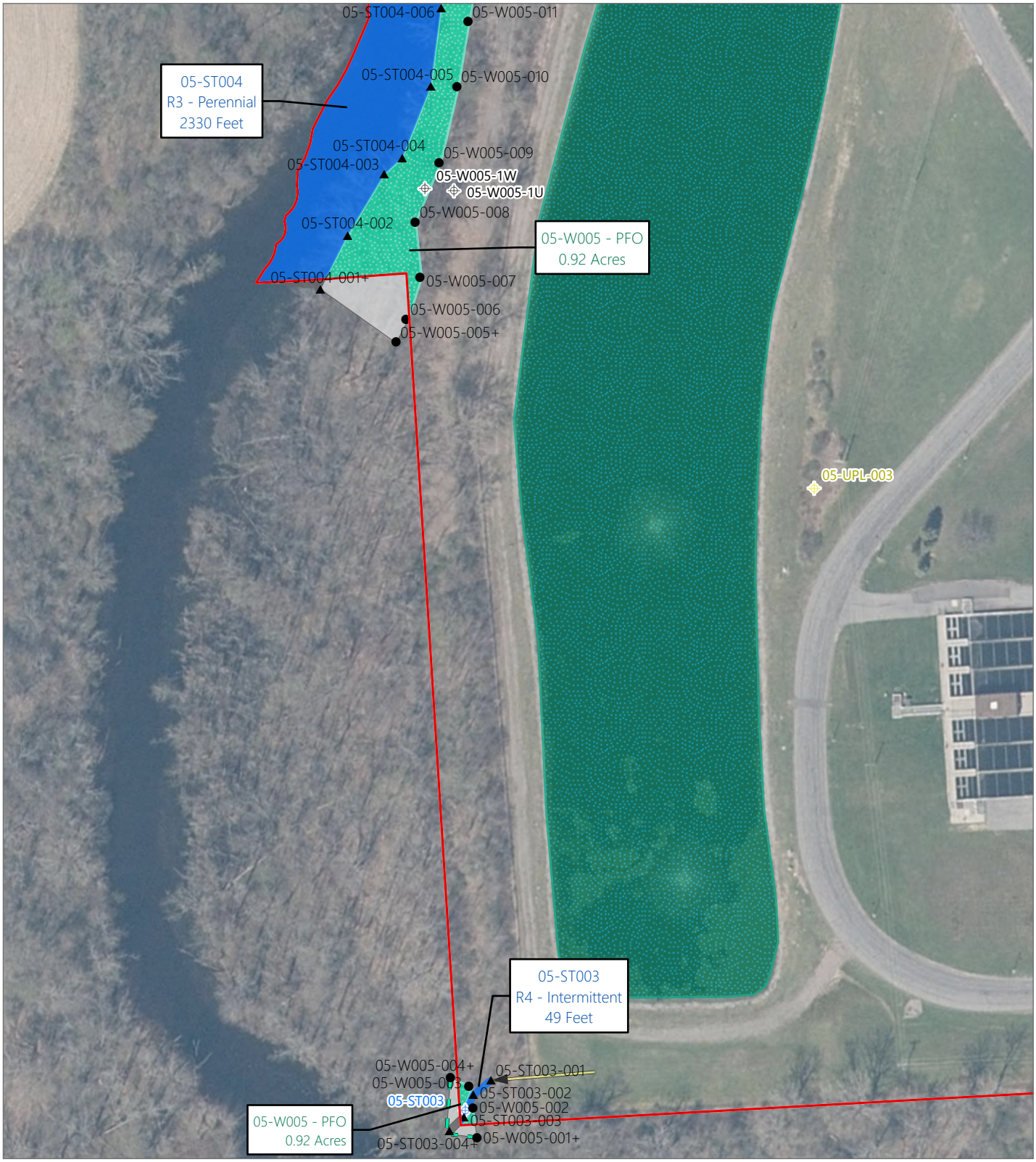

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Prepared August 14, 2024

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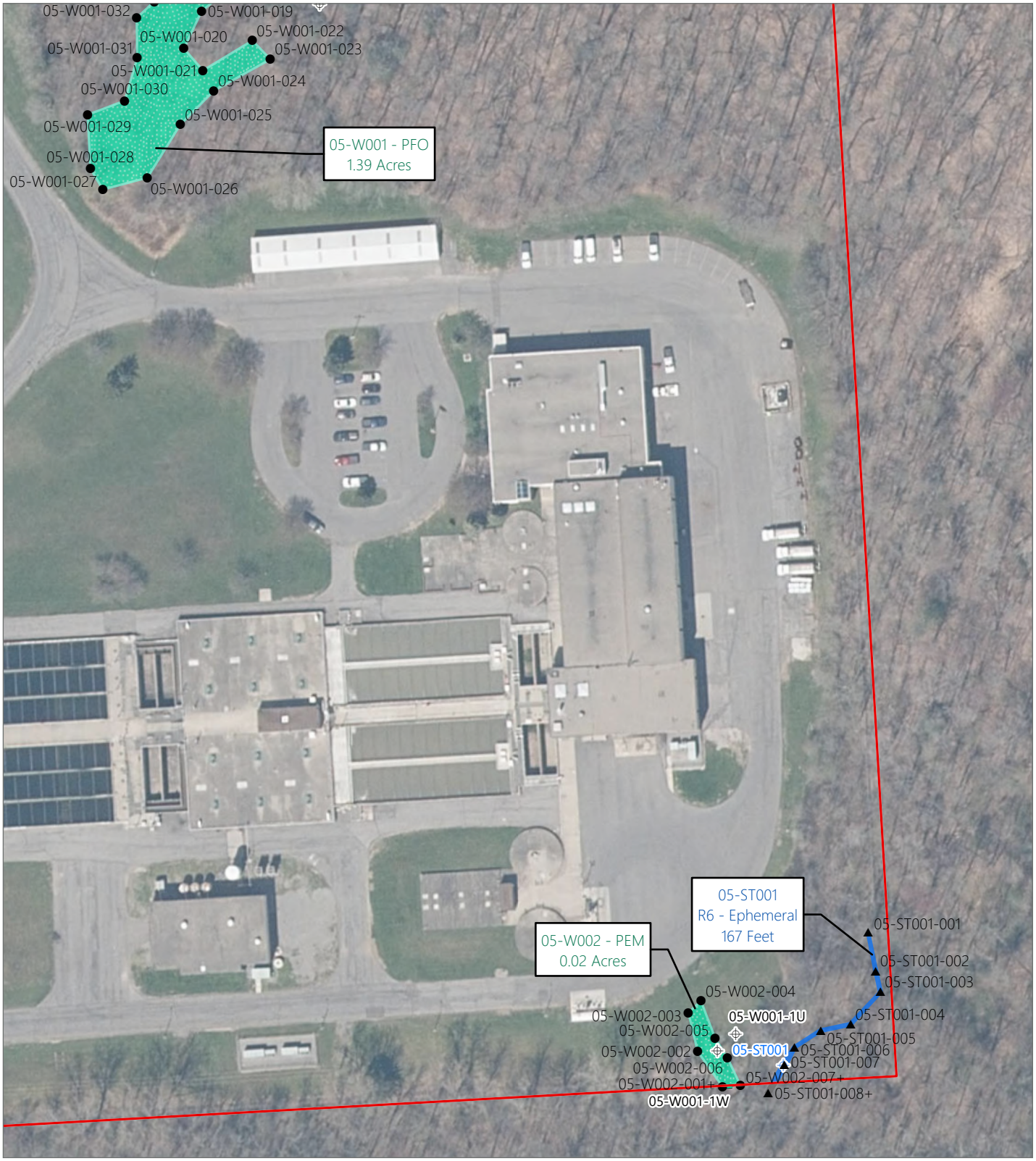

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Feet

Prepared August 14, 2024

Basemap: NYSDOP "2022" orthoimagery map service

EDR

Appendix B

Routine Wetland Determination Data Sheets and OHWM Data Forms

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard City/County: Onondaga County Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County State: New York Sampling Point: 05-UPL-001
Investigator(s): JK, MC Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Flat Local relief (concave, convex, none): none Slope (%): 0-5
Subregion (LRR or MLRA): LRR L Lat: 43.2039295 Long: -76.21140133333333 Datum: WGS 1984
Soil Map Unit Name: Collamer silt loam, 2 to 6 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-UPL-001

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Lotus unifoliolatus* / American bird's foot trefoil	50	Yes	NI
2. *Centaurea jacea* / Brownray knapweed	50	Yes	FACU
3. *Solidago altissima* / Canada goldenrod	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	110	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species	0	x 1 =	0	
FACW species	0	x 2 =	0	
FAC species	0	x 3 =	0	
FACU species	60	x 4 =	240	
UPL species	50	x 5 =	250	
Column Totals:	110	(A)	490	(B)

Prevalence Index = B/A = 4.45

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-UPL-001

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Very gravelly. Gravel refusal at 5 inches.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard City/County: Onondaga County Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County State: New York Sampling Point: 05-UPL-002
Investigator(s): JK, MC Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Flat Local relief (concave, convex, none): none Slope (%): 0-5
Subregion (LRR or MLRA): LRR L Lat: 43.20270583333333 Long: -76.20796383333334 Datum: WGS 1984
Soil Map Unit Name: Collamer silt loam, 2 to 6 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

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- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
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Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-UPL-002

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus deltoides* / Eastern cottonwood	20	Yes	FAC
2. *Populus tremuloides* / Quaking aspen	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	30	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Lonicera morrowii* / Morrow's honeysuckle	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Solidago canadensis* / Canada goldenrod	90	Yes	FACU
2. *Rosa multiflora* / Multiflora rose, Multiflora rosa	10	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	120	x 4 =	480
UPL species	0	x 5 =	0
Column Totals:	140 (A)		540 (B)

Prevalence Index = B/A = 3.86

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-UPL-002

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/3	100					Silt Loam	
12-18	2.5Y 5/6	100					Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard City/County: Onondaga County Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County State: New York Sampling Point: 05-UPL-003
Investigator(s): JK, MC Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Flat Local relief (concave, convex, none): none Slope (%): 0-5
Subregion (LRR or MLRA): LRR L Lat: 43.19940466666667 Long: -76.2105315 Datum: WGS 1984
Soil Map Unit Name: Dunkirk silt loam, rolling NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
un mowed area adjacent to around utility pole, adjacent to waste water lagoon.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-UPL-003

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Lonicera morrowii* / Morrow's honeysuckle	20	Yes	FACU
2. *Salix sp.* / Willow	5	Yes	NI
3.			
4.			
5.			
6.			
7.			
	25	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Solidago canadensis* / Canada goldenrod	40	Yes	FACU
2. *Phragmites australis* / Common reed	30	Yes	FACW
3. *Lythrum salicaria* / Purple loosestrife	2	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	72	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	2	x 1 =	2
FACW species	30	x 2 =	60
FAC species	0	x 3 =	0
FACU species	60	x 4 =	240
UPL species	5	x 5 =	25
Column Totals:	97 (A)		327 (B)

Prevalence Index = B/A = 3.37

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-UPL-003

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	90	10YR 4/4	10	C	M	Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W001-1U
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Flat | Local relief (concave, convex, none): none | Slope (%): 0-5
Subregion (LRR or MLRA): LRR L | Lat: 43.20050216666667 | Long: -76.20896066666667 | Datum: WGS 1984
Soil Map Unit Name: Niagara silt loam, 0 to 4 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____
Wetland Hydrology Present?	Yes ____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W001-1U

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia* / American beech	25	Yes	FACU
2. *Carya ovata* / Shag-bark hickory	15	Yes	FACU
3. *Liriodendron tulipifera* / Tuliptree	15	Yes	FACU
4. *Acer rubrum* / Red maple	10	No	FAC
5.			
6.			
7.			
	65	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Fagus grandifolia* / American beech	10	Yes	FACU
2. *Acer rubrum* / Red maple	5	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	

Herb Stratum (Plot size: 5-ft)			
1. *Toxicodendron radicans* / Eastern poison ivy	10	Yes	FAC
2. *Podophyllum peltatum* / May-apple	5	Yes	FACU
3. *Fraxinus pennsylvanica* / Green ash	5	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	20	= Total Cover	

Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 37.5 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species	0	x 1 =	0	
FACW species	5	x 2 =	10	
FAC species	25	x 3 =	75	
FACU species	70	x 4 =	280	
UPL species	0	x 5 =	0	
Column Totals:	100	(A)	365	(B)

Prevalence Index = B/A = 3.65

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W001-1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 3/2	100					Silt Loam	
14-18	10YR 5/3	80	10YR 5/8	20	C	M	Fine Sndy Lm	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W001-1W
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Bowl shaped depression | Local relief (concave, convex, none): concave | Slope (%): 0-6
Subregion (LRR or MLRA): LRR L | Lat: 43.20058566666667 | Long: -76.20930383333334 | Datum: WGS 1984
Soil Map Unit Name: Niagara silt loam, 0 to 4 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** Yes X No ___
Hydric Soil Present?	Yes X	No ___	If yes, optional Wetland Site ID: 05-W001-1W PFO
Wetland Hydrology Present?	Yes X	No ___	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W001-1W

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum* / Red maple	20	Yes	FAC
2. *Liriodendron tulipifera* / Tuliptree	15	Yes	FACU
3. *Carya ovata* / Shag-bark hickory	10	No	FACU
4. *Tsuga canadensis* / Eastern hemlock	10	No	FACU
5.			
6.			
7.			
	55	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15-ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size: 5-ft)			
1. *Toxicodendron radicans* / Eastern poison ivy	60	Yes	FAC
2. *Impatiens capensis* / Spotted jewelweed	35	Yes	FACW
3. *Fraxinus pennsylvanica* / Green ash	10	No	FACW
4. *Lindera benzoin* / Northern spicebush	5	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	110	= Total Cover	

Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	50	x 2 =	100
FAC species	80	x 3 =	240
FACU species	35	x 4 =	140
UPL species	0	x 5 =	0
Column Totals:	165 (A)		480 (B)

Prevalence Index = B/A = 2.91

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W001-1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/1	100					Fine Sndy Lm	
8-18	10YR 5/2	80	10YR 5/8	20	C	M	Fine Sndy Lm	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard City/County: Onondaga County Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County State: New York Sampling Point: 05-W001-2U
Investigator(s): JK, MC Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Mound Local relief (concave, convex, none): convex Slope (%): 2-6
Subregion (LRR or MLRA): LRR L Lat: 43.20125566666667 Long: -76.20863966666667 Datum: WGS 1984
Soil Map Unit Name: Collamer silt loam, 2 to 6 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W001-2U

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Centaurea jacea* / Brownray knapweed	50	Yes	FACU
2. *Lotus unifoliolatus* / American bird's foot trefoil	50	Yes	NI
3. *Phleum pratense* / Common timothy, Cultivated timothy	10	No	FACU
4. *Phragmites australis* / Common reed	5	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	115	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	5	x 2 =	10
FAC species	0	x 3 =	0
FACU species	60	x 4 =	240
UPL species	50	x 5 =	250
Column Totals:	115 (A)		500 (B)

Prevalence Index = B/A = 4.35

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W001-2U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Very gravelly. Gravel refusal at 5 inches.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W001-2W
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Flat | Local relief (concave, convex, none): none | Slope (%): 0-5
Subregion (LRR or MLRA): LRR L | Lat: 43.20124383333334 | Long: -76.20844483333333 | Datum: WGS 1984
Soil Map Unit Name: Collamer silt loam, 2 to 6 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** Yes X No ___
Hydric Soil Present?	Yes X	No ___	If yes, optional Wetland Site ID: 05-W001-2W PEM
Wetland Hydrology Present?	Yes X	No ___	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W001-2W

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Solidago gigantea* / Smooth goldenrod	30	Yes	FACW
2. *Phragmites australis* / Common reed	20	Yes	FACW
3. *Eupatorium perfoliatum* / Common boneset	10	No	FACW
4. *Scirpus atrovirens* / Green bulrush	10	No	OBL
5. *Lythrum salicaria* / Purple loosestrife	5	No	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	60	x 2 =	120
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	75 (A)		135 (B)

Prevalence Index = B/A = 1.8

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W001-2W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	90	10YR 5/6	10	C	PL,M	Clay Loam	
12-18	10YR 5/3	70	10YR 5/8	30	C	M	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard City/County: Onondaga County Sampling Date: 07/30/2024
Applicant/Owner: Onondaga County State: New York Sampling Point: 05-W002-1U
Investigator(s): JK, MC Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Hillslope Local relief (concave, convex, none): convex Slope (%): 0-4
Subregion (LRR or MLRA): LRR L Lat: 43.19829833333333 Long: -76.207756 Datum: WGS 1984
Soil Map Unit Name: Niagara silt loam, 0 to 4 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____
Wetland Hydrology Present?	Yes ____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W002-1U

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Lonicera morrowii* / Morrow's honeysuckle	10	Yes	FACU
2. *Elaeagnus umbellata* / Autumn olive	10	Yes	NI
3. *Rhamnus cathartica* / European buckthorn	10	Yes	FAC
4. *Rosa multiflora* / Multiflora rose, Multiflora rosa	5	No	FACU
5.			
6.			
7.			
	35	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Taraxacum officinale* / Red seeded dandelion, Common dan	25	Yes	FACU
2. *Plantago lanceolata* / Ribwort, English plantain	20	Yes	FACU
3. *Plantago major* / Common plantain	15	Yes	FACU
4. *Prunella vulgaris* / Self heal	15	Yes	FAC
5. *Oxalis stricta* / Upright yellow wood-sorrel	10	No	FACU
6. *Centaurea stoebe* / Spotted knapweed	10	No	NI
7. *Toxicodendron radicans* / Eastern poison ivy	5	No	FAC
8. *Daucus carota* / Carrot, Carrot, Queen anne's lace	5	No	UPL
9. *Hieracium caespitosum* / Meadow hawkweed	5	No	NI
10.			
11.			
12.			
	110	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 28.6 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	30	x 3 =	90
FACU species	85	x 4 =	340
UPL species	30	x 5 =	150
Column Totals:	145 (A)		580 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W002-1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/3	100					Silt Loam	
6-18	10YR 5/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/30/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W002-1W
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Hillslope | Local relief (concave, convex, none): concave | Slope (%): 0-4
Subregion (LRR or MLRA): LRR L | Lat: 43.19826183333333 | Long: -76.207809 | Datum: WGS 1984
Soil Map Unit Name: Niagara silt loam, 0 to 4 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** Yes X No ___
Hydric Soil Present?	Yes X	No ___	If yes, optional Wetland Site ID: 05-W002-1W PEM
Wetland Hydrology Present?	Yes X	No ___	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Small seep from maintained lawn adjacent pavement area.

VEGETATION - Use scientific names of plants. Sampling Point: 05-W002-1W

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Agrostis stolonifera* / Redtop, Creeping bent	40	Yes	FACW
2. *Eleocharis palustris* / Common spikerush	20	Yes	OBL
3. *Juncus tenuis* / Slender rush, Poverty or slender rush	5	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	65	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	40	x 2 =	80
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	65 (A)		115 (B)

Prevalence Index = B/A = 1.77

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W002-1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	95	7.5YR 4/4	5	C	PL,M	Clay Loam	
5-18	2.5Y 4/1	90	10YR 5/8	10	C	PL,M	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/30/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W003-1U
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Mound | Local relief (concave, convex, none): convex | Slope (%): 0-6
Subregion (LRR or MLRA): LRR L | Lat: 43.20449783333333 | Long: -76.20919766666667 | Datum: WGS 1984
Soil Map Unit Name: Collamer silt loam, 2 to 6 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____
Wetland Hydrology Present?	Yes ____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W003-1U

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum* / Red maple	60	Yes	FAC
2. *Pinus resinosa* / Red pine	15	No	FACU
3. *Fraxinus pennsylvanica* / Green ash	10	No	FACW
4.			
5.			
6.			
7.			
	85	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Rhamnus cathartica* / European buckthorn	15	Yes	FAC
2. *Juglans nigra* / Black walnut	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	25	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Parthenocissus quinquefolia* / Virginia creeper	40	Yes	FACU
2. *Persicaria virginiana* / Jumpseed	20	Yes	FAC
3. *Fraxinus pennsylvanica* / Green ash	15	No	FACW
4. *Rosa multiflora* / Multiflora rose, Multiflora rosa	10	No	FACU
5. *Rhamnus cathartica* / European buckthorn	10	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	25	x 2 =	50
FAC species	105	x 3 =	315
FACU species	75	x 4 =	300
UPL species	0	x 5 =	0
Column Totals:	205 (A)		665 (B)

Prevalence Index = B/A = 3.24

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W003-1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/30/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W003-1W
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Toeslope | Local relief (concave, convex, none): concave | Slope (%): 0-6
Subregion (LRR or MLRA): LRR L | Lat: 43.20430766666666 | Long: -76.20910716666667 | Datum: WGS 1984
Soil Map Unit Name: Collamer silt loam, 2 to 6 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** Yes X No ___
Hydric Soil Present?	Yes X	No ___	If yes, optional Wetland Site ID: 05-W003-1W PSS
Wetland Hydrology Present?	Yes X	No ___	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W003-1W

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus pennsylvanica* / Green ash	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Cornus racemosa* / Gray dogwood	30	Yes	FAC
2. *Fraxinus pennsylvanica* / Green ash	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Solidago rugosa* / Wrinkle-leaf goldenrod	40	Yes	FAC
2. *Juncus tenuis* / Slender rush, Poverty or slender rush	20	Yes	FAC
3. *Symphyotrichum sp.* / Aster	15	No	NI
4. *Impatiens capensis* / Spotted jewelweed	10	No	FACW
5. *Geum laciniatum* / Rough avens	10	No	FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	55	x 2 =	110
FAC species	90	x 3 =	270
FACU species	0	x 4 =	0
UPL species	15	x 5 =	75
Column Totals:	160 (A)		455 (B)

Prevalence Index = B/A = 2.84

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W003-1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	90	7.5YR 4/4	10	C	M	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard City/County: Onondaga County Sampling Date: 07/30/2024
Applicant/Owner: Onondaga County State: New York Sampling Point: 05-W004-1U
Investigator(s): JK, MC Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Hillslope Local relief (concave, convex, none): convex Slope (%): 8-15
Subregion (LRR or MLRA): LRR L Lat: 43.204748 Long: -76.211759 Datum: WGS 1984
Soil Map Unit Name: Dunkirk silt loam, rolling NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W004-1U

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juglans nigra* / Black walnut	30	Yes	FACU
2. *Fraxinus pennsylvanica* / Green ash	10	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	40	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Lonicera morrowii* / Morrow's honeysuckle	25	Yes	FACU
2. *Fraxinus pennsylvanica* / Green ash	5	No	FACW
3.			
4.			
5.			
6.			
7.			
	30	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Persicaria virginiana* / Jumpseed	40	Yes	FAC
2. *Rubus allegheniensis* / Allegheny blackberry	25	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	65	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	15	x 2 =	30
FAC species	40	x 3 =	120
FACU species	80	x 4 =	320
UPL species	0	x 5 =	0
Column Totals:	135 (A)		470 (B)

Prevalence Index = B/A = 3.48

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W004-1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 5/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/30/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W004-1W
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Bowl shaped depression | Local relief (concave, convex, none): concave | Slope (%): 2-15
Subregion (LRR or MLRA): LRR L | Lat: 43.204913 | Long: -76.211904 | Datum: WGS 1984
Soil Map Unit Name: Dunkirk silt loam, rolling | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 05-W004-1W PFO
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 2
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W004-1W

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum* / Red maple	30	Yes	FAC
2. *Fraxinus pennsylvanica* / Green ash	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Fraxinus pennsylvanica* / Green ash	30	Yes	FACW
2. *Rhamnus cathartica* / European buckthorn	15	Yes	FAC
3. *Lonicera morrowii* / Morrow's honeysuckle	5	No	FACU
4.			
5.			
6.			
7.			
	50	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Saururus cernuus* / Lizard's-tail	30	Yes	OBL
2. *Onoclea sensibilis* / Sensitive fern	20	Yes	FACW
3. *Impatiens capensis* / Spotted jewelweed	10	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species	80	x 2 =	160
FAC species	45	x 3 =	135
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	160 (A)		345 (B)

Prevalence Index = B/A = 2.16

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W004-1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/1	95	10YR 5/6	5	C	M	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W005-1U
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Hillslope | Local relief (concave, convex, none): convex | Slope (%): 8-15
Subregion (LRR or MLRA): LRR L | Lat: 43.200039 | Long: -76.2115765 | Datum: WGS 1984
Soil Map Unit Name: Saprists and Fluvaquents, ponded | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____
Wetland Hydrology Present?	Yes ____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)
Soils problematic due to rocks fill along slope.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W005-1U

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Prunus virginiana* / Chokecherry	10	Yes	FACU
2. *Populus deltoides* / Eastern cottonwood	5	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Rhamnus cathartica* / European buckthorn	15	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Parthenocissus quinquefolia* / Virginia creeper	15	Yes	FACU
2. *Vitis riparia* / River-bank grape	10	Yes	FAC
3. *Toxicodendron radicans* / Eastern poison ivy	10	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	35	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	40	x 3 =	120
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column Totals:	65 (A)		220 (B)

Prevalence Index = B/A = 3.38

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W005-1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Rock refusal at 0 inches. Large area adjacent to wetland has been filled along seep grad with 2+ inch rock fill.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W005-1W
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Toeslope | Local relief (concave, convex, none): concave | Slope (%): 0-15
Subregion (LRR or MLRA): LRR L | Lat: 43.200048 | Long: -76.21166 | Datum: WGS 1984
Soil Map Unit Name: Saprists and Fluvaquents, ponded | NWI classification: PAB/UBHh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 05-W005-1W PFO
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W005-1W

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Ulmus americana* / American elm	15	Yes	FACW
2. *Acer rubrum* / Red maple	10	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	25	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Rosa multiflora* / Multiflora rose, Multiflora rosa	15	Yes	FACU
2. *Carpinus caroliniana* / American hornbeam	15	Yes	FAC
3. *Quercus bicolor* / Swamp white oak	10	Yes	FACW
4. *Rhamnus cathartica* / European buckthorn	5	No	FAC
5. *Fraxinus pennsylvanica* / Green ash	5	No	FACW
6.			
7.			
	50	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Saururus cernuus* / Lizard's-tail	30	Yes	OBL
2. *Parthenocissus quinquefolia* / Virginia creeper	10	Yes	FACU
3. *Rosa multiflora* / Multiflora rose, Multiflora rosa	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	45	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 71.4 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species	30	x 2 =	60
FAC species	30	x 3 =	90
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column Totals:	120 (A)		300 (B)

Prevalence Index = B/A = 2.5

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W005-1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	N 3/	85	5Y 4/1	10	D	M	Clay Loam	
0-18			10YR 4/6	5	C	M	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard City/County: Onondaga County Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County State: New York Sampling Point: 05-W005-2U
Investigator(s): JK, MC Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Hillslope Local relief (concave, convex, none): convex Slope (%): 8-20
Subregion (LRR or MLRA): LRR L Lat: 43.20340566666667 Long: -76.21240116666667 Datum: WGS 1984
Soil Map Unit Name: Saprists and Fluvaquents, ponded NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W005-2U

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Juglans nigra* / Black walnut	30	Yes	FACU
2. *Ulmus rubra* / Slippery elm	10	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	40	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1. *Elaeagnus umbellata* / Autumn olive	40	Yes	UPL
2. *Lonicera morrowii* / Morrow's honeysuckle	20	Yes	FACU
3. *Rhamnus cathartica* / European buckthorn	10	No	FAC
4.			
5.			
6.			
7.			
	70	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Toxicodendron radicans* / Eastern poison ivy	25	Yes	FAC
2. *Persicaria virginiana* / Jumpseed	10	Yes	FAC
3. *Amphicarpaea bracteata* / American hog-peanut	8	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	43	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	63	x 3 =	189
FACU species	50	x 4 =	200
UPL species	40	x 5 =	200
Column Totals:	153 (A)		589 (B)

Prevalence Index = B/A = 3.85

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W005-2U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/3	100					Silt Loam	
5-14	10YR 5/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Very gravelly. Gravel refusal at 14 inches.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Oak Orchard | City/County: Onondaga County | Sampling Date: 07/31/2024
Applicant/Owner: Onondaga County | State: New York | Sampling Point: 05-W005-2W
Investigator(s): JK, MC | Section, Township, Range: Town of Clay
Landform (hillslope, terrace, etc): Riverine | Local relief (concave, convex, none): concave | Slope (%): 0-8
Subregion (LRR or MLRA): LRR L | Lat: 43.2033305 | Long: -76.21240616666667 | Datum: WGS 1984
Soil Map Unit Name: Saprists and Fluvaquents, ponded | NWI classification: PAB/UBHh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	If yes, optional Wetland Site ID: 05-W005-2W PEM
Wetland Hydrology Present?	Yes X	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 4+
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: 05-W005-2W

Tree Stratum (Plot size: 30-ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15-ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size: 5-ft)			
1. *Peltandra virginica* / Green arrow arum, Tuckahoe	20	Yes	OBL
2. *Typha angustifolia* / Narrow leaf cattail, Narrow-leaved cattai	15	Yes	OBL
3. *Onoclea sensibilis* / Sensitive fern	10	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	45	= Total Cover	
Woody Vine Stratum (Plot size: 30-ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	35	x 1 =	35
FACW species	10	x 2 =	20
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	45 (A)		55 (B)

Prevalence Index = B/A = 1.22

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: 05-W005-2W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/1	90	5YR 4/6	10	C	PL,M	Clay Loam	
8-18	7.5YR 5/1	100					Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

Oak Orchard - OHWM 1.1

Project	24187 - Oak Orchard
ID	470604
Survey Date	07/30/2024
User	Megan Cammett
General Information	
Sampling Point	05-ST001
Project	Oak Orchard
Date	07/30/2024
Time	08:53 AM
Location	
Latitude	43.1982327
Longitude	-76.2076213
Investigator(s)	JK, MC
Step 1: Site overview from remote and online resources	
Check boxes for online resources used to evaluate site	LiDAR, climatic data, geologic maps, land use maps, other, satellite imagery, topographic maps
Other	Natural Resource Mapper
Describe land use and flow conditions from online resources.	Stream flows through forested area directly adjacent to wastewater treatment plant. Forested area is bordered by fields with solar panels on south side.
Step 2: Site conditions during field assessment	
Describe Site Condition	Ephemeral stream flows southwest through forested area. No flow at time of delineation. Developed bank present at the lower stretch with a change in vegetation.
Step 3 Indicators	
Geomorphic Indicators	
Break in slope	Present
Break in Slope Indicator Location	x
On the bank	Present
On the bank Indicator Location	x
Undercut Bank	
Valley Bottom	
Other break in slope description	
Shelving	
Channel bar	

made with Wildnote

Instream bedforms and other bedload transport evidence	
Secondary channels	

Sediment Indicators	
Soil development	
Changes in character of soil	
Mudcracks	
Changes in particle-sized distribution	

Vegetation Indicators	
Change in vegetation type and/or density	Present
Vegetation Indicator Location	x
Vegetation Change From	vegetation absent
Vegetation Change To	forbs
Vegetation matted down and/or bent:	
Exposed roots below intact soil layer:	

Ancillary Indicators	
Wracking/presence of organic litter	
Presence of large wood	
Leaf litter disturbed or washed away	
Water staining	
Weathered clasts or bedrock	
Other observed indicators?	No

Step 4: Additional Information	
Is additional information needed to support this determination?	No

Step 5: Rationale	
Describe rationale for location of OHWM	The OHWM indicators of break in slope on the bank and change in vegetation were persistent throughout the entire delineated reach of stream.
Additional observations or notes	

Photos	
Photo log attached?	Yes
Photos	



Change in vegetation type and break in slope.

Oak Orchard - OHWM 1.1

Project	24187 - Oak Orchard
ID	470608
Survey Date	07/30/2024
User	Megan Cammett
General Information	
Sampling Point	05-ST002
Project	Oak Orchard
Date	07/30/2024
Time	12:04 PM
Location	
Latitude	43.2049395
Longitude	-76.20786683333333
Datum	NAD83/2011
Investigator(s)	JK, MC
Step 1: Site overview from remote and online resources	
Check boxes for online resources used to evaluate site	LiDAR, climatic data, geologic maps, land use maps, other, satellite imagery, topographic maps
Other	Natural Resource Mapper
Describe land use and flow conditions from online resources.	Stream flows through shrubland bordered by residential housing and wastewater treatment plant.
Step 2: Site conditions during field assessment	
Describe Site Condition	Intermittent drainage stream flows west from offsite through successional shrubland and drains wetland. No flow at time of delineation. Bank and bed well developed.
Step 3 Indicators	
Geomorphic Indicators	
Break in slope	Present
Break in Slope Indicator Location	x
On the bank	Present
On the bank Indicator Location	x
Undercut Bank	
Valley Bottom	
Other break in slope description	
Shelving	
Channel bar	
Instream bedforms and other bedload transport evidence	

Secondary channels	

Sediment Indicators	
Soil development	
Changes in character of soil	
Mudcracks	
Changes in particle-sized distribution	

Vegetation Indicators	
Change in vegetation type and/or density	Present
Vegetation Indicator Location	x
Vegetation Change From	vegetation absent
Vegetation Change To	forbs
Vegetation matted down and/or bent:	
Exposed roots below intact soil layer:	

Ancillary Indicators	
Wracking/presence of organic litter	
Presence of large wood	Present
Presence of Large Wood Indicator Location	x
Leaf litter disturbed or washed away	
Water staining	
Weathered clasts or bedrock	
Other observed indicators?	No

Step 4: Additional Information	
Is additional information needed to support this determination?	No

Step 5: Rationale	
Describe rationale for location of OHWM	The OHWM indicators of brake in slope on the bank and change in vegetation type were persistent throughout the entire delineated reach of stream. The indicator of presence of large wood was observed but not persistent.
Additional observations or notes	

Photos	
Photo log attached?	Yes
Photos	







Break in slope on the bank and change in vegetation type.



Presence of large wood.

Oak Orchard - OHWM 1.1

Project	24187 - Oak Orchard
ID	471569
Survey Date	08/01/2024
User	Megan Cammett
General Information	
Sampling Point	05-ST003
Project	Oak Orchard
Date	07/31/2024
Time	08:27 AM
Location	
Latitude	43.1980791
Longitude	-76.2115564
Investigator(s)	JK, MC
Step 1: Site overview from remote and online resources	
Check boxes for online resources used to evaluate site	LiDAR, climatic data, geologic maps, land use maps, other, satellite imagery, topographic maps
Other	Natural Resource Mapper
Describe land use and flow conditions from online resources.	Surrounded by forested area bordered by developed land of wastewater treatment plant. Northeast of NWI mapped wetland with classification PFO1/SS1E, NYSDEC Class C mapped stream, and NYSDEC mapped wetland BRE-17.
Step 2: Site conditions during field assessment	
Describe Site Condition	Intermittent stream flows southwest through forested wetland. Fed from culvert with outflow from wastewater treatment plant. Light base flow at time of delineation. Well developed bank and substrate bottom present.
Step 3 Indicators	
Geomorphic Indicators	
Break in slope	Present
Break in Slope Indicator Location	x
On the bank	Present
On the bank Indicator Location	x
Undercut Bank	
Valley Bottom	
Other break in slope description	
Shelving	
Channel bar	
Instream bedforms and other bedload transport evidence	

Secondary channels	

Sediment Indicators	
Soil development	
Changes in character of soil	
Mudcracks	
Changes in particle-sized distribution	

Vegetation Indicators	
Change in vegetation type and/or density	Present
Vegetation Indicator Location	x
Vegetation Change From	vegetation absent
Vegetation Change To	forbs
Vegetation matted down and/or bent:	
Exposed roots below intact soil layer:	

Ancillary Indicators	
Wracking/presence of organic litter	
Presence of large wood	Present
Presence of Large Wood Indicator Location	x
Leaf litter disturbed or washed away	
Water staining	
Weathered clasts or bedrock	
Other observed indicators?	No

Step 4: Additional Information	
Is additional information needed to support this determination?	No

Step 5: Rationale	
Describe rationale for location of OHWM	The OHWM indicators of break in slope on the bank and change in vegetation type were persistent throughout the entire delineated reach of stream. The indicator of presence of large wood was noted but not persistent.
Additional observations or notes	In addition to forbs, vegetation also changed to woody shrubs.

Photos	
Photo log attached?	Yes
Photos	



Presence of large wood.



Change in vegetation type and break in slope on the bank.

Oak Orchard - OHWM 1.1

Project	24187 - Oak Orchard
ID	471572
Survey Date	08/01/2024
User	Megan Cammett
General Information	
Sampling Point	05-ST004
Project	Oak Orchard
Date	07/31/2024
Time	04:17 PM
Location	
Latitude	43.20472
Longitude	-76.213823
Investigator(s)	JK, MC
Step 1: Site overview from remote and online resources	
Check boxes for online resources used to evaluate site	LiDAR, climatic data, geologic maps, land use maps, other, satellite imagery, topographic maps
Other	Natural Resource Mapper
Describe land use and flow conditions from online resources.	Stream corresponds with NYSDEC Class C mapped stream. Also flows within NYSDEC mapped wetland BRE-17 and an NWI mapped wetland with classification PAB/UBHh. Stream flows through forested area that is bordered by an agriculture field and wastewater treatment plant.
Step 2: Site conditions during field assessment	
Describe Site Condition	Perennial stream flows north bordered by a forested and emergent wetland complex on both sides. Outflows into 05-ST005 via under a road bridge. Strong base flow rate during time of delineation. Stream has a well developed bank and distinct change in vegetation. Downhill from wastewater treatment plant.
Step 3 Indicators	
Geomorphic Indicators	
Break in slope	Present
Break in Slope Indicator Location	x
On the bank	Present
On the bank Indicator Location	x
Undercut Bank	
Valley Bottom	
Other break in slope description	
Shelving	
Channel bar	
Instream bedforms and	

other bedload transport evidence	
Secondary channels	

Sediment Indicators	
Soil development	
Changes in character of soil	
Mudcracks	
Changes in particle-sized distribution	

Vegetation Indicators	
Change in vegetation type and/or density	Present
Vegetation Indicator Location	x
Vegetation Change From	vegetation absent
Vegetation Change To	forbs
Vegetation matted down and/or bent:	
Exposed roots below intact soil layer:	

Ancillary Indicators	
Wracking/presence of organic litter	
Presence of large wood	
Leaf litter disturbed or washed away	
Water staining	
Weathered clasts or bedrock	
Other observed indicators?	Yes
Describe	Aquatic vegetation was observed during time of delineation.

Step 4: Additional Information	
Is additional information needed to support this determination?	No

Step 5: Rationale	
Describe rationale for location of OHWM	The OHWM indicators of break in slope on the bank and change in vegetation type were persistent throughout the entire delineated reach of stream.
Additional observations or notes	In addition to forbs, vegetation also changes to woody shrubs and deciduous trees.

Photos	
Photo log attached?	Yes
Photos	



Break in slope on the bank.



Change in vegetation type.

Oak Orchard - OHWM 1.1

Project	24187 - Oak Orchard
ID	471575
Survey Date	08/01/2024
User	Megan Cammett
General Information	
Sampling Point	05-ST005
Project	Oak Orchard
Date	07/31/2024
Time	11:19 AM
Location	
Latitude	43.205311
Longitude	-76.213826
Investigator(s)	JK, MC
Step 1: Site overview from remote and online resources	
Check boxes for online resources used to evaluate site	LiDAR, climatic data, geologic maps, land use maps, other, satellite imagery, topographic maps
Other	Natural Resource Mapper
Describe land use and flow conditions from online resources.	Stream corresponds with NYSDEC Class B mapped stream and NWI mapped waterbody with classification R2UBH. Bordered by deciduous forests, residential neighborhoods, and paved roads with multiple bridge overpasses. Outflows into Oneida Lake.
Step 2: Site conditions during field assessment	
Describe Site Condition	Perennial stream flows northwest through developed, successional scrub shrub, and forested areas. Receives outflow from 05-ST004 via under road bridge. Strong base flow present during time of delineation. Well developed bank and distinct change in vegetation present.
Step 3 Indicators	
Geomorphic Indicators	
Break in slope	Present
Break in Slope Indicator Location	x
On the bank	Present
On the bank Indicator Location	x
Undercut Bank	
Valley Bottom	
Other break in slope description	
Shelving	
Channel bar	
Instream bedforms and other bedload transport	

evidence	
Secondary channels	

Sediment Indicators	
Soil development	
Changes in character of soil	
Mudcracks	
Changes in particle-sized distribution	

Vegetation Indicators	
Change in vegetation type and/or density	Present
Vegetation Indicator Location	x
Vegetation Change From	vegetation absent
Vegetation Change To	deciduous trees
Vegetation matted down and/or bent:	
Exposed roots below intact soil layer:	

Ancillary Indicators	
Wracking/presence of organic litter	
Presence of large wood	
Leaf litter disturbed or washed away	
Water staining	
Weathered clasts or bedrock	
Other observed indicators?	No

Step 4: Additional Information	
Is additional information needed to support this determination?	No

Step 5: Rationale	
Describe rationale for location of OHWM	The OHWM indicators of break in slope on the bank and change in vegetation type were persistent throughout the entire delineated reach of stream.
Additional observations or notes	In addition to deciduous trees, vegetation also changes to woody shrubs and forbs.

Photos	
Photo log attached?	Yes
Photos	



Change in vegetation type.



Break in slope on the bank.



Appendix C

Photo Documentation



Photo 1
Representative photograph of a wastewater treatment lagoon.



Photo 2
Representative photograph of the palustrine forested (PFO) portion of wetland 05-W001.



Photo 3
Photograph of drop culvert within wetland 05-W001.



Photo 4
Photograph of wetland 05-W001 beyond the Study Area. Wetland extends approximately 40 feet into upland forest.



Photo 5
Representative photograph of the palustrine emergent (PEM) portion of wetland 05-W001.



Photo 6
Representative photograph of the upland area adjacent to the PFO portion of wetland 05-W001.



Photo 7
Representative photograph of the upland area adjacent to the PEM portion of wetland 05-W001.



Photo 8
Representative photograph of palustrine emergent (PEM) wetland 05-W002.



Photo 9
Representative photograph of the upland area adjacent to wetland 05-W002.



Photo 10
Representative photograph of palustrine scrub-shrub (PSS) wetland 05-W003.



Photo 11
Representative photograph of the upland area adjacent to wetland 05-W003.



Photo 12
Representative photograph of palustrine forested (PFO) wetland 05-W004.



Photo 13
Representative photograph of the upland area adjacent to wetland 05-W004.



Photo 14
Representative photograph of the palustrine forested (PFO) portion of wetland 05-W005.



Photo 15
Representative photograph of the palustrine emergent (PEM) portion of wetland 05-W005.



Photo 16
Representative photograph of the upland area adjacent to the PFO portion of wetland 05-W005.



Photo 17
Representative photograph of the upland area adjacent to the PFO portion of wetland 05-W005.



Photo 18
Representative photograph of ephemeral stream 05-ST001.



Photo 19
Representative photograph of intermittent stream 05-ST002.



Photo 20
Representative photograph of intermittent stream 05-ST003.



Photo 21
Representative photograph of Mud Creek, perennial stream 05-ST004.



Photo 22
Representative photograph of the Oneida River, perennial stream 05-ST005.

APPENDIX E

JURISDICTIONAL DETERMINATION REQUEST

May 1, 2025

NYSDEC-Region 7
5786 Widewaters Parkway
Syracuse, NY 13214
R7BEH@dec.ny.gov
Via email

RE: Jurisdictional Determination Request-Consultant Option
Oak Orchard Wastewater Treatment Plant Expansion
Clay, Onondaga County, NY
CHA Project No.: 090316

On behalf of the Onondaga County Department of Water Environment Protection, CHA is submitting a request for a jurisdictional determination- consultant option. The following information has been provided for your review.

Property owner contact:

Onondaga County Department of Water Environment Protection
Commissioner-Shannon L. Harty
650 Hiawatha Blvd. West
Syracuse, NY 13204
315-435-2260
shannonharty@ongov.net

Consultant contact:

CHA- Nicole Frazer
III Winners Circle
Albany, NY 12205
518-453-8211
nfrazer@chasolutions.com

Parcel Location:

4300 Oak Orchard Road, Clay, NY, 13041, Onondaga County. Tax parcel 031.-01-03.0.

Jurisdiction:

Environmental Design & Research (EDR) completed a wetland and stream delineation in July 2024 on the approximately 76.7 acre Study Area and prepared a Wetland and Stream Delineation Memorandum dated August 16, 2024. Five wetlands were delineated within the Study Area (05-W001, 05-W002, 05-W003, 05-W004 and 05-W005).

According to the New York State Department of Environmental Conservation (NYSDEC), Environmental Resource Mapper (ERM), previously mapped freshwater wetland BRE-17, a Class 1 wetland, is mapped within portions of the Study Area and previously mapped freshwater wetland BRE-13, a Class 3 wetland is mapped to the east of the Study Area. Wetlands 05-W004 and 05-W005 are part of BRE-17. Wetland 05-W003 connects to BRE-13 outside of the Study Area via a stream and is within 50 meters of this previously mapped freshwater wetland. As a result, it is assumed to be part of the same wetland complex and is therefore assumed to be state regulated. Please refer to the attached Wetland and Stream Delineation Memorandum for further details.

It should be noted that, although Wetland 05-W001 also appears to be within approximately 50 meters of previously mapped freshwater wetland BRE-13 to the east, the wetland drains to the west, away from BRE-13, to a stormwater drop culvert. No surface water connection between the two areas was noted. Additionally, Wetland 05-W001 is topographically positioned high above the previously mapped state wetland and as such there is no opportunity for any hydrologic interaction or reasonable connection for the movement of wetland dependent animal species between these two wetlands.

Based on review of NYSDEC's Standard Operating Procedures (SOP), since Wetlands 05-W004, 05-W005, and 05-W003 are at least 12.4 acres, they are considered to be state jurisdictional. Since these wetlands meet the size threshold, the unusual importance criteria do not need to be reviewed.

The unusual Importance criteria were reviewed for Wetlands 05-W001 and 05-W002. Wetlands 05-W001 and 05-W002 do not meet the criteria as wetlands of unusual importance and are not considered to be state jurisdictional. The results are as follows:

- Significant flooding- These wetlands are not located in or within 100 feet of the HUC 12 watersheds identified in Appendix B of the SOP.
- Urban areas- These wetlands are not within or adjacent to an urban area as identified by the United States Census Bureau.

- Rare plants- The New York Natural Heritage Program (NYNHP) indicated in a letter dated February 21, 2025, that hairy small-leaved tick trefoil (*Desmodium ciliare*), a threatened plant, was documented in 1991, within 200 yards northeast of the Study Area. The NYNHP did not identify rare plants within the Study Area. Additionally, the indicator status of this species is UPL, and is therefore not a species found in wetlands or connected to wetland habitat.
- Rare animals- The NYNHP indicated in a letter dated February 21, 2025, that the pied-billed grebe (*Podilymbus podiceps*) and bald eagle (*Haliaeetus leucocphalus),* both threatened birds and lake sturgeon (*Acipenser fluvescens*) a threatened fish, have been documented in the vicinity of the Study Area. The letter also noted that Indiana bat (*Myotis sodalis*), an endangered bat, has been documented within 2.5 miles of the Study Area. Wetland 05-W001 is a mix of PEM and PFO and Wetland 05-W002 is PEM. These wetlands do not contain habitat for pied-billed grebe, lake sturgeon or bald eagle. No bald eagle nests were identified when CHA completed a site investigation for the Habitat Assessment on March 25, 2025. Although the site investigation revealed the presence of potential suitable summer roosting habitat for Indiana Bat within the forested portion of Wetland 05-W001, the Indiana Bat is not a wetland dependent species. Therefore, this criterion would not apply.
- Class I-Based on review of 6 CRR-NY 664.5(a), these wetlands do not meet any of the listed criteria. Based on review of the list of wetland plant communities identified as nutrient poor wetlands in the SOP, these wetlands are not nutrient poor wetlands.
- Unusual local importance- Based on review of the ERM, these wetlands are not previously mapped wetlands.
- Vernal pools- The NYS Productive Vernal Pool list is not yet available to the public, however, the NYSDEC has indicated that the only known productive vernal pools occur on NYS lands. The project site is not on NYS lands. Additionally, based on review of the NYNHP Vernal Pool Database Map dated February 8, 2019, there do not appear to be any mapped vernal pools in Onondaga County.
- Floodways- Based on review of the Federal Emergency Management Agency Flood Insurance Rate Map, these wetlands are not within the floodway.
- Previously mapped wetlands- Based on review of the ERM, these wetlands are not previously mapped wetlands.
- Local and regional significance-These wetlands are not located in or in the vicinity of a Critical Environmental Area and are not located within the Adirondack Park.
- Important for Protection of New York State’s Water Quality- Based on review of the ERM, these wetlands are not previously mapped freshwater wetlands. It is understood that DEC will need to review this criterion since consultants do not have access to the Commissioner’s written determinations pursuant to 664.6(k).

Proposed Classifications:

The Federal Emergency Management Agency Flood Insurance Rate Map indicates that Wetland 05-W004 and 05-W005 are within a Zone AE floodplain, with regulatory floodway mapped along Mud Creek. Wetland 05-W005 is along Mud Creek. Wetland 05-W004 is on the east side of the access to the wastewater treatment plant (WWTP). A culvert was noted within this wetland that extends under the access road to the WWTP. Therefore, Class 1 is proposed for these wetlands.

Within the Study Area, Wetland 05-W003 is scrub shrub wetland that connects via stream to previously mapped freshwater wetland BRE-13 to the east. BRE-13 has areas of open water as well as emergent wetland. Therefore, this wetland has three wetland structural groups. Class 2 is proposed for this wetland. Please refer to Table 1 for a summary.

Table 1- Summary

Feature	Size (AC) within Study Area	Size (AC) on ERM	State Jurisdiction	Proposed Classification
05-W001	1.52	N/A	No	N/A
05-W002	0.02	N/A	No	N/A
05-W003	0.79	34.1 (BRE-13)	Yes	Class 2
05-W004	2.45	2,184 (BRE-17)	Yes	Class 1
05-W005	2.16	2,184 (BRE-17)	Yes	Class 1

Please see the wetland delineation survey shape files attached to the email for further information.

We hope the information contained herein is sufficient for you to complete your review. Should you have any questions, please contact me at 518-453-8211 or nfrazer@chasolutions.com.

Sincerely,

Nicole E. Frazer
Principal Scientist

CC: Laura Cassalia- CHA
Darcy Sachs-Carollo Engineers

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APPENDIX F

TECHNICAL MEMORANDUM 1: INFLUENT FLOWS AND LOADS

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

Oak Orchard Service Area WWTP Expansion Program



TECHNICAL MEMORANDUM 1

Influent Flows and Loads

August 2025 / FINAL

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

Oak Orchard Service Area WWTP Expansion Program

TECHNICAL MEMORANDUM 1

Influent Flows and Loads

August 2025 / FINAL

Digitally signed by Scott W. Davis
Contact Info: Carollo Engineers, P.C,
Date: 2025.08.20 15:37:27-04'00'



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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

Oak Orchard Service Area Wastewater Treatment Plant Expansion Program

Project No.:	203580
Date:	August 20, 2025
Prepared By:	Anne Conklin, Nick Guho, and Marcella Capuco
Reviewed By:	Andre Gharagozian
Subject:	Technical Memorandum 1: Influent Flows and Loads

TM 1 INFLUENT FLOWS AND LOADS

1.1 Introduction

Onondaga County Department of Water Environment Protection (WEP) operates the Oak Orchard Wastewater Treatment Plant (OOWWTP) in Clay, New York. WEP is upgrading and expanding OOWWTP to accommodate flow from planned growth in the service area while replacing aging equipment and providing an operator friendly, energy efficient facility. Increased flows will include sanitary flow from the new Micron campus as well as projected residential, commercial, and industrial growth.

The upgraded OOWWTP will serve not only the Oak Orchard service area but will also provide regional biosolids treatment and generate reclaimed water for use by Micron and other unidentified industrial users. A new pump station and force main will be constructed to convey reclaimed water to end users.

1.1.1 Technical Memorandum Objectives

This Technical Memorandum (TM) 1: Influent Flows and Loads evaluates the future loading of OOWWTP. Future influent flows and loads are based on review of existing flows and loads and projections derived from anticipated residential, commercial, and industrial development as well as inflow and infiltration in OOWWTP service area. The flows and loads anticipated from Micron during the validation period will be addressed in a future document. Attachment A includes more detail on the analysis of the current flows and loads. Attachment B includes the detailed flow and load projection analysis summarized in this TM and was used as the basis for the influent flow and load design criteria recommended for OOWWTP upgrade and expansion.

1.2 Service Area Description

OOWWTP currently serves approximately 28,000 acres in the Town of Clay and the Town of Cicero as shown in Figure 1.1. Boundaries of the existing service area are assumed to remain for the projection period included in this TM. OOWWTP currently serves a population of approximately 46,000 residential, commercial, and industrial users. Clintons Ditch Cooperative Corporation (Clinton's Ditch), a Pepsi product bottling and distribution facility, is the largest existing industrial contributor within the Oak Orchard service area (which an average BOD load of approximately 2,100 ppd).

Future development within the Oak Orchard service area will include the new Micron campus and White Pine Pump Station, both shown in Figure 1.1 below. Other development within the Oak Orchard service area was projected based on town and county zoning. Residential development projections suggest a full buildout population increase of 16,824, primarily located in Clay. Commercial and industrial development projections suggest a full buildout increase of 1,140 acres and 1,522 acres, respectively. Service area development projections are further described in Attachment B: Future Flow and Load Analysis. This analysis assumes increase in population is associated with development of vacant parcels within the service area. Connection of existing onsite wastewater treatment systems in OOWWTP's service area are not anticipated based on current town planning.

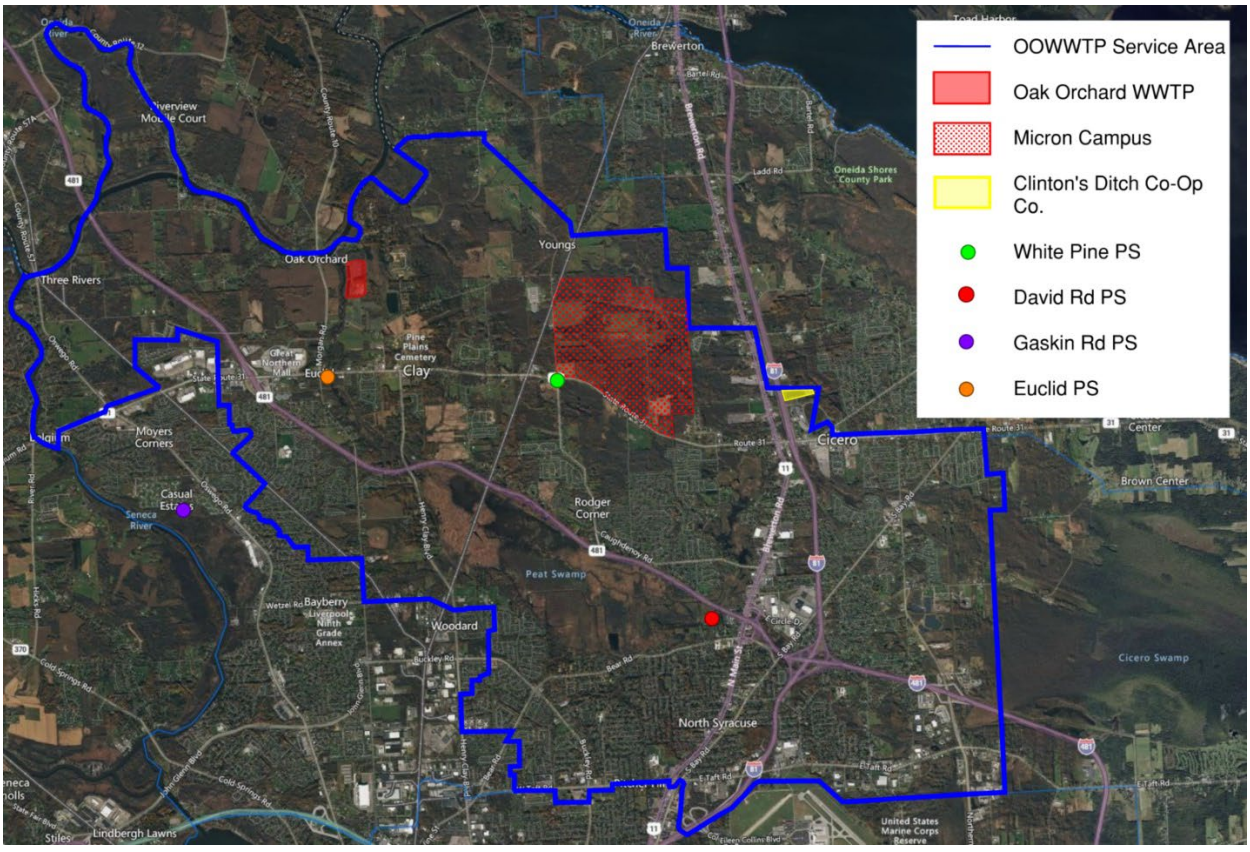

Figure 1.1 OOWWTP Service Area Map

OOWWTP's collection system is depicted schematically in Figure 1.2. As shown, composite samples are routinely collected at Clinton's Ditch (self-monitoring required by their industrial wastewater discharge permit), the Davis Road pump station, and the influent to OOWWTP. Additionally, the operation and configuration of the Gaskin Road pump station and Horseshoe Island forcemain are unique:

1. Under normal operations, the Gaskin Road pump station discharges to the Wetzel Road wastewater treatment plant (WWTP). WEP instituted this change in 2013 to reduce the load sent to OOWWTP. When the total influent flow to the Wetzel Road WWTP approaches 13 to 15 million gallons per day (mgd), WEP may redirect the discharge to OOWWTP to stay below the hydraulic capacity of the Wetzel Road WWTP. As such, peak flows to OOWWTP may include flows from outside its normal service area. WEP estimates that approximately three such diversions lasting a total of eight days from 2020 through 2024.
2. The Horseshoe Island forcemain discharges into the influent bunker which is downstream of the influent sample at OOWWTP. This is a small (approximately 25,000 gallons per day [gpd]) predominantly residential contribution.

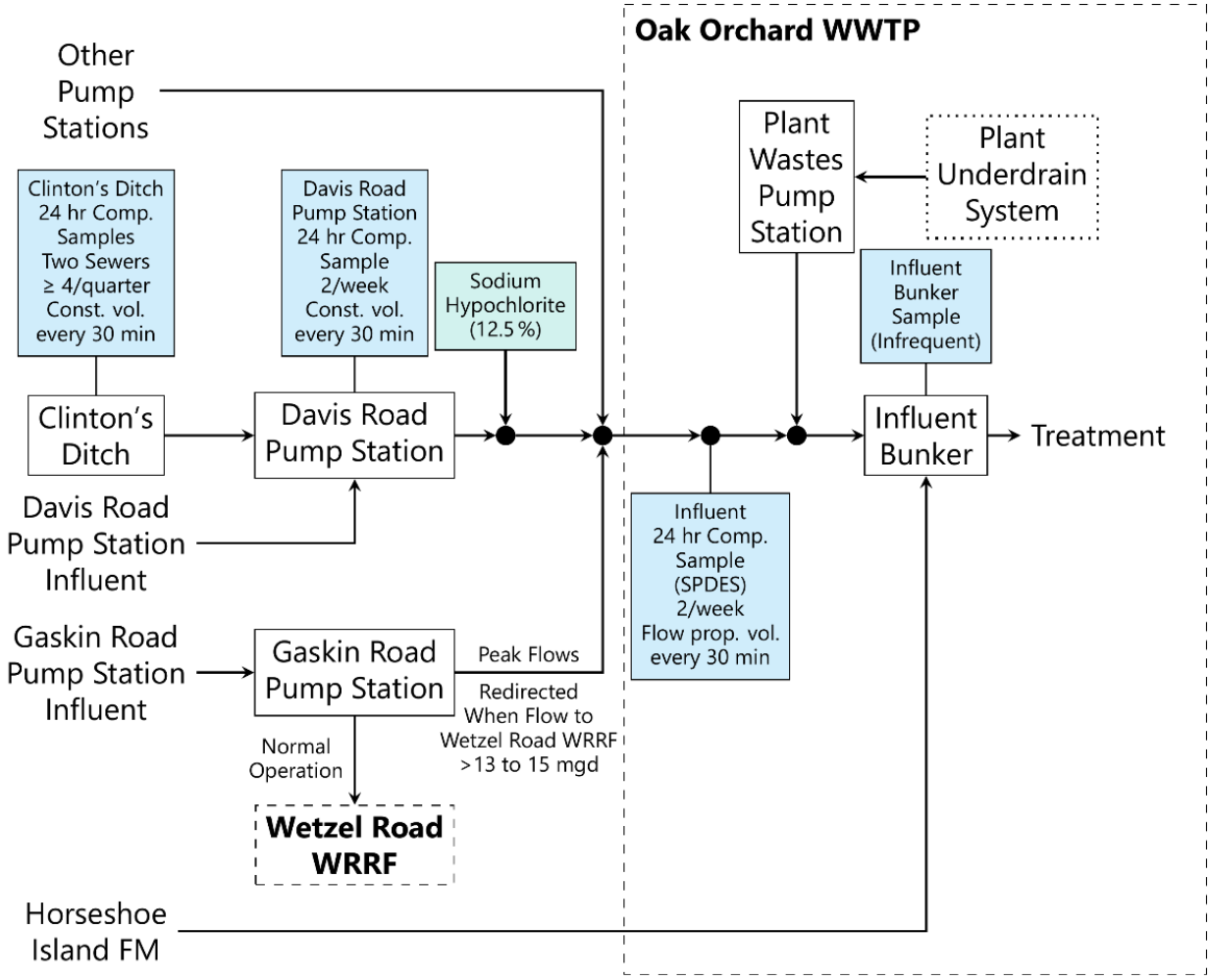

Figure 1.2 Schematic Representation of OOWWTP's Collection System Including Sample Locations.

1.3 Current Flows and Loads

WEP provided historical process data collected at OOWWTP and Clinton's Ditch for 2020 through 2024. Davis Road pump station influent sampling and discharge flow measurement data were provided from 2021 through October 2024 and 2021 through November 2024, respectively. These data were reviewed to estimate current flows and loads and quantify the peaking factors. Attachment A summarizes the results of this analysis, which were then used to develop the projections detailed in Attachment B. The current influent flows and loads at OOWWTP determined from this analysis are summarized below in Table 1.1. Per capita flow and loads were developed using a census population of approximately 46,000.

Table 1.1 Current OOWWTP Influent Flows and Loads Summary

Flow Scenario	Flow (mgd)	BOD (ppd)	TSS (ppd)	NHx-N (ppd)	TKN (ppd)	TP (ppd)
Annual Average Day	5.34	9,733	6,095	920	1,306	167
Maximum Month(1)	7.19	12,663	8,984	1,090	1,510	209
Maximum Week(1)	10.29	17,163	15,554	1,306	2,106	325
Peak Day(1)	18.39	24,049	23,546	1,405	2,227	466
Peak Hour(1)	21.07	n/a	n/a	n/a	n/a	n/a
Per Capita Values(2)	116 gpd/ca	0.21 ppd/ca	0.13 ppd/ca	0.020 ppd/ca	0.028 ppd/ca	0.004 ppd/ca
Current Design Maximum Month Limitations	10(3)	17,100(4)	16,700(5)			

Notes:
(1) To allow for a comparison with smaller data sets from earlier periods, Influent maximum month, maximum week, peak day, and peak hour flows and loads were determined from the maximum of (1) the measured value over the five year window; (2) the product of the average flow or load and the maximum peaking factor relative to the average load in each calendar year; and (3) the product of the current maximum month flow or load and the maximum peaking factor relative to the maximum month load in each calendar year
(2) Per capita values quantified from annual average day flow and loads with a service area population of approximately 46,000.
(3) Effluent flow limit from SPDES permit effective date 7/1/2014.
(4) Letter from New York State Department of Environmental Conservation dated April 26, 2016 regarding "Oak Orchard – Approval for Re-Rate of BOD Influent Loading."
(5) Letter from New York State Department of Environmental Conservation date March 25, 2024 regarding "Oak Orchard WWTP 2023 Annual Flow Certification NY0027081."
Abbreviations: ppd – pound per day; BOD – biochemical oxygen demand; ca – capita; mgd – million gallon per day; TSS – total suspended solids; n/a – not applicable; NHx-N – ammonia as nitrogen; TKN – total Kjeldahl nitrogen; TP – total phosphorus

The current OOWWTP influent flows and loads summarized in Table 1.1 were developed with the following assumptions:

1. *The composition of the wastewater contributed by the Horseshoe Island forcemain is comparable to that measured by the OOWWTP influent sample.*
2. *The Gaskin Road pump station will continue to be directed to the Wetzel Road WRRF under normal conditions.*

3. *Current peak hour flows were developed based on maximum flows observed over the past five years.* During this time period, similar peak hour flows were observed with a significant contribution from the Gaskin Road Pump Station (August 8, 2023) and with no contribution from the Gaskin Road Pump Station (August 19, 2021). So as to develop projections that align with current observed peak hour flows at the OOWWTP influent, this analysis did not assume a co-occurrence of peak flows within the Oak Orchard service area along with peak flows from the Gaskin Road Pump Station

Table 1.2 Peak Flows During Gaskin Road Pump Station Diversion to OOWWTP

Flow (mgd)	2021-08-19	2023-08-08
Peak Day Flow		
Oak Orchard Service Area (does not include flow from Gaskin Road)(1)	17.9	15.2
Gaskin Road	0	3.19
OOWWTP Influent	17.9	18.39
Peak Hour Flow		
Oak Orchard Service Area (does not include flow from Gaskin Road)(1)	20.73	12.29
Gaskin Road PHF	0	7.78(1)
OOWWTP Influent	20.73	20.07

Notes:
(1) Determined by subtracting the Gaskin Road flow from the OOWWTP Influent flow.
(2) Measured flow exceeds the firm peak flow capacity of the Gaskin Road PS provided by WEP of 5 mgd by 56 percent.

4. *The influent OOWWTP sample is representative of the wastewater composition entering OOWWTP.* The influent OOWWTP data were compared with data from Clinton's Ditch and the Davis Road pump station following the schematic shown in Figure 1.2. The influent OOWWTP sample is collected for SPDES compliance and was considered the most representative of the influent to OOWWTP. This was corroborated by process model calibration to historical process data. However, the following observations were made from this comparative analysis that may warrant further investigation:
    a. *The current per capita flow and TSS load differ from those recommended by design guidelines and Ten States Standards.* Table 1.3 compares the historical OOWWTP per capita flow, BOD load, and TSS load with typical values from Metcalf and Eddy (2014)[1] and Ten States Standards (2014)[2]. As shown, the per capita flow is higher than the value recommended by Ten States Standards. It was assumed that this per capita flow was indicative of a higher I&I rate. The per capita BOD and TSS loads are lower than both Metcalf and Eddy and Ten States Standards.

[1] Metcalf and Eddy and AECOM (2014). Wastewater Engineering: Treatment and Resource Recovery. Fifth Edition. McGraw Hill.
[2] Great Lakes- Upper Mississippi Board of State and Provincial Public Health and Environmental Managers (2014). Recommended Standards for Wastewater Facilities. 2014 Edition. Health Research, Inc.

Table 1.3 Historical Per Capita Flow and Loads Comparison

Source	Flow (gpd/capita)	BOD Load (ppd/capita)	TSS Load (ppd/capita)
OOWWTP Average Annual Daily Influent (2020-2024)(1)	113(2)	0.15(2)	0.14
Metcalf and Eddy, 2014	50-89(3)	0.17	0.16
Ten States Standards, 2014	100	0.17	0.20

Notes:
(1) Per capita values quantified from annual average day flow and loads with a service area population of approximately 46,000.
(2) Excludes contributions from Clinton's Ditch.
(3) Average wastewater flow rate estimated from typical domestic water consumption. Does not include infiltration and inflow.

b. *The TSS data from the Davis Road pump station differs from the influent TSS measured at OOWWTP*. As shown in Table 1.4, the average TSS load measured at the Davis Road pump station is higher than the average influent TSS load measured at OOWWTP, even though Davis Road only constitutes 82 percent of the OOWWTP influent flow on average.

c. *The BOD data from the Davis Road pump station is lower than expected*. As shown in Table 1.4, the average BOD load measured at the Davis Road pump station is only 72 percent of the average influent BOD load measured at OOWWTP, even though Davis Road constitutes 82 percent of the OOWWTP influent flow on average. Additionally, the Davis Road pump station is downstream of Clinton's Ditch. As such, it is expected that the Davis Road pump station would constitute a higher fraction of the influent BOD load to OOWWTP.

Table 1.4 Comparison of Davis Road Pump Station and OOWWTP Influent

Parameter	Units	Davis Road Pump Station	OOWWTP Influent	Davis Road Pump Station/ OOWWTP Influent
Flow	mgd	4.58	5.33	86%
BOD	ppd	7051	9734	72.4%
TSS	ppd	6858	6096	112.5%

d. *Influent Bunker sampling generally corroborates the OOWWTP influent sample*. WEP provided sampling data collected from the influent bunker for three periods between 2020 and 2024. These data are summarized in Table 1.5 with the corresponding influent sampling data and estimated influent bunker concentrations incorporating the plant wastes pump station. As shown, the influent bunker TSS, cBOD, and BOD concentrations are generally consistent with those expected based on the measured influent sample. Additional sampling is recommended to corroborate this conclusion.

Table 1.5 Comparison of OOWWTP Influent and Influent Bunker Sampling

	TSS (mg/L)				cBOD (mg/L)				BOD (mg/L)			
Date	Infl.	Bunker	Est.(1)	Diff.(1)	Infl.	Bunker	Est.(1)	Diff.(1)	Infl.	Bunker	Est.(1)	Diff.(1)
2020-09-15	191		253		330		233		290		265	
2020-09-20	175	37	**243**	**-85%**	340	230	238	-20%	300	190	270	-15%
2020-09-22	227	306	286	7%	290	230	166	9%	210	180	229	1%
2020-09-23		212	262	-19%		270	206	-8%		190	249	8%
2020-09-24		45	**263**	**-83%**		200	205	-12%		180	248	-19%
2020-09-27	201		265		300		190		240		237	
2023-07-11	96		151		260		191		220		225	
2023-07-13(2)		95	179	-22%		610	**174**	**232%**		580	**192**	**218%**
2023-07-16	148		208		190		158		190		158	
2024-07-30	161		230		320		200		250		256	
2024-08-04(2)	163	146	238	-10%	230	610	**141**	**325%**	180	600	**180**	**239%**
2024-08-06	165		234		290		168		210		231	

Notes:

(1) Estimated influent bunker concentrations were determined from an assumed plant waste pump station flow of 1 mgd with a TSS and BOD concentration of 500 mg/L and 5 mg/L, respectively. Values set in **bold** denote estimated influent bunker concentrations that differ measured values by more than 25 percent.

(2) Influent bunker sampling on 2023-07-13 and 2024-08-04 was conducted as part of an investigation into an unusual discharge. Samples were grab.

Based on the historical flow and load data from Davis Road pump station, OOWWTP Influent, and OOWWTP influent bunker, as well as process model calibration, the OOWWTP influent BOD and TSS data were considered to be more reliable than the Davis Road pump station samples. As noted above, additional sampling of the influent bunker is recommended to verify that the OOWWTP influent sample is representative. This analysis would be improved if paired with composite TSS and BOD sampling of the plant wastes pump station and coordinated composite sampling at the Davis Road pump station.

1.4 Projected Flows and Loads

Projected flows and loads were developed by adding the anticipated growth to the average annual flows and loads summarized in Table 1.1 and Attachment A. Table 1.6 and Table 1.7 summarize the buildout average annual flows and loads for the residential, commercial and industrial categories. As is shown in Table 1.6 the industrial portion of the average annual flows is projected to increase from 3 percent currently to 16 percent by buildout. Additionally, as is shown in Table 1.7, the industrial portion of the average annual BOD and TSS loads are projected to increase from 21 percent and 0 percent currently to 36 percent and 31 percent, respectively, by buildout.

During an April 21, 2025 meeting with the Onondaga County Industrial Development Agency (OCIDA), it was noted that future anticipated industrial development related to the Micron campus and supporting industries is currently evolving. The current flow and load projections include 1.522 mgd of capacity reserved for industrial growth within the OOWWTP service area. As required by WEP, new industrial users will need to submit an Industrial Wastewater Discharge Permit Application to WEP and will be required to meet the loading and substance of concern limits imposed under WEP's industrial pre-treatment program. WEP may also direct industrial user's wastewater to the new Industrial WWTP collocating on the OOWWTP site at their discretion.

Table 1.6 Historical and Projected Buildout Average Annual Flow Comparison

Source	Residential, mgd	Commercial, mgd	Micron Sanitary, mgd	Clinton's Ditch, mgd	Other Industrial, mgd	Combined average annual flow, mgd
Current	5.178(1)	0(1)	N/A	0.158	N/A	5.336
Buildout growth from current	1.682(2)	1.735(3)	0.700(4)	0.040(5)	1.522(6)	5.680
Buildout	6.860	1.735	0.700	0.198	1.522	11.016

Notes:
(1) Current commercial flows were not separated from residential flows.
(2) Calculated based design per capita flow of 100 gpcd from Ten State Standards.
(3) Calculated assuming 1,500 gallon/acre-day based on middle of the suggested range from Metcalf and Eddy.
(4) Based on Micron's anticipated peak sanitary flow of 480 gpm per semiconductor fab, and an estimated annual average 122 gpm per fab.
(5) Buildout growth from current assumes 8/7 of current loads assuming the addition of 1 new processing train.
(6) Calculated assuming 1,000 gallon/acre-day based on the low end of the range from Metcalf and Eddy.

Table 1.7 Historical and Buildout Average Annual Load Comparison

Source	Residential + Commercial, ppd(1)	Micron Sanitary, ppd(2)	Clinton's Ditch, ppd(3)	Other Industrial, ppd(4)	Combined average annual, ppd
BOD Load					
Current(5)	7,650	0	2,083	0	9,733
Buildout growth from current	2,860	313	298	3,809	7,279
Buildout	10,510	313	2,380	3,809	17,012
TSS Load					
Current	6,074	0	22	0	6,095
Buildout growth from current	3,359	368	5	4,443	8,176
Buildout	9,432	368	27	4,443	14,271
Ammonia Load					
Current	917	0	3.3	0	920
Buildout growth from current	286	31	0.8	355	673
Buildout	1,202	31	4.1	355	1,593

Source	Residential + Commercial, ppd(1)	Micron Sanitary, ppd(2)	Clinton's Ditch, ppd(3)	Other Industrial, ppd(4)	Combined average annual, ppd
TKN Load					
Current	1,301	0	4.6	0	1,306
Buildout growth from current	487	53	1.2	508	1,049
Buildout	1,788	53	5.8	508	2,355
TP Load					
Current	167	0.0	0.6	0	167
Buildout growth from current	79	8.6	0.2	127	215
Buildout	246	8.6	0.7	127	382
OP Load					
Current	83	0.0	0.3	0	84
Buildout growth from current	39	4.4	0.1	63	107
Buildout	123	4.4	0.4	63	191

Notes:
(1) Calculated based on design per capita load from Ten State Standards.
(2) Based on Micron's anticipated number of employees assuming 20 percent proration for full time equivalents.
(3) Buildout growth from current assumes 8/7 of current loads assuming the addition of 1 new processing train.
(4) Calculated assuming 1000 gpd/acre based on the Onondaga County's current pretreatment regulations.
(5) Does not include Clinton's Ditch.

Future flow and load projections were developed by applying the peaking factors developed in Attachment A to the average annual flows and loads summarized in Table 1.6 and Table 1.7. Table 1.8 summarizes the future influent flow and load projections for OOWWTP. More information on the methodology and assumptions used to develop the projections are summarized in Attachment B.

Table 1.8 Projected OOWWTP Influent Flows and Loads Summary

Flow/Load Scenario		Flow (mgd)	BOD (ppd)	TSS (ppd)	NHx-N (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
10 Year Projections	Annual Average Day	8.16	13,521	10183	1256	1831	274	137
	Concentration (mg/L)		199	149	18.4	26.9	4.02	2.01
	Minimum Month	5.74	11,425	8,629	1,057	1,606	244	122
	Maximum Month	10.73	16,994	13,957	1,456	2,077	327	164
	Maximum Two Week	12.19	20,017	18,954	1,520	2,221	383	191
	Maximum Week	15.03	22,374	22,529	1,709	2,796	474	237
	Peak Day	26.25	30,326	32,977	1,825	2,943	652	326
	Peak Hour	29.97	n/a	n/a	n/a	n/a	n/a	n/a

Flow/Load Scenario		Flow (mgd)	BOD (ppd)	TSS (ppd)	NHx-N (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
20 Year Projections	Annual Average Day	10.00	15,678	12709	1464	2156	340	170
	Concentration (mg/L)		188	152	17.5	25.8	4.08	2.04
	Minimum Month	7.12	13,471	10,923	1,246	1,907	306	153
	Maximum Month	13.04	19,406	17,049	1,683	2,430	401	200
	Maximum Two Week	14.77	22,722	22,795	1,753	2,589	463	232
	Maximum Week	18.14	25,274	26,907	1,960	3,228	566	283
	Peak Day	31.46	33,396	38,921	2,087	3,390	768	384
	Peak Hour	35.86	n/a	n/a	n/a	n/a	n/a	n/a
Full Future Buildout Projections	Annual Average Day	10.98	17,012	14271	1593	2355	382	191
	Concentration (mg/L)		186	156	17.4	25.7	4.17	2.08
	Minimum Month	7.88	14,742	12,353	1,364	2,092	345	172
	Maximum Month	14.26	20,883	18,929	1,821	2,644	446	223
	Maximum Two Week	16.13	24,364	25,099	1,895	2,812	513	256
	Maximum Week	19.76	27,027	29,513	2,112	3,487	623	311
	Peak Day	34.12	35,244	42,409	2,245	3,658	837	419
	Peak Hour	38.86	n/a	n/a	n/a	n/a	n/a	n/a

Table 1.9 summarizes the projected increase in average annual flows and loads. As is shown in Table 1.9, the projected growth in flows, BOD and TSS loads are different. This difference is due to assumptions on the flow expected from the commercially zoned parcels and the per capita loads used to project residential growth taken from the 10 State Standards.

Table 1.9 Absolute and Relative Increase in Average Annual Flows and Loads from Current

Scenario	Average Annual Flow (mgd)	Average Annual BOD Load (ppd)	Average Annual TSS Load (ppd)
10 year	2.82 (53%)	3788 (39%)	4088 (67%)
20 year	4.66 (87%)	5945 (61%)	6614 (109%)
Full Future Buildout	5.64 (106%)	7279 (75%)	8176 (134%)

1.5 Conclusions and Recommendations

Given the relatively small increase in projected flows and loads between the 20-year projection and full future buildout, it is recommended that the flow and load projections developed for the full future buildout projections be adopted for the present design. The recommended design flows and loads for OOWWTP are summarized below in Table 1.10.

Table 1.10 OOWWTP Flow and Load Design Criteria Summary

Scenario	Flow (mgd)	BOD (ppd)	TSS (ppd)	NHx-N (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
Annual Average Day	10.98	17,012	14271	1593	2355	382	191
Concentration (mg/L)		186	156	17.4	25.7	4.17	2.08
Minimum Month	7.88	14,742	12,353	1,364	2,092	345	172
Maximum Month	14.26	20,883	18,929	1,821	2,644	446	223
Maximum Two Week	16.13	24,364	25,099	1,895	2,812	513	256
Maximum Week	19.76	27,027	29,513	2,112	3,487	623	311
Peak Day	34.12	35,244	42,409	2,245	3,658	837	419
Peak Hour	38.86	n/a	n/a	n/a	n/a	n/a	n/a

ATTACHMENT A

HISTORICAL DATA SUMMARY

Table A.1 Historical OOWWTP Influent Flow

Year	AA		MM			MW				MD				PH			
	Flow mgd	Per capita gpd/capita	Flow mgd	PF MM/AA	Date	Flow mgd	PF MW/AA	PF MW/MM	Date	Flow mgd	PF MD/AA	PF MD/MM	Date	Flow mgd	PF PH/AA	PF PH/MM	Date
2020	5.09	111	6.65	1.31	03-10	7.66	1.50	1.15	03-04	10.00	1.97	1.50	05-01	16.07	3.16	2.42	04-30
2021	5.41	118	7.07	1.31	11-15	10.12	1.87	1.43	08-24	17.86	3.30	2.53	08-19	20.73	3.83	2.93	08-19
2022	5.10	111	6.86	1.34	03-18	8.42	1.65	1.23	02-23	12.61	2.47	1.84	02-18	17.27	3.39	2.52	11-12
2023	5.58	121	7.19	1.29	04-11	8.82	1.58	1.23	08-13	18.39	3.30	2.56	08-08	20.56	3.69	2.86	08-07
2024	5.50	120	6.96	1.27	01-16	8.76	1.59	1.26	01-31	14.62	2.66	2.10	01-26	19.35	3.52	2.78	01-26
2020-2024	5.34	116	7.19	1.34	n/a	10.12	1.87	1.43	n/a	18.39	3.30	2.56	n/a	20.73	3.83	2.93	n/a
Selected	5.34	116	7.19	1.35	n/a	10.29	1.93	1.43	n/a	18.39	3.45	2.56	n/a	21.07	3.95	2.93	n/a

Notes:
AA = average annual; MM = maximum month; MW = maximum week; MD = maximum day; PH = peak hour; mgd = million gallons per day; gpd = gallons per day.

Table A.2 Historical OOWWTP Influent TSS

Year	AA			MM			MW				MD			
	AAL ppd	Per capita ppd/capita	Conc. mg/L	MML ppd	PF MM/AA	Date	MWL ppd	PF MW/AA	PF MW/MM	Date	MDL ppd	PF MD/AA	PF MD/MM	Date
2020	5920	0.129	139	6878	1.16	08-13	8629	1.46	1.25	08-09	9697	1.64	1.41	01-05
2021	6353	0.138	141	8241	1.30	05-27	13,119	2.07	1.59	05-16	16,841	2.65	2.04	05-11
2022	5902	0.129	139	7052	1.19	03-27	9633	1.63	1.37	03-06	10,781	1.83	1.53	03-01
2023	6195	0.135	133	8795	1.42	05-11	12,190	1.97	1.39	04-18	17,643	2.85	2.01	04-16
2024	6106	0.133	133	8984	1.47	07-04	15,554	2.55	1.73	02-18	23,546	3.86	2.62	06-11
2020-2024	6095	0.133	137	8984	1.47	n/a	15,554	2.55	1.73	n/a	23,546	3.86	2.62	n/a
Selected	6095	0.133	137	8984	1.47	n/a	15,554	2.55	1.73	n/a	23,546	3.86	2.62	n/a

Notes:
AA = average annual; MM = maximum month; MW = maximum week; MD = maximum day; PH = peak hour; mgd = million gallons per day; gpd = gallons per day.

Table A.3 Historical OOWWTP Influent BOD

	AA			MM			MW				MD			
Year	AAL ppd	Per capita ppd/capita	Conc. mg/L	MML ppd	PF MM/AA	Date	MWL ppd	PF MW/AA	PF MW/MM	Date	MDL ppd	PF MD/AA	PF MD/MM	Date
2020	9930	0.216	234	11,329	1.14	09-01	12,514	1.26	1.10	06-04	14,015	1.41	1.24	07-12
2021	10,310	0.225	228	12,663	1.23	08-03	15,667	1.52	1.24	07-20	20,570	2.00	1.62	10-26
2022	9655	0.210	227	12,155	1.26	10-27	16,262	1.68	1.34	10-30	23,085	2.39	1.90	10-25
2023	9457	0.206	203	11,770	1.24	06-29	15,953	1.69	1.36	06-20	15,953	1.69	1.36	06-20
2024	9313	0.203	203	11,650	1.25	07-04	15,187	1.63	1.30	06-16	18,146	1.95	1.56	06-11
2020-2024	9733	0.212	219	12,663	1.26	n/a	16,262	1.69	1.36	n/a	23,085	2.39	1.90	n/a
Selected	9733	0.212	219	12,663	1.30	n/a	17,163	1.76	1.36	n/a	24,049	2.47	1.90	n/a

Notes:
AA = average annual; MM = maximum month; MW = maximum week; MD = maximum day; PH = peak hour; mgd = million gallons per day; gpd = gallons per day.

Table A.4 Historical OOWWTP Influent cBOD

	AA			MM			MW				MD			
Year	AAL ppd	Per capita ppd/capita	Conc. mg/L	MML ppd	PF MM/AA	Date	MWL ppd	PF MW/AA	PF MW/MM	Date	MDL ppd	PF MD/AA	PF MD/MM	Date
2020	7987	0.174	188	9263	1.16	08-18	10,160	1.27	1.10	07-26	11,800	1.48	1.27	07-21
2021	8785	0.191	195	10,049	1.14	07-08	13,474	1.53	1.34	10-26	18,405	2.10	1.83	10-26
2022	8426	0.184	198	10,458	1.24	11-10	15,588	1.85	1.49	10-30	23,085	2.74	2.21	10-25
2023	8077	0.176	174	10,391	1.29	07-01	13,161	1.63	1.27	06-20	13,330	1.65	1.28	06-11
2024	7692	0.168	168	9168	1.19	07-04	11,647	1.51	1.27	06-16	13,825	1.80	1.51	06-11
2020-2024	8193	0.178	184	10,458	1.29	n/a	15,588	1.85	1.49	n/a	23,085	2.74	2.21	n/a
Selected	8193	0.178	184	10,541	1.29	n/a	15,711	1.92	1.49	n/a	23,269	2.84	2.21	n/a

Notes:
AA = average annual; MM = maximum month; MW = maximum week; MD = maximum day; PH = peak hour; mgd = million gallons per day; gpd = gallons per day.

Table A.5 Historical OOWWTP Influent TKN

	AA			MM			MW				MD			
Year	AAL ppd	Per capita ppd/capita	Conc. mg/L	MML ppd	PF MM/AA	Date	MWL ppd	PF MW/AA	PF MW/MM	Date	MDL ppd	PF MD/AA	PF MD/MM	Date
2020	1312	0.029	30.9	1437	1.10	08-06	1534	1.17	1.07	06-07	1755	1.34	1.22	10-19
2021	1298	0.028	28.7	1483	1.14	06-03	2068	1.59	1.39	07-06	2187	1.69	1.47	10-26
2022	1280	0.028	30.1	1390	1.09	05-12	1496	1.17	1.08	03-06	1620	1.27	1.17	01-30
2023	1299	0.028	27.9	1487	1.14	07-01	1610	1.24	1.08	06-13	1907	1.47	1.28	04-30
2024	1340	0.029	29.2	1510	1.13	07-04	1754	1.31	1.16	06-11	1866	1.39	1.24	06-11
2020-2024	1306	0.028	29.3	1510	1.14	n/a	2068	1.59	1.39	n/a	2187	1.69	1.47	n/a
Selected	1306	0.028	29.3	1510	1.16	n/a	2106	1.61	1.39	n/a	2227	1.71	1.47	n/a

Notes:
AA = average annual; MM = maximum month; MW = maximum week; MD = maximum day; PH = peak hour; mgd = million gallons per day; gpd = gallons per day.

Table A.6 Historical OOWWTP Influent NHx-N

	AA			MM			MW				MD			
Year	AAL ppd	Per capita ppd/capita	Conc. mg/L	MML ppd	PF MM/AA	Date	MWL ppd	PF MW/AA	PF MW/MM	Date	MDL ppd	PF MD/AA	PF MD/MM	Date
2020	978	0.021	23.0	1057	1.08	04-19	1119	1.14	1.06	04-07	1208	1.24	1.14	07-12
2021	914	0.020	20.2	1038	1.14	06-10	1244	1.36	1.20	07-06	1338	1.46	1.29	05-16
2022	884	0.019	20.8	977	1.10	05-22	1031	1.17	1.06	05-03	1132	1.28	1.16	01-02
2023	883	0.019	19.0	1046	1.18	07-02	1160	1.31	1.11	06-13	1248	1.41	1.19	06-11
2024	940	0.020	20.5	1034	1.10	05-30	1104	1.17	1.07	01-11	1167	1.24	1.13	01-07
2020-2024	920	0.020	20.7	1057	1.18	n/a	1244	1.36	1.20	n/a	1338	1.46	1.29	n/a
Selected	920	0.020	20.7	1090	1.18	n/a	1306	1.42	1.20	n/a	1405	1.53	1.29	n/a

Notes:
AA = average annual; MM = maximum month; MW = maximum week; MD = maximum day; PH = peak hour; mgd = million gallons per day; gpd = gallons per day.

Table A.7 Historical OOWWTP Influent TP

Year	AA			MM			MW				MD			
	AAL ppd	Per capita ppd/capita	Conc. mg/L	MML ppd	PF MM/AA	Date	MWL ppd	PF MW/AA	PF MW/MM	Date	MDL ppd	PF MD/AA	PF MD/MM	Date
2020	168	0.004	3.96	194	1.15	08-27	222	1.32	1.14	08-09	247	1.47	1.28	08-04
2021	166	0.004	3.69	190	1.14	06-10	230	1.38	1.21	07-06	279	1.68	1.47	05-16
2022	168	0.004	3.94	180	1.08	11-17	206	1.23	1.14	08-21	231	1.38	1.28	08-21
2023	163	0.004	3.50	188	1.15	07-01	220	1.35	1.17	06-13	247	1.51	1.31	02-05
2024	171	0.004	3.73	209	1.22	12-19	325	1.90	1.55	12-01	466	2.72	2.23	11-26
2020-2024	167	0.004	3.76	209	1.22	n/a	325	1.90	1.55	n/a	466	2.72	2.23	n/a
Selected	167	0.004	3.76	209	1.25	n/a	325	1.94	1.55	n/a	466	2.79	2.23	n/a

Notes:
AA = average annual; MM = maximum month; MW = maximum week; MD = maximum day; PH = peak hour; mgd = million gallons per day; gpd = gallons per day.

ATTACHMENT B

FUTURE FLOW AND LOAD ANALYSIS



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Future Flow and Load Analysis

Carollo Engineers
Oak Orchard Wastewater Treatment Plant
Onondaga County, New York

Prepared for:
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August 13, 2025

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Appendix A – OOWWTP Flow and Load Estimates

1.0 Background

In October of 2022, Micron Technology, Inc. (Micron) announced plans to construct a new semiconductor fabrication facility in Clay, New York. This facility is planned to be the largest of its kind in the United States and is anticipated to significantly increase the sewer needs in Onondaga County in order to convey and treat wastewater generated by this facility as well as ancillary development of the surrounding area. The location of Micron's proposed facility is within the service area for the Oak Orchard Wastewater Treatment Plant (OOWWTP) which is owned and operated by the Onondaga County Department of Water Environment Protection (OCDWEP). The OOWWTP will need to be expanded to treat the increased flows and loads that will result from development anticipated over the next 20 years.

OCDWEP retained the services of Carollo Engineers (Carollo) to provide program management services related to the expansion of the OOWWTP. One of the initial tasks for this program is to estimate the anticipated future flows and loads within the OOWWTP service area to use as a basis for the planning and design of the treatment plant upgrades. Carollo has partnered with C&S Engineers, Inc. (C&S) on this effort.

The OOWWTP service area encompasses portions of the Towns of Clay and Cicero as well as the Village of North Syracuse. C&S reviewed property class and land use data within the service area and consulted with each respective town to estimate the anticipated development over a 10-year and 20-year planning period and to quantify the future wastewater flow and loads that will be generated as a result of this development. This report summarizes the analysis performed and presents the results of the study in support of the OOWWTP expansion program.

2.0 Existing Flow and Loads

The OOWWTP service area encompasses approximately 28,000 acres in the Towns of Clay and Cicero and serves an estimated population of 46,000 including commercial and industrial customers. The plant is currently permitted to treat up to 10 MGD but only treats approximately 5.3 MGD on average.

Carollo compiled and analyzed OOWWTP's Discharge Monitoring Reports (DMRs) received from OCDWEP for a period of 2020 to 2024. From this data, the current minimum month, average day, max month, max two week, max week, and max day flows and loads were determined. These values were then used to estimate peaking factors relative to the average annual values which will be applied to the projected future flows and loads developed as part of this study. Table 1 below summarizes the current influent flows and loads with associated peaking factors.

Table 1 Existing Oak Orchard Flow and Load Summary

	Minimum Month	Annual Average Day	Maximum Month	Maximum Two Week	Maximum Week	Peak Day	Peak Hour
Flow (MGD)	3.59	5.34	7.19	8.24	10.29	18.39	21.07
Flow Peak Factor	0.67	1.0	1.35	1.55	1.93	3.45	3.95
BOD_5 (ppd)	7,942	9,733	12,663	15,183	17,163	24,049	-
BOD_5 Peak Factor	0.82	1.0	1.30	1.56	1.76	2.47	-
TSS (ppd)	4,905	6,095	8,984	12,809	15,544	23,546	-
TSS Peak Factor	0.81	1.0	1.47	2.10	2.55	3.86	-
TKN (ppd)	1,120	1,306	1,510	1,629	2,106	2,227	-
TKN Peak Factor	0.86	1.0	1.16	1.25	1.61	1.71	-
NH3 (ppd)	750	920	1,090	1,145	1,306	1,405	-
NH3 Peak Factor	0.82	1.0	1.19	1.24	1.42	1.53	-
TP (ppd)	143	167	209	253	325	466	-
TP Peak Factor	0.86	1.0	1.25	1.51	1.95	2.79	-

A major industrial user within the service area is Clinton's Ditch Cooperative Corporation (Clinton's Ditch). Clinton's Ditch bottles and distributes Pepsi products and contributes approximately 21% of the influent BOD loading measured at Oak Orchard. For this reason, separate BOD loads and peaking factors were calculated for Oak Orchard that do not include Clinton's Ditch to develop domestic peaking factors that could be applied to future growth estimates. Table 2 below depicts the adjusted values. The loadings provided for Clinton's Ditch are based on self-monitoring reports submitted to OCDWEP by Clinton's Ditch.

Table 2 Adjusted Oak Orchard BOD Load Current Values and Peaking Factors

	Measured Oak Orchard Influent	Clinton's Ditch	Adjusted Oak Orchard Influent
Minimum Month (ppd)	7,942	1,170	6,772
Minimum Month Peak Factor	0.82	0.56	0.89
Annual Average (ppd)	9,733	2,083	7,650
Annual Average Peak Factor	1.0	1.0	1.0
Maximum Month (ppd)	12,663	3,092	9,571
Maximum Month Peak Factor	1.30	1.48	1.25
Maximum Two Week (ppd)	15,183	3,406	11,777
Maximum Two Week Peak Factor	1.56	1.64	1.54
Maximum Week	17,163	3,911	13,252
Maximum Week Peak Factor	1.76	1.88	1.73
Maximum Day (ppd)	24,049	9,519	14,530
Maximum Day Peak Factor	2.47	4.57	1.90

3.0 Future Flow and Loads

The Towns of Clay and Cicero are anticipated to experience significant growth over the next 20 years as a result of Micron's planned semiconductor fabrication facility. This growth will not only include the Micron site itself but also ancillary residential, commercial and industrial growth in the surrounding area that will support the facility. The OOWWTP expansion will be sized to adequately treat the wastewater generated by these various types of users. Therefore, the projected future flows and loads were estimated for the following sources.

- Residential
- Commercial
- Industrial
- Micron
- Inflow and Infiltration

The following section describes the process used to quantify the flows and loads anticipated to be generated by each of the sources identified above.

3.1 Approach

Tax parcel data for the OOWWTP service area was obtained from OCDWEP. This data was filtered based on property class and the following property class codes were selected for further analysis due to their development potential.

- 105 – Agricultural vacant land (productive)
- 120 – Field crops
- 240 – Rural residence with acreage
- 241 – Primary residential, also used in agricultural production
- 250 – Estate
- 310 – Residential
- 311 – Residential vacant land
- 312 – Residential land including a small improvement (not used for living accommodations)
- 314 – Rural vacant lots of 10 acres or less
- 320 – Rural
- 322 – Residential vacant land over 10 acres
- 323 – Other rural vacant lands
- 330 – Vacant land located in commercial areas
- 331 – Commercial vacant land with minor improvements
- 340 – Vacant land located in industrial areas
- 341 – Industrial vacant land with minor improvements
- 352 – Shell building – commercial
- 910 – Private wild and forest lands except for private hunting and fishing clubs

Existing residential, commercial, and industrial parcels receiving public sewer service were excluded from this analysis as it is assumed that the current flows and loads summarized in Table 1 capture these existing users. Any change of use by these existing parcels may impact the estimates provided herein. Parcels classified as protected forest lands, public services, utilities, underwater, owned by a land trust, and/or observed to be in a wetland area were excluded as these areas are not considered desirable for development.

Once all developable parcels were identified, these properties were further classified based on the applicable Town zoning code to determine the type of development allowed on each parcel and any restrictions that will dictate maximum future density. In general, the Town zoning code limits the density of future development based on lot size and/or width. For this analysis, the most conservative metric was used to estimate the future buildout of each parcel. If parcels were identified as having multiple zoning designations, the one that resulted in the greatest density was used. The currently adopted zoning code was referenced for this analysis. The Towns of Clay and Cicero are both in the process of developing new comprehensive plans which could change the densities calculated. The following sections discuss the analysis performed for each of the anticipated wastewater sources.

3.1.1 Residential

For parcels zoned as residential, the total number of households that each parcel could support was determined based on the parcel size and allowed buildout per square foot and/or width in feet. If a parcel is zoned for apartments, it was assumed that 2-bedroom apartments would be the most common based on an average household size of approximately 2.5 people according to Census data. Neither the Town of Clay nor the Town of Cicero have provisions for high-density residential development in their current zoning law. Barring any changes to the zoning code, it is assumed that high-density residential development such as high-rise apartment buildings will not occur or be very limited in the future.

Both the Clay and Cicero zoning code includes provisions for mixed use development through Planned Development Districts (PDDs) and Planned Unit Development (PUDs). When parcels were zoned as either PDD or PUD, it was assumed that both residential and commercial development would occur here. Each Town was consulted to determine the anticipated split between residential and commercial development in these areas. In the Town of Clay, it was assumed that 25% of development within a PDD would be commercial, consistent with their regional commercial zoning, and the remaining 75% would be predominantly residential apartments. In the Town of Cicero, it was assumed that 20% of development within a PUD would be commercial, consistent with their general commercial zoning, and the remaining 80% would be multifamily residential.

Based on this analysis, it is estimated that developable land within the OOWWTP service area could support 7,039 additional households, 5,636 in Clay, 1,144 in Cicero, and 259 in North Syracuse. Based on an average household size of 2.38, 2.46, and 2.3 respectively, this would result in an estimated population increase of 16,824.

To calculate the projected future wastewater flow associated with this population increase, a unit flow rate of 100 gpd/capita was used in accordance with Ten State Standards. To calculate the projected future wastewater loads associated with this population increase, the unit loadings shown in Table 3 were applied.

Table 3 Design Domestic Wastewater Unit Loadings

Parameter	Unit Loading (lb/capita*d)	Reference
5-Day Biochemical Oxygen Demand (BOD_5)	0.17	Ten States Recommended Standards for Wastewater, 2014
Total Suspended Solids (TSS)	0.20	Ten States Recommended Standards for Wastewater, 2014
Ammonia-Nitrogen (NH3)	0.017	Metcalf & Eddy, 2014
Total Kjeldahl Nitrogen (TKN)	0.029	Metcalf & Eddy, 2014
Total Phosphorus (TP)	0.0047	Metcalf & Eddy, 2014
Orthophosphate (OP)	0.0024	OP/TP ratio of 0.5 calculated from historical plant data

3.1.2 Commercial

To determine the potential contribution from commercial development, the total area of all developable parcels within the OOWWTP service area zoned for commercial uses was calculated. As discussed in the previous section, parcels zoned as PDDs and PUDs were assumed to include residential and commercial uses. The commercial component of these developments was included in this calculation.

Once the total area for commercial development was determined, a unit flow rate of 1,500 gpd/acre was applied to estimate the projected future wastewater flow to be generated by the commercial sector. The unit flow rate selected represents a typical flow for commercial developments as presented in Metcalf & Eddy, 2014. It is assumed that the wastewater loads associated with the anticipated commercial flows will be consistent with the unit loadings presented in Table 3 above. Additional loading calculations were not performed for the commercial sector as it is assumed that

these are captured in the projected residential loadings as the patrons of local commercial establishments predominantly live and work in the area.

3.1.3 Industrial

To determine the potential contribution from industrial development, the total area of all developable parcels within the OOWWTP service area zoned for industrial uses was calculated. For this analysis, the parcels associated with the Micron site were excluded as the industrial process waste from the semiconductor facility will be handled separately as discussed in the following section.

Once the total area for industrial development was determined, a unit flow rate of 1,000 gpd/acre was applied to estimate the projected future wastewater flow to be generated by the industrial sector. The unit flow rate selected represents a typical flow for light industrial developments as presented in Metcalf & Eddy, 2014. To calculate the projected future wastewater loads associated with the industrial sector, the unit loadings shown in Table 4 were applied to the calculated flow.

Table 4 Design Industrial Wastewater Unit Loadings

Parameter	Unit Loading (mg/L)
5-Day Biochemical Oxygen Demand (BOD_5)	300
Total Suspended Solids (TSS)	350
Ammonia-Nitrogen (NH_3)	28[1]
Total Kjeldahl Nitrogen (TKN)	40
Total Phosphorus (TP)	10
Orthophosphate (OP)	5[2]

[1]Assumed NH_3/TKN ratio of 0.7

[2]Assumed OP/TP ratio of 0.5

These loadings are based on the local limits defined in the Onondaga County Sewer Use Rules & Regulations for BOD, TSS, TKN, and TP as it is assumed that new industrial users will be required to meet these limits prior to discharging any wastewater to the collection system tributary to Oak Orchard. These local limits are enforced by OCDWEP through their industrial pretreatment program. It should be noted that OCDWEP has the authority to allow industries to discharge waste that exceeds these limits and assess an Industrial Wastewater Surcharge based on the strength of the waste. Therefore, these limits may not be representative of all industries.

There are currently no local limits established for ammonia and orthophosphate. The unit loadings used for these two constituents were estimated to be a percentage of the loading for TKN and total phosphorus based on historical plant data. Ammonia is assumed to make up 70% of the total nitrogen in the wastewater and orthophosphate is assumed to make up 50% of the total phosphorus loading.

Clinton's Ditch, as discussed previously, is already a significant contributor of BOD to the plant and is planning an expansion. The expansion will increase their warehouse and office space as well as add a fleet maintenance facility. There are currently no plans to expand their production capabilities, however the current expansion will leave space for the addition of one new production line in the future to bring their total number of production lines up to eight. Based on this, it was assumed that Clinton's Ditch could increase their production in the next 5 years and the associated BOD load was included as part of this analysis. For simplicity, only the BOD load was included in these projections as the flow and remaining loads are considered to be relatively minor. The future BOD load for Clinton's Ditch was estimated to be 14% greater than the current load presented in Table 2 based on the planned increase in production lines from seven to eight. The future BOD contribution from Clinton's Ditch is anticipated to be as follows.

- Min Month = 1,337 ppd
- Annual Average = 2,381 ppd
- Max Month = 3,534 ppd
- Max Two Week = 3,893 ppd
- Max Week = 4,470 ppd
- Max Day = 10,879 ppd

3.1.4 Micron

It is anticipated that Micron will send domestic wastewater generated at their semiconductor fab to Oak Orchard. Their industrial process wastewater will be treated onsite prior to being sent to a dedicated industrial wastewater treatment facility that will be constructed at the Oak Orchard campus. In the near term until this industrial treatment facility is commissioned, Micron plans to discharge their construction and validation wastewater to OOWWTP. The flows and loads for this period will be addressed as part of a separate memo.

Micron provided an anticipated peak sanitary flow of 480 gpm per semiconductor fab. Based on the peak hour peaking factor calculated using plant influent flow of 3.95, it is estimated that the average annual flow for each fab is approximately 122 gpm, or 176,000 gpd. Based on Micron's anticipated construction schedule, it is assumed that two fabs will be operational by 2035 and all four proposed fabs will be operational by 2045.

The estimated domestic wastewater loads were calculated based on Micron's anticipated number of employees (2,300 employees/fab) and the per capita loadings presented in Table 3. These estimates were prorated based on a full-time equivalent of 20% to account for the average amount of time an employee spends at work annually.

3.1.5 Inflow and Infiltration

Anticipated inflow and infiltration (I/I) is accounted for in the per capita unit flow rate used as well as applied peaking factors. Based on the review of historical flow data measured at OOWWTP, the current per capita base flow is 89 gpcd. This is lower than the unit flow rate recommended in Ten States Standards, therefore it is assumed that the unit flow rate of 100 gpcd used to estimate future flows includes approximately 10 gpcd for I/I. Further, the peaking factors developed for max month, max week, max day, and peak hour flow were calculated relative to the average annual flow measured at the plant and are inclusive of I/I present in the existing collection system. By applying these peaking factors to future flow estimates, wet weather conditions resulting from I/I are captured.

3.1.6 Growth Period

A 10 and 20-year growth period was analyzed as part of this study in addition to determining the maximum future buildout. The review and determination of developable land and maximum future density discussed in the previous sections assumes 100% buildout. Through consultation with both the Town of Clay and the Town of Cicero, it was determined that it may not be reasonable to assume that 100% buildout will occur over the next 20 years. Therefore, these estimates were prorated based on the growth periods defined. Both Towns anticipate that 50% of the possible full buildout will occur over the next 10 years. The Town of Clay anticipates that after 20 years, they will reach 75% of full buildout, while the Town of Cicero anticipates that they will reach 80% of full buildout in 20 years.

3.2 Results

The projected future wastewater flow was calculated using the methodology outlined in the previous sections. Peaking factors for min month, max month, max two week, max week, max day, and peak hour presented in Table 1 were applied to the calculated future average annual flow for the residential, commercial, and Micron sanitary sources. Peaking factors were not applied to the future industrial flow as it is not influenced by wet weather conditions the way domestic flows in the collection system are. The projected future flow was then added to the current flow presented in Table 1 to estimate the total future

influent flow. The total projected future wastewater flows for the 10-year and 20-year growth period as well as full buildout are presented in Appendix A.

The projected future wastewater loadings were also calculated using the methodology outlined in the previous sections. Peaking factors for min month, max month, max two week, max week, and max day were applied to the calculated future average annual loadings for the residential, commercial, and Micron sanitary sources. Peaking factors were not applied to the future industrial loads at this time as they are industry specific and no future industrial users have been identified to date. However, peaking factors were applied to the current and future BOD load from Clinton's Ditch based on available monitoring data.

Peaking factors from Table 1 were applied to the average annual values for each constituent loading except BOD. Adjusted peaking factors from Table 2 were used for the BOD loads. The relevant peaking factors were applied to the projected future average annual residential, commercial, and Micron sanitary loads. These peaked loads were then combined with the future industrial loads and the current loads presented in Table 1 to estimate the total future influent loading. The total projected future wastewater loads for the 10-year and 20-year growth period as well as full buildout are also presented in Appendix A.

3.3 Design Condition

It is recommended to design the OOWWTP upgrades to treat the projected future wastewater flow and loads under the full buildout condition. This will ensure the plant has adequate capacity to accommodate the maximum future growth within the existing service area. The projections provided in this memo are based on typical sanitary/industrial flow and load properties as well as the currently adopted zoning code. Wastewater with different characteristics or changes to the existing zoning restrictions may require pre-treatment of wastewater and/or plant expansion. The base flow and load allocations for each wastewater source are summarized in Table 5 below.

Table 5 Projected Base Flow and Load Allocations

Source	Flow (MGD)	BOD (ppd)	TSS (ppd)	NH3 (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
Residential	1.68	2,860	3,365	286	488	79	40
Commercial	1.74						
Industrial	1.52	6,189	4,443	355	508	127	63
Micron (Sanitary only)	0.70	313	368	31	53	9	4

A summary of all flow conditions, including min month, max month, max two week, max week, max day, and peak hour, is provided in Appendix A.

Appendix A
OOWWTP Flow and Load Estimates

Oak Orchard WWTP Expansion Program **3/28/2025**
Future Sewer Planning **Prepared By:** MEM
AX7.001.001 **Checked By:** EKP

Table 1: Projected Future Wastewater Flows and Loads (10-year Growth Period)

Development	Total Households or Acres	Population/ Household	Total Population	Unit Flow Rate (gal/cap*d or gal/ac*d)	Average Daily Flow (gpd)	Constituent Loading					
						BOD (ppd)	TSS (ppd)	NH3 (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
Residential											
Clay	2,818.00	2.38	6,707	100	670,684	1,140.16	1,341.37	114.02	194.50	31.52	15.76
Cicero	572.00	2.46	1,407	100	140,712	239.21	281.42	23.92	40.81	6.61	3.31
North Syracuse	129.50	2.30	298	100	29,785	50.63	59.57	5.06	8.64	1.40	0.70
Commercial	578.45	-	-	1,500	867,670	Assume this is captured in residential loadings					
Industrial	761.12	-	-	1,000	761,115	1,904.31	2,221.69	177.74	253.91	63.48	31.74
				Subtotal	2,469,966	3,334	3,904	321	498	103	52
				Clinton's Ditch (BOD Only)	-	2,381[1]	-	-	-	-	-
				Micron Sanitary Flow - 0.176 MGD ADF/fab (Assume Fab 1 & 2 operational by 2035)	352,000	156	184	16	27	4	2
				Future Minimum Month	2,146,007	4,653	3,724	307	486	101	50
				Future Average Day	2,821,966	5,871	4,088	336	525	107	54
				Future Maximum Month	3,537,081	7,423	4,973	366	567	118	59
				Future Max Two Week	3,945,130	8,240	6,145	375	592	130	65
				Future Maximum Week	4,736,497	9,122	6,985	403	690	149	74
				Future Peak Day	7,862,808	15,796	9,431	420	716	186	93
				Future Peak Hour (Flow Only)	8,897,355	-	-	-	-	-	-
				Current Minimum Month	3,590,000	6,772[2]	4,905	750	1,120	143	72
				Current Average Day	5,340,000	7,650[2]	6,095	920	1,306	167	84
				Current Max Month	7,190,000	9,571[2]	8,984	1,090	1,510	209	105
				Current Max Two Week	8,240,000	11,777[2]	12,809	1,145	1,629	253	127
				Current Max Week	10,290,000	13,252[2]	15,544	1,306	2,106	325	163
				Current Peak Day	18,390,000	14,531[2]	23,546	1,405	2,227	466	233
				Current Peak Hour (Flow Only)	21,070,000	-	-	-	-	-	-
				Total Future Minimum Month	5,736,007	11,425	8,629	1,057	1,606	244	122
				Total Future Average Day	8,161,966	13,521	10,183	1,256	1,831	274	137
				Total Future Maximum Month	10,727,081	16,994	13,957	1,456	2,077	327	164
				Total Future Max Two Week	12,185,130	20,017	18,954	1,520	2,221	383	191
				Total Future Maximum Week	15,026,497	22,374	22,529	1,709	2,796	474	237
				Total Future Peak Day	26,252,808	30,326	32,977	1,825	2,943	652	326
				Total Future Peak Hour (Flow Only)	29,967,355	-	-	-	-	-	-

[1] 8/7 of current BOD load

[2] Does not include Clinton's Ditch

Oak Orchard WWTP Expansion Program **3/28/2025**
Future Sewer Planning **Prepared By:** MEM
AX7.001.001 **Checked By:** EKP

Table 2: Projected Future Wastewater Flows and Loads (20-year Growth Period)

Development	Total Households or Acres	Population/ Household	Total Population	Unit Flow Rate (gal/cap*d or gal/ac*d)	Average Daily Flow (gpd)	Constituent Loading					
						BOD (ppd)	TSS (ppd)	NH3 (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
Residential											
Clay	4,508.80	2.38	10,731	100	1,073,094	1,824.26	2,146.19	182.43	311.20	50.44	25.22
Cicero	915.20	2.46	2,251	100	225,139	382.74	450.28	38.27	65.29	10.58	5.29
North Syracuse	207.20	2.30	477	100	47,656	81.02	95.31	8.10	13.82	2.24	1.12
Commercial	925.51	-	-	1,500	1,388,272	Assume this is captured in residential loadings					
Industrial	1,217.78	-	-	1,000	1,217,784	3,046.90	3,554.71	284.38	406.25	101.56	50.78
				Subtotal	3,951,946	5,335	6,246	513	797	165	82
				Clinton's Ditch (BOD Only)	-	2,381[1]	-	-	-	-	-
				Micron Sanitary Flow - 0.176 MGD ADF/fab (Assume all four fabs operational by 2045)	704,000	313	368	31	53	9	4
				Future Minimum Month	3,528,229	6,699	6,018	496	787	163	82
				Future Average Day	4,655,946	8,028	6,614	544	850	173	87
				Future Maximum Month	5,848,988	9,835	8,065	593	920	192	96
				Future Max Two Week	6,529,744	10,945	9,986	608	960	210	105
				Future Maximum Week	7,849,998	12,022	11,363	654	1,122	241	121
				Future Peak Day	13,065,690	18,866	15,375	682	1,163	302	151
				Future Peak Hour (Flow Only)	14,791,647	-	-	-	-	-	-
				Current Minimum Month	3,590,000	6,772[2]	4,905	750	1,120	143	72
				Current Average Day	5,340,000	7,650[2]	6,095	920	1,306	167	84
				Current Max Month	7,190,000	9,571[2]	8,984	1,090	1,510	209	105
				Current Max Two Week	8,240,000	11,777[2]	12,809	1,145	1,629	253	127
				Current Max Week	10,290,000	13,252[2]	15,544	1,306	2,106	325	163
				Current Peak Day	18,390,000	14,531[2]	23,546	1,405	2,227	466	233
				Current Peak Hour (Flow Only)	21,070,000	-	-	-	-	-	-
				Total Future Minimum Month	7,118,229	13,471	10,923	1,246	1,907	306	153
				Total Future Average Day	9,995,946	15,678	12,709	1,464	2,156	340	170
				Total Future Maximum Month	13,038,988	19,406	17,049	1,683	2,430	401	200
				Total Future Max Two Week	14,769,744	22,722	22,795	1,753	2,589	463	232
				Total Future Maximum Week	18,139,998	25,274	26,907	1,960	3,228	566	283
				Total Future Peak Day	31,455,690	33,396	38,921	2,087	3,390	768	384
				Total Future Peak Hour (Flow Only)	35,861,647	-	-	-	-	-	-

[1]8/7 of current BOD load

[2]Does not include Clinton's Ditch

Oak Orchard WWTP Expansion Program **3/28/2025**
Future Sewer Planning **Prepared By:** MEM
AX7.001.001 **Checked By:** EKP

Table 3: Projected Future Wastewater Flows and Loads (Full Buildout)

Development	Total Households or Acres	Population/ Household	Total Population	Unit Flow Rate (gal/cap*d or gal/ac*d)	Average Daily Flow (gpd)	Constituent Loading					
						BOD (ppd)	TSS (ppd)	NH3 (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
Residential											
Clay	5,636.00	2.38	13,414	100	1,341,368	2,280.33	2,682.74	228.03	389.00	63.04	31.52
Cicero	1,144.00	2.46	2,814	100	281,424	478.42	562.85	47.84	81.61	13.23	6.61
North Syracuse	259.00	2.30	596	100	59,570	101.27	119.14	10.13	17.28	2.80	1.40
Commercial	1,156.89	-	-	1,500	1,735,340	Assume this is captured in residential loadings					
Industrial	1,522.23	-	-	1,000	1,522,230	3,808.62	4,443.39	355.47	507.82	126.95	63.48
				Subtotal	4,939,932	6,669	7,808	641	996	206	103
				Clinton's Ditch (BOD Only)	-	2,381[1]	-	-	-	-	-
				Micron Sanitary Flow - 0.176 MGD ADF/fab (Assume all four fabs operational by 2045)	704,000	313	368	31	53	9	4
				Future Minimum Month	4,292,014	7,970	7,448	614	972	202	101
				Future Average Day	5,643,932	9,362	8,176	673	1,049	215	107
				Future Maximum Month	7,074,163	11,312	9,945	731	1,134	237	118
				Future Max Two Week	7,890,260	12,587	12,290	750	1,183	260	130
				Future Maximum Week	9,472,994	13,775	13,969	806	1,381	298	149
				Future Peak Day	15,725,616	20,714	18,863	840	1,431	371	186
				Future Peak Hour (Flow Only)	17,794,710	-	-	-	-	-	-
				Current Minimum Month	3,590,000	6,772[2]	4,905	750	1,120	143	72
				Current Average Day	5,340,000	7,650[2]	6,095	920	1,306	167	84
				Current Max Month	7,190,000	9,571[2]	8,984	1,090	1,510	209	105
				Current Max Two Week	8,240,000	11,777[2]	12,809	1,145	1,629	253	127
				Current Max Week	10,290,000	13,252[2]	15,544	1,306	2,106	325	163
				Current Peak Day	18,390,000	14,531[2]	23,546	1,405	2,227	466	233
				Current Peak Hour (Flow Only)	21,070,000	-	-	-	-	-	-
				Total Future Minimum Month	7,882,014	14,742	12,353	1,364	2,092	345	172
				Total Future Average Day	10,983,932	17,012	14,271	1,593	2,355	382	191
				Total Future Maximum Month	14,264,163	20,883	18,929	1,821	2,644	446	223
				Total Future Max Two Week	16,130,260	24,364	25,099	1,895	2,812	513	256
				Total Future Maximum Week	19,762,994	27,027	29,513	2,112	3,487	623	311
				Total Future Peak Day	34,115,616	35,244	42,409	2,245	3,658	837	419
				Total Future Peak Hour (Flow Only)	38,864,710	-	-	-	-	-	-

[1]8/7 of current BOD load

[2]Does not include Clinton's Ditch

Oak Orchard WWTP Expansion Program **3/28/2025**
Future Sewer Planning **Prepared By:** EKP
AX7.001.001 **Checked By:** EKP

Table 4: Wastewater Flow and Load Projections (Full Buildout)

Development	Flow (gpd)	Constituent Loading					
		BOD (ppd)	TSS (ppd)	NH3 (ppd)	TKN (ppd)	TP (ppd)	OP (ppd)
Municipal Sanitary	3,417,702	2,860	3,365	286	488	79	40
Micron Sanitary	704,000	313	368	31	53	9	4
Sanitary Subtotal (Average Day)	4,121,702	3,173	3,733	317	541	88	44
Sanitary Min Month	2,769,784	2,824	3,005	259	464	75	37
Sanitary Max Month	5,551,933	3,970	5,502	376	626	110	55
Sanitary Max Two Week	6,368,030	4,886	7,846	395	675	133	66
Sanitary Max Week	7,950,764	5,496	9,526	451	873	171	85
Sanitary Peak Day	14,203,386	6,026	14,420	485	923	244	122
Sanitary Peak Hour (Flow Only)	16,272,480	-	-	-	-	-	-
Industrial[1]	1,522,230	3,809	4,443	355	508	127	63
Clinton's Ditch Average Day[2]	-	2,381	-	-	-	-	-
Industrial Subtotal (Average Day)	1,522,230	6,189	4,443	355	508	127	63
Industrial Min Month[2]	-	5,146	-	-	-	-	-
Industrial Max Month[2]	-	7,342	-	-	-	-	-
Industrial Max Two Week[2]	-	7,701	-	-	-	-	-
Industrial Max Week[2]	-	8,278	-	-	-	-	-
Industrial Peak Day[2]	-	14,687	-	-	-	-	-
Current Average Day	5,340,000	7,650[3]	6,095	920	1,306	167	84
Current Min Month	3,590,000	6,772[2]	4,905	750	1,120	143	72
Current Max Month	7,190,000	9,571[3]	8,984	1,090	1,510	209	105
Current Max Two Week	8,240,000	11,777[2]	12,809	1,145	1,629	253	127
Current Max Week	10,290,000	13,252[3]	15,544	1,306	2,106	325	163
Current Peak Day	18,390,000	14,531[3]	23,546	1,405	2,227	466	233
Current Peak Hour (Flow Only)	21,070,000	-	-	-	-	-	-
Total Future Average Day	10,983,932	17,012	14,271	1,593	2,355	382	191
Total Future Min Month	7,882,014	14,742	12,353	1,364	2,092	345	172
Total Future Max Month	14,264,163	20,883	18,929	1,821	2,644	446	223
Total Future Max Two Week	16,130,260	24,364	25,099	1,895	2,812	513	256
Total Future Max Week	19,762,994	27,027	29,513	2,112	3,487	623	311
Total Future Peak Day	34,115,616	35,244	42,409	2,245	3,658	837	419
Total Future Peak Hour (Flow Only)	38,864,710	-	-	-	-	-	-

[1]Includes future development only.

[2]Includes current and future load for Clinton's Ditch. Peaking factor applied to Clinton's Ditch loading only.

[3]Does not include Clinton's Ditch.

APPENDIX G

SPDES PERMIT NUMBER NY-0030317

Admin File

New York State Department of Environmental Conservation
Division of Environmental Permits, 4th Floor
625 Broadway, Albany, NY 12233-1750
Phone: (518) 402-9167 • **Fax:** (518) 402-9168
Website: www.dec.ny.gov

Joe Martens
Commissioner

June 9, 2014

Mr. Tom Rhoades, P.E.
Commissioner
Onondaga Co. Dept of Water Environment Protection
650 Hiawatha Blvd West
Syracuse, NY 13204-1194

Re: Oak Orchard WWTP
DEC#7-3124-00018/00001 SPDES#: NY0030317

Dear Mr. Rhoades:

Enclosed is a final renewed State Pollutant Discharge Elimination System (SPDES) permit for the above referenced facility. Comments on the draft permit were received from you and Ms. Michelle Josilo, NPDES Section Chief, USEPA, Region 2. All comments are addressed in the enclosed responsiveness summary.

Be advised, the Uniform Procedures Regulations (6NYCRR Part 621) provide that an applicant may request a public hearing if a permit contains conditions which are unacceptable to them. Any such request must be made in writing within 30 calendar days of the date of permit issuance and must be addressed to the Chief Permit Administrator at the letterhead address. A copy should also be sent to the Chief Administrative Law Judge at NYSDEC, 625 Broadway, 1st Floor, Albany, NY 12233-1550.

Should you have questions on the administration of this modification and renewal, please feel free to contact me at the address or phone number listed above. Should you have technical questions on permit content, please contact the permit engineer, John Weidman, at (518) 402-8197, or the Regional Water Engineer, Joseph Zalewski, at (315) 426-7500.

Sincerely,

Teresa Diehsner
Division of Environmental Permits

Enclosure
c: D. Bimber, RPA
J. Zalewski, RWE
J. Weidman, Permit Engineer
C. Jamison, CO-BWP Permit Coordinator
M. Josilo, EPA Reg 2
N. Myers, NYSEFC
M. Child, IJC
NYSDOH District Office

RECEIVED
ONONDAGA COUNTY
2014 JUN 12 PM 2:30
DEPARTMENT OF
WATER ENVIRONMENT
PROTECTION

Responsiveness Summary
Oak Orchard WWTP
DEC ID 7-3124-00018/00001 NY0030317
Prepared By: John Weidman, Bureau of Water Permits
December 2013

Background: The above referenced draft SPDES permit was developed after a full technical review was completed and a tentative determination was made to renew the permit. The draft permit was public noticed on 9/18/2013 in the Environmental Notice Bulletin and on 9/17/2013 in The Syracuse Post Standard. The public comment period ended on 10/18/13. Comments dated 10/17/2013 were received from Tom Rhoads, Commissioner, Onondaga County Department of Water Environment Protection (County). Comments dated 10/28/13 were received from Sieglinde Pylypchuk, Clean Water Regulatory Branch, US Environmental Protection Agency (USEPA), Region 2. All comments are addressed below. A revised drafted permit has been provided to USEPA.

Comments received on October 17, 2013 from Tom Rhoads, Onondaga County Department of Water Environment Protection

Comment 1 – General Comments: On August 1, 2013, the permittee submitted a "Plan for Future Growth" for this facility because the design loading for BOD5 was exceeded for any eight (8) months of the calendar year. The County requested that DEC consider re-rating the facility based on contemporary performance and applicable/permitted design. Since we have not received a response to this request, we are insisting that the permit renewal process be postponed until this important issue is addressed.

> **Response:** No changes to the draft permit would result from the "Plan for Future Growth" document.

Comment 2: Although not added to the Oak Orchard permit, there appears to be some inconsistency with the application of monitoring requirements for Enterococci bacterial monitoring (included on Meadowbrook Limestone, but excluded on Oak Orchard and Baldwinsville). Is there a NYSDEC basis for the application of Enterococci bacterial monitoring?

> **Response:** The permittee does not discharge to coastal recreation waters so it appears that 131.41 is not applicable and no E. coli or Enterococci monitoring is warranted at this time.

Comment 3 - Page 4 of 21: Flow Monitoring - Flow measurement is listed as "influent". Please be advised that the Department has historically measured/reported flow at the secondary clarifier effluent as measured by a Parshall flume.

> **Response:** The monitoring location for flow has been identified as "influent" in the permit since at least 1977 and has been carried over in the draft permit. However, since the actual monitoring location is at the secondary clarifier effluent as measured by a Parshall flume the monitoring location in the permit will be changed to "effluent."

Comment 4 - Page 4 of 21 and 5 of 21: Nitrogen, Ammonia Total - Previous permit specified Ammonia (as NH3), please clarify that the NYSDEC would like NH3-N reported.

Response: The permit has been clarified to show Ammonia (as NH3) as is listed on the fact sheet and in the current permit. Also, based on comments received from the USEPA Region 2 the Ammonia (as NH3) limit has been re-calculated for both the winter and summer period. The revised limits are listed in the permit, fact sheet and as follows: The summer Ammonia (as NH3) limit has been changed to 307 lb/day. The winter Ammonia (as NH3) limit is 2,026 lb/day. The sample type of this water quality based effluent limit has been changed to monthly average from daily maximum. The dissolved oxygen limit of 5.0 mg/l (minimum) has also been recalculated and as a result will be changed to 2.0 mg/l (minimum).

Comment 5 - Page 4 of 21, Page 5 of 21, and Fact Sheet Page 12 of 13: Disinfection period in the permit (June 15 to October 31) is not consistent with the disinfection period identified in the fact sheet (May 15 to Oct 15). Please clarify the appropriate disinfection period.

Response: The permit has been corrected and is now consistent with the current permit.

Comment 6 - Page 5 of 21 and 16 of 21: TRC Limit and Schedule of Compliance: Five out of six County permits are currently under renewal, each requiring a disinfection upgrade. In order to accomplish the regulatory and water quality goals successfully, the County needs to budget, fund and initiate projects consistent with County protocols. Some of these required upgrades are currently in the design phase, while others have not even been budgeted. In example, the effective date of the TRC final permit limit (EDP + I year) is wholly inadequate for the design, funding, and construction for a permit limit that by necessity will result in ultraviolet disinfection. The County categorically rejects any compliance schedule until the NYSDEC and the County can finalize a mutually agreed upon disinfection compliance schedule for all five treatment plants.

In light of these findings, provided to DEC as an aspect of the phosphorus TMDL development process, it is incumbent on DEC to exercise maximum regulatory flexibility in crafting permit requirements such as compliance schedules and imposing permit conditions that reflect true water quality needs and not purely mathematical constructs that yield little water quality impacts but could prove socially and economically burdensome.

Moreover, it is our understanding that the DEC is conducting its federally-mandated "triennial review" of the State's water quality standards and is looking to revise pathogen indicators for recreational waters to reflect the new EPA criteria. In light of this pending review and possible revision to DEC's long standing water quality regulations, it would appear to be appropriate for DEC to suspend currently mandated and/or proposed permit changes for all Onondaga County facilities that would result in upgrades and/or new construction of disinfection facilities pending adoption, if any, of revised water quality criteria for pathogens and assessment of impacts of revised disinfection requirements.

Response: As requested, the Department has extended the effective date of the final TRC limit to allow for the design, funding and construction as may be necessary to meet the final TRC limit for each of the County facilities. In addition, the Water Quality standard for Total Residual Chlorine resulted is a calculated limit of 45 ppb (0.045 mg/l). The Water Quality standard for Total Residual Chlorine will not change as a result of any revised pathogen indicators. Therefore, no changes to the permit are necessary with the

exception of a revised schedule to allow the County adequate time for the design, funding and construction necessary to meet the new permit limit.

Comment 7 - Page 6 of 21: Footnote 3 should be deleted since, as written, this footnote is not utilized for any parameter listed in this permit.

Response: The footnotes have been corrected.

Comment 8 - Page 6 of 21: Total Iron, Footnote 6: Delete footnote specifying the 24 hr. composite be collected as 3 grab samples at 8 hr. intervals. This parameter can be collected from a standard 24 hour composite sample.

Response: Permit changed as requested.

Comment 9 - Page 6 of 21: Action Levels - the Arsenic and Phenol collection method should be listed as 24 hr. composite and reference footnote (6) for specific details regarding grab sample intervals which make up the composite samples. Alternatively, provide a sampling footnote for grab sample(s) associated with an 8 hour composite as currently written.

Response: The footnotes have been corrected.

Comment 10 - Page 6 of 12: Action Level Limits - The Department is very concerned about the drastic lowering of the Action Levels and reviewed the recent performance (2010-2013) in comparison to the proposed action level values in draft permit (see table below). Based on historical data, we should not necessarily exceed any action levels with the new limits, however, they do not leave any room for inherent analytical or flow rate variability. Based on the DEC's analysis included in the fact sheet, the existing action levels are sufficiently protective of the water quality. The County rejects any arbitrary reductions in the Action Levels.

Response: After further review and discussion with the County the Department will retain current action levels. In addition, since there is no water quality standard or guidance value for Iron for discharge to a Class B receiving water the Action Level for Iron has been replaced with a monitor only requirement. The fact sheet has been updated accordingly.

Comment 11 - Page 7 or 21 - WET Testing: If WET testing shall consist of Chronic only testing, why are Acute action levels listed? These should be deleted and listed as monitor only.

Response: The 7-day chronic testing also generates reportable 48-hr acute data. Class C waters and above are technically required to meet both the applicable acute and chronic criteria at the edge of the respective mixing zones. By running a "chronic only" test but also reporting the acute results, separate acute and chronic tests are not necessary. Therefore, both acute and chronic WET action levels are required in the permit. There are no "monitor only" WET requirements per TOGS 1.3.2 and numerical values (i.e. either action levels or limits) must always be included.

Comment 12 - Page 12 of 21: Storm Water Pollution Prevention Plan for POTW's with Storm Water Outfalls - The permit does not list the due date for the initial completed SWPPP; typically listed as within 12 months of EDP.

Response: The SWPPP requirements have been updated. The initial completed SWPPP must be submitted by EDP + 6 months to the Regional Water Engineer. The SWPPP must be implemented within 6 months of submission, unless a different time frame is approved by the Department.

Comments on Fact Sheet:

Comment 13 - Page 1 of 13, Section 1.3: TRC limit of 0.22 mg/l is inconsistent with the permit (0.35 mg/l).

Response: The fact sheet has been corrected.

Comment 14 - Page 2 of 13: Section B, Outfall 001: Please fix typographical errors in 4th paragraph, replace "were" with "where" (2 times).

Response: The fact sheet has been corrected.

Comment 15 - Page 3 of 13: 1st Paragraph: References six (6) pump stations owned by the Town of Salina. This should be the Town of Clay, not Salina.

Response: The fact sheet has been updated as requested.

Comment 16 - The Oak Orchard WWTP Service Area has a total of twenty one (21) outlying pumping stations, which collect and transport wastewater to the treatment plant. Nine (9) of these pumping stations are owned by Onondaga County, six (6) are owned by the town of Cicero and six (6) are owned by the town of Salina. It should be noted that all of the pumping stations are maintained by OCDWEP personnel.

Response: No changes to fact sheet.

Comment 17 - Page 4 of 13: Section C - Discharge Composition: It is unclear how TOGS 1.2. 1, which is guidance for industrial permitting, was applied to the development of the Action Levels since many were established at the maximum value in the data set and significantly more restrictive than the current permit. Please provide additional information in the computation of the proposed action levels.

Response: TOGS 1.2.1 outlines the process for developing Action Levels, which applies to municipal and industrial facilities. In this case, as discussed above, action levels from previous permit have been retained.

Comment 18 - Page 6 of 1 3: TRC: "Based on TOGS 1.3.3, a daily maximum limit of 2.0 mg/l is appropriate". This is inconsistent with the Permit and remainder of the fact sheet. Consider deleting entire description, and add the same note as Mercury; "See WQBEL section below".

Response: TOGS 1.3.3 requires a minimum technology based effluent limit of 2.0 mg/l unless the calculated water quality based effluent limit is lower. A note has been added to refer to the WQBEL section for additional information.

Comment 19 - Page 7 of 13, Mercury: There is an incorrect reference to the "maximum value of 0.68 ng/l which exceeds the water quality standard of 0.7 ng/l". The value 0.68 ng/l does not exceed 0.7 ng/l.

Response: Fact sheet has been corrected.

Comment 20 - Page 12 of 13: There is apparent confusion on the appropriate disinfection season for this facility. The Fact Sheet lists May 15 - October 15, the draft permit lists June 15 - October 31.

Response: Fact sheet has been clarified.

Comment 21 - Page 13 of 13: The County is unaware that the NYDEC has promulgated the water quality standard for iron. The AWQC should not be listed for this parameter, nor should any calculations or determinations be made using this value as a driver.

Response: Fact sheet has been clarified.

Comment 22 - Page 13 of 13: In the table for Existing Effluent Quality, it is believed to be incorrect to report the Maximum value at something less than the 99th percentile. Several parameters seem to be in error.

Response: The 99th percentile is correct but does not change any permit limits or monitoring requirements in the draft permit.

Comments received on October 28, 2013 from Sieglinde Pylypchuk, Clean Water Regulatory Branch, US Environmental Protection Agency (USEPA), Region 2.

Comment – Ammonia: The draft Oak Orchard WWTP establishes an effluent limitation for total ammonia from June 1 to October 31 but requires only monitoring from November 1 to May 31. The water quality standard for ammonia, established at 6 NYCRR Part 703.5, is based on the temperature and pH of the receiving water. As the temperature decreases, the water quality standard becomes more stringent. It is unclear why a water-quality based effluent limitation for total ammonia has been established in the summer months but not in the winter months, when the water-quality standard is more stringent and the effluent is more likely to have the reasonable potential to cause or contribute to an exceedance of the water quality standard. Please conduct a reasonable potential analysis for total ammonia in the summer and winter months and, if necessary, establish appropriate seasonal effluent limitations.

Additionally, the effluent limitation for total ammonia from June 1 to October 1 is mass-based. As discussed in the "concentration-based effluent limitations" comment below, please establish a concentration-based effluent limitation for total ammonia.

Response: The Ammonia (as NH3) limit has been re-calculated for both winter and summer. The revised limits are listed in the permit and as follows: The summer Ammonia (as NH3) limit has been changed to 307 lb/day. The winter Ammonia (as NH3) limit is 2,026 lb/day. The sample type of this water quality based effluent limit has been changed to monthly average from daily maximum. The dissolved oxygen limit of 5.0 mg/l (minimum) has also been recalculated and as a result will be changed to 2.0 mg/l (minimum). The fact sheet has been updated accordingly.

Comment - Concentration-based Effluent Limitations: The draft Oak Orchard WWTP permit establishes mass-based action levels for cadmium, chromium, copper, nickel, and zinc but does not establish concentration-based action levels for these parameters. The draft permit also establishes a mass-based effluent limitation for total ammonia but does not establish a concentration-based effluent limitation. 40 CFR 122.45(f)(ii) states that mass-based limits are required except when applicable standards are expressed in terms of another unit of measure. As the standards for these parameters in the NYSWQS at 6 NYCRR Part 700 are concentration-based, please ensure that concentration-based action levels for cadmium, chromium, copper, nickel and zinc and concentration-based effluent limitations for total ammonia are established in the Oak Orchard WWTP permit.

> **Response**: In this case the applicable regulations do not require concentration-based limits. EPA's recommendation to add such limits has been reviewed. Considering the available effluent dilution the Department believes that mass-based limits are sufficient to protect water quality and that concentration-based limits are not necessary.

Comment - Dissolved Oxygen: The draft Oak Orchard WWTP permit establishes an effluent limitation for dissolved oxygen from June 1 to October 31 but does not establish an effluent limitation during the rest of the year. The water-quality standard for dissolved oxygen, as established in 6 NYCRR Part 703.3, is not a seasonal standard. If the effluent from the Oak Orchard WWTP permit has the reasonable potential to cause or contribute to a violation of the dissolved oxygen standard, a year-round effluent limitation must be established in the permit.

> **Response**: The fact sheet and permit have been revised to indicate that a worst case dissolved oxygen level of 2.0 mg/l was used to calculate permit limits. Therefore, the permit has been revised and a minimum dissolved oxygen limit of 2.0 mg/l has been added which will ensure that the discharge meets New York State Water Quality Standards as all times.

Comment – Mercury: TOGS 1.3.10 provides that the Multiple Discharger Variance (MDV) is in effect for "five years from the effective date specified on page 1 of this document". Page 1 indicates that the issue date (assuming this is the same as the effective date as well) is October 2012, therefore the MDV is in effect until September 2015. As the term of the draft modified Oak Orchard WWTP permit extends beyond the expiration date of the MDV, the permit must reflect a final water quality-based effluent limit of 0.7 ng/l as of September 2015 unless other relief is provided in the permit (e.g., compliance schedule, renewal of the MDV).

> **Response**: NYSDEC's interpretation of the applicable regulations (40 CFR Part 132, Appendix F, Procedure 2 and 6 NYCRR Part 702.17) and policy (DOW 1.3.10, Section 4.2.1.11) is that the MDV may be applied from October 2010 thru September 2015 and that the "variance" actually happens when an individual permit is changed to include these requirements, i.e., if the MDV is applied to a permit prior to October 2015 then the resulting requirements may be in effect for the permit term which extends past October 2015. NYSDEC's interpretation is consistent with practices in other States.

Comment – Pathogen Criteria Implementation: The Oak Orchard WWTP discharges to class B waters. As specified in NYSWQS at 6 NYCRR Part 701.8, the best usage of class B fresh water is primary and secondary contact recreation and fishing. Class B waters must also be suitable for fish, shellfish, and wildlife propagation and survival. The draft Oak Orchard WWTP

permit establishes effluent limitations for fecal coliforms but does not establish effluent limitations for total coliforms. The NYSWQS at 6 NYCRR Part 703.4 establish water quality criteria for fecal coliforms and total coliforms discharging into class B waters. As stated in the NYSWQS (6 NYCRR Part 701.1), the discharge of sewage, industrial waste, or other wastes shall not cause impairment of the best usages of the receiving water. In order to comply with the NYSWQS and ensure that the best usage of the receiving water are not impaired, please conduct a reasonable potential analysis for total coliforms and, if necessary, establish total coliforms limitations in the Oak Orchard WWTP permit.

Response: The proposed fecal coliform limits are consistent with DEC's existing disinfection policy in TOGS 1.3.3. Parallel monitoring for total coliform is not typically required.

Comment – Pretreatment Program Implementation Requirements: Section B(4)c of the Pretreatment Program Implementation Requirements should refer to 40 CFR 403.8(f)(2)(viii), not 403.8(f)(2)(vii).

Response: Permit changed as requested.

Comment – Water Treatment Chemicals: Page 9 of the fact sheet for the draft Oak Orchard WWTP permit states that the permittee must provide an annual report to NYSDEC detailing the use of water treatment chemicals. However, no corresponding requirement is established in the draft permit. Please establish a requirement for the permittee to submit an annual water treatment chemical report in the Schedule of Submittals on page 17 of the draft permit.

Response: The General Conditions page of the permit has been changed to establish an annual reporting requirement in the permit.

Comment – Whole Effluent Toxicity: The fact sheet for the draft Oak Orchard WWTP permit states that a reasonable potential analysis has been performed for WET. However, there is no WET data is provided in the Pollutant Summary Table. With no data, it is not clear not the permit meets the requirements of 40 CFR 122.44(d)(i) or 40 CFR part 132 which specify that if the WET of an effluent is or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any numeric WET criterion, an effluent limitation for WET must be established in the permit. Please provide an RPA of existing WET data or a justification for not establishing effluent limitations for WET.

Response: The Division has reviewed EPA's comment regarding the WET testing requirements in the draft permit. As part of the permit development process, the SPDES permit application and the facility's submitted data were evaluated using the most recent edition of Division of Water Technical and Operational Guidance Series (1.3.2), ACUTE AND CHRONIC TOXICITY TESTING IN THE SPDES PERMIT PROGRAM. This guidance document, which was reviewed and accepted by EPA, describes the procedures which should be followed when determining whether to include WET testing in a SPDES permit. This facility is new to the WET program; therefore no WET data exists to be able to perform a reasonable potential determination (RPD) to determine the need for WET Limits. As a result, we believe in accordance with TOGS 1.3.2, the facility has received the appropriate WET program requirements with this initial WET Action Levels. Once four quarterly WET tests are completed, the RPD will be completed to determine if the WET Action Levels should be upgraded to enforceable WET Limits.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

Industrial Code:	**4952**	SPDES Number:	**NY-0030317**
Discharge Class (CL):	**05**	DEC Number:	**7-3124-00018/00001**
Toxic Class (TX):	**N**	Effective Date (EDP):	**07/01/2014**
Major Drainage Basin:	**07**	Expiration Date (ExDP):	**06/30/2019**
Sub Drainage Basin:	**03**	Modification Dates:(EDPM)	
Water Index Number:	**ONT-66-11**		
Compact Area:	**IJC**		

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name: **Onondaga County** Attention: **Commissioner, WEP**

Street: **650 Hiawatha Blvd. West**

City: **Syracuse** State: **NY** Zip Code: **13204-1194**

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: **Oak Orchard Wastewater Treatment Plant**

Location (C,T,V): **Clay (T)** County: **Onondaga**

Facility Address: **4300 Oak Orchard Road**

City: **Clay** State: **NY** Zip Code: **13212**

NYTM -E: NYTM - N:

From Outfall No.: **001** at Latitude: **43 ° 12 ' 18.6 ''** & Longitude: **76 ° 12 ' 49.7 ''**

into receiving waters known as: **Oneida River** Class: **B**

and; (list other Outfalls, Receiving Waters & Water Classifications)

See stormwater outfalls list, page 2 of permit.

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1 and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: **Onondaga County Department of Water Environment Protection**

Street: **650 Hiawatha Blvd**

City: **Syracuse** State: **NY** Zip Code: **13204-1194**

Responsible Official or Agent: **Head Operator** Phone: **(315) 652-5097**

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:

CO BWP - Permit Coordinator
RWE
RPA
EPA Region II – Michelle Josilo
NYSEFC
NYSDOH District Office
IJC

Chief Permit Permit Administrator: John J. Ferguson

Address: Division of Environmental Permits
625 Broadway
Albany, NY 12233-1750

Signature: Date: 6/8/14

STORMWATER OUTFALLS

The following outfalls discharge on-site stormwater only, from roofs and catch basins:

Outfall	Description	Latitude/Longitude	Receiving Water
002	Stormwater runoff only from catch basin, roof drains, grass covered swales.	43° 12' 12.9" N 76° 12' 42" W	Mud Creek to Oneida River
003	Stormwater runoff only from catch basin and paved roadway areas.	43° 12' 00" N 76° 12' 30.9" W	Drainage area of Oneida River
004	Stormwater runoff only from catch basins, roof drains, grassed areas and paved areas.	43° 11' 53.3" N 76° 12' 40.8" W	Mud Creek to Oneida River

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.		

PARA-METER	EFFLUENT LIMIT	PRACTICAL QUANTITATION LIMIT (ML)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based standards, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the analytical method specified in the permit shall be used to monitor the amount of the pollutant in the outfall to this level, provided that the laboratory analyst has complied with the specified quality assurance/quality control procedures in the relevant method. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This ML can be neither lowered nor raised without a modification of this permit.	Action Levels are monitoring requirements, as defined below in Note 2, that trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, Temperature, concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Note 1: DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day. DAILY MAX: The highest allowable daily discharge. DAILY MIN: The lowest allowable daily discharge. MONTHLY AVG (daily avg): The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week. 12 MRA (twelve month rolling avg): The average of the most recent twelve month's monthly averages. 30 DAY GEOMETRIC MEAN (30 d geo mean): The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of : the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. 7 DAY GEOMETRIC MEAN (7 d geo mean): The highest allowable geometric mean of daily discharges over a calendar week.

Note 2: ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards. The additional monitoring requirement is triggered upon receipt by the permittee of any monitoring results in excess of the stated Action Level.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL No.	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	June 16 to October 31	Oneida River	07/01/2014	06/30/2019

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly average	10.0	mgd	-	-	Continuous	Recorder		X	
$CBOD_5$	Monthly average	25	mg/l	2085	lbs/d	2/week	24-hr. Comp.	X	X	(1)
$CBOD_5$	7 day average	40	mg/l	3336	lbs/d	2/week	24-hr. Comp.	X	X	
BOD_5	Monthly average	Monitor	mg/l	Monitor	lbs/d	1/month	24-hr. Comp.	X		
UOD	Daily maximum	Monitor	mg/l	4289	lbs/d	2/week	24-hr. Comp.	X	X	(2)
Solids, Suspended	Monthly average	30	mg/l	2500	lbs/d	2/week	24-hr. Comp.	X	X	(1)
Solids, Suspended	7 day average	45	mg/l	3750	lbs/d	2/week	24-hr. Comp.	X	X	
Solids, Settleable	Daily maximum	0.3	ml/l	-	-	3/day	Grab	X	X	
pH	Range	6.0 to 9.0	SU	-	-	3/day	Grab	X	X	
Temperature	Daily maximum	Monitor	Deg C	-	-	3/day	Grab	X	X	
Dissolved Oxygen	Daily Minimum	2.0	mg/l	-	-	2/week	Grab		X	
Nitrogen, Ammonia Total (as NH_3)	Monthly average	Monitor	mg/l	307	lbs/d	2/week	24-hr. Comp.		X	
Nitrogen, TKN (as N)	Daily maximum	Monitor	mg/l	-	-	2/week	24-hr. Comp.		X	
Phosphorus, Total (as P)	Monthly average	1.0	mg/l	-	-	2/week	24-hr. Comp.		X	
Mercury, Total	Daily maximum	50	ng/l	-	-	Quarterly	Grab		X	(4)
Effluent Disinfection required: [ ] All Year [X] Seasonal from May 15 to October 15										
Coliform, Fecal	30 day geometric mean	200	No./ 100 ml	-	-	2/week	Grab.		X	
Coliform, Fecal	7 day geometric mean	400	No./ 100 ml	-	-	2/week	Grab.		X	
Chlorine, Total Residual *(Interim – effective EDP to 11/1/2018)*	Daily maximum	0.35	mg/l	-	-	3/day	Grab		X	(5)
Chlorine, Total Residual *(Final – becomes effective 11/1/2018)*	Daily maximum	0.045	mg/l	-	-	3/day	Grab		X	(5)

FOOTNOTES: See page 6

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL No.	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	November 1 to June 15	Oneida River	07/01/2014	06/30/2019

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly average	10.0	mgd	-	-	Continuous	Recorder		X	
$CBOD_5$	Monthly average	25	mg/l	2085	lbs/d	2/week	24-hr. Comp.	X	X	(1)
$CBOD_5$	7 day average	40	mg/l	3336	lbs/d	2/week	24-hr. Comp.	X	X	
BOD_5	Monthly average	Monitor	mg/l	Monitor	lbs/d	1/month	24-hr. Comp.	X		
UOD	Daily maximum	-	mg/l	-	lbs/d	2/week	24-hr. Comp.	X	X	(2)
Solids, Suspended	Monthly average	30	mg/l	2500	lbs/d	2/week	24-hr. Comp.	X	X	(1)
Solids, Suspended	7 day average	45	mg/l	3750	lbs/d	2/week	24-hr. Comp.	X	X	
Solids, Settleable	Daily maximum	0.3	ml/l	-	-	3/day	Grab	X	X	
pH	Range	6.0 to 9.0	SU	-	-	3/day	Grab	X	X	
Temperature	Daily maximum	Monitor	Deg C	-	-	3/day	Grab	X	X	
Dissolved Oxygen	Daily Minimum	2.0	mg/l	-	-	2/week	Grab		X	
Nitrogen, Ammonia Total (as NH_3)	Monthly average	Monitor	mg/l	2,026	lbs/d	2/week	24-hr. Comp.		X	
Nitrogen, TKN (as N)	Daily maximum	Monitor	mg/l	-	-	2/week	24-hr. Comp.		X	
Phosphorus, Total (as P)	Monthly average	1.0	mg/l	-	-	2/week	24-hr. Comp.		X	
Mercury, Total	Daily maximum	50	ng/l	-	-	Quarterly	Grab		X	(4)
Effluent Disinfection required: [ ] All Year [X] Seasonal from May 15 to October 15										
Coliform, Fecal	30 day geometric mean	200	No./ 100 ml	-	-	2/week	Grab.		X	
Coliform, Fecal	7 day geometric mean	400	No./ 100 ml	-	-	2/week	Grab.		X	
Chlorine, Total Residual *(Interim – effective EDP to 11/1/2018)*	Daily maximum	0.35	mg/l	-	-	3/day	Grab		X	5
Chlorine, Total Residual *(Final – becomes effective 11/1/2018)*	Daily maximum	0.045	mg/l	-	-	3/day	Grab		X	5

FOOTNOTES: See page 6

PERMIT LIMITS, ACTION LEVELS AND MONITORING

OUTFALL No.	LEVELS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise noted	Oneida River	07/01/2014	06/30/2019

PARAMETER	EFFLUENT LIMIT		MONITORING ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Monthly Avg.	Daily Max					
Iron, Total Recoverable			Monitor	lbs/day	1/quarter	24 hr. Comp.	
Chloroform			1.3	lbs/day	1/quarter	24 hr. Comp.	(3)
Cadmium, Total Recoverable			0.4	lbs/day	1/quarter	24 hr. Comp.	
Chromium, Total Recoverable			1.9	lbs/day	1/quarter	24 hr. Comp.	
Copper, Total Recoverable			1.8	lbs/day	1/quarter	24 hr. Comp.	
Nickel, Total Recoverable			2.9	lbs/day	1/quarter	24 hr. Comp.	
Zinc, Total Recoverable			5.4	lbs/day	1/quarter	24 hr. Comp.	
Arsenic, Total Recoverable			Monitor	lbs/day	1/quarter	24 hr. Comp.	
Phenols, Total			Monitor	lbs/day	1/quarter	24 hr. Comp.	(3)

FOOTNOTES:

(1) Effluent shall not exceed 15 % and 15 % of influent concentration values for $CBOD_5$ & TSS respectively.
(2) Ultimate Oxygen Demand shall be computed as follows: UOD = 1.5 X $CBOD_5$ + 4.5 X TKN (Total Kjeldahl Nitrogen).
(3) The 24-hr. composites shall be collected as 3 grab samples at 8 hr. intervals. Three grab samples shall be collected and combined in laboratory prior to analysis.
(4) EPA Method 1631 is required for Mercury sampling.
(5) Monitoring of these parameters is only required during the period when disinfection is required.

WHOLE EFFLUENT TOXICITY (WET) TESTING REQUIREMENTS

OUTFALL No.	LEVELS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise noted	Oneida River	07/01/2014	06/30/2019

PARAMETER	EFFLUENT LIMIT		PQL	MONITORING ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Monthly Avg.	Daily Max.	Daily Max.					
WET - Acute Invertebrate				1.5	TUa	Quarterly	seefootnote	1
WET - Acute Vertebrate				1.5	TUa	Quarterly	seefootnote	1
WET - Chronic Invertebrate				9.0	TUc	Quarterly	seefootnote	1
WET - Chronic Vertebrate				9.0	TUc	Quarterly	seefootnote	1

Footnotes:

1. Whole Effluent Toxicity (WET) Testing:

Testing Requirements - WET testing shall consist of Chronic only testing. WET testing shall be performed in accordance with 40 CFR Part 136 and TOGS 1.3.2 unless prior written approval has been obtained from the Department. The test species shall be *Ceriodaphnia dubia* (water flea - invertebrate) and *Pimephales promelas* (fathead minnow - vertebrate). Receiving water collected upstream from the discharge should be used for dilution. The appropriate dilution series bracketing the IWC and including one exposure group of 100% effluent should be used to generate a definitive test endpoint, otherwise an immediate rerun of the test is required. WET testing shall be coordinated with the monitoring of chemical and physical parameters limited by this permit so that the resulting analyses are also representative of the sample used for WET testing. The ratio of critical receiving water flow to discharge flow (i.e. dilution ratio) is 5:1 for acute, and 9:1 for chronic. Discharges which are disinfected using chlorine should be dechlorinated prior to WET testing or samples shall be taken immediately prior to the chlorination system.

Monitoring Period - WET testing shall be performed at the specified sample frequency for the duration of the permit during calendar years ending in 1 and 6 beginning in January and lasting for a period of one full year.

Reporting - Toxicity Units shall be calculated and reported on the DMR as follows: TUa = (100)/(48 hr LC50) or (100)/(48 hr EC50) (note that Acute data is generated by both Acute and Chronic testing) and TUc = (100)/(NOEC) when Chronic testing has been performed or TUc = (TUa) x (10) when only Acute testing has been performed and is used to predict Chronic test results, where the 48 hr LC50 or 48 hr EC50 and NOEC are expressed in % effluent. This must be done for both species and using the Most Sensitive Endpoint (MSE) or the lowest NOEC and corresponding highest TUc. Report a TUa of 0.3 if there is no statistically significant toxicity in 100% effluent as compared to control.

The complete test report including all corresponding results, statistical analyses, reference toxicity data, daily average flow at the time of sampling and other appropriate supporting documentation, shall be submitted within 60 days following the end of each test period to the Toxicity Testing Unit. A summary page of the test results for the invertebrate and vertebrate species indicating TUa, 48 hr LC50 or 48 hr EC50 for Acute tests and/or TUc, NOEC, IC25, and most sensitive endpoints for Chronic tests, should also be included at the beginning of the test report.

WET Testing Action Level Exceedances - If an action level is exceeded then the Department may require the permittee to conduct additional WET testing including Acute and/or Chronic tests. Additionally, the permittee may be required to perform a Toxicity Reduction Evaluation (TRE) in accordance with Department guidance. If such additional testing or performance of a TRE is necessary, the permittee shall be notified in writing by the Regional Water Engineer. The written notification shall include the reason(s) why such testing or a TRE is required.

PRETREATMENT PROGRAM IMPLEMENTATION REQUIREMENTS

A. DEFINITIONS. Generally, terms used in this Section shall be defined as in the General Pretreatment Regulations (40 CFR Part 403). Specifically, the following definitions apply to terms used in this Section (PRETREATMENT PROGRAM IMPLEMENTATION REQUIREMENTS):

1. Categorical Industrial User (CIU) - an industrial user of the POTW that is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N;

2. Local Limits - General Prohibitions, specific prohibitions and specific limits as set forth in 40 CFR 403.5.

3. The Publicly Owned Treatment Works (the POTW) - as defined by 40 CFR 403.3(q) and that discharges in accordance with this permit.

4. Program Submission(s) - requests for approval or modification of the POTW Pretreatment Program submitted in accordance with 40 CFR 403.11 or 403.18 and approved by letter dated June 11, 1984.

5. Significant Industrial User (SIU) -

   a. CIUs;

   b. Except as provided in 40 CFR 403.3(v)(3), any other industrial user that discharges an average of 25,000 gallons per day or more of process wastewater (excluding sanitary, non-contact cooling and boiler blowdown wastewater) to the POTW;

   c. Except as provided in 40 CFR 403.3(v)(3), any other industrial user that contributes a process wastestream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant;

   d. Any other industrial user that the permittee designates as having a reasonable potential for adversely affecting the POTW's operation or for violating a pretreatment standard or requirement.

6. Substances of Concern - Substances identified by the New York State Department of Environmental Conservation Industrial Chemical Survey as substances of concern.

B. IMPLEMENTATION. The permittee shall implement a POTW Pretreatment Program in accordance 40 CFR Part 403 and as set forth in the permittee's approved Program Submission(s). Modifications to this program shall be made in accordance with 40 CFR 403.18. Specific program requirements are as follows:

1. Industrial Survey. To maintain an updated inventory of industrial dischargers to the POTW the permittee shall:

   a. Identify, locate and list all industrial users who might be subject to the industrial pretreatment program from the pretreatment program submission and any other necessary, appropriate and available sources. This identification and location list will be updated, at a minimum, every five years. As part of this update the permittee shall collect a current and complete New York State Industrial Chemical Survey form (or equivalent) from each SIU.

   b. Identify the character and volume of pollutants contributed to the POTW by each industrial user identified in B.1.a above that is classified as a SIU.

   c. Identify, locate and list, from the pretreatment program submission and any other necessary, appropriate and available sources, all significant industrial users of the POTW.

2. Control Mechanisms. To provide adequate notice to and control of industrial users of the POTW the permittee shall:

   a. Inform by certified letter, hand delivery courier, overnight mail, or other means which will provide written acknowledgment of delivery, all industrial users identified in B.1.a. above of applicable pretreatment standards and requirements including the requirement to comply with the local sewer use law, regulation or

PRETREATMENT PROGRAM IMPLEMENTATION REQUIREMENTS (continued)

ordinance and any applicable requirements under section 204(b) and 405 of the Federal Clean Water Act and Subtitles C and D of the Resource Conservation and Recovery Act.

b. Control through permit or similar means the contribution to the POTW by each SIU to ensure compliance with applicable pretreatment standards and requirements. Permits shall contain limitations, sampling frequency and type, reporting and self-monitoring requirements as described below, requirements that limitations and conditions be complied with by established deadlines, an expiration date not later than five years from the date of permit issuance, a statement of applicable civil and criminal penalties and the requirement to comply with Local Limits and any other requirements in accordance with 40 CFR 403.8(f)(1).

3. Monitoring and Inspection. To provide adequate, ongoing characterization of non-domestic users of the POTW, the permittee shall:

a. Receive and analyze self-monitoring reports and other notices. The permittee shall require all SIUs to submit self-monitoring reports at least every six months unless the permittee collects all such information required for the report, including flow data.

b. The permittee shall adequately inspect each SIU at a minimum frequency of once per year.

c. The permittee shall collect and analyze samples from each SIU for all priority pollutants that can reasonably be expected to be detectable at levels greater than the levels found in domestic sewage at a minimum frequency of once per year.

d. Require, through permits, each SIU to collect at least one 24 hour, flow proportioned composite (where feasible) effluent sample every six months and analyze each of those samples for all priority pollutants that can reasonably be expected to be detectable in that discharge at levels greater than the levels found in domestic sewage. The permittee may perform the aforementioned monitoring in lieu of the SIU except that the permittee must also perform the compliance monitoring described in 3.c.

4. Enforcement. To assure adequate, equitable enforcement of the industrial pretreatment program the permittee shall:

a. Investigate instances of noncompliance with pretreatment standards and requirements, as indicated in self-monitoring reports and notices or indicated by analysis, inspection and surveillance activities. Sample taking and analysis and the collection of other information shall be performed with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions. Enforcement activities shall be conducted in accordance with the permittee's Enforcement Response Plan developed and approved in accordance with 40 CFR Part 403.

b. Enforce compliance with all national pretreatment standards and requirements in 40 CFR Parts 406 - 471.

c. Provide public notification of significant non-compliance as required by 40 CFR 403.8(f)(2)(viii).

d. Pursuant to 40 CFR 403.5(e), when either the Department or the USEPA determines any source contributes pollutants to the POTW in violation of Pretreatment Standards or Requirements the Department or the USEPA shall notify the permittee. Failure by the permittee to commence an appropriate investigation and subsequent enforcement action within 30 days of this notification may result in appropriate enforcement action against the source and permittee.

5. Record keeping. The permittee shall maintain and update, as necessary, records identifying the nature, character, and volume of pollutants contributed by SIUs. Records shall be maintained in accordance with 6 NYCRR Part 750-2.5(c).

6. Staffing. The permittee shall maintain minimum staffing positions committed to implementation of the Industrial Pretreatment Program in accordance with the approved pretreatment program.

PRETREATMENT PROGRAM IMPLEMENTATION REQUIREMENTS (continued)

C. SLUDGE DISPOSAL PLAN. The permittee shall notify NYSDEC, and USEPA as long as USEPA remains the approval authority, 60 days prior to any major proposed change in the sludge disposal plan. NYSDEC may require additional pretreatment measures or controls to prevent or abate an interference incident relating to sludge use or disposal.

D. REPORTING. The permittee shall provide to the offices listed on the Monitoring, Reporting and Recording page of this permit and to the Chief-Water Compliance Branch; USEPA Region II; 290 Broadway; New York, NY 10007; a periodic report that briefly describes the permittee's program activities over the previous year. This report shall be submitted to the above noted offices within 60 days of the end of the reporting period. The reporting period shall be ANNUAL with reporting period(s) ending on December 31.

The periodic report shall include:

1. Industrial Survey. Updated industrial survey information in accordance with 40 CFR 403.12(i)(1) (including any NYS Industrial Chemical Survey forms updated during the reporting period).

2. Implementation Status. Status of Program Implementation, to include:

   a. Any interference, upset or permit violations experienced at the POTW directly attributable to industrial users.

   b. Listing of significant industrial users issued permits.

   c. Listing of significant industrial users inspected and/or monitored during the previous reporting period and summary of results.

   d. Listing of significant industrial users notified of promulgated pretreatment standards or applicable local standards who are on compliance schedules. The listing should include for each facility the final date of compliance.

   e. Summary of POTW monitoring results not already submitted on Discharge Monitoring Reports and toxic loadings from SIU's organized by parameter.

   f. A summary of additions or deletions to the list of SIUs, with a brief explanation for each deletion.

3. Enforcement Status. Status of enforcement activities to include:

   a. Listing of significant industrial users in Significant Non-Compliance (as defined by 40 CFR 403.8(f)(2)(viii)) with federal or local pretreatment standards at end of the reporting period.

   b. Summary of enforcement activities taken against non-complying significant industrial users. The permittee shall provide a copy of the public notice of significant violators as specified in 40 CFR Part 403.8(f)(2)(viii).

MERCURY MINIMIZATION PROGRAM – High Priority POTWs

1. **General** - The permittee shall develop, implement, and maintain a Mercury Minimization Program (MMP). The MMP is required because the 50 ng/L permit limit exceeds the statewide water quality based effluent limit (WQBEL) of 0.70 nanograms/liter (ng/L) for Total Mercury. The goal of the MMP will be to reduce mercury effluent levels in pursuit of the WQBEL. Note – The mercury-related requirements in this permit conform to the mercury Multiple Discharge Variance specified in NYSDEC policy *DOW 1.3.10*.

2. **MMP Elements** - The MMP shall be documented in narrative form and shall include any necessary drawings or maps. Other related documents already prepared for the facility may be used as part of the MMP and may be incorporated by reference. As a minimum, the MMP shall include an on-going program consisting of: periodic monitoring designed to quantify and, over time, track the reduction of mercury; an acceptable control strategy for reducing mercury discharges via cost-effective measures, which may include more stringent control of tributary waste streams; and submission of periodic status reports.

A. Monitoring - The permittee shall conduct periodic monitoring designed to quantify and, over time, track the reduction of mercury. All permit-related wastewater and stormwater mercury compliance point (outfall) monitoring shall be performed using EPA Method 1631. Use of EPA Method 1669 during sample collection is recommended. Unless otherwise specified, all samples shall be grabs. Monitoring at influent and other locations tributary to compliance points may be performed using either EPA Methods 1631 or 245.7. Monitoring of raw materials, equipment, treatment residuals, and other non-wastewater/non-stormwater substances may be performed using other methods as appropriate. Monitoring shall be coordinated so that the results can be effectively compared between internal locations and final outfalls. Minimum required monitoring is as follows:

i. Sewage Treatment Plant Influent & Effluent, and Type II SSO Outfalls - Samples at each of these locations must be collected in accordance with the minimum frequency specified on the mercury permit limits page.
ii. Key Locations in the Collection System and Potential Significant Mercury Sources - The minimum monitoring frequency at these locations shall be semi-annual. Monitoring of properly treated dental facility discharges is not required.
iii. Hauled Wastes - Hauled wastes which may contain significant mercury levels must be periodically tested prior to acceptance to ensure compliance with pretreatment/local limits requirements and/or determine mercury load.
iv. Additional monitoring must be completed as may be required elsewhere in this permit or upon Department request.

B. Control Strategy - An acceptable control strategy is required for reducing mercury discharges via cost-effective measures, including but not limited to more stringent control of industrial users and hauled wastes. The control strategy will become enforceable under this permit and shall contain the following minimum elements:

i. Pretreatment/Local Limits - The permittee shall evaluate and revise current requirements in pursuit of the goal.
ii. Periodic Inspection - The permittee shall inspect users as necessary to support the MMP. Each dental facility shall be inspected at least once every five years to verify compliance with the wastewater treatment operation, maintenance, and notification elements of 6NYCRR Part 374.4. Other mercury sources shall also be inspected once every five years. Alternatively, the permittee may develop an outreach program which informs these users of their responsibilities once every five years and is supported by a subset of site inspections. Monitoring shall be performed as above.
iii. Systems with CSO & Type II SSO Outfalls - Priority shall be given to controlling mercury sources upstream of CSOs and Type II SSOs through mercury reduction activities and/or controlled-release discharge. Effective control is necessary to avoid the need for the Department to establish mercury permit limits at these outfalls.
iv. Equipment and Materials – Equipment and materials which may contain mercury shall be evaluated by the permittee and replaced with mercury-free alternatives where environmentally preferable.

C. Annual Status Report - An annual status report shall be submitted to the Regional Water Engineer and to the Bureau of Water Permits summarizing: (a) all MMP monitoring results for the previous year; (b) a list of known and potential mercury sources; (c) all action undertaken pursuant to the strategy during the previous year; (d) actions planned for the upcoming year; and, (e) progress toward the goal. The first annual status report is due one year after the permit is modified to include the MMP requirement and follow-up status reports are due annually thereafter. A file shall be maintained containing all MMP documentation, including the dental forms required by 6NYCRR Part 374.4, which shall be available for review by NYSDEC representatives. Copies shall be provided upon request.

3. **MMP Modification** - The MMP shall be modified whenever: (a) changes at the facility or within the collection system increase the potential for mercury discharges; (b) actual discharges exceed 50 ng/L; (c) a letter from the Department identifies inadequacies in the MMP; or, (d) pursuant to a permit modification.

STORM WATER POLLUTION PREVENTION PLAN FOR POTWs WITH STORMWATER OUTFALLS

1. General - The Department has determined that stormwater discharges from POTWs with design flows at or above 1 mgd shall be covered under the SPDES permit. If the permittee has already submitted a Notice of Intent to the Department for coverage under the General Storm Water permit, the permittee shall submit a Notice of Termination to the Department upon receipt of this final SPDES permit containing the requirement to develop a SWPPP.

The permittee is required to develop, maintain, and implement a Storm Water Pollutant Prevention Plan (SWPPP) to prevent releases of significant amounts of pollutants to the waters of the State through plant site runoff; spillage and leaks; sludge or waste disposal; and other stormwater discharges including, but not limited to, drainage from raw material storage.

The SWPPP shall be documented in narrative form and shall include the 13 minimum elements below and plot plans, drawings, or maps necessary to clearly delineate the direction of stormwater flow and identify the conveyance, such as ditch, swale, storm sewer or sheet flow, and receiving water body. Other documents already prepared for the facility such as a Safety Manual or a Spill Prevention, Control and Countermeasure (SPCC) plan may be used as part of the SWPPP and may be incorporated by reference. A copy of the current SWPPP shall be submitted to the Department as required in item (2.) below and a copy must be maintained at the facility and shall be available to authorized Department representatives upon request.

2. Compliance Deadlines - The initial completed SWPPP shall be submitted by EDP + 6 months to the Regional Water Engineer. The SWPPP shall be implemented within 6 months of submission, unless a different time frame is approved by the Department. The SWPPP shall be reviewed annually and shall be modified whenever: (a) changes at the facility materially increase the potential for releases of pollutants; (b) actual releases indicate the SWPPP is inadequate, or (c) a letter from the Department identifies inadequacies in the SWPPP. The permittee shall certify in writing, as an attachment to the December Discharge Monitoring Report (DMR), that the annual review has been completed. All SWPPP revisions (with the exception of minimum elements - see item (4.B.) below) must be submitted to the Regional Water Engineer within 30 days. Note that the permittee is not required to obtain Department approval of the SWPPP (or of any minimum elements) unless notified otherwise. Subsequent modifications to or renewal of this permit does not reset or revise these deadlines unless a new deadline is set explicitly by such permit modification or renewal.

3. Facility Review - The permittee shall review all facility components or systems (including but not limited to material storage areas; in-plant transfer, process, and material handling areas; loading and unloading operations; storm water, erosion, and sediment control measures; process emergency control systems; and sludge and waste disposal areas) where materials or pollutants are used, manufactured, stored or handled to evaluate the potential for the release of pollutants to the waters of the State. In performing such an evaluation, the permittee shall consider such factors as the probability of equipment failure or improper operation, cross-contamination of storm water by process materials, settlement of facility air emissions, the effects of natural phenomena such as freezing temperatures and precipitation, fires, and the facility's history of spills and leaks. The relative toxicity of the pollutant shall be considered in determining the significance of potential releases.

The review shall address all substances present at the facility that are identified in Tables 6-10 of SPDES application Form NY-2C (available at *http://www.dec.state.ny.us/website/dcs/permits/olpermits/form2c.pdf*) as well as those that are required to be monitored by the SPDES permit.

4. A. 13 Minimum elements - Whenever the potential for a release of pollutants to State waters is determined to be present, the permittee shall identify Best Management Practices (BMPs) that have been established to prevent or minimize such potential releases. Where BMPs are inadequate or absent, appropriate BMPs shall be established. In selecting appropriate BMPs, the permittee shall consider good industry practices and, where appropriate, structural measures such as secondary containment and erosion/sediment control devices and practices. USEPA guidance for development of minimum elements of the SWPPP and BMPs is available in the September 1992 manual *Storm Water Management for Industrial Activities,* EPA 832-R-92-006 (available on-line at http://nepis.epa.gov/pubtitleOW.htm). At a minimum, the plan shall include the following elements:

1. Pollution Prevention Team
2. Reporting of BMP Incidents
3. Risk Identification & Assessment
4. Employee Training
5. Inspections and Records
6. Security
7. Preventive Maintenance
8. Good Housekeeping
9. Materials/Waste Handling, Storage, & Compatibility
10. Spill Prevention & Response
11. Erosion & Sediment Control
12. Management of Runoff
13. Street Sweeping

STORM WATER POLLUTION PREVENTION PLAN FOR POTWs WITH STORMWATER OUTFALLS (continued)

Note that for some facilities, especially those with few employees, some of the above may not be applicable. It is acceptable in these cases to indicate "Not Applicable" for the portion(s) of the SWPPP that do not apply to your facility, along with an explanation, for instance if street sweeping did not apply because no streets exist at the facility.

B. Stormwater Pollution Prevention Plans (SWPPPs) Required for Discharges of Stormwater From Construction Activity to Surface Waters - As part of the erosion of and sediment control element, a SWPPP shall be developed prior to the initiation of any site disturbance of one acre or more of uncontaminated area. Uncontaminated area means soils or groundwater which are free of contamination by any toxic or non-conventional pollutants identified in Tables 6-10 of SPDES application Form NY-2C. Disturbance of any size contaminated area(s) and the resulting discharge of contaminated stormwater is not authorized by this permit unless the discharge is under State or Federal oversight as part of a remedial program or after review by the Regional Water Engineer; nor is such discharge authorized by any SPDES general permit for stormwater discharges. SWPPPs are not required for discharges of stormwater from construction activity to groundwaters.

The SWPPP shall conform to the *New York Standards and Specifications for Erosion and Sediment Control* and *New York State Stormwater Management Design Manual,* unless a variance has been obtained from the Regional Water Engineer, and to any local requirements. The permittee shall submit a copy of the SWPPP and any amendments thereto to the local governing body and any other authorized agency having jurisdiction or regulatory control over the construction activity at least 30 days prior to soil disturbance. The SWPPP shall also be submitted to the Regional Water Engineer if contamination, as defined above, is involved and the permittee must obtain a determination of any SPDES permit modifications and/or additional treatment which may be required prior to soil disturbance. Otherwise, the SWPPP shall be submitted to the Department only upon request. When a SWPPP is required, a properly completed *Notice of Intent* (NOI) form shall be submitted (available at *www.dec.state.ny.us/website/dow/toolbox/swforms.html*) prior to soil disturbance. Note that submission of a NOI is required for informational purposes; the permittee is not eligible for and will not obtain coverage under any SPDES general permit for stormwater discharges, nor are any additional permit fees incurred. SWPPPs must be developed and submitted for subsequent site disturbances in accordance with the above requirements. The permittee is responsible for ensuring that the provisions of each SWPPP is properly implemented.

DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c) and (g) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed before initiation of any discharge.

(b) Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

(c) The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address :

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years.

(f) The permittee shall periodically inspect the outfall identification sign(s) in order to ensure they are maintained, are still visible, and contain information that is current and factually correct. Signs that are damaged or incorrect shall be replaced within 3 months of inspection.

DISCHARGE NOTIFICATION REQUIREMENTS (continued)

(g) All requirements of the Discharge Notification Act, including public repository requirements, are waived for any outfall meeting any of the following circumstances, provided Department notification is made in accordance with (h) below:

(i) such sign would be inconsistent with any other state or federal statute;

(ii) the Discharge Notification Requirements contained herein would require that such sign could only be located in an area that is damaged by ice or flooding due to a one-year storm or storms of less severity;

(iii) instances in which the outfall to the receiving water is located on private or government property which is restricted to the public through fencing, patrolling, or other control mechanisms. Property which is posted only, without additional control mechanisms, does not qualify for this provision;

(iv) instances where the outfall pipe or channel discharges to another outfall pipe or channel, before discharge to a receiving water; or

(v) instances in which the discharge from the outfall is located in the receiving water, two-hundred or more feet from the shoreline of the receiving water.

(h) If the permittee believes that any outfall which discharges wastewater from the permitted facility meets any of the waiver criteria listed in (g) above, notification (form enclosed) must be made to the Department's Bureau of Water Permits, Central Office, of such fact, and, provided there is no objection by the Department, a sign and DMR repository for the involved outfall(s) are not required. This notification must include the facility's name, address, telephone number, contact, permit number, outfall number(s), and reason why such outfall(s) is waived from the requirements of discharge notification. The Department may evaluate the applicability of a waiver at any time, and take appropriate measures to assure that the ECL and associated regulations are complied with.

SCHEDULE OF COMPLIANCE

a) The permittee shall comply with the following schedule:

Outfall(s)	Parameter(s) Affected	Interim Effluent Limit(s)	Compliance Action	Due Date
001	Chlorine, Total Residual	0.35 mg/l	Interim Permit Limit	Effective 07/01/2014 to 11/1/2018
001	Chlorine, Total Residual	-	Permittee must provide plans to the Department for achieving final permit limit	04/01/2015
001	Chlorine, Total Residual	-	Permittee must provide status report to the Department documenting progress toward achieving final permit limit.	01/01/2016 (see note (b) below)
001	Chlorine, Total Residual	0.045 mg/l (final)	Final Permit Limit	Effective 11/1/2018

The above compliance actions are one time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT," the permittee is not required to repeat the submission(s) noted above. The above due dates are independent from the effective date of the permit stated in the "SPDES NOTICE/RENEWAL APPLICATION/PERMIT" letter.

b) For any action where the compliance date is greater than 9 months past the previous compliance due date, the permittee shall submit interim progress reports to the Department every nine (9) months until the due date for these compliance items are met.

c) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:

1. A short description of the non-compliance;
2. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
3. A description or any factors which tend to explain or mitigate the non-compliance; and
4. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

d) The permittee shall submit copies of any document required by the above schedule of compliance to the NYSDEC Regional Water Engineer at the location listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS and to the Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505, unless otherwise specified in this permit or in writing by the Department.

SPECIAL CONDITIONS: Schedule of Submittals

The permittee shall submit the following information to the Regional Water Engineer at the address listed on the Recording, Reporting and Monitoring page of this Permit, and to the Bureau of Water Permits, 625 Broadway, Albany NY 12233-3505:

Outfall	Required Action	Due Date
001	Mercury Minimization Program: Submit annual status report by April 1st of each calendar year (for the previous year) with follow-up reports due annually thereafter.	Annually, by April 1st
	Whole Effluent Toxicity Testing: WET testing shall be performed at the specified sample frequency during calendar years ending in 1 and 6 beginning in January and lasting for a period of one full year.	Years ending in 1 and 6

Notes:

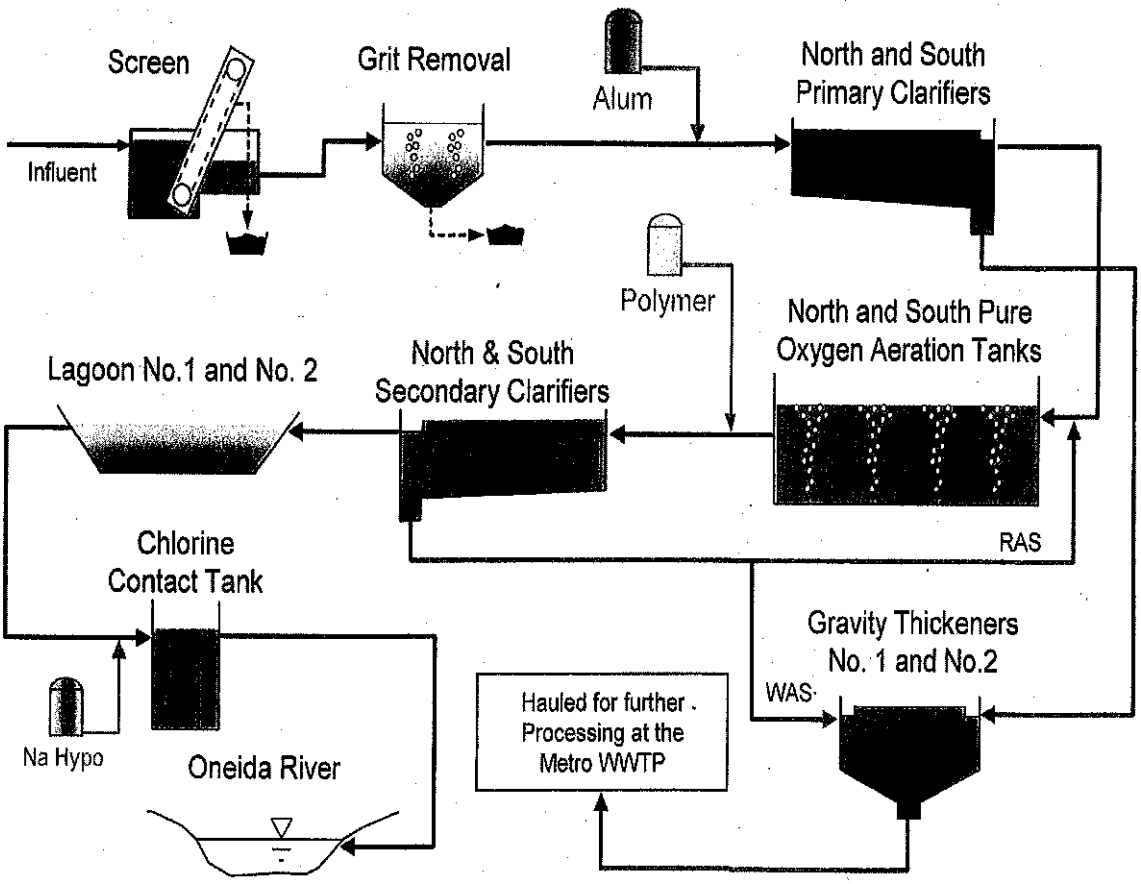
1. The permittee shall make every effort to comply with the above dates. Requests for extension, with justification, may be made to the Regional Water Engineer at the address listed above. Failure to submit either the information requested or a request for an extension by the dates listed above shall constitute noncompliance with this Permit.

MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the location(s) specified below:

Oak Orchard WWTP

Process Flow Diagram



GENERAL REQUIREMENTS

A. The regulations in 6 NYCRR Part 750 are hereby incorporated by reference and the conditions are enforceable requirements under this permit. The permittee shall comply with all requirements set forth in this permit and with all the applicable requirements of 6 NYCRR Part 750 incorporated into this permit by reference, including but not limited to the regulations in paragraphs B through H as follows:.

B. General Conditions

1.	Duty to comply	6 NYCRR Part 750-2.1(e) & 2.4
2.	Duty to reapply	6 NYCRR Part 750-1.16(a)
3.	Need to halt or reduce activity not a defense	6 NYCRR Part 750-2.1(g)
4.	Duty to mitigate	6 NYCRR Part 750-2.7(f)
5.	Permit actions	6 NYCRR Part 750-1.1(c), 1.18, 1.20 & 2.1(h)
6.	Property rights	6 NYCRR Part 750-2.2(b)
7.	Duty to provide information	6 NYCRR Part 750-2.1(i)
8.	Inspection and entry	6 NYCRR Part 750-2.1(a) & 2.3

C. Operation and Maintenance

1.	Proper Operation & Maintenance	6 NYCRR Part 750-2.8
2.	Bypass	6 NYCRR Part 750-1.2(a)(17), 2.8(b) & 2.7
3.	Upset	6 NYCRR Part 750-1.2(a)(94) & 2.8(c)

D. Monitoring and Records

1.	Monitoring and records	6 NYCRR Part 750-2.5(a)(2), 2.5(c)(1), 2.5(c)(2), 2.5(d) & 2.5(a)(6)
2.	Signatory requirements	6 NYCRR Part 750-1.8 & 2.5(b)

E. Reporting Requirements

1.	Reporting requirements	6 NYCRR Part 750-2.5, 2.6, 2.7 & 1.17
2.	Anticipated noncompliance	6 NYCRR Part 750-2.7(a)
3.	Transfers	6 NYCRR Part 750-1.17
4.	Monitoring reports	6 NYCRR Part 750-2.5(e)
5.	Compliance schedules	6 NYCRR Part 750-1.14(d)
6.	24-hour reporting	6 NYCRR Part 750-2.7(c) & (d)
7.	Other noncompliance	6 NYCRR Part 750-2.7(e)
8.	Other information	6 NYCRR Part 750-2.1(f)
9.	Additional conditions applicable to a POTW	6 NYCRR Part 750-2.9
10.	Special reporting requirements for discharges that are not POTWs	6 NYCRR Part 750-2.6

F. Planned Changes

1. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

   a. The alteration or addition to the permitted facility may meet of the criteria for determining whether facility is a new source in 40 CFR §122.29(b); or
   b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, or to notification requirements under 40 CFR §122.42(a)(1); or
   c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

   In addition to the Department, the permittee shall submit a copy of this notice to the United States Environmental Protection Agency at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

GENERAL REQUIREMENTS continued

G. Notification Requirement for POTWs

1. All POTWs shall provide adequate notice to the Department and the USEPA of the following:
   a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; or
   b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
   c. For the purposes of this paragraph, adequate notice shall include information on:
      i. the quality and quantity of effluent introduced into the POTW, and
      ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

POTWs shall submit a copy of this notice to the United States Environmental Protection Agency, at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

H. Sludge Management

The permittee shall comply with all applicable requirements of 6 NYCRR Part 360.

I. SPDES Permit Program Fee

The permittee shall pay to the Department an annual SPDES permit program fee within 30 days of the date of the first invoice, unless otherwise directed by the Department, and shall comply with all applicable requirements of ECL 72-0602 and 6 NYCRR Parts 480, 481 and 485. Note that if there is inconsistency between the fees specified in ECL 72-0602 and 6 NYCRR Part 485, the ECL 72-0602 fees govern.

J. Water Treatment Chemicals (WTCs)

New or increased use and discharge of a WTC requires prior Department review and authorization. At a minimum, the permittee must notify the Department in writing of its intent to change WTC use by submitting a completed *WTC Notification Form* for each proposed WTC. The Department will review that submittal and determine if a SPDES permit modification is necessary or whether WTC review and authorization may proceed outside of the formal permit administrative process. The majority of WTC authorizations do not require SPDES permit modification. In any event, use and discharge of a WTC shall not proceed without prior authorization from the Department. Examples of WTCs include biocides, coagulants, conditioners, corrosion inhibitors, defoamers, deposit control agents, flocculants, scale inhibitors, sequestrants, and settling aids.

1. WTC use shall not exceed the rate explicitly authorized by this permit or otherwise authorized in writing by the Department.
2. The permittee shall **maintain a logbook** of all WTC use, noting for each WTC the date, time, exact location, and amount of each dosage, and, the name of the individual applying or measuring the chemical. The logbook must also document that adequate process controls are in place to ensure that excessive levels of WTCs are not used.
3. The permittee shall **submit a completed *WTC Annual Report Form*** each year that they use and discharge WTCs. This form shall be attached to either the December DMR or the annual monitoring report required below.

The *WTC Notification Form* and *WTC Annual Report Form* are available from the Department's website at http://www.dec.ny.gov/permits/93245.html .

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

A. The monitoring information required by this permit shall be summarized, signed and retained for a period of at least five years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each 1 month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 each year and must summarize information for January to December of the previous year in a format acceptable to the Department.

[ ] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:
[ ] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:
Department of Environmental Conservation
Division of Water, Bureau of Water Compliance
625 Broadway, Albany, New York 12233-3506
Phone: (518) 402-8177

Send an **additional copy** of each DMR page to:
Onondaga Co. Dept. of Health
PO Box 1325
421 Montgomery Street
Syracuse, NY 13202

Send the **first copy** (second sheet) of each DMR page to:
Department of Environmental Conservation
Regional Water Engineer, Region 7
615 Erie Blvd West
Syracuse, New York 13204-2400
(315) 426-7500

B. Monitoring and analysis shall be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

C. More frequent monitoring of the discharge(s), monitoring point(s), or waters of the State than required by the permit, where analysis is performed by a certified laboratory or where such analysis is not required to be performed by a certified laboratory, shall be included in the calculations and recording of the data on the corresponding DMRs.

D. Calculations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

E. Unless otherwise specified, all information recorded on the DMRs shall be based upon measurements and sampling carried out during the most recently completed reporting period.

F. Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section 502 of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be directed to the New York State Department of Health, Environmental Laboratory Accreditation Program.

Municipal SPDES Permit Fact Sheet
Oak Orchard WWTP
SPDES Number NY0030317

I. SUMMARY OF PROPOSED PERMIT CHANGES

A SPDES permit renewal is proposed for this facility. Following is a summary of the proposed changes in the permit as compared to the currently effective permit, the details of these changes are specified below and in the draft permit:

1. Added stormwater only outfalls table listing on-site stormwater outfalls (Outfalls 002, 003 and 004) from roofs, catch basins and paved roadways (page 2 of permit) that were identified in the SPDES permit application.
2. As required by the Division of Water's TOGS 1.3.10 (*Mercury - SPDES Permitting, Multiple Discharge Variance, and Water Quality Monitoring*) a 50 ng/l permit limit for Mercury has been added to the permit.
3. The seasonal calculated water quality based effluent limit for Total Residual Chlorine has been reduced (from 0.35 mg/l to 0.045 mg/l).
4. Discharge Notification Act Requirements have been retained but updated. The updated pages can be found in the permit.
5. A minimum dissolved oxygen limit of 2.0 mg/l has been added to the permit.
6. Technology based effluent limits for $CBOD_5$ have been included in the Permit as per TOGS 1.3.3.
7. Monitoring requirement for influent BOD_5 was added to the permit (monitoring only, not a permit limit).
8. Permit limit for Total Iron was replaced with a monitor only action level requirement.
9. UOD limit (summer) changed from monthly average to daily max (Water Quality Based Effluent Limit).
10. The water quality based effluent limit for Ammonia (as NH3) of 400 lb/d has been reduced to 307 lb/d. A winter limit (of 2,026 lb/d) has also been added to the permit. Monitoring type has been changed to monthly average.
11. Monthly monitoring for BOD_5 has been added to the permit.

Please note that when the Department updates a permit this typically includes updated forms incorporating the latest general conditions.

II. BACKGROUND INFORMATION

As noted throughout this document, SPDES permits are based on both federal and state requirements - law, regulation, policy, and guidance. These can generally be found on the internet. Current locations include: Clean Water Act (CWA) *www.epa.gov/lawsregs/laws/index.html#env*; Environmental Conservation Law (ECL) *www.dec.ny.gov/regulations/40195.html*; federal regulations *www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR*; state environmental regulations *www.dec.ny.gov/regulations/regulations.html*; NYSDEC water policy *www.dec.ny.gov/regulations/2654.html*.

A. Administrative History

The current SPDES permit for the facility became effective on 01/01/1998 and had an expiration date of 01/01/2003. It was administratively renewed in 2003 and 2008 and expires on 12/31/2012.

On June 28, 2012 the permittee submitted a permit renewal application form NY-2A and sampling data.

B. Outfall and Receiving Water Information

The facility discharges, or proposes to discharge, wastewater and/or stormwater to waters of the state via the following outfalls:

Outfall 001

The Oak Orchard WWTP has been in service since 1981 and has an average design flow capacity of ten (10) MGD with a peak flow capacity of twenty four (24) MGD. Discharge from Outfall 001 is to the Oneida River.

This facility provides advanced secondary treatment of wastewater using pure oxygen activated sludge process. Wastewater is collected throughout portions of the Towns of Cicero and Clay and the Village of North Syracuse. A system of gravity sewers and smaller pumping stations convey wastewater from a large portion of the service area to the Davis Road Pumping Station. Flow from this pump station is transported over six (6) miles, through two interconnected force mains (24" and 36") that combine to form a single 30" force main at Euclid in the Town of Clay, which then conveys the sewage to the Oak Orchard WWTP grit chamber. The wastewater influent is primarily from residential sources, with some commercial use discharges and four (4) permitted industries contributing to the daily flow. A significant industrial contributor is Clintons Ditch Co-op, Inc., located in the Town of Cicero.

Raw influent wastewater enters the Headworks Building where it is split into two (2) separate channels. The wastewater then flows into one of two (2) covered aerated grit chambers, collected grit is removed via a mechanical clam shell removal system. The flow then undergoes screenings removal, passing through one of two (2) automatic screen rakes. Collected screenings and grit are stored in dumpsters, removed by trucks and eventually hauled to landfill.

Wastewater flows through the screen rakes into a channel where the flow is split and directed to two (2) primary clarifier structures, which provide for removal of settled solids and floating material. The two (2) separate rectangular primary clarifiers, using a traveling cog bridge with flights and chain, provide for removal of solids and skimming of floating scum and grease. Primary effluent then flows via gravity to two (2) covered pure oxygen activated sludge tanks where biological breakdown of nutrients is accomplished. The activated sludge (Mixed Liquor) then flows via gravity into six (6) separate rectangular secondary clarifier tanks, where settling of solids occurs with the help of a cationic polymer. Flights and chain are used in these clarifiers for removal of settled solids and skimming of floating scum and grease. Secondary effluent passes through a 3 foot Parshall flume and then through two (2) aerated lagoons, prior to flowing into the chlorine contact tank, where seasonal disinfection is accomplished using sodium hypochlorite.

After disinfection, the final effluent is discharged into the Oneida River. Phosphorus is removed year round with the addition of aluminum sulfate into the primary clarifier influent.

Solids from the primary clarifiers and the secondary clarifiers settle out in the two (2) Gravity Thickener Tanks. Collected solids from these tanks are removed via tanker truck to the Metropolitan-Syracuse WWTP for further treatment.

Sanitary Sewer Overflows (SSOs)

The permit application did not identify any SSOs. Therefore, the draft permit does not include any known and possible Sanitary Sewer Overflows (SSOs) within the collection system tributary to the collection

system. Bypass from these types of outfalls is prohibited except as noted in 6 NYCRR Part 750-2.8(b)(2) and 40 CFR 122.41.

The Oak Orchard WWTP Service Area has a total of twenty one (21) outlying pumping stations, which collect and transport wastewater to the treatment plant. Nine (9) of these pumping stations are owned by Onondaga County, six (6) are owned by the town of Cicero and six (6) are owned by the town of Clay. It should be noted that all of the pumping stations are maintained by OCDWEP personnel.

None of the pumping stations have an outfall which could be used as an emergency outfall or diversion. All wastewater is transported via closed sewer pipe to the treatment plant.

All pumping stations have remote monitoring and alarm systems to detect any equipment malfunctions or unusual conditions. These alarm systems are monitored on a twenty-four (24) hour basis by OCDWEP staff.

Facility Stormwater Collection and Conveyance System Description

The Oak Orchard WWTP facility site is a relatively level parcel of land which is bounded by seasonally flooded upland forest, agricultural land and Mud Creek, which is tributary to the Oneida River. The facility is made up of operational buildings, wastewater tankage, paved roadways, and grassed lawn areas. Also, the facility has two (2) lagoons along the Western edge of the property which provide additional treatment to the secondary effluent, prior to disinfection. The facility has a total of six (6) catch basins; four (4) which drain to Outfall # 004, one (1) which drains to Outfall # 003 and one (1) which drains to Outfall #002. These catch
basins collect storm water from surface runoff and roof drains from some operational buildings. Other buildings and areas of the facility do not have a closed stormwater drainage system, runoff drains as sheet flows over pavement, sloped toward the surrounding grassed swales around the property.

The three (3) stormwater outlets convey runoff from areas of paved roadway, roof drains and grassed lawn areas. These outlets discharge into drainage swale's and wooded locations which have been landscaped to transport stormwater. These areas blend into the surrounding property, which drain naturally, via small tributaries, into Mud Creek and then the Oneida River. The Oneida River is a Class B waterway located approximately 1/4 mile North of the Oak Orchard WWTP.

Stormwater Outfall 002
The drainage area for Outlet #002 is located in the Northwest corner of the property. Stormwater runoff is collected from grassed lawn areas (65%), paved roadways (20%) and roof drains (15%). The drainage area is approximately 3,700 SF. Stormwater drains via a closed pipe to a drainage swale adjacent to the Chlorine Contact Tank.

Stormwater Outfall 003
The drainage area for Outlet #003 is located North of the Administration/Operations Building. Stormwater runoff is collected from paved roadways (50%) and grassed lawn areas (50%). The drainage area is approximately 800 SF. Stormwater drains via closed pipe to a drainage swale adjacent to a wooded area behind the Maintenance Garage.

Stormwater Outfall 004
The drainage area for Outlet #004 is located North of the main process/operational tankage. Stormwater runoff is collected from grassed lawn areas (50%), paved roadways (25%) and roof drains (25%). The

drainage area is approximately 22,000 SF. Stormwater drains via a closed pipe to a wooded area just outside the property fence line adjacent to Mud Creek.

It should be noted that a Chemical Transfer Station is located along the East side of the main process building, where there are no storm catch basins or drains. Bulk deliveries of aluminum sulfate take place in the permanently installed concrete containment system. Stormwater collected in this containment structure is stored separately in a concrete containment manhole. This manhole is pumped out as needed, and the contents disposed of as required by law.

The location of the main outfall(s), and the name, classification, and index numbers of the receiving waters are indicated in the *Outfall & Receiving Water Location Table* at the end of this fact sheet. The classifications of individual surface waters are specified in 6 NYCRR Parts 800 – 941. The best uses and other requirements applicable to the specific water classes are specified in 6 NYCRR Part 701.

The 7Q10 flow was obtained from NYSDEC Water Quality files. The 30Q10 flow was obtained from the same source. Mixing zone analyses are conducted assuming complete mixing. Other critical receiving water data for Temperature, pH, hardness and/or salinity were based on conservative estimates. This flow information is listed in the *Pollutant Summary Table* at the end of this fact sheet together with applicable ambient water quality criteria, ambient background data (if available), and outfall pollutant data.

Impaired Waterbody Information – The CWA requires states to identify impaired waters, where designated uses are not fully supported. For these impaired waters/pollutants, states must consider the development of a Total Maximum Daily Load (TMDL) or other strategy to reduce the input of the specific pollutant(s) restricting waterbody uses. As of 2012 the Oneida River was not listed as impaired.

C. Discharge Composition

The *Pollutant Summary Table* at the end of this fact sheet presents the existing effluent quality of the facility. Concentration and mass data are presented, based on Discharge Monitoring Report (DMR), permit application, and possibly other data submitted by the permittee for the period July 2009 to August 2012. The statistical methods utilized to calculate 95th and 99th percentiles are in accordance with TOGS 1.2.1 and the USEPA, Office of Water, Technical Support Document For Water Quality-based Toxics Control, March 1991, Appendix E. Statistical calculations were not performed for parameters with insufficient data. Generally, ten or more data points are needed to calculate percentiles (See TOGS 1.2.1 Appendix D). Non-detects were excluded from the statistical calculations.

D. Compliance History

A review of the facility's DMRs and other compliance information from July 2009 to August 2012 shows that the facility had the following violations:

Parameter	Date	Permit Limit	Reported Value
Coliform, Fecal	August 2010	400/100 ml (7-day)	1700/100 ml
Dissolved Oxygen	August 2010	5.0 mg/l (minimum)	4.6 mg/l
Dissolved Oxygen	October 2010	5.0 mg/l (minimum)	4.8 mg/l

III. PROPOSED PERMIT REQUIREMENTS

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act (CWA) provide the basis for the effluent limitations and other conditions in the draft permit. The NYSDEC evaluates discharges with respect to

these sections of the CWA, New York State Environmental Conservation Law, and the relevant federal/state regulations, policy, and guidance to determine which conditions to include in the draft permit.

For existing permittees, the previous permit typically forms the basis for the next permit. Permit revisions are implemented where justified due to changed conditions at the facility and/or in response to updated regulatory requirements.

A. Effluent Limitations

If applicable, the existing permit limits are evaluated to determine if these should be continued, revised, or deleted. Generally, existing limits are continued unless there is justification to do otherwise. Other pollutant monitoring data are also reviewed to determine the presence of additional contaminants that should be included in the permit.

The permit writer determines the **technology-based effluent limits (TBELs)** that must be incorporated into the permit. A TBEL requires a minimum level of treatment for industrial point sources based on currently available treatment technologies and/or Best Management Practices (BMPs). The Department then evaluates the water quality expected to result from technology controls to determine if any exceedances of water quality criteria in the receiving water might result. If there is a reasonable potential for exceedances to occur, **water quality-based effluent limits (WQBELs)** must be included in the permit. A WQBEL is designed to ensure that the water quality standards of receiving waters are being met. In general, the Clean Water Act requires that the effluent limits for a particular pollutant are the more stringent of either the TBEL or WQBEL.

1. TBELs & Anti-Backsliding:

Sections 301(b)(1)(B) and 304(d)(1) of the CWA require technology-based controls, known as secondary treatment, on POTW effluents. The applicable federal regulations are specified in 40 CFR Part 133.102. These and other requirements are summarized in TOGS 1.3.3.

Anti-backsliding requirements are specified in the CWA, sections 402(o) and 303(d)(4), and regulations at 40 CFR 122.44(l). These requirements are summarized in TOGS 1.2.1. Generally, the regulations prohibit the relaxation of effluent limits in reissued permits unless one of the specified exceptions applies. In practice, limits in reissued permits will generally be no less stringent than previous permit limits to ensure compliance with anti-backsliding requirements. Otherwise, the specific exceptions that allow backsliding will be cited on a case-by-case basis.

Following is the TBEL & Anti-backsliding assessment for each pollutant present in the discharge(s). A summary of this analysis is provided in the *Pollutant Summary Table* at the end of this fact sheet.

Pollutant-Specific TBEL & Anti-Backsliding Analysis:

In addition to the concentration limits noted below, 40 CFR 122.45(f) requires that SPDES permits contain mass-based limits for most pollutants. Mass-based limits in lbs/day are derived by multiplying the design flow in MGD by the concentration limit in mg/L by a conversion factor of 8.34. Limits are typically expressed using two significant figures.

Outfall 001

Flow – Consistent with TOGS 1.3.3, a monthly average flow limit of 10.0 MGD is specified, which is equal to the design capacity of the treatment plant.

pH range – 40 CFR 133.102 requires that the effluent pH be within the range of 6.0 to 9.0 standard units (SU).

Temperature – Monitoring is required for process control and informational purposes.

Dissolved Oxygen – Monitoring is required for process control and informational purposes.

5 day Carbonaceous Biochemical Oxygen Demand (CBOD5) – 40 CFR 133.102 requires that the 30 day (monthly) average be limited to 25 mg/L, the 7-day (weekly) average be limited to 40 mg/L, and the minimum monthly average percent removal be 85%.

Total Suspended Solids (TSS) – 40 CFR 133.102 requires that the 30 day (monthly) average be limited to 30 mg/L, the 7-day (weekly) average be limited to 45 mg/L, and the minimum monthly average percent removal be 85%.

Settleable Solids – In accordance with TOGS 1.3.3 a limit of 0.3 is specified.

Phosphorus – Based on TOGS 1.3.3, for a POTW which discharges to Lakes Erie or Ontario or their respective drainage basins and are not subject to more stringent requirements under TOGS 1.3.6 the current permit limit of 1.0 mg/l has been retained in the permit.

Fecal Coliform – Based on TOGS 1.3.3, for a discharge to a Class B water seasonal disinfection is required. See WQBEL section.

Total Residual Chlorine (TRC) – Effluent disinfection is required as noted below in the WQBEL section. Based on TOGS 1.3.3, a daily maximum limit of 2.0 mg/l is appropriate. This limit prevents excessive use of chlorine while maintaining an appropriate process control indicator for effective disinfection. See WQBEL section for additional information on the revised TRC limit. See WQBEL section below for additional information.

Mercury – See WQBEL section below.

2. WQBELs & Anti-Degradation:

In addition to the TBELs previously discussed, the NYSDEC evaluated the discharge to determine compliance with Sections 101 and 301(b)(1)(C) of the CWA and 40 CFR 122.44(d)(1). These require that permits include limits for all pollutants or parameters which are or may be discharged at a level which will cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. The limits must be stringent enough to ensure that water quality standards are met and must be consistent with any available wasteload allocation (WLA).

The procedure for developing WQBELs includes knowing the pollutants present in the discharge(s), identifying water quality criteria applicable to these pollutants, determining if WQBELs are necessary (reasonable potential), and calculating the WQBELs. Factors also considered in this analysis include available dilution of effluent in the receiving water, receiving water chemistry, and other pollutant sources. If the expected concentration of the pollutant of concern in the receiving water may exceed the ambient water quality standard or guidance value then there is reasonable potential that the discharge may cause or contribute to a violation of the water quality, and a WQBEL or WLA for the pollutant is required.

Antidegradation Policy: New York State implements the antidegradation portion of the CWA based upon two documents: (1) Organization and Delegation Memorandum #85-40, entitled "Water Quality Antidegradation

Policy," signed by the Commissioner of NYSDEC, dated September 9, 1985; and, (2) TOGS 1.3.9, entitled "Implementation of the NYSDEC Antidegration Policy – Great Lakes Basin (Supplement to Antidegradation Policy dated September 9, 1985)." A SPDES permit cannot be issued that would result in the water quality criteria being violated. The permit for the facility contains effluent limits which ensure that the existing beneficial uses of the receiving waters will be maintained.

Following is the WQBEL analysis for each pollutant present in the discharge(s). Anti-degradation analysis which justifies applying water quality standards of a higher classification is noted below, if applicable. Refer to section II.B. above for information on discharge location, receiving water information (class, dilution, chemistry), and the existence of any TMDLs. A summary of this analysis is provided in the *Pollutant Summary Table* at the end of this fact sheet.

Pollutant-Specific WQBEL & Anti-Degradation Analysis:

Outfall 001

pH range – The dilution ratio is at least 1:1 so a limit equal to the TBEL is appropriate.

Temperature – The discharge is to non-trout waters and, typical of STPs, existing effluent quality is below 90 F. Therefore, a limit is not necessary (see 6 NYCRR 704.2(b)(1)(i)).

Ultimate Oxygen Demand (UOD) – The seasonal (June 1 to October 31) daily maximum water based effluent limit for UOD of 4289 lbs/day has been retained in the permit. Sample type changed from monthly average to daily max.

Dissolved Oxygen – The dissolved oxygen limit has been established assuming a worst case dissolved oxygen level of 2.0 mg/l. Therefore, the permit has been revised and a minimum dissolved oxygen limit of 2.0 mg/l has been added which will ensure that the discharge meets New York State Water Quality Standards as all times. This change has resulted from new information that has become available during the calculation of the water quality based effluent limit which justify the change to this limit.

Total Suspended Solids (TSS) – The TBEL limit has been retained in the draft permit.

Settleable Solids – The narrative water quality standards provided in 6 NYCRR Part 703.2 state that the discharge of settleable solids shall not cause deposition or impair the receiving waters for their best usages. The TBEL is sufficient in this case.

Total Kjeldahl Nitrogen/Ammonia – As per TOGS 1.3.3 all POTWs with a design flow of 1.0 MGD or greater monitor for influent and effluent TKN and Ammonia. These requirements are being retained from the previous permit. Sample type has been changed to monthly average.

Phosphorus – The current permit limit of 1.0 mg/l will be retained. TOGS 1.3.3 requires, for POTWs which discharge to Lakes Erie or Ontario or their respective drainage basins and are not subject to more stringent requirements under TOGS 1.3.6, New York State's implementation of the 1987 Great Lakes Water Quality Agreement (GLWQA) by the International Joint Commission (IJC) requires that the effluent concentration of total phosphorus be limited to 1.0 mg/l on an average 30 day basis.

Fecal Coliform – In accordance with TOGS 1.3.3, seasonal effluent disinfection is required because the discharge is to a class B water body. Geometric mean limits of 200/100 ml monthly average and 400/100 ml weekly average are specified.

Total Residual Chlorine (TRC) – A daily maximum TRC WQBEL of 45 ug/L (or 0.045 mg/l) was determined by multiplying the water quality standard of 5 ug/L by the chronic dilution ratio of 8.95. See also TOGS 1.3.1.E. The current limit of 0.35 mg/l will remain in effect until 11/1/2018.

Mercury – The current permit includes a limit of 50 ng/l for Mercury. Mercury is has been detected in the effluent at a maximum value of 0.68 ng/L. New York State's mercury multiple discharge variance (MDV) in TOGS 1.3.10 is being applied. Consequently, the permit includes a 50 ng/L effluent limit; a mercury minimization program requirement; and routine monitoring using EPA Method 1631. Refer to TOGS 1.3.10 for further detail.

Whole Effluent Toxicity (WET) Testing – WET tests use small vertebrate and invertebrate species to measure the aggregate toxicity of an effluent. There are two different durations of toxicity tests: acute and chronic. Acute toxicity tests measure survival over a 96-hour test exposure period. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure. Per TOGS 1.3.2, WET testing may be required when any one of the following seven criteria are applicable:

1. There is the presence of substances in the effluent for which ambient water quality criteria do not exist.
2. There are uncertainties in the development of TMDLs, WLAs, and WQBELs, caused by inadequate ambient and/or discharge data, high natural background concentrations of pollutants, available treatment technology, and other such factors.
3. There is the presence of substances for which WQBELs are below analytical detectability.
4. There is the possibility of complex synergistic or additive effects of chemicals, typically when the number of metals or organic compounds discharged by the permittee equals or exceeds five.
5. There are observed detrimental effects on the receiving water biota.
6. Previous WET testing indicated a problem.
7. Treatment plants which exceed a discharge of 1 MGD. Facilities of less than 1 MGD may be required to test, e.g., POTWs < 1 MGD which are managing industrial pretreatment programs.

A Reasonable Potential analysis was performed, including an evaluation of the discharge against the seven criteria noted above. Criteria applicable to the discharge include number(s) 4 and 7. Based upon this evaluation, WET testing action levels of 1.5 TUa and 9.0 TUc have been added to the draft permit for each species. The chronic limit/action level is equal to the chronic dilution ratio. The acute limit/action level is equal to 50% of the chronic dilution ration multiplied by 0.3. Refer to the SPDES permit for details.

B. Monitoring & Reporting Requirements

Section 308 of the Clean Water Act and federal regulations 40 CFR 122.44(i) require that monitoring be included in permits to determine compliance with effluent limitations. Additional effluent monitoring may also be required to gather data to determine if effluent limitations may be required. The permittee is responsible for conducting the monitoring and for reporting results on DMRs. The permit contains the monitoring requirements for the facility. Monitoring frequency is based on the minimum sampling necessary to adequately monitor the facility's performance. For municipal facilities, sampling frequency is based on guidance provided in TOGS 1.3.3.

C. Other Conditions Specific To This Permit

Schedule of Submittals: The schedule of submittals page has been included in the permit to summarize the due dates for submission of the Mercury Minimization Program annual status report and the Whole Effluent Toxicity Testing program. .

Compliance Schedule(s): The schedule of compliance page has been included in the permit to summarize the interim and final permit limits for total residual chlorine.

Industrial Pretreatment Program: The permittee is required to implement a Pretreatment Program in accordance with 40 CFR 403. The program specifies development of an industrial user compliance program, submission of user information, modification of local sewer use law (if necessary), and periodic reporting. This requirement is based on 40 CFR 403 and TOGS 1.3.3 and is being continued from the previous permit. The current Industrial Pretreatment Program was approved on June 11, 1984.

Water Treatment Chemicals (WTCs): The use and discharge of WTCs requires the prior review and authorization by the NYSDEC. In most cases, a permit modification is not necessary. WTC usage must be logged and detailed in an annual report sent to the DEC. The permit lists any authorized WTCs for the facility.

Pollutant Minimization Program (PMP): As discussed above, a PMP for Mercury is being implemented at the facility because the WQBEL of 0.7 ng/L is lower than the compliance limit of 50 ng/L. The goal of the PMP is to meet the calculated WQBEL. Since the design flow of 10.0 mgd exceeds 5.0 mgd TOGS 1.3.10 requires a mercury limit of 50 ng/l along with a High Priority Mercury Minimization Program (page 11 of draft permit). This is a new permit requirement.

Discharge Notification Act: In accordance with Discharge Notification Act (ECL 17-0815-a), the permittee is required to post a sign at each point of wastewater discharge to surface waters. This requirement is being retained, but updated, compared to the previous permit.

Stormwater Pollution Prevention Plan: The permittee is required to develop and maintain a stormwater pollution prevention plan to minimize contamination of stormwater run-off from the on-site stormwter outfalls at the facility. This requirement is being continued from the previous permit.

D. General Conditions Applicable To All Permits

The permit contains standard regulatory language that is required to be in all SPDES permits. These permit provisions, based largely upon 40 CFR 122 subpart C and 6 NYCRR Part 750, include requirements pertaining to monitoring, recording, reporting, and compliance responsibilities. These "general conditions" of permits are typically specified, summarized, or referenced on the first and last pages of the permit.

OUTFALL & RECEIVING WATER LOCATION TABLE

Permit Number	Permittee Name	Facility Name	Location (C, T, V)	County	Industrial Code	Major/Sub Basin
NY 003 0317	Onondaga County	Oak Orchard Wastewater Treatment Plant	Lysander (T)	Onondaga	4952	07-03

Outfall Information					**Receiving Water Information**								
	Latitude	Longitude	Flow Rate (MGD)					*For use by WQ Engineer* - Critical Data					
Outfall #	°, ', "	°, ', "	Average	Design	Name	Class	Water Index Number	7Q10 (cfs)	30Q10 (cfs)	Dilution	pH	Temp (°C)	Hardness (mg/l)
001	43,12,18.6	76,12,49.7	5.7	10.0	Oneida River	B	ONT 66-11	123(s) 199(w)	143(s) 680(w)	See below	8.3	25	150
				(15.47 cfs)				Acute Dilution Summer/winter		5.0 / 7.4			
								Chronic Dilution Summer/winter		8.95 / 13.9			
								HEW-Dilution Summer/winter		10.24 / 45			

HEW- Human, Aesthetic, Wildlife Protection
(s) = summer
(w) = winter

POLLUTANT SUMMARY TABLE(S)

Outfall	001

Type of Treatment:	This facility provides advanced secondary treatment of wastewater using pure oxygen activated sludge process. Raw influent wastewater enters the Headworks Building where it is split into two (2) separate channels. The wastewater then flows into one of two (2) covered aerated grit chambers, collected grit is removed via a mechanical clam shell removal system. The flow then undergoes screenings removal, passing through one of two (2) automatic screen rakes. Collected screenings and grit are stored in dumpsters, removed by trucks and eventually hauled to landfill. Wastewater flows through the screen rakes into a channel were the flow is split and directed to two (2) primary clarifier structures, which provide for removal of settled solids and floating material. The two (2) separate rectangular primary clarifiers, using a traveling cog bridge with flights and chain, provide for removal of solids and skimming of floating scum and grease. Primary effluent then flows via gravity to two (2) covered pure oxygen activated sludge tanks where biological breakdown of nutrients is accomplished. The activated sludge (Mixed Liquor) then flows via gravity into six (6) separate rectangular secondary clarifier tanks, were settling of solids occurs with the help of a cationic polymer. Flights and chain are used in these clarifiers for removal of settled solids and skimming of floating scum and grease. Secondary effluent passes through a 3 foot Parshall flume and then through two (2) aerated lagoons, prior to flowing into the chlorine contact tank, where seasonal disinfection is accomplished using sodium hypochlorite.
and	
Sludge Handling:	Solids from the primary clarifiers and the secondary clarifiers settle out in the two (2) Gravity Thickener Tanks. Collected solids from these tanks are removed via tanker truck to the Metropolitan-Syracuse WWTP for further treatment.

Effluent Parameter (Units) (concentration units - mg/l, ug/l or ng/l; mass units - lbs/d or g/d)	**Existing Effluent Quality**				**Technology Based Effluent Limit**				**Water Quality Based Effluent Limit**				**Permit Basis** (T or WQ)
	concentration		mass		Conc.	Mass	Type	Basis	AWQC conc.	Effluent conc.	Effluent mass	Effluent Type	
	Avg	Max	Avg	Max									
Whole Effluent Toxicity (WET) TESTING									Recommended?		YES		WQ
Flow Rate, units = MGD	Average	5.7	Maximum	8.2	10		MA	R - BPJ, TOGS 1.3.3					T
pH (SU)	Minimum	6.1	Maximum	7.5	6.0 – 9.0		Range	R - 40 CFR133. 102(c)	6.5 – 8.5	TBEL – OK (High Dilution)			T
$CBOD_5$ (30 day), mg/l, lbs/day (limits apply Nov 1st to June 15th)	2.63	5	142	300	25	2085	30 day mean	R - 40 CFR 133.102	DO= 4.0	Apply TBEL			T
$CBOD_5$ (7 day), mg/l, lbs/day (limits apply Nov 1st to June 15th)	4.9	12	281	1000	40	3336	7 day mean	R - 40 CFR 133.102					T
$CBOD_5$ (30 day), mg/l, lbs/day (limit applies June 16th to Oct 31st)	2.63	5	142	300	25	2085	30 day mean	40 CFR 133.102	DO= 4.0	Apply UOD limit			T
$CBOD_5$ (7 day), mg/l, lbs/day (limit applies June 16th to Oct 31st)	4.9	12	281	1000	40	3336	7 day mean	40 CFR 133.102					T
UOD, (daily max), mg/l, lbs/day (limit applies June 16th to Oct 31st)	-	-	776	2000	-	4289	30 day mean	R	DO= 4.0		4289.0	DM	WQ

TSS (30 day), mg/l, lbs/day	3.6	5	168	300	30	2500	30 day mean	R - 40 CFR 133.102	Narrative Std.		++		T
TSS (7 day), mg/l, lbs/day	4.6	9	229	700	45	3750	7 day mean	R - 40 CFR 133.102					T
Solids, Settleable, ml/l	0.1	0.1	-	-	0.3	-	DM	R - TOGS 1.3.3	Narrative Std.		++		T
Effluent Disinfection: [ ] All Year [X] Seasonal from: MAY 15th to OCT 15th													
Fecal Coliform(30 day/7 day), #/100 ml	3.4/98.3	15/1700	-	-	200/400	-	GM	R - 6NYCRR 703.4	200#	200#	-------	-----	T
Chlorine, Total Residual, mg/l	0.26	0.32	11.9	17.5	0.35		DM	R	0.005	0.045	-------	DM	WQ
Phosphorus, Total (mo. avg), mg/l, lbs/day	0.14	0.53	-	-	1.0	-	MA	R – TOGS 1.3.3	1.0-GLWQA	1.0	-------	MA	WQ
Dissolved Oxygen (minimum), mg/l (limit applies June 16th to Oct 31st)	6.54 (avg)	4.6 (min)	-	-	5.0	-	D Min	R	DO= 4.0	2.0	------	Min.	WQ
Ammonia (as NH_3) (monthly average) (Summer: applies June 16th to Oct 31st)	1.7	7.3	76	329		400	MA	R	0.41*	3.69	307	MA	WQ
Ammonia (as NH_3) (monthly average) (Winter: applies November 1st to June 15th)	-	-	-	-	-	-	-	-	0.59*	24.3	2026.0	MA	WQ
TKN, mg/l	5.1	12.9	-	-	Monitor	-	DM	R	-	-	-	-	T

Notes: ++ - Apply TBEL
*=background concentration = 0.05mg/l

Outfall	001 (continued)

Effluent Parameter (Units) (concentration units - mg/l, ug/l or ng/l; mass units - lbs/d or g/d)	**Existing Effluent Quality**				**Technology Based Effluent Limit**					**Water Quality Based Effluent Limit**				**Permit Basis** (T or WQ)
	Concentration		mass					PQL		AWQC	Effluent			
	Avg	Max	Avg/Max	95%/99%	Conc.	Mass	Type	Conc.	Basis	conc.	conc.	mass	Type	
Iron, Total Recoverable, lbs/day	-	-	5.8/11.2	8.8/10.6	Monitor	Monitor	DM		BPJ (99%)	No Std./Guidance Value				T
Chloroform, (lbs/day)	-	4.5*	0.2/0.7	0.45/0.57	Monitor	1.3	AL		R - BPJ	No Std./Guidance Value				T
Cadmium, Total Recoverable (lbs/day)	-	<0.0008	0.09/0.4	0.26/0.34	Monitor	0.4	AL		R - BPJ (99%)	0.0027-HFC	0.028	2.3	MA	T
Chromium, Total Recoverable (lbs/day)	-	< 0.008*	0.4/0.65	0.7/0.85	Monitor	1.9	AL		R - BPJ	0.033-C	0.925	77	DM	T
Copper, Total Recoverable (lbs/day)	-	<0.01	0.6/0.9	0.8/0.9	Monitor	1.8	AL		R - BPJ	0.0197-A	0.103	8.6	DM	T
Nickel, Total Recoverable (lbs/day)	-	<0.015	0.9/1.2	1.2/1.4	Monitor	2.9	AL		R - BPJ	0.0733-C	0.658	55	DM	T
Zinc, Total Recoverable (lbs/day)	-	0.0473	1.9/2.4	2.6/2.9	Monitor	5.4	AL		R - BPJ	0.1652-A	0.838	70	DM	T
Arsenic, Total Recoverable (lbs/day)	-		0.16/0.45	0.37/0.47	Monitor	Monitor			BPJ (STHI in last permit – all non-detect)	0.150-C	1.34	112	DM	T
Phenols, Total (lbs/day)	-	0.0121*	0.9/2.8	2.1/2.9	Monitor	Monitor			BPJ (STHI in last permit – all non-detect)	0.005-E	0.051	4.3	MA	T
Mercury, Total (ng/l)	-	0.68**	-	-	50	-	DM		TOGS 1.3.10	0.0007 ug/ l-HFC	50ng/l –TOGS 1.3.10		DM	WQ/T

Notes: * Sample result from Priority Pollutant sampling provided with the 2012 NY-2A SPDES application; Units for WQ Std. & Effluent Limit- mg/l
** Mercury sample collected on 4/11/2012 (analyzed using EPA Method 1631)

Existing Effluent Quality (Mass based data) obtained from DMRs (2009-2012)

APPENDIX H

PHOTOGRAPHIC INVENTORY

Figure 1: Sludge Process Room

November 12, 2024



Figure 2: Sludge Process Control Room Equipment

November 12, 2024





Figure 3: Heat Exchangers/Boilers

November 12, 2024



Figure 4: Polymer Feed System

November 12, 2024



Figure 5: Aluminum Sulfate Chemical Storage

November 12, 2024



Figure 6: Headworks

November 12, 2024



Figure 7: Influent Slide Gate and Mechanical Screen

November 12, 2024



Figure 8: Odor Control

November 12, 2024





Figure 9: Primary Clarifiers

November 12, 2024



Figure 10: Aeration Basins

November 12, 2024



Figure 11: WAS Pump Controls

November 12, 2024



Figure 12: Secondary Clarifiers

November 12, 2024



Figure 13: Oxidative Liquor Pumps and Plant Water Pump and Strainer

November 12, 2024



Figure 14: Oxygen Generation Air Compressors

November 12, 2024



Figure 15: Return Sludge Pumps

November 12, 2024



Figure 16: WAS Pumps

November 12, 2024



Figure 17: Primary Sludge Pumps

November 12, 2024



Figure 18: Thickened Sludge Blowers

November 12, 2024



Figure 19: Sampling Station

November 12, 2024



Figure 20: Thickened Sludge Pumps

November 12, 2024



Figure 21: Sludge Thickener

November 12, 2024



Figure 22: Polishing Lagoons

November 12, 2024



Figure 23: Chlorine Contact Tanks

November 12, 2024



Figure 24: Dechlorination Contact Tanks

November 12, 2024



Figure 25: Chlorination Blowers

November 12, 2024



Figure 26: Hypo Chemical Storage/Pumping

November 12, 2024



APPENDIX I

OOWWTP UPGRADE AND BIOSOLIDS FACILITY DRAFT 25 PERCENT DESIGN DRAWINGS

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

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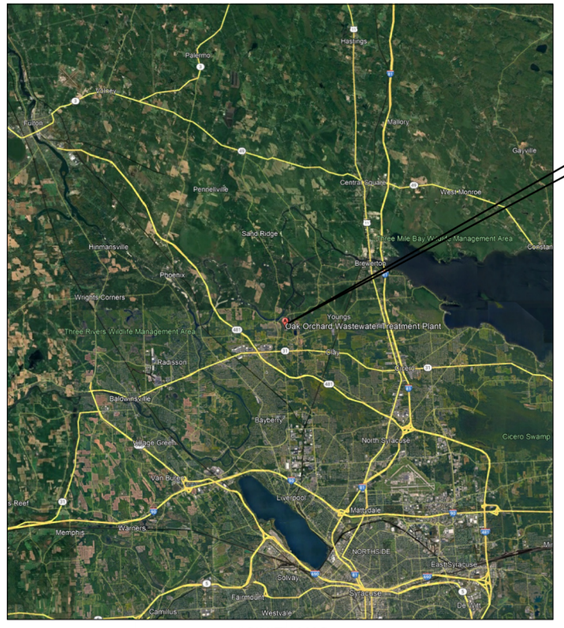
JUNE 2025

VOLUME 2 OF 4



VICINITY MAP



LOCATION MAP

REV	DATE	BY	DESCRIPTION
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DESIGNED	S. DAVIS
DRAWN	A. CHARDE
CHECKED	T. SHIMADA
DATE	JULY 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

GENERAL

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SHEET NO. 1 OF 251

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FILE NAME:

DRAWING NO.	DRAWING TITLE
GENERAL	
00G01	COVER SHEET
00G02	DRAWING INDEX - 1
00G03	DRAWING INDEX - 2
00G04	NOTES, LEGEND, AND SYMBOLS
00G05	ABBREVIATIONS
00G06	SITE PLAN DEMO
00G07	SITE PLAN
00G08	HYDRAULIC PROFILE
00G09	PROCESS FLOW DIAGRAM
ARCHITECTURAL	
10A01	HEADWORKS - PLAN AT EL. 395.00'
10A02	HEADWORKS - LOW ROOF PLAN AT EL. 425.17'
10A03	HEADWORKS - HIGH ROOF PLAN AT EL. 432.50'
10A04	HEADWORKS - EAST ELEVATION
10A05	HEADWORKS - WEST ELEVATION
10A06	HEADWORKS - NORTH ELEVATION
10A07	HEADWORKS - SOUTH ELEVATION
28A01	SOLIDS HANDLING ODOR CONTROL - PLAN AT EL. 392.00'
28A02	SOLIDS HANDLING ODOR CONTROL - ELEVATIONS
28A03	SOLIDS HANDLING ODOR CONTROL - ELEVATIONS
30A01	FINE SCREENING - PLAN AT EL. 391.50'
30A02	FINE SCREENING - PLAN AT EL. 395.98'
30A03	FINE SCREENING - EAST ELEVATION
30A04	FINE SCREENING - NORTH ELEVATION
30A05	FINE SCREENING - SOUTH ELEVATION
30A06	FINE SCREENING - WEST ELEVATION
33A01	BLOWER BUILDING - PLAN AT EL. 390.50'
33A02	BLOWER BUILDING - ELEVATIONS
33A03	BLOWER BUILDING - SECTION
43A01	MEMBRANE BUILDING - PLAN - EL. 390.50'
43A02	MEMBRANE BUILDING - NORTH AND SOUTH ELEVATION
43A03	MEMBRANE BUILDING - EAST AND WEST ELEVATION
51A01	DIGESTER COMPLEX - PLAN AT EL. 394.21'
51A02	DIGESTER COMPLEX - ELEVATIONS
51A03	DIGESTER COMPLEX - SECTIONS
53A01	GAS FLARE AND GAS STORAGE - PLAN AT EL. 390.50'
53A02	GAS FLARE AND GAS STORAGE - ELEVATIONS
54A01	THICKENING-DEWATERING - PLAN AT EL. 393.58'
54A02	THICKENING-DEWATERING - PLAN AT EL. 414.58'
54A03	THICKENING-DEWATERING - PLAN AT EL. 430.14'
54A04	THICKENING-DEWATERING - SOUTH ELEVATION
54A05	THICKENING-DEWATERING - EAST AND WEST ELEVATIONS
56A01	PRIMARY SLUDGE GRAVITY THICKENERS - BASEMENT FLOOR PLAN AT EL. 376.42'
56A02	PRIMARY SLUDGE GRAVITY THICKENERS - FIRST FLOOR PLAN AT EL. 390.50'
56A03	PRIMARY SLUDGE GRAVITY THICKENERS - ELEVATIONS
57A01	HSW AND MSW RECEIVING STATIONS - PLAN AT EL. 393.20'
57A02	HSW AND MSW RECEIVING STATIONS - ELEVATIONS
58A01	DRYER BUILDING - PLAN AT EL. 390.50'
58A02	DRYER BUILDING - ELEVATIONS - 1
58A03	DRYER BUILDING - ELEVATIONS - 2
59A01	FERRIC CHLORIDE BUILDING - PLAN AT EL. 390.50' AND SECTION
59A02	FERRIC CHLORIDE BUILDING - ELEVATIONS
STRUCTURAL	
10S01	HEADWORKS - BASEMENT PLAN AT EL. 382.00'
10S02	HEADWORKS - OVERALL PLAN AT EL. 395.00'
10S03	HEADWORKS - OVERALL PLAN AT EL. 407.00'
10S04	HEADWORKS - ROOF PLAN AT EL. 432.50'
10S05	HEADWORKS - SECTION 1
10S06	HEADWORKS - SECTION 2
10S07	HEADWORKS - SECTION 3
21S01	PRIMARY CLARIFIER TANKS - PLAN AT EL. 396.00'
21S02	PRIMARY CLARIFIER TANKS - SECTIONS
28S01	SOLIDS HANDLING ODOR CONTROL - PLAN AT EL. 392.00'
28S02	SOLIDS HANDLING ODOR CONTROL - BIOFILTER CELL SECTIONS
29S01	RETURN FLOW PUMP STATION - PLAN AT EL. 374.00'
29S02	RETURN FLOW PUMP STATION - PLAN AT EL. 384.00'
29S03	RETURN FLOW PUMP STATION - PLAN AT EL. 390.00'
29S04	RETURN FLOW PUMP STATION - SECTION
30S01	FINE SCREENING - PLAN AT EL. 386.90'
30S02	FINE SCREENING - PLAN AT EL. 391.50'
30S03	FINE SCREENING - PLAN AT EL. 395.98'
30S04	FINE SCREENING - SECTION 1
30S05	FINE SCREENING - SECTION 2
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31S02	BIOREACTORS - PLAN AT EL. 370.00' - 2
31S03	BIOREACTORS - PLAN AT EL. 390.00'
31S04	BIOREACTORS - ENLARGED PLAN & SECTIONS
33S01	BLOWER BUILDING - PLAN AT EL. 390.50'
43S01	MEMBRANE BUILDING - PLAN EL. 390.50'
43S02	MEMBRANE BUILDING - PLAN EL. 373.50'
43S03	MEMBRANE BUILDING - SECTION
51S01	DIGESTER COMPLEX - PLAN AT EL. 381.21'
51S02	DIGESTER COMPLEX - PLAN AT EL. 394.21'
51S03	DIGESTER COMPLEX - SECTIONS
53S01	DIGESTER GAS HANDLING, STORAGE, AND FLARE - FLOOR PLAN AT EL. 390.50'
53S02	DIGESTER GAS HANDLING, STORAGE, AND FLARE - SECTION
54S01	THICKENING-DEWATERING - PLAN AT EL. 393.58'
54S02	THICKENING-DEWATERING - PLAN AT EL. 414.58'
54S03	THICKENING-DEWATERING - PLAN AT EL. 430.14'
54S04	THICKENING-DEWATERING - SECTION 1
54S05	THICKENING-DEWATERING - SECTION 2
54S06	THICKENING-DEWATERING - SECTION 3
56S01	PRIMARY SLUDGE GRAVITY THICKENERS - BASEMENT FLOOR PLAN AT EL. 376.42'
56S02	PRIMARY SLUDGE GRAVITY THICKENERS - FIRST FLOOR PLAN AT EL. 390.50'
56S03	PRIMARY SLUDGE GRAVITY THICKENERS - SECTION
57S01	HSW AND MSW RECEIVING STATIONS - PLAN AT EL. 393.20'
58S01	DRYER BUILDING - PLAN AT EL. 390.50'
58S02	DRYER BUILDING - SECTIONS
59S01	FERRIC CHLORIDE BUILDING - PLAN AT EL. 390.50' AND SECTION
PROCESS MECHANICAL	
00GM01	GENERAL LEGENDS AND SYMBOLS
10M01	HEADWORKS - BASEMENT PLAN AT EL. 382.00'
10M02	HEADWORKS - OVERALL PLAN AT EL. 395.00'
10M03	HEADWORKS - SECTION
10M04	HEADWORKS - ODOR CONTROL PLAN AT EL. 390.50'
21M01	PRIMARY CLARIFIER TANKS - PLAN AT EL- 396-00
28M01	SOLIDS HANDLING ODOR CONTROL - PLAN AT EL. 392.00'
29M01	RETURN FLOW PUMP STATION - PLAN AT EL. 384.00'
29M02	RETURN FLOW PUMP STATION - SECTION
30M01	FINE SCREENING - PLAN AT EL. 391.50'
30M02	FINE SCREENING - PLAN AT EL. 395.98'
30M03	FINE SCREENING - SECTION 1
30M04	FINE SCREENING - SECTION 2
31M01	BIOREACTORS - PLAN AT EL. 370.00'
31M02	BIOREACTORS - PLAN AT EL. 390.00'
31M03	BIOREACTORS - ENLARGED PLAN & SECTIONS
33M01	BLOWER BUILDING - PLAN AT EL. 390.50'
33M02	BLOWER BUILDING - SECTION
43M01	MEMBRANE BUILDING - PLAN AT EL- 373.50'
43M02	MEMBRANE BUILDING - PLAN AT EL- 390.50'
43M03	MEMBRANE BUILDING - SECTIONS 1
43M04	MEMBRANE BUILDING - SECTIONS 2
51M01	DIGESTER COMPLEX - PLAN AT EL. 381.21'
51M02	DIGESTER COMPLEX - PLAN AT EL. 394.21'
51M03	DIGESTER COMPLEX - SECTION
53M01	DIGESTER GAS HANDLING, STORAGE, AND FLARE - PLAN AT EL. 390.50'
53M02	DIGESTER GAS STORAGE - SECTION
54M01	THICKENING-DEWATERING - PLAN AT EL- 393.58'
54M02	THICKENING-DEWATERING - PLAN AT EL- 414.58'
54M03	THICKENING-DEWATERING - PLAN AT EL- 430.14'
54M04	THICKENING-DEWATERING - SECTION 1
54M05	THICKENING-DEWATERING - SECTION 2
54M06	THICKENING-DEWATERING - SECTION 3
56M01	PRIMARY SLUDGE GRAVITY THICKENERS - BASEMENT FLOOR PLAN AT EL. 376.42'
56M02	PRIMARY SLUDGE GRAVITY THICKENERS - FIRST FLOOR PLAN AT EL. 390.50'
56M03	PRIMARY SLUDGE GRAVITY THICKENERS - SECTION
57M01	HSW AND MSW RECEIVING STATIONS - PLAN AT EL. 393.20'
58M01	DRYER BUILDING - PLAN AT EL. 390.50'
58M02	DRYER BUILDING - SECTIONS
59M01	FERRIC CHLORIDE BUILDING - PLAN AT EL. 390.50' AND SECTION
ELECTRICAL	
00GE01	GENERAL LEGEND AND SYMBOL
00GE02	ABBREVIATIONS
10E01	HEADWORKS - ONE - LINE DIAGRAM - 01
10E02	HEADWORKS - ONE - LINE DIAGRAM - 02
10E03	HEADWORKS - ONE - LINE DIAGRAM - 03
10E04	HEADWORKS - ONE - LINE DIAGRAM - 04
20E01	PRIMARY CLARIFIERS - ONE - LINE DIAGRAM - 01
20E02	PRIMARY CLARIFIERS - ONE - LINE DIAGRAM - 02
31E01	MBR BIOREACTORS - ONE - LINE DIAGRAM - 01
31E02	MBR BIOREACTORS - ONE - LINE DIAGRAM - 02
31E03	MBR BIOREACTORS - ONE - LINE DIAGRAM - 03
43E01	MEMBRANE BUILDING - ONE - LINE DIAGRAM
50E01	BIOSOLIDS FACILITY - ONE - LINE DIAGRAM - 01
50E02	BIOSOLIDS FACILITY - ONE - LINE DIAGRAM - 02
50E03	BIOSOLIDS FACILITY - ONE - LINE DIAGRAM - 03
50E04	BIOSOLIDS FACILITY - ONE - LINE DIAGRAM - 04
57E01	HSW & MS RECEIVING STATIONS - ONE - LINE DIAGRAM - 01
57E02	HSW & MS RECEIVING STATIONS - ONE - LINE DIAGRAM - 02
57E03	HSW & MS RECEIVING STATIONS - ONE - LINE DIAGRAM - 03
58E01	DRYER BUILDING - ONE - LINE DIAGRAM - 01
58E02	DRYER BUILDING - ONE - LINE DIAGRAM - 02
58E03	DRYER BUILDING - ONE - LINE DIAGRAM - 03

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED S. DAVIS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

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FILE NAME:

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00GN01	SYMBOLS AND ABBREVIATIONS 1
00GN02	SYMBOLS AND ABBREVIATIONS 2
00GN03	SYMBOLS AND ABBREVIATIONS 3
00GN04	SYMBOLS AND ABBREVIATIONS 4
00GN05	SCHEMATIC SYMBOLS
00GN06	EQUIPMENT TAGGING
10N01	P&ID - HEADWORKS INFLUENT CHANNEL
10N02	P&ID - HEADWORKS COMMON SCREEN EFFLUENT CHANNEL
10N03	P&ID - BAR SCREENS
10N04	P&ID - WASHER COMPACTOR NO. 1
10N05	P&ID - GRIT REMOVAL - 1
10N06	P&ID - GRIT REMOVAL - 2
10N07	P&ID - GRIT PUMP NO.1
10N08	P&ID - GRIT CLASSIFIER NO.1
10N09	P&ID - HEADWORKS ODOR CONTROL
21N01	P&ID - TYPICAL PRIMARY CLARIFIER
28N01	P&ID - BIOSOLIDS ODOR CONTROL 1
28N02	P&ID - BIOSOLIDS ODOR CONTROL 2
29N01	P&ID - RETURN FLOW PUMP STATION
30N01	P&ID - FINE SCREENS
30N02	P&ID - FINE SCREENINGS WASH COMPACTOR AND CONVEYANCE
30N03	P&ID - FINE SCREENS ODOR CONTROL
31N01	P&ID - BNR BASIN TYPICAL 1
31N02	P&ID - BNR BASIN TYPICAL 2
31N03	P&ID - BNR BASIN TYPICAL 3
31N04	P&ID - MEMBRANE AIR SCOUR BLOWERS TYPICAL
31N05	P&ID - MEMBRANE AIR HEADER 1
31N06	P&ID - MEMBRANE AIR HEADER 2
31N07	P&ID - MEMBRANE SYSTEM AIR COMPRESSORS
31N08	P&ID - MEMBRANE TANKS COMMON INFLUENT CHANNEL
31N09	P&ID - MEMBRANE TRAIN NO.1
31N10	P&ID - MEMBRANE TRAIN PERMEATE PUMP 1
31N11	P&ID - MEMBRANE TRAIN PERMEATE PUMP 2
31N12	P&ID - CIP BACK PULSE PUMPS TYPICAL
31N13	P&ID - CIP - BACK PULSE PUMPS DISTRIBUTION
31N14	P&ID - CITRIC ACID STORAGE TANKS
31N15	P&ID - CITRIC ACID FEED PUMPS
31N16	P&ID - SODIUM HYPOCHLORITE TANK
31N17	P&ID - SODIUM HYPOCHLORITE PUMP
33N01	P&ID - AERATION BLOWERS TYPICAL
33N02	P&ID - LARGE BUBBLE MIXING SYSTEM TYPICAL
43N01	P&ID - UV REACTORS INLET HEADER
43N02	P&ID - UV REACTOR 1
43N03	P&ID - UV REACTOR 2
43N04	P&ID - RAS WET WELL AND PUMPS
43N05	P&ID - WASFOAM WET WELL AND PUMPS
51N01	P&ID - DIGESTER 1 TANK AND MIXING
51N02	P&ID - SLUDGE HEATING
51N03	P&ID - DIGESTERS HOT WATER LOOPS
51N04	P&ID - DIGESTER 1 GAS SYSTEM
51N05	P&ID - SLUDGE TRANSFER PUMPS
51N06	P&ID - DIGESTER BOILERS
51N07	P&ID - DIGESTER PRIMARY HEAT LOOPS
51N08	P&ID - DIGESTER CONTROL BUILDING SUMP
51N09	P&ID - SLUDGE STORAGE TANK
53N01	P&ID - WASTE GAS FLARE
53N02	P&ID - BIOGAS STORAGE SYSTEM
53N03	P&ID - BIOGAS CONDITIONING SYSTEM
54N01	P&ID - GRAVITY BELT THICKENER 1
54N02	P&ID - TWAS PUMPS
54N03	P&ID - THICKENER POLYMER BLENDERS
54N04	P&ID - DEWATERING CENTRIFUGE 1
54N05	P&ID - CAKE BELT CONVEYORS
54N06	P&ID - CAKE HOPPER 1
54N07	P&ID - CAKE HOPPER 2
54N08	P&ID - NEAT POLYMER STORAGE
54N09	P&ID - CENTRIFUGE POLYMER BLENDER SKIDS
54N10	P&ID - POLYMER AGING TANKS AND CENTRIFUGE POLYMER FEED PUMPS
56N01	P&ID - PRIMARY SLUDGE SCREEN 1
56N02	P&ID - GRAVITY THICKENER 1
56N03	P&ID - THICKENED PRIMARY SLUDGE PUMPS
56N04	P&ID - THICKENER CONTROL BUILDING SUMP PUMPS
57N01	P&ID - HSW TANK 1
57N02	P&ID - HSW HEATING
57N03	P&ID - HSW HOT WATER PUMP
57N04	P&ID - HSW TRANSFER PUMPS
57N05	P&ID - MS TANK 1
57N06	P&ID - MS HEATING
57N07	P&ID - MUNICIPAL HEX HOT WATER PUMPS
57N08	P&ID - MUNICIPAL SOLIDS TRANSFER PUMPS
57N09	P&ID - BLEND TANK 1
57N10	P&ID - BSL HEATING
57N11	P&ID - BLEND HEX HOT WATER PUMPS
57N12	P&ID - BLEND TANK TRANSFER PUMPS
58N01	P&ID - BIOSOLIDS DRYER 1 - 01
58N02	P&ID - BIOSOLIDS DRYER 1 - 02
58N03	P&ID - BIOSOLIDS DRYER 1 - 03
59N01	P&ID - FERRIC CHLORIDE STORAGE AND PUMPING

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED S. DAVIS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

carollo®

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

GENERAL

DRAWING INDEX - 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 00G03

SHEET NO. 3 OF 251

LAST SAVED BY:

PROJECT NO.

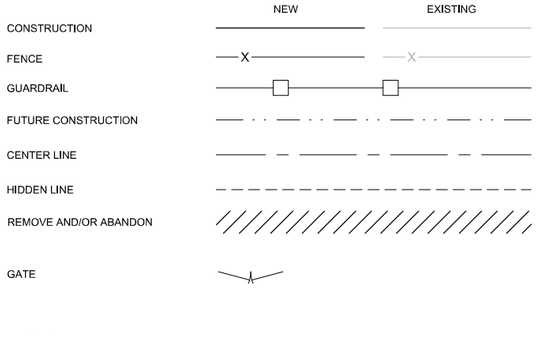
FILE NAME:

GENERAL NOTES

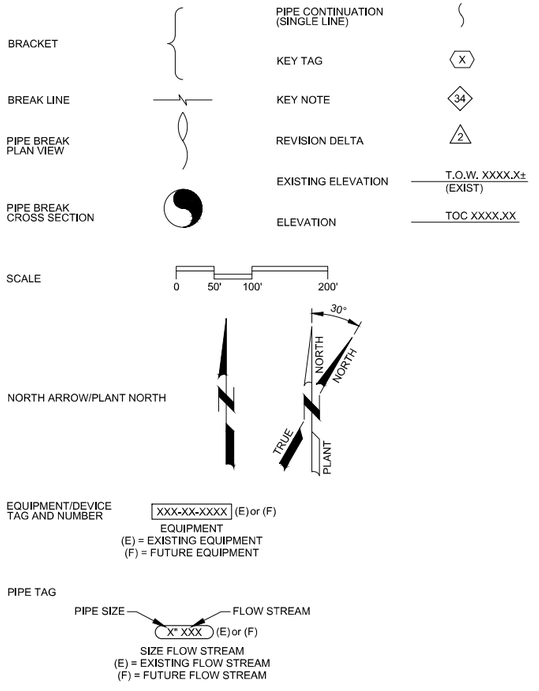
1. FOLLOWING NOTES ARE GENERAL AND APPLY TO ALL SHEETS OF THESE CONTRACT DOCUMENTS AS IF THEY WERE WRITTEN IN THEIR ENTIRETY ON EACH SHEET.
2. THIS SUBMITTAL IS INTENDED AS A REPRESENTATIVE DESIGN ONLY. VERIFICATION OF DESIGN IS THE REPONSIBILITY OF THE FINAL DESIGN CONSULTANT.
3. CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK AND SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING ALL EXISTING CONDITIONS INCLUDING LOCATION AND DIMENSIONS OF ALL EXISTING CONSTRUCTION AND UTILITIES. CONTRACTOR SHALL NOTIFY ENGINEER IF THERE IS A CONFLICT BETWEEN THE CONTRACT DOCUMENTS AND EXISTING CONSTRUCTION BEFORE PROCEEDING WITH WORK.
4. UNLESS DETAILED, SPECIFIED, OR OTHERWISE INDICATED ON THE DRAWINGS, CONSTRUCTION SHALL BE AS INDICATED IN THE APPLICABLE TYPICAL DETAILS AND GENERAL NOTES. TYPICAL DETAILS SHALL APPLY EVEN THOUGH NOT REFERENCED AT SPECIFIC LOCATIONS ON DRAWINGS.
5. WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF WORK. DETAILS SHALL BE IN THE SAME AS FOR OTHER SIMILAR WORK.
6. CONTRACTOR SHALL COMPLY WITH LOCAL CONSTRUCTION STORM WATER DISCHARGE REGULATIONS AND REQUIREMENTS.
7. PRIOR TO EXCAVATION FOR NEW STRUCTURES, ELECTRICAL CONDUIT, FABRICATION OF NEW PIPING AND/OR OTHER PROPOSED UTILITIES, CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING PIPING AND UTILITIES IN THE CONSTRUCTION AREA. THE CONTRACTOR SHALL TEMPORARILY RELOCATE CONFLICTING EXISTING UTILITIES AT TIE-IN/CONNECTION LOCATIONS AND REINSTALL THEM AS REQUIRED TO ELIMINATE THE CONFLICT AT NO ADDITIONAL COST TO THE OWNER.
8. ALL PIPELINES 12" AND LARGER SHALL HAVE A MINIMUM COVER OF 36" UNLESS THE COVER DEPTH IS SPECIFICALLY INDICATED ON THE DRAWINGS. PIPE SMALLER THAN 12" SHALL HAVE A MINIMUM COVER OF 30" UNLESS NOTED OTHERWISE. PIPES SHALL BE ROUTED AS SHOWN UNLESS MINOR REVISIONS ARE NECESSARY TO MISS EXISTING PIPES, STRUCTURES, ETC. CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING ALL FITTINGS AND ADAPTERS REQUIRED TO MAKE THE ROUTING CHANGES AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR SHALL INCLUDE COST FOR THIS IN THE BID.
9. EXISTING FACILITY AND UTILITY INFORMATION SHOWN ON THE DRAWINGS WAS OBTAINED FROM AVAILABLE RECORDS OR ELECTRONIC FILES. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR FACILITIES AND UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS, SIZES, MATERIAL TYPES, AND ELEVATIONS SHOWN AROUND OR NEAR AREAS OF NEW CONSTRUCTION PRIOR TO START OF CONSTRUCTION.
10. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT FROM DAMAGE EXISTING FACILITIES AND UTILITIES SHOWN OR NOT SHOWN THAT ARE TO REMAIN IN PLACE. ALL FACILITIES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED TO THE ORIGINAL OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE WITHOUT ADDITIONAL COMPENSATION.
11. CONTRACTOR SHALL MAKE CONNECTIONS TO EXISTING PIPE, EQUIPMENT, ETC. AS REQUIRED AND SHALL PROVIDE ALL FITTINGS, ADAPTERS, AND APPURTENANCES REQUIRED TO MAKE THE CONNECTIONS. PROVIDE ALL SUPPORTS REQUIRED FOR A RIGIDLY SUPPORTED COMPLETE AND WORKING SYSTEM.
12. ADJUST ALL VALVE BOXES, VAULTS, PULL BOXES, AND MANHOLES TO FINISHED GRADE UNLESS OTHERWISE SHOWN OR DIRECTED. MANHOLES IN OPEN FIELDS SHALL BE SET TWELVE INCHES ABOVE FINISHED GRADE AND VAULTS SHALL BE SIX INCHES ABOVE FINISHED GRADE.
13. THE CONTRACTOR SHALL CONTACT THE PROPER UTILITY REPRESENTATIVE AS FOLLOWS FOR QUESTIONS OR COORDINATION OF CONSTRUCTION RELATED TO EXISTING UTILITIES.

    STATE/REGION/MUNICIPALITY SPECIFIC: 1-800-XXX-XXXX
14. CONTRACTOR SHALL VERIFY THAT PIPING SHOWN TO BE ABANDONED OR AS ABANDONED PREVIOUSLY IS NO LONGER IN SERVICE. LINES IN SERVICE SHALL BE MAINTAINED UNTIL NO LONGER REQUIRED BY THE PLANT.
15. ALL EXISTING PIPES THAT ARE TO BE ABANDONED IN PLACE OR REMOVED MAY NOT BE SHOWN. WHERE PIPING IS TO BE ABANDONED AND MUST REMAIN IN SERVICE UNTIL COMPLETION OF OTHER PHASES OF WORK, AND IT CONFLICTS WITH NEW PIPING, TEMPORARILY RELOCATE PIPING AS REQUIRED TO MAINTAIN SERVICE BY THE PLANT.
16. CONTRACTOR SHALL REROUTE THE EXISTING PIPING IF REQUIRED TO MISS THE PROPOSED STRUCTURES. THE EXISTING PIPE SHALL REMAIN IN SERVICE UNTIL NEW PIPING IS READY TO BE PLACED INTO SERVICE. DOWNTIME SHALL BE A MAXIMUM OF 2 HOURS, UNLESS SPECIFIED OR SHOWN OTHERWISE.
17. ALL SIDEWALKS TO BE 3'-0" WIDE UNLESS SHOWN OTHERWISE.
18. THE CONTRACTOR SHALL TAKE SPECIAL PRECAUTIONS IN THE VICINITY OF ANY OVERHEAD ELECTRIC LINES. CONTRACTOR SHALL ABIDE BY THE NATIONAL ELECTRIC CODE AND ANY REQUIREMENT BY THE OWNER OF THE ELECTRIC LINES.
19. PROVIDE ALL SHEETING/SHORING REQUIRED TO PROTECT EXISTING STRUCTURES, PIPES AND FACILITIES.
20. CONTRACTOR SHALL VERIFY LOCATION OF ALL ARCHITECTURAL, MECHANICAL, AND ELECTRICAL ITEMS BEFORE PLACING ANY STRUCTURAL STEEL OR CONCRETE. ALSO, STRUCTURAL DIMENSIONS AND OPENINGS CONTROLLED BY ARCHITECTURAL, MECHANICAL, OR ELECTRICAL EQUIPMENT SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
21. MECHANICAL AND ELECTRICAL EQUIPMENT SUPPORTS, ANCHORAGES, OPENINGS, RECESSES, AND REVEALS NOT SHOWN ON THE STRUCTURAL DRAWINGS, THAT ARE REQUIRED BY OTHER CONTRACT DRAWINGS, SHALL BE PROVIDED PRIOR TO CASTING CONCRETE.

LINE WORK



SYMBOLS



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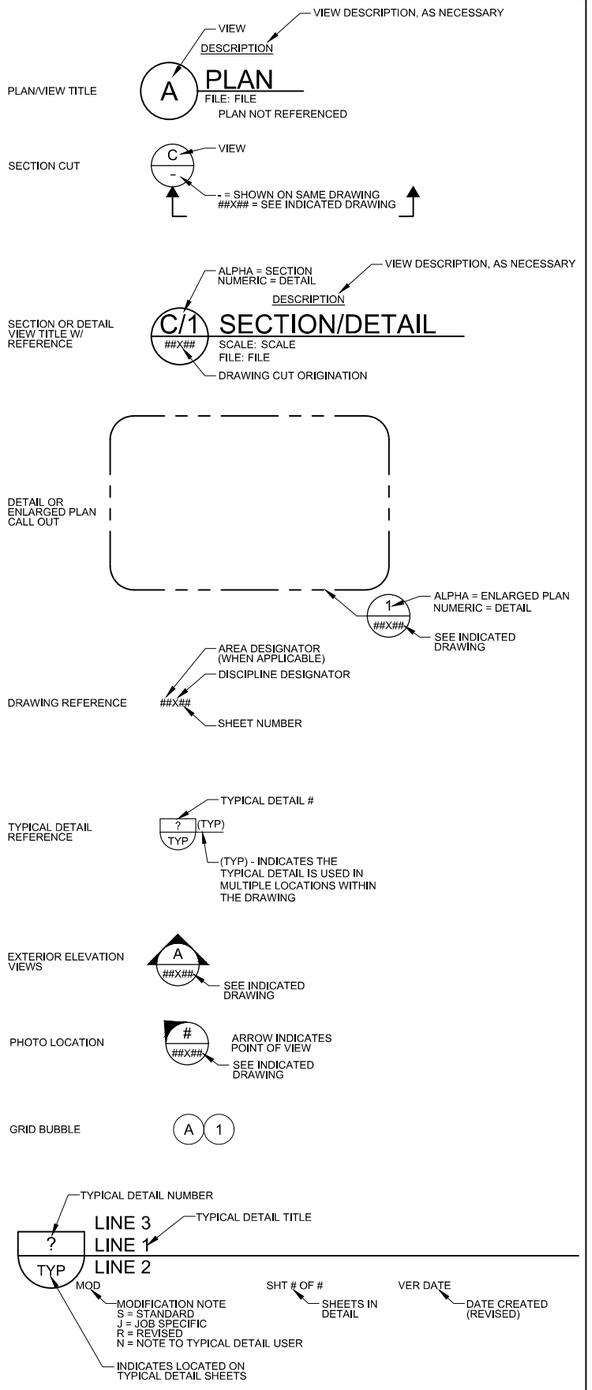
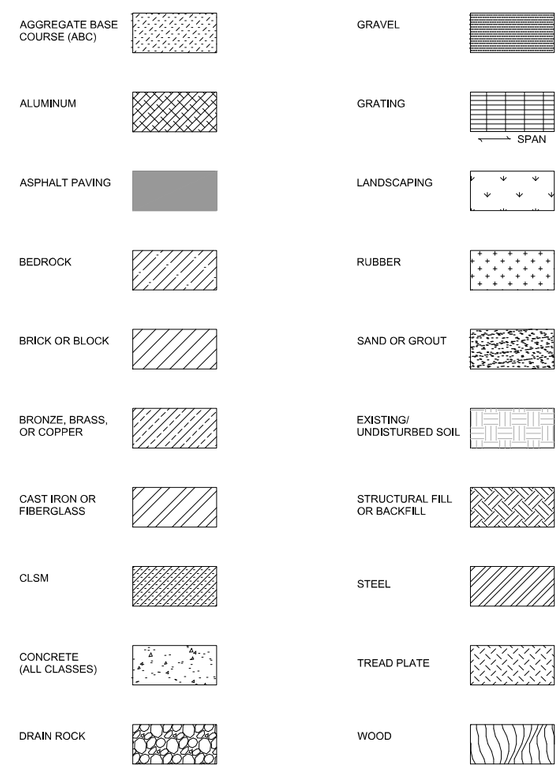
DETAIL REFERENCES



HATCH PATTERNS



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED S. DAVIS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
GENERAL
NOTES, LEGEND, AND SYMBOLS

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 00G04
SHEET NO. 4 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:

@	AT (MEASUREMENT)
△	DEFLECTION ANGLE, CENTRAL ANGLE
#	NUMBER (REBAR Ø)

A

AB	ADHESIVE BOND
AC	ASPHALTIC CONCRETE
ACB	AIR CIRCUIT BREAKER
ACI	AMERICAN CONCRETE INSTITUTE
ACU	AIR CONDITIONING UNIT
AD	AREA DRAIN
ADDL	ADDITIONAL
ADJ	ADJACENT, ADJUST, ADJUSTABLE
ADMIN	ADMINISTRATION
ADR	ACCESS DOOR
AED	AREA EQUIPMENT DRAIN
AER	AERAT(ION)(OR)
AFC	AFTERCOOLER
AFF	ABOVE FINISHED FLOOR
AFM	AIR FLOW MONITOR
AHU	AIR HANDLING UNIT
AIC	AIR COMPRESSOR
AIL	AIR INTAKE LOUVER
AIR	AIR PIPE
ALT	ALTERNATE
AL	ALUMINUM
AM	AIR METHOD
ANCH	ANCHOR
ANV	ANGLE VALVE
APPROX	APPROXIMATE, APPROXIMATELY
AR	AIR SCOUR
ARCH	ARCHITECTURAL
ARV	AIR RELEASE VALVE
ASSY	ASSEMBLY
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AVG	AVERAGE
AVV	AIR AND VACUUM VALVE

B

BC	BEGIN CURVE, BRASS CAP, BACK OF CURB, BOLT CIRCLE
BDR	BASIN DRAIN LINE
BF	BLIND FLANGE
BFG	BELOW FINISHED GRADE
BFP	BELT FILTER PRESS
BFV	BUTTERFLY VALVE
BG	BREAK GLASS HAND SWITCH
BKW	BACKWASH
BLDG	BUILDING
BLK	BLOCK
BLKHD	BULKHEAD
BLR	PROCESS BLOWER
BM	BEAM, BENCH MARK
BO	BOTTOM OF
BOTT	BOTTOM
BOTTS	BOTTOM SLUDGE
BPV	BACK PRESSURE VALVE
BRG	BEARING
BS	BELL AND SPIGOT
BSP	BLACK STEEL PIPE
BT	BITUMINOUS COATING
BTU	BRITISH THERMAL UNITS
BTWN	BETWEEN
BV	BALL VALVE
BW	BACKWASH
BW	BUTT WELD
BWS	BACKWASH SUPPLY
BWCCP	BAR-WRAPPED CONCRETE CYLINDER PIPE

C

C	CLOSE, CONDUIT CHANNEL (STRUCTURAL)
CA	CONCRETE ANCHOR, CITRIC ACID
CB	CATCH BASIN
CC	CENTER OF CURVATURE, CENTER TO CENTER
CCB	CHLORINE CONTACT BASIN
CCP	CHEMICAL CARRIER PIPE
CDL	CHEMICAL DRAIN LINE
CDT	CONDUIT
CEF	CEILING EXHAUST FAN
CF	CUBIC FEET
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CHEMD	CHEMICAL DRAIN
CHF	CHEMICAL FEEDER
CI	CAST IRON
CIP	CAST IRON PIPE, CLEAN-IN-PLACE
CIPP	CIP PERMEATE
CIPR	CIP RETURN
CIPS	CIP SUPPLY
CIRC	CIRCUMFERENTIAL/CIRCUMFERENCE
CJ	CONSTRUCTION JOINT
CKA	CHECK VALVE, ANGLE
CKB	CHECK VALVE, BALL
CKF	CHECK VALVE, FLAP
CKS	CHECK VALVE, SWING
CL	CENTER LINE
CL	CLASS
CLK	CHAIN LINK
CLD	CHLORINE LEAK DETECTOR
CLL	CHLORINE LIQUID
CLR	CLEAR
CLS	CHLORINE SOLUTION
CLV	CHLORINE GAS (VACUUM)
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CNV	CONVEYOR
CO	CLEANOUT
COL(S)	COLUMN(S)
COMP	COMPRESSION
CON	CONTAINER/CARRIER
CONC	CONCRETE
CONN	CONNECT, CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS OR CONTINUATION OR (D) (OUS)
CORR	CORRUGATE(D), CORROSION
CP	CONTROL POINT, CATIONIC POLYMER
CPLG	COUPLING
CPT	CARPET
CPVC	CHLORINATED POLYVINYL CHLORIDE
CS	CARBON STEEL, CIRCULATING SLUDGE, CAUSTIC SODA
CSP	CHEMICAL SUMP PUMP, CORRUGATED STEEL PIPE
CTE	COAL TAR EPOXY
CTJ	CONTROL JOINT
CTL	CONTROL
CTR	CENTER, CENTERED
CU	CUBIC
CV	CHECK VALVE
CW	COLD WATER
CY	CUBIC YARD

D

D	DEPTH, DIGITAL OR DISCRETE, DRAIN
D/W	DRIVEWAY
DBL	DOUBLE
DEG OR °	DEGREE
DEMO	DEMOLISH, DEMOLITION
DET	DETAIL
DFL	DECANT/FILTRATE
DG	DOOR GRILLE
DIA OR Ø	DIAMETER
DIAG	DIAGONAL
DIF	DIFFUSER
DIG	DIGESTER
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DISCH	DISCHARGE
DIW	DEIONIZED WATER
DL	DEAD LOAD, DRAIN LINE
DLV	DOOR LOUVER
DMP	DAMPER
DMS	DIAPHRAGM SEAL
DN	DOWN
DO	DITTO
DO	DOOR OPENING
DP	DEEP (OR DEPTH)
DPV	DIAPHRAGM VALVE
DR	DOOR, DRAIN
DRN	DRAIN
DRCY	DENITRIFIED RECYCLE
DRT	DRIP TRAP
DRV	DRAIN VALVE
DS	DIGESTED SLUDGE, DOWN SPOUT
DSW	DISTILLED WATER, DOOR SWITCH
DUC	DUST COLLECTOR
DUH	DUCT HEATER UNIT
DW	DISTILLED WATER, DISINFECTED WATER
DWD	DEWATERING DRAIN
DWG(S)	DRAWING(S)
DWL(S)	DOWEL(S)

E

E	EAST
EA	EACH
EC	END OF CURVE
ECU	EVAPORATOR COOLING UNIT
ED	EQUIPMENT DRAIN
EF	EXHAUST FAN, EACH FACE
EFF	EFFLUENT
EG	EXHAUST GRILLE
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
EJR	INJECTOR/EDUCTOR
EL	ELEVATION
ELEC	ELECTRICAL
ELL	ELBOW
EMBED	EMBEDMENT
EMH	ELECTRICAL MANHOLE
EP	EDGE OF PAVEMENT
EPS	EXPANDED POLYSTYRENE
EQ	EQUAL
EQUIP	EQUIPMENT
ER	EXHAUST REGISTER
ES	EACH SIDE
ESEW	EMERGENCY SHOWER AND EYE WASH
ESMT	EASEMENT
ESS	EMERGENCY HAND SWITCH
ET	ELECTRICALLY HEAT TRACED
EUH	ELECTRIC UNIT HEATER
EVR	EVAPORATOR
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY EACH FACE
EWH	ELECTRIC WATER HEATER, EXHAUST
EX	EXISTING
EXIST	EXISTING
EXP	EXPANSION, EXPANSION TANK
EXPO	EXPOSED
EXT	EXTERIOR

F

F	FILTRATE
FA	FRESH AIR
FBW	FILTER BACKWASH
FC	FACE OF CURB, FLEXIBLE COUPLING, FERRIC CHLORIDE
FCA	FLANGE COUPLING ADAPTER
FD	FIRE DAMPER, FLOOR DRAIN, FOUND
FDC	FIRE DEPARTMENT CONNECTION
FDL	FLOOR DRAIN LINE
FDR	FEEDER
FEFF	FINAL EFFLUENT
FG	FLAP GATE
FH	FIRE HYDRANT
FILT	FILTRATE
FIN	FINISH
FIN FL	FINISHED FLOOR
FIN GR	FINISHED GRADE
FL	FLOOR, FLOW LINE
FL	FLANGE
FLA	FOUL AIR
FLD	FILTER DRAIN
FLE	FILTER EFFLUENT
FLEX	FLEXIBLE
FLG	FLANGE, OR FLANGED
FLR	FILTER
FM	FORCE MAIN, FLOW METER
FND	FOUNDATION
FO	FUEL OIL
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPP	FLEXIBLE PLASTIC PIPE
FRP	FIBERGLASS REINFORCED PLASTIC
FRPP	FIBERGLASS REINFORCED PLASTIC PIPE
FS	FAR SIDE
FT OR '	FOOT, FEET
FTG	FOOTING
FTW	FILTER TO WASTE
FV	FLAP VALVE
FW	FLUSHING WATER, FINISHED WATER, FILTERED WATER
FX	FIRE EXTINGUISHER

G

G	GAS, GROUND, GUTTER
GA	GAUGE OR GAGE
GAL	GALLONS
GALV	GALVANIZE(D)
GAV	GRAVITY VENTILATOR
GBT	GRAVITY BELT THICKENER
GEN	GENERAL, GENERATOR
GL	GLASS
GM	GAS METER
GND	GROUND
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
GR	GRADE
GR	GRAVITY METHOD
GRT	GRIT
GRTG	GRATING
GSP	GALVANIZED STEEL PIPE
GV	GATE VALVE

H

H	EXPLOSION-PROOF, HIGH, HORIZONTAL
HAS	HEADED ANCHOR STUD
HB	HOSE BIBB
HDW	HARDWARE
HDWL	HEADWALL
HEF	HOOD EXHAUST FAN
HGT	HEIGHT
HORIZ	HORIZONTAL
HP	HEAT PUMP, HORSEPOWER, HIGH PRESSURE
HPA	HIGH PRESSURE AIR, MIXING AIR
HPC	HIGH PERFORMANCE COATING (SEE SPECS)
HPT	HIGH POINT
HPU	HEAT PUMP UNIT AIR
HR	HANDRAIL, HOSE REEL, HOUR
HSS	HOLLOW STRUCTURAL SECTION (STEEL)
HSS	HEAT SHRINK SLEEVE
HTX	HEAT EXCHANGER
HV	HOSE VALVE
HW	HOT WATER
HWL	HIGH WATER LEVEL
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HYD	HYDRANT

I

IA	INSTRUMENT AIR
ID	INSIDE DIAMETER, INSIDE DIMENSION, IDENTIFICATION
I.F.	INSIDE FACE
IN OR "	INCHES
INCL	INCLUDE, INCLUDING
INF	INFLUENT
INJ	INJECTOR
INSTR	INSTRUMENTATION
INSUL	INSULAT(E)(ED)(ING)(ION)
INT	INTERIOR
INV	INVERT

J

JST	JOIST
JT	JOINT

L

L	ANGLE (STRUCTURAL), LENGTH, LOUVER
LAB	LABORATORY
LAS	LIQUID AMMONIUM SULFATE
LAV	LAVATORY
LB(S)	POUND(S)
LF	LINEAL FEET
LG	LONG
LH	LEFT HAND
LH	LOW HEAD METHOD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LP	LOW PRESSURE
LPA	LOW PRESSURE AIR, AERATION AIR
LPT	LOW POINT
LR	LONG RADIUS
LS	LAB SINK
LT	LEFT
LWL	LOW WATER LEVEL

M

M	MOTOR
MAINT	MAINTENANCE
MAN	MANUAL
MASY	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MD	MOTORIZED DAMPER
MECH	MECHANICAL
MET	METAL
MFR	MANUFACTURER
MG/L	MILLIGRAMS PER LITER
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MIX	MIXER
MJ	MECHANICAL JOINT
ML	MIXED LIQUOR
MOD	MODIFIED
MOIST	MOISTURE
MON	MONUMENT
MOS	MOISTURE SEPARATOR
MPM	METERING PUMP
MS	MOP SINK
MTD	MOUNTED

N

N	NORTH, NEUTRAL
NA OR N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NEV	VALVE, NEEDLE
NG	NATURAL GRADE, NATURAL OR LP GAS
NIC	NOT IN CONTRACT
NO., #	NUMBER
NOM	NOMINAL
NPW	NON-POTABLE WATER
NRCY	NITRIFIED RECYCLE
NS	NEAR SIDE
NTS	NOT TO SCALE

O

O	OPEN
OC	ON CENTER
OD	OUTSIDE DIAMETER, OUTSIDE DIMENSION
OED	OPEN EQUIPMENT DRAIN
O.F.	OUTSIDE FACE
OF	OVERFLOW
OFL	OVERFLOW
OPNG	OPENING
OPP	OPPOSITE
OZ	OUNCE

P

P	POLE
PA	PLANT AIR
PC	POINT OF CURVATURE
PC	PRESSURE CLASS
PCC	PLANT CONTROL CENTER
PCE	PRIMARY CLARIFIED EFFLUENT
PCP	PROGRESSIVE CAVITY PUMP
PE	PLAIN END
PE	POLYETHYLENE
PEE	POLYETHYLENE ENCASEMENT (SEE DIP SPEC)
PERP	PERPENDICULAR
PG	PRESSURE GAUGE
PH	PHASE, PHYSICALLY HANDICAPPED
PI	POINT OF INTERSECTION
PIV	POST INDICATOR VALVE
PL	PLATE, PROPERTY LINE
PLAS	PLASTIC
PLCS	PLACES
PLS	POLYMER SOLUTION
PM	CIRCULATE, PERMEATE
PMP	PUMP
PMR	PERMEATE RETURN
PNL(S)	PANEL(S)
POL	POLYMER
POLY	POLYETHYLENE
POS	POSITION
POW	POTABLE WATER
PP	POWER POLE
PPMV	PARTS PER MILLION (VOLUME)
PRC	POINT OF REVERSE CURVATURE
PREFAB	PREFABRICATED
PRG	PRESSURE REGULATOR
PRI	PRIMARY
PROJ	PROJECTION
PRR	PRESSURE OR VACUUM RELIEF VALVE
PRV	PRESSURE REDUCING VALVE, PRESSURE REGULATION VALVE, PRESSURE RELIEF VALVE
PS	PUMP STATION, PIPE SUPPORT
PSF	POUNDS PER SQUARE FOOT
PSG	PRESSURE GAUGE
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH GAUGE
PT	POINT, POINT OF TANGENCY
PTW	POLYETHYLENE TAPE WRAP
PU	POLYURETHANE
PV	PLUG VALVE
PVC	POINT OF VERTICAL CURVATURE, POLYVINYL CHLORIDE
PVDF	POLYVINYLIDENE FLUORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
PVT	POINT OF VERTICAL TANGENCY
PLW	PLANT WATER
PW	POTABLE WATER

Q

QTY	QUANTITY

R

R	RISER
R/W OR R.O.W.	RIGHT OF WAY
RAD	RADIUS, RADIAL
RAS	RETURN ACTIVATED SLUDGE
RCP	REINFORCED CONCRETE PIPE
RCCP	REINFORCED CONCRETE CYLINDER PIPE
RD	ROOF DRAIN
RDL	ROOF DRAIN LINE
RDOF	ROOF DRAIN OVERFLOW
RECIRC	RECIRCULATING
RED	REDUCER, ROOF EQUIPMENT DRAIN
REF	REFERENCE
REG	REGULATOR, REGULATING
REINF	REINFORCE(D)(ING)(MENT)
REJ	RUBBER EXPANSION JOINT
REQD	REQUIRED
RER	REACTOR
RES	RESERVOIR
REV	REVISION, REVERSE
RF	RETURN FAN
RG	RETURN GRILLE RUBBER GASKET
RH	RIGHT HAND
RHR	RIGHT HAND REVERSE
RHRA	RIGHT HAND REVERSE ACTIVE
RHRB	RIGHT HAND REVERSE BEVEL
RLS	REGISTERED LAND SURVEYOR
RM	ROOM
RO	ROUGH OPENING
ROC	RO CONCENTRATE
ROF	RO FEED
ROFL	RO FLUSH
ROT	ROTAMETER
ROP	RO PERMEATE
RP	RADIUS POINT
RPM	REVOLUTIONS PER MINUTE
RPMP	REINFORCED PLASTIC MORTAR PIPE
RR	RETURN REGISTER
RT	RIGHT
RTF	ROTARY FEEDER
RTU	ROOF TOP UNIT
RUD	RUPTURE DISK
RW	RECLAIMED WATER, REUSE WATER, RAW WATER, HYDRONIC SUPPLY
RWR	RECLAIMED WATER RETURN
RWW	RAW WASTEWATER

S

S	SOUTH, SWITCH, SLOPE
S/W	SIDEWALK
SA	SAMPLE, SULFURIC ACID
SC	SECONDARY CLARIFIER
SCB	SCRUBBER
SCD	SMOKE CONTROL DAMPER
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SCO	SURFACE CLEANOUT
SCR	BAR SCREEN
SCR	SILICON CONTROL RECTIFIER
SD	SMOKE DETECTOR, SPLITTER DAMPER, STORM DRAIN
SDL	SUMP DISCHARGE DRAIN LINE
SDO	SLUDGE DRAWOFF
SE	SECONDARY EFFLUENT
SEC	SECONDARY, SECOND
SECT	SECTION
SED	SEDIMENTATION
SEP	SEPTAGE
SF	SUPPLY FAN
SFW	SOFTENED WATER
SG	SUPPLY GRILLE
SGS	STORE FRONT GLAZING SYSTEM
SH	SODIUM HYDROXIDE
SHC	SODIUM HYPOCHLORITE
SHD	SHOWER DRAIN
SHDR	SOLIDS HANDLING-RECYCLE
SHR	SHOWER
SHT	SHEET
SI	SCALE INHIBITOR
SIM	SIMILAR
SJ	SOLDERED
SK	SKIMMINGS
SL	SLOPE, SLUDGE
SLC	SLUDGE COLLECTOR DRIVE
SLG	SLIDE GATE
SLV	SLEEVE VALVE
SMP	SAMPLER, SUMP PUMP
SN	SUPERNATANT OR SUBNATANT
SOL	SOLUTION
SP	STATIC PRESSURE, SET POINT
SPD	SUMP PUMP DRAIN
SPDT	SINGLE POLE DOUBLE THROW
SPEC(S)	SPECIFICATION(S)
SPL	SPLITTER BOX
SPR	SPARE
SPS	SAMPLE SINK
SPW	SAMPLE WATER
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN(S)	SQUARE INCH(ES)
SR	SHORT RADIUS, SUPPLY REGISTER
SRL	SCRUBBER RECIRCULATION LIQUID (CAUSTIC)
SS	SANITARY SEWER, SELECTOR SWITCH
SSK	SERVICE SINK
SSL	SECONDARY SLUDGE
SST	STAINLESS STEEL
ST	SLUDGE TRANSFER
STA	STATION
STB	STABILIZER
STD(S)	STANDARDS(S)
STM	STORM WATER
STIFF	STIFFENER
STIR	STIRRUPS
STL	STEEL
STM	STEAM
STP	STEEL PIPE
STR	STRAINER
STRUCT	STRUCTURAL
SUPT	PIPE SUPPORT, SUPPORT
SV	SERVICE VALVE, SHUTOFF VALVE, SOLENOID VALVE
SW	SANITARY WASTE, SETTLED WATER
SW	SOLVENT WELD
SYM	SYMMETRICAL
SYN	SYNTHETIC

T

T	TANGENT LENGTH, THERMOSTAT, TIMER, TREAD
T&B	TOP AND BOTTOM
TAS	THREADED ANCHOR STUD
TB	TEST AND BALANCE (HVAC)
TC	TOP OF CURB
TCV	TEMPERATURE CONTROL VALVE
TDR	TIME DELAY RELAY, TOWEL DISPENSER/RECEPTACLE
THK	THICKENER, THICKNESS, THICK
TKS	THICKENED SLUDGE
TMP	TEMPERATURE
TNK	TANK
T.O.	TOP OF
TOC	TOP OF CONCRETE
TOG	TOP OF GRATING
TOM	TOP OF MASONRY
TOS	TOP OF STEEL
T.O.W.	TOP OF WALL
TR	TRIAD (THREE CONDUCTOR SHIELDED CABLE), TIMING RELAY
TS	THICKENER SUPERNATANT OR SUBNATANT
TSD	THICKENED SLUDGE DECANT
TSTAT	THERMOSTAT
TUR	TURBINE
TW	TREATED WATER
TYP	TYPICAL

U

UC	UNDERCUT
UG	UNDERGROUND
US	UTILITY SINK

V

V	VALVE
VAC	VACCUM
VAR	VARIES
VB	VALVE BOX
VERT	VERTICAL
VOL	VOLUME
VTR	VENT THROUGH ROOF

W

W	WEST, WIDTH
W/	WITH
W/O	WITHOUT
WAS	WASTE ACTIVATED SLUDGE
WCO	WALL CLEANOUT
WEF	WALL EXHAUST FAN
WH	WATER HEATER
WI	WEIGHT INDICATOR
WL	WALL LOUVER, WATER LEVEL
WLD	WELD
WM	WATER METER
WOD	WASTE OIL DRAIN
WP	WORKING PRESSURE
WRS	WATER SOFTENER
WS	WATER SURFACE
WSTP	WATERSTOP
WT	WALK THROUGH, WEIGHT
WTF	WATER TREATMENT FACILITY
WTP	WATER TREATMENT PLANT
WTR	WATER
WV	WATER CONTROL VALVE
WW	WASTEWATER
WWTF	WASTEWATER TREATMENT FACILITY
WWTP	WASTEWATER TREATMENT PLANT

Z

ZP	ZINC PHOSPHATE
ZNC	ZINC COATING (SEE DIP SPEC)

REV	DATE	BY	DESCRIPTION
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DESIGNED S. DAVIS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

GENERAL

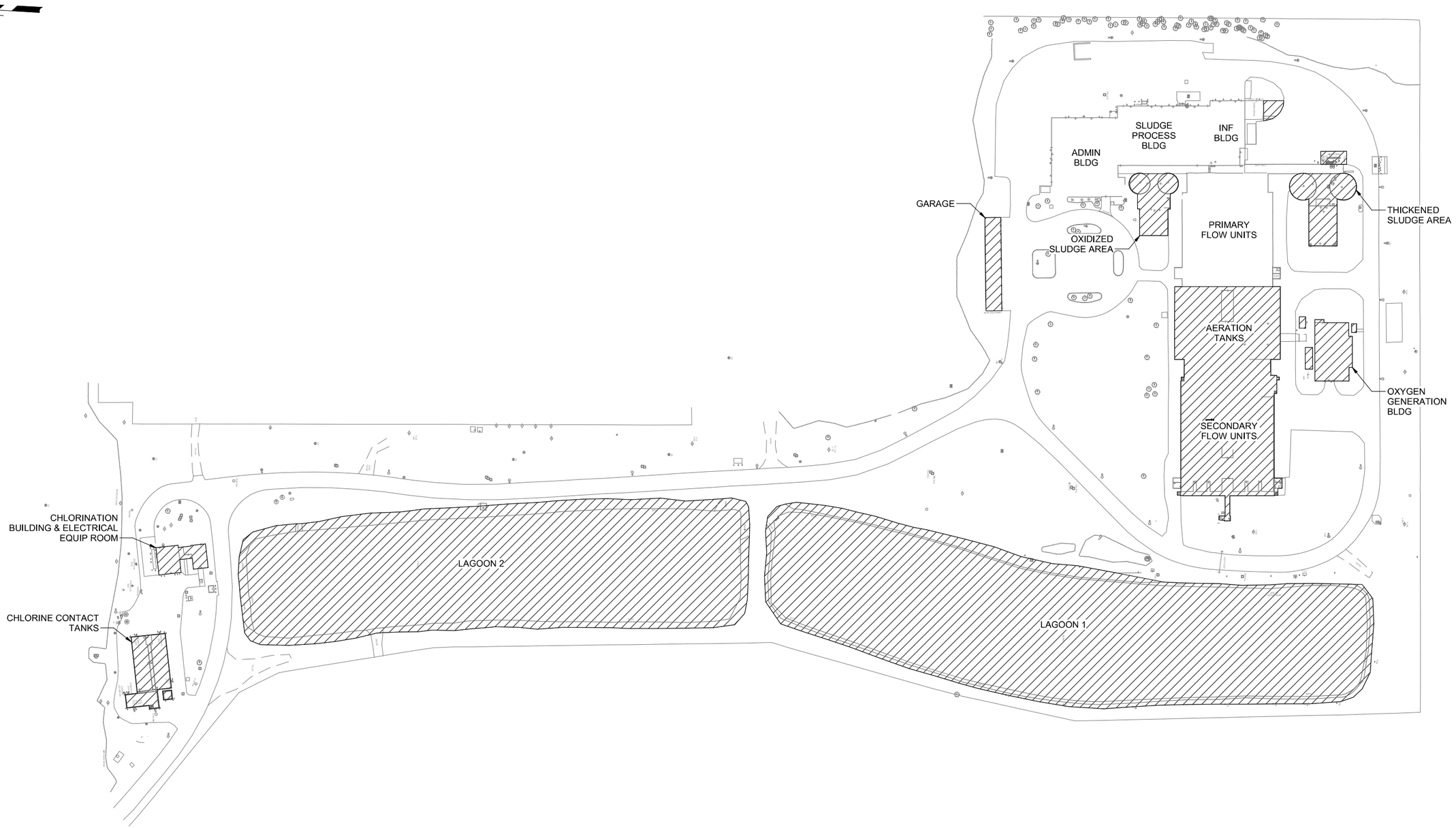
ABBREVIATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00G05
SHEET NO. 5 OF 251

LAST SAVED BY:

PROJECT NO. FILE NAME:



1 PLAN

SCALE: 1" = 80'-0"

25% DESIGN SUBMITTAL
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REV	DATE	BY	DESCRIPTION

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DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
GENERAL
SITE PLAN DEMO

VERIFY SCALES
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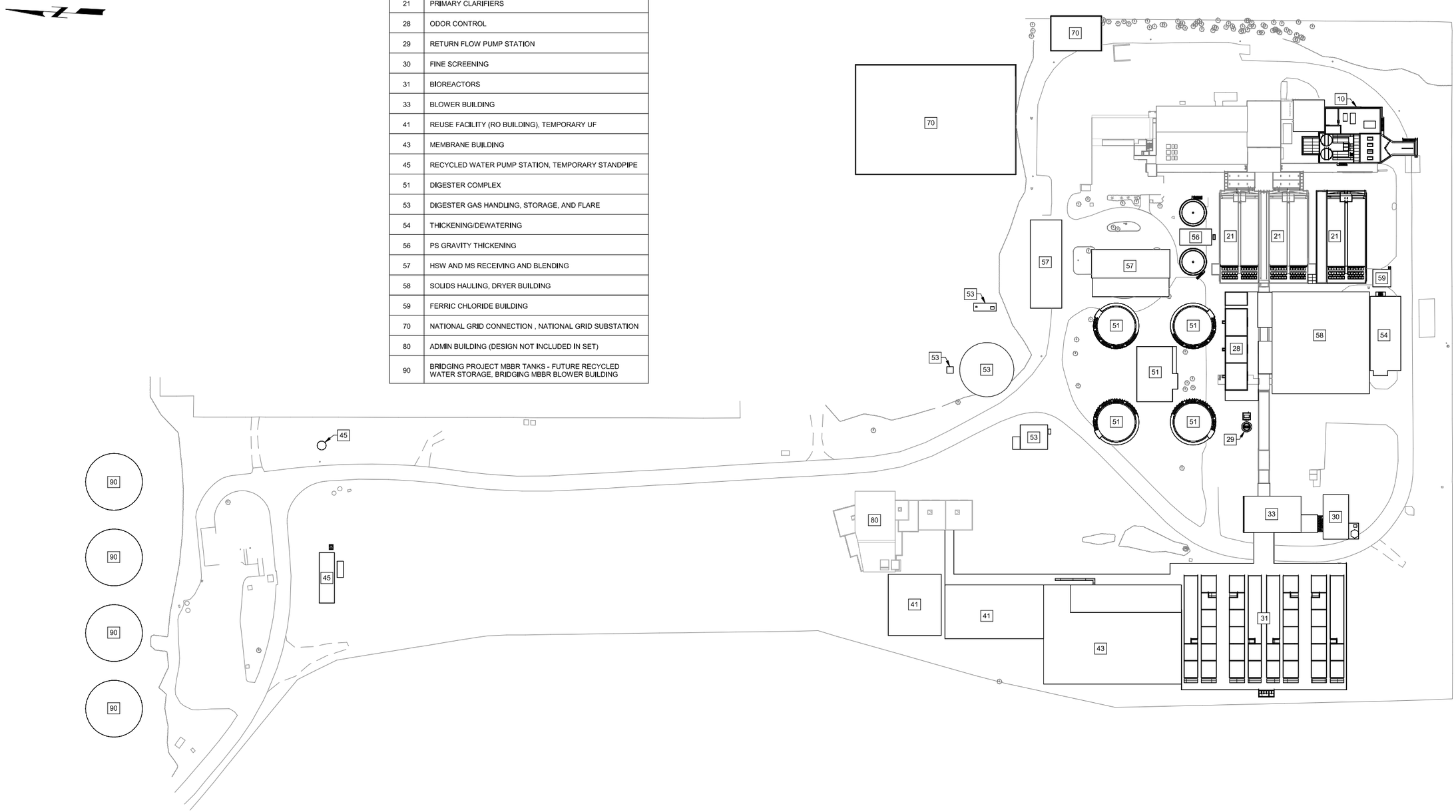
JOB NO. 203580
DRAWING NO. 00G06
SHEET NO. 6 OF 251

PLOT DATE: 6/10/2025 9:52:10 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/00-G-3D-101.rvt

AREA CODE	AREAS
10	HEADWORKS
21	PRIMARY CLARIFIERS
28	ODOR CONTROL
29	RETURN FLOW PUMP STATION
30	FINE SCREENING
31	BIOREACTORS
33	BLOWER BUILDING
41	REUSE FACILITY (RO BUILDING), TEMPORARY UF
43	MEMBRANE BUILDING
45	RECYCLED WATER PUMP STATION, TEMPORARY STANDPIPE
51	DIGESTER COMPLEX
53	DIGESTER GAS HANDLING, STORAGE, AND FLARE
54	THICKENING/DEWATERING
56	PS GRAVITY THICKENING
57	HSW AND MS RECEIVING AND BLENDING
58	SOLIDS HAULING, DRYER BUILDING
59	FERRIC CHLORIDE BUILDING
70	NATIONAL GRID CONNECTION , NATIONAL GRID SUBSTATION
80	ADMIN BUILDING (DESIGN NOT INCLUDED IN SET)
90	BRIDGING PROJECT MBBR TANKS - FUTURE RECYCLED WATER STORAGE, BRIDGING MBBR BLOWER BUILDING



1 **PLAN**
SCALE: 1" = 80'-0"

REV	DATE	BY	DESCRIPTION
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DESIGNED S. DAVIS
DRAWN A. CHARDE
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
GENERAL
SITE PLAN

VERIFY SCALES
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JOB NO. 203580
DRAWING NO. 00G07
SHEET NO. 7 OF 251

PLOT DATE: 7/17/2025 12:34:09 PM

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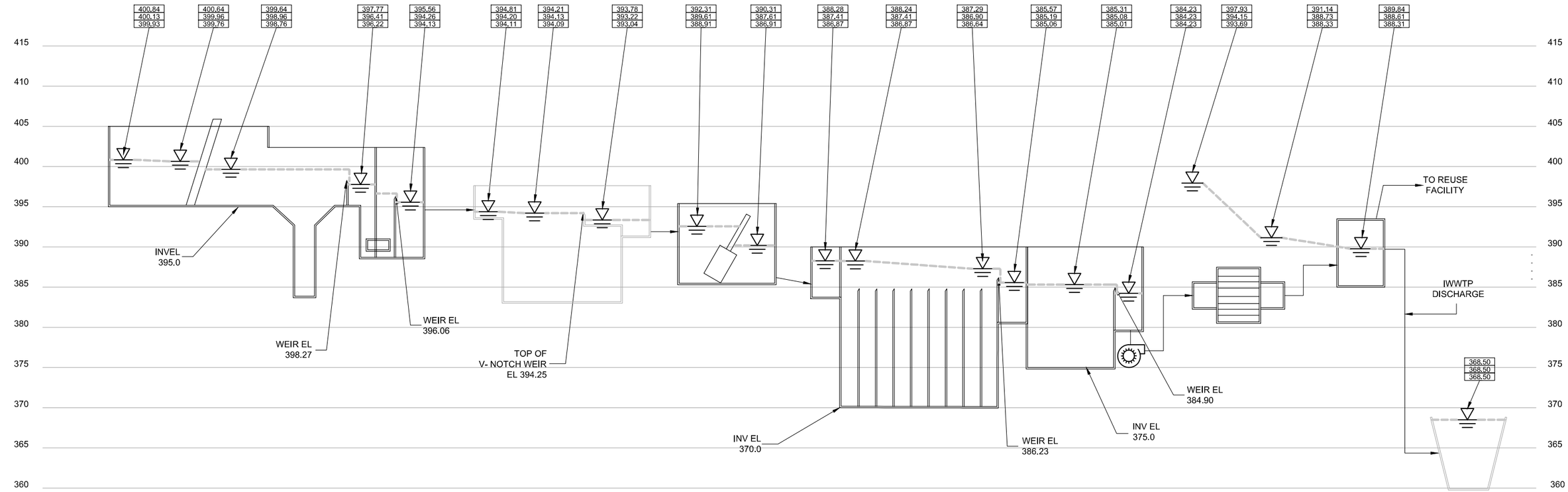

XXX.XX PEAK HOURLY FLOW - 38.86 MGD
XXX.XX AVERAGE DRY WEATHER FLOW - 10.98 MGD
XXX.XX STARTUP MINIMUM MONTH FLOW - 4.60 MGD

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REV	DATE	BY	DESCRIPTION

DESIGNED S. DAVIS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
GENERAL
HYDRAULIC PROFILE

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
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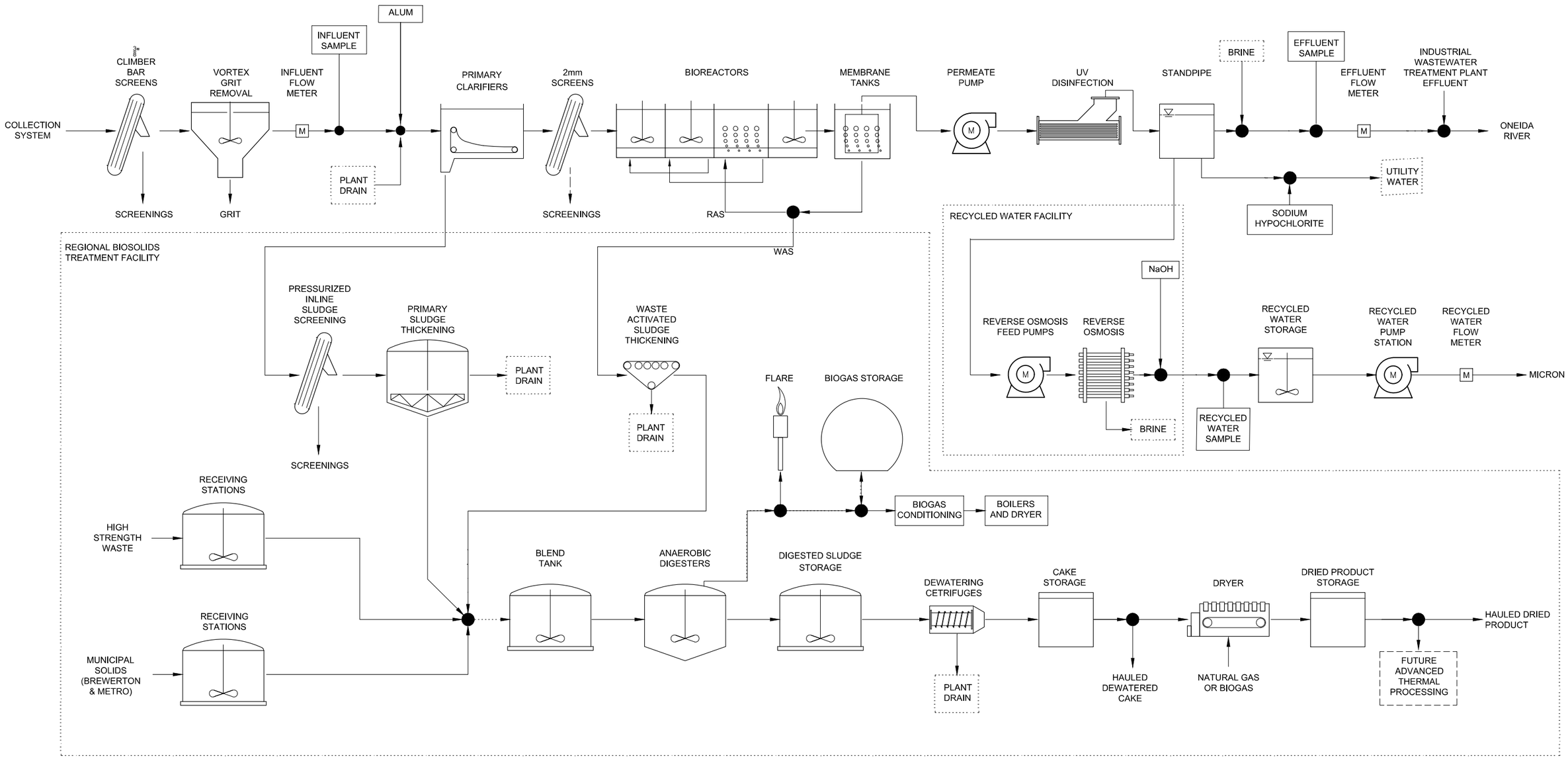
JOB NO. 203580-60000
DRAWING NO. 00G08
SHEET NO. 8 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

GENERAL

PROCESS FLOW DIAGRAM

VERIFY SCALES
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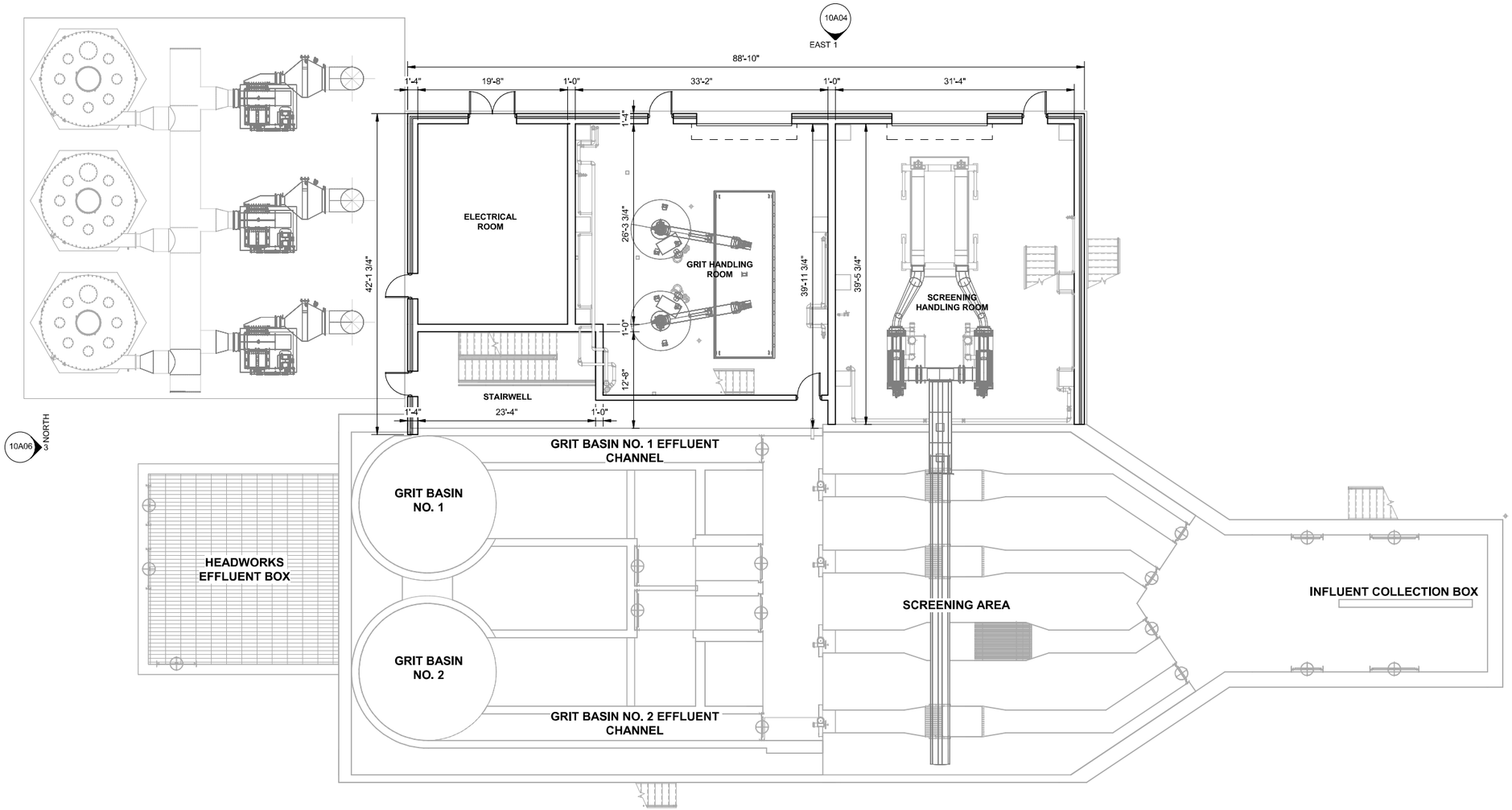
JOB NO. 203580-60000
DRAWING NO. 00G09
SHEET NO. 9 OF 251

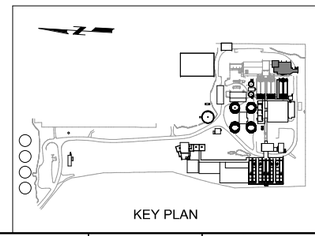
LAST SAVED BY:

PROJECT NO.

FILE NAME:



1 PLAN
SCALE: 1/8" = 1'-0"



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
PROJECT TITLE
ARCHITECTURAL
HEADWORKS - PLAN AT EL. 395.00'

VERIFY SCALES
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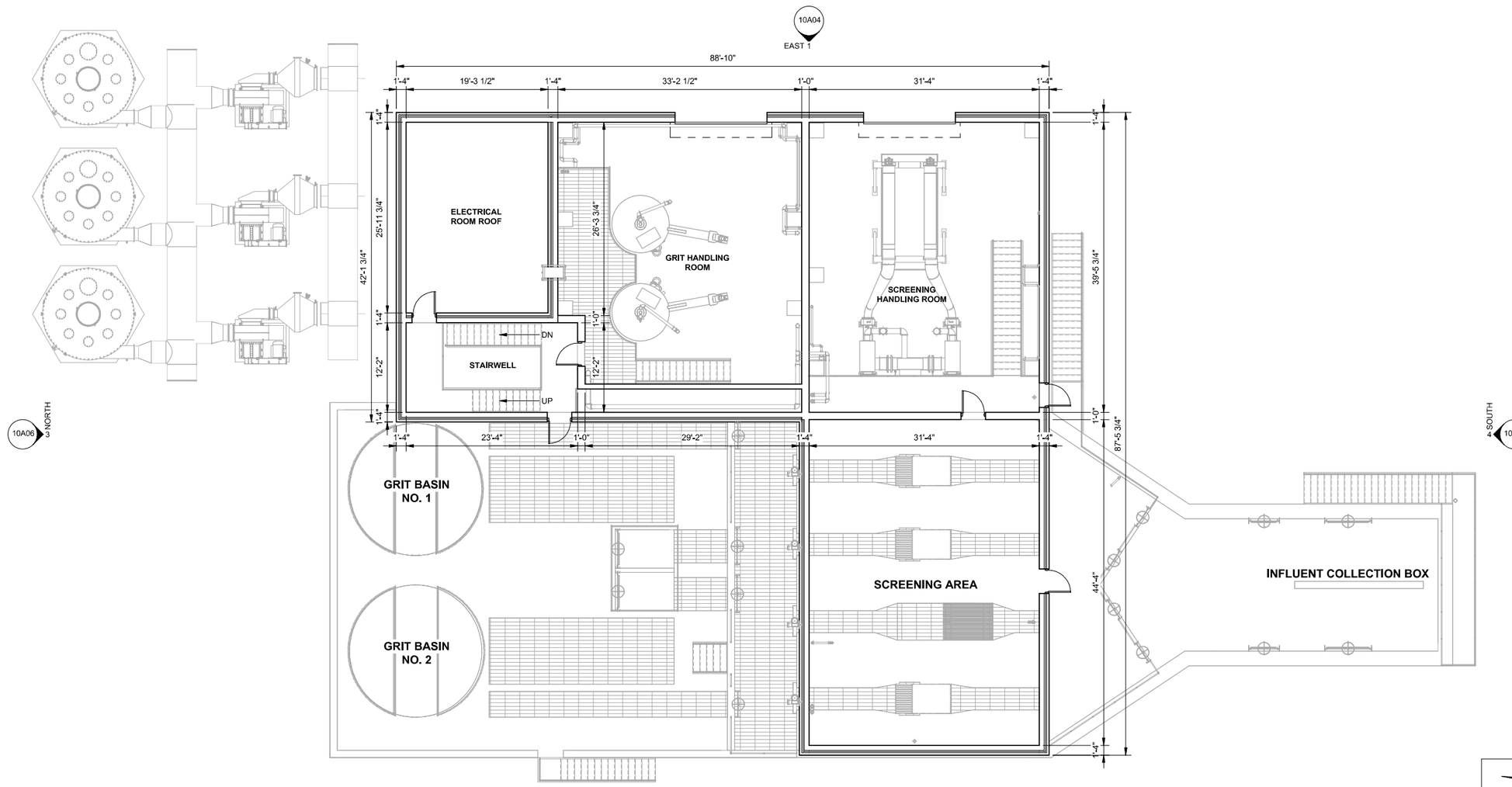
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

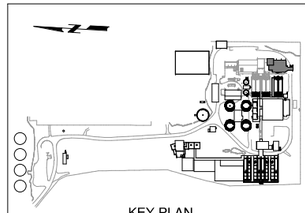
JOB NO. 203580
DRAWING NO. 10A01
SHEET NO. 10 OF 251

PLOT DATE: 6/10/2025 3:44:00 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-A-3D-101.rvt



1 **PLAN**
SCALE: 1/8" = 1'-0"



KEY PLAN

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DATE JULY 2025

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PROJECT TITLE

ARCHITECTURAL

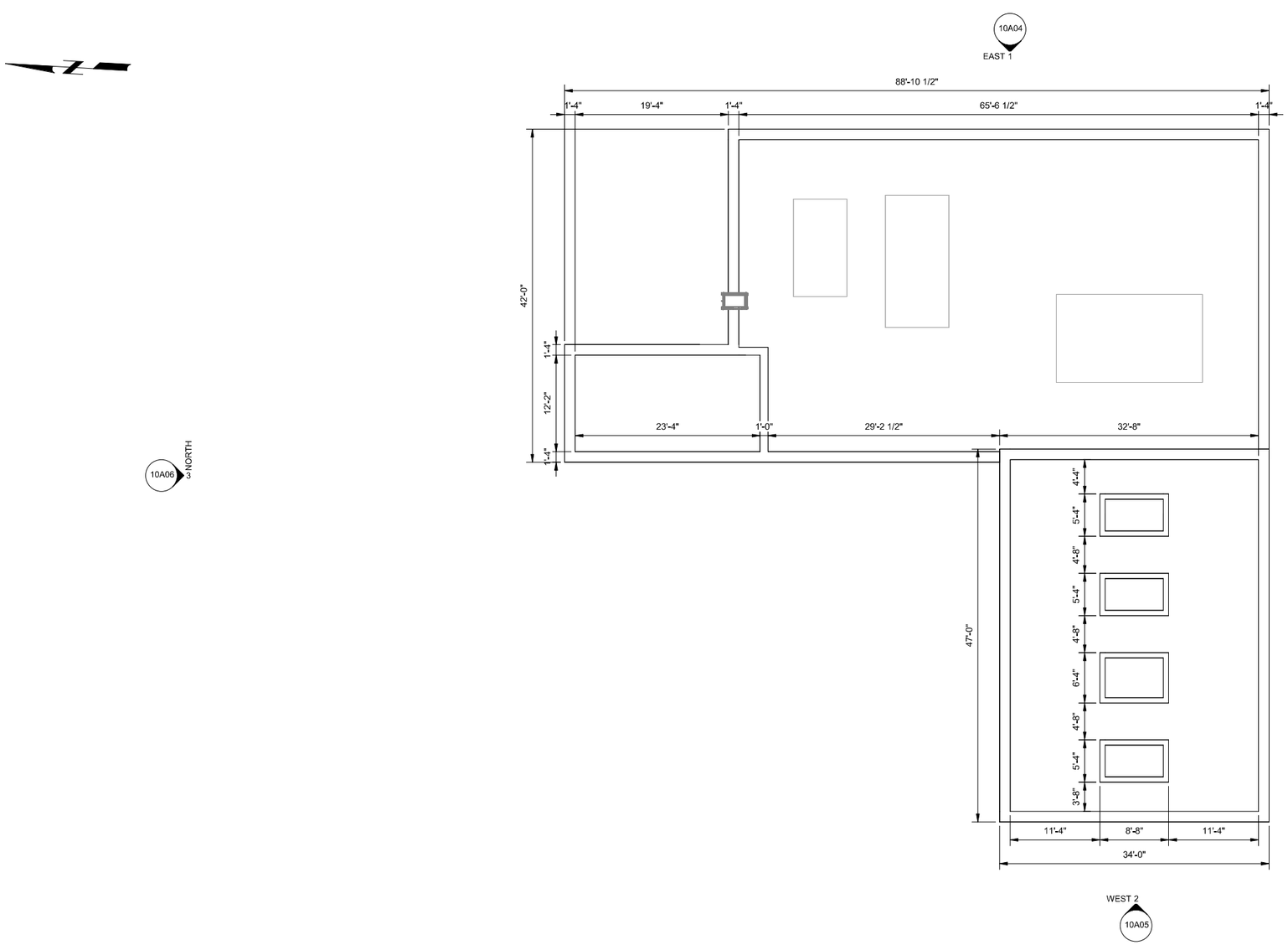
HEADWORKS - LOW ROOF PLAN AT EL. 425.17'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

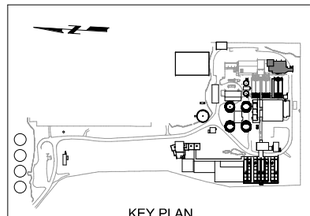
JOB NO. 203580
DRAWING NO. 10A02
SHEET NO. 11 OF 251

PLOT DATE: 6/10/2025 4:36:30 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-A-3D-101.rvt



1 10A04 **PLAN**
SCALE: 1/8" = 1'-0"


KEY PLAN

PLOT DATE: 6/10/2025 4:00:53 PM

REV	DATE	BY	DESCRIPTION
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PROJECT TITLE

ARCHITECTURAL

HEADWORKS - HIGH ROOF PLAN AT EL. 432.50'

VERIFY SCALES
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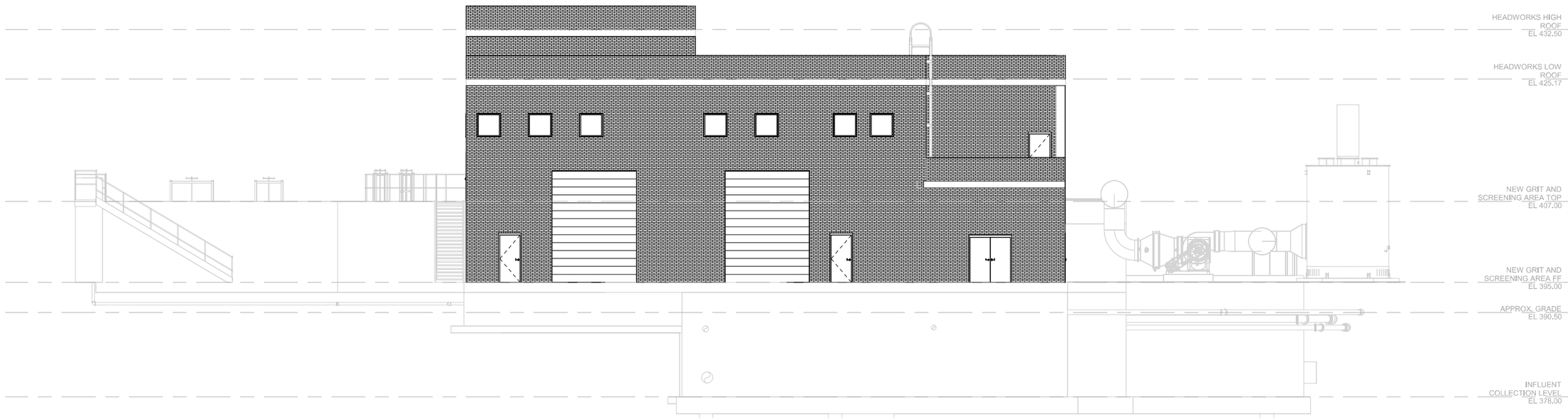
JOB NO. 203580
DRAWING NO. 10A03
SHEET NO. 12 OF 251

FILE NAME: Autodesk Docs://OCDWEP 203580/10-A-3D-101.rvt



EAST ELEVATION

1 / 10A01 **ELEVATION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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CHECKED T. SHIMADA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

PROJECT TITLE

ARCHITECTURAL

HEADWORKS - EAST ELEVATION

VERIFY SCALES
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0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10A04
SHEET NO. 13 OF 251

PLOT DATE: 6/10/2025 3:44:03 PM

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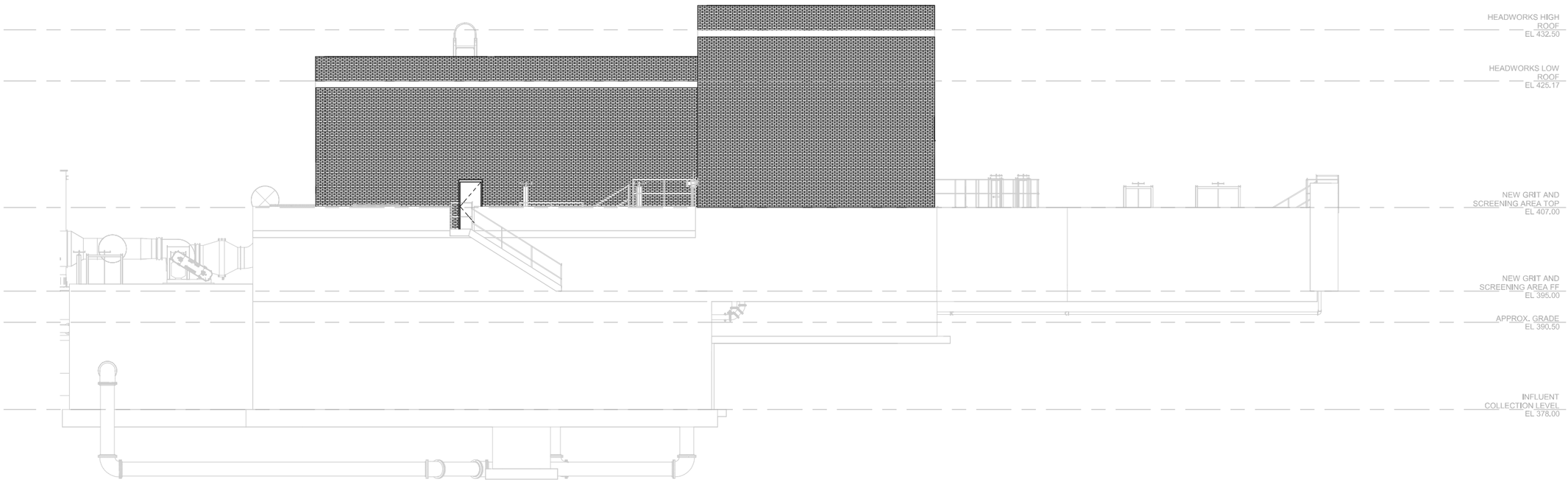

WEST ELEVATION

2 / 10A03 **ELEVATION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DATE JULY 2025

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PROJECT TITLE

WEST ELEVATION

HEADWORKS - WEST ELEVATION

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

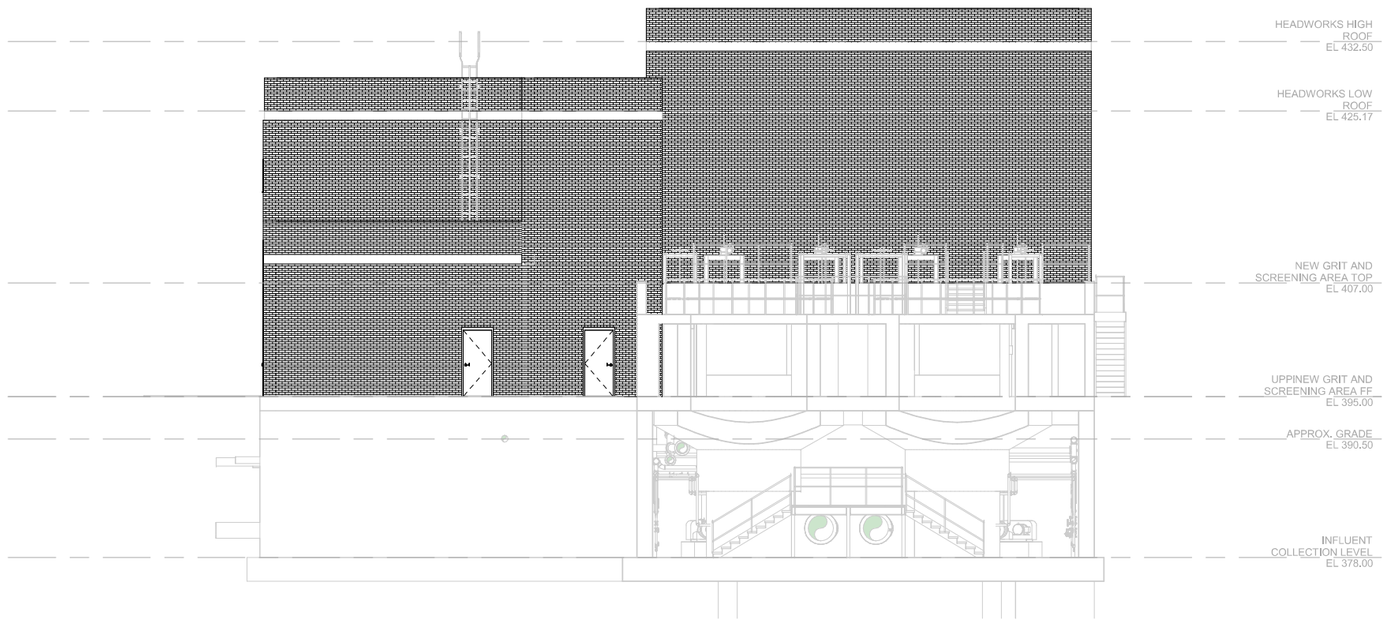
JOB NO. 203580

DRAWING NO. 10A05

SHEET NO. 14 OF 251

PLOT DATE: 6/10/2025 3:44:05 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-A-3D-101.rvt



NORTH ELEVATION

3 / 10A01 **ELEVATION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
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CHECKED T. SHIMADA
DATE JULY 2025

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PROJECT TITLE

ARCHITECTURAL

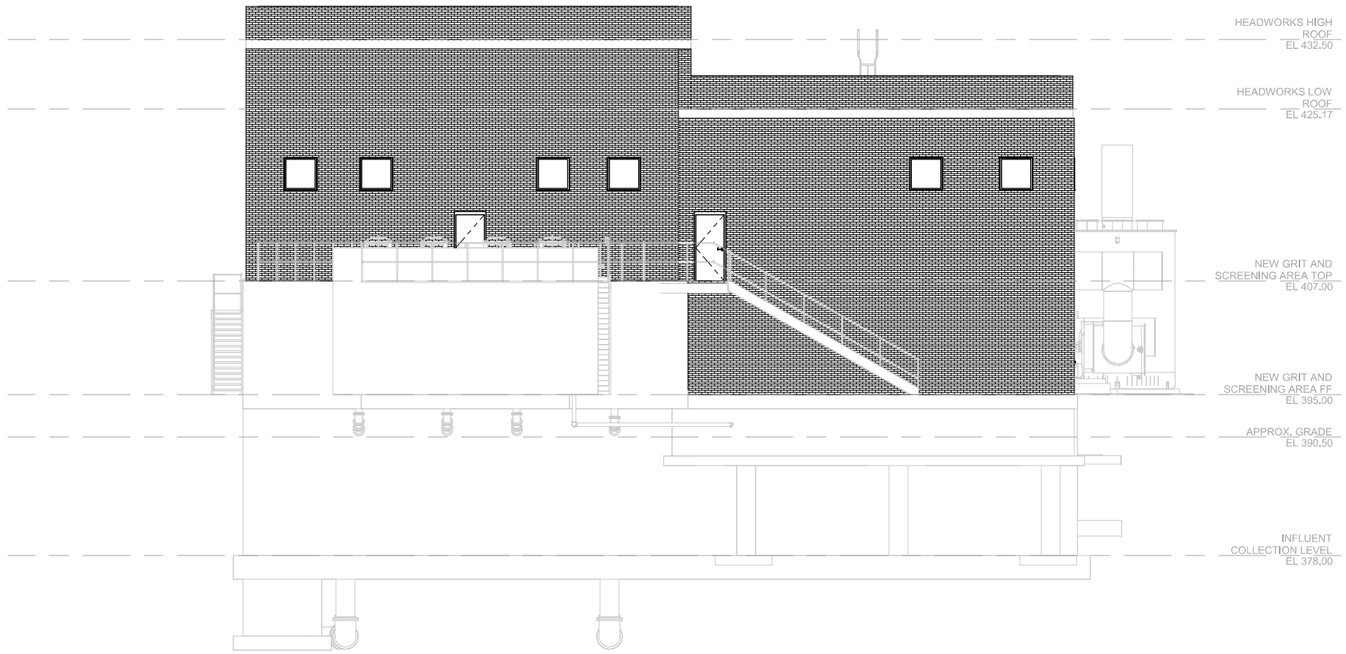
HEADWORKS - NORTH ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10A06
SHEET NO. 15 OF 251

PLOT DATE: 6/10/2025 3:44:06 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-A-3D-101.rvt



SOUTH ELEVATION

4 / 10A02 **ELEVATION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

PROJECT TITLE

ARCHITECTURAL

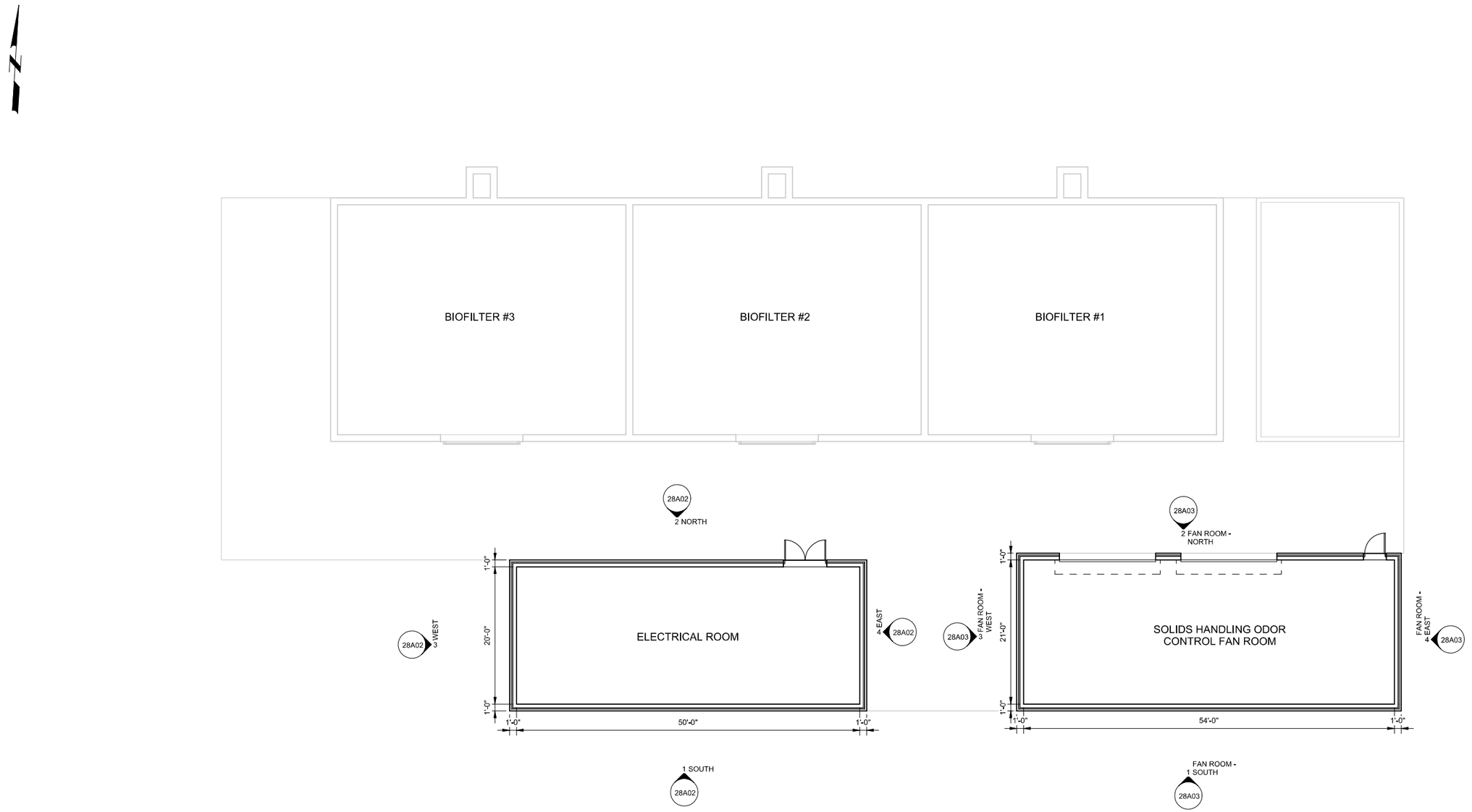
HEADWORKS - SOUTH ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

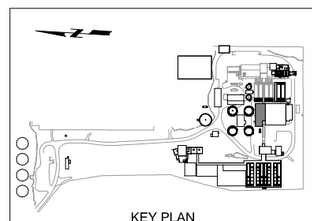
JOB NO. 203580
DRAWING NO. 10A07
SHEET NO. 16 OF 251

PLOT DATE: 6/10/2025 3:44:08 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-A-3D-101.rvt



1 PLAN
SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
ARCHITECTURAL
SOLIDS HANDLING ODOR CONTROL - PLAN AT EL. 392.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 28A01
SHEET NO. 17 OF 251

PLOT DATE: 6/10/2025 12:24:05 PM

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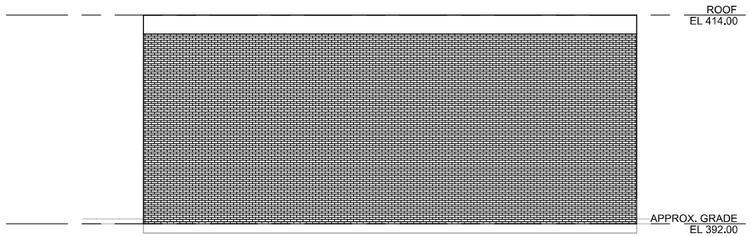
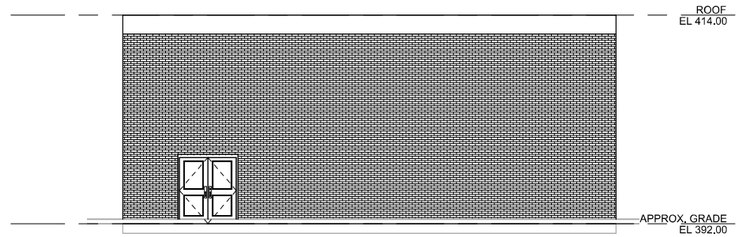


SOUTH ELEVATION

1 ELEVATION

28A01

SCALE: 1/8" = 1'-0"

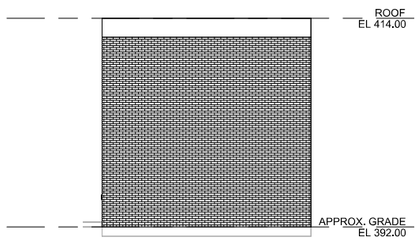


NORTH ELEVATION

2 ELEVATION

28A01

SCALE: 1/8" = 1'-0"

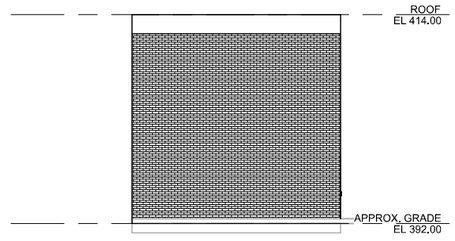


WEST ELEVATION

3 ELEVATION

28A01

SCALE: 1/8" = 1'-0"



EAST ELEVATION

4 ELEVATION

28A01

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

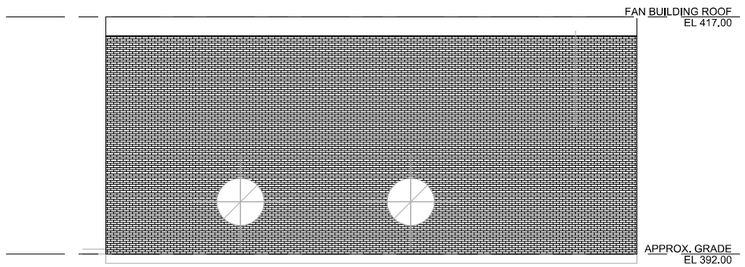
SOLIDS HANDLING ODOR CONTROL - ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 28A02
SHEET NO. 18 OF 251

PLOT DATE: 6/10/2025 12:25:43 PM

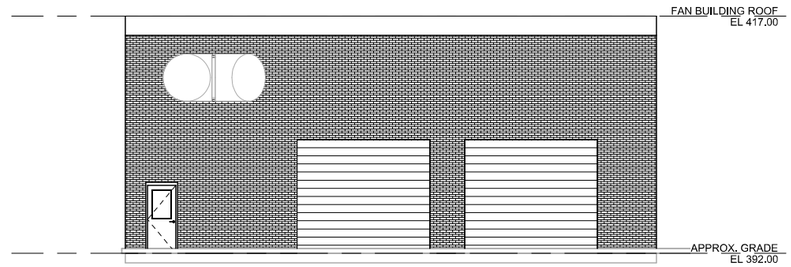
FILE NAME: Autodesk Docs://OCDWEP 203580/28-A-3D-101.rvt



SOUTH ELEVATION

1 ELEVATION
28A01

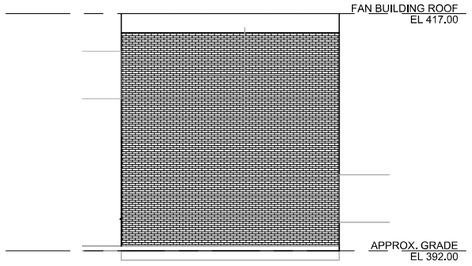
SCALE: 1/8" = 1'-0"



NORTH ELEVATION

2 ELEVATION
28A01

SCALE: 1/8" = 1'-0"



WEST ELEVATION

3 ELEVATION
28A01

SCALE: 1/8" = 1'-0"



EAST ELEVATION

4 ELEVATION
28A01

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
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ARCHITECTURAL

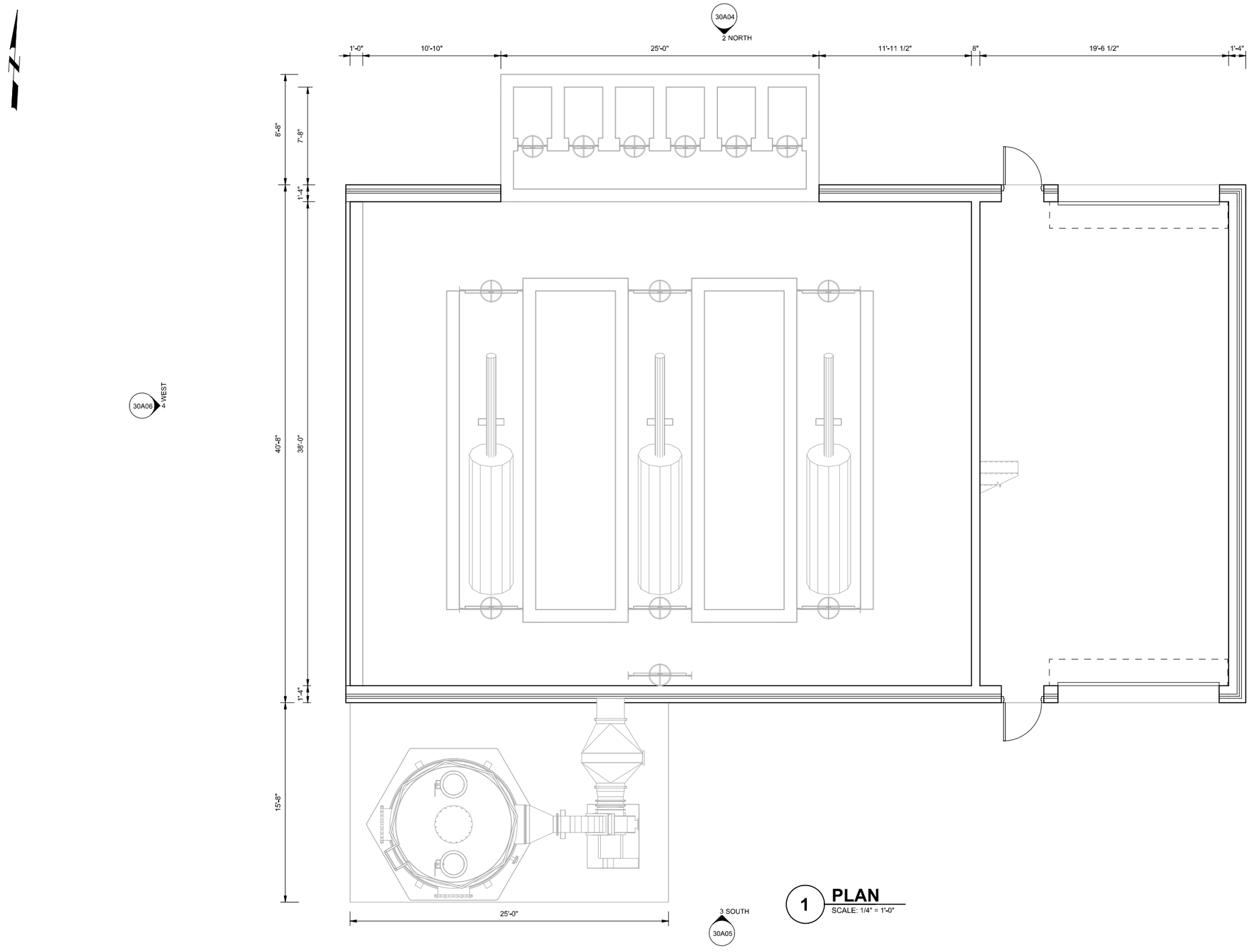
SOLIDS HANDLING ODOR CONTROL - ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

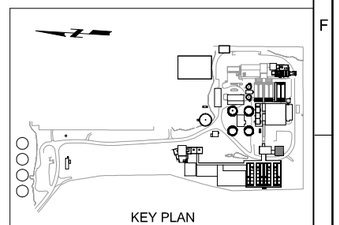
JOB NO. 203580
DRAWING NO. 28A03
SHEET NO. 19 OF 251

PLOT DATE: 6/10/2025 12:25:09 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/28-A-3D-101.rvt



1 PLAN
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DATE JULY 2025

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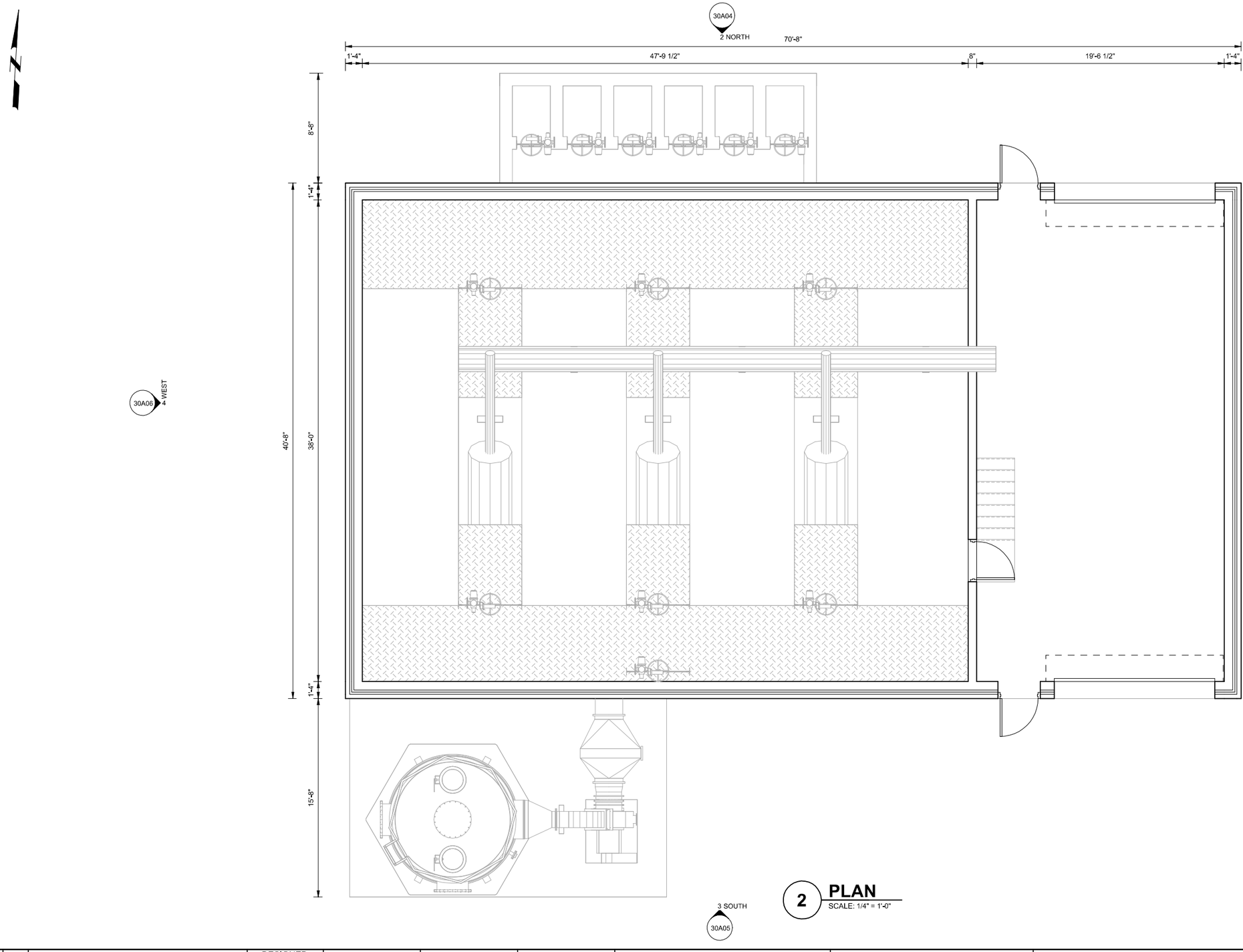
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
ARCHITECTURAL
FINE SCREENING - PLAN AT EL. 391.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

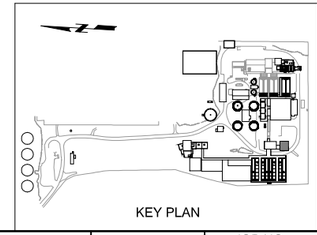
JOB NO. 203580
DRAWING NO. 30A01
SHEET NO. 20 OF 251

PLOT DATE: 6/10/2025 10:40:54 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-A-3D-101.rvt



2 PLAN
SCALE: 1/4" = 1'-0"



REV	DATE	BY	DESCRIPTION

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DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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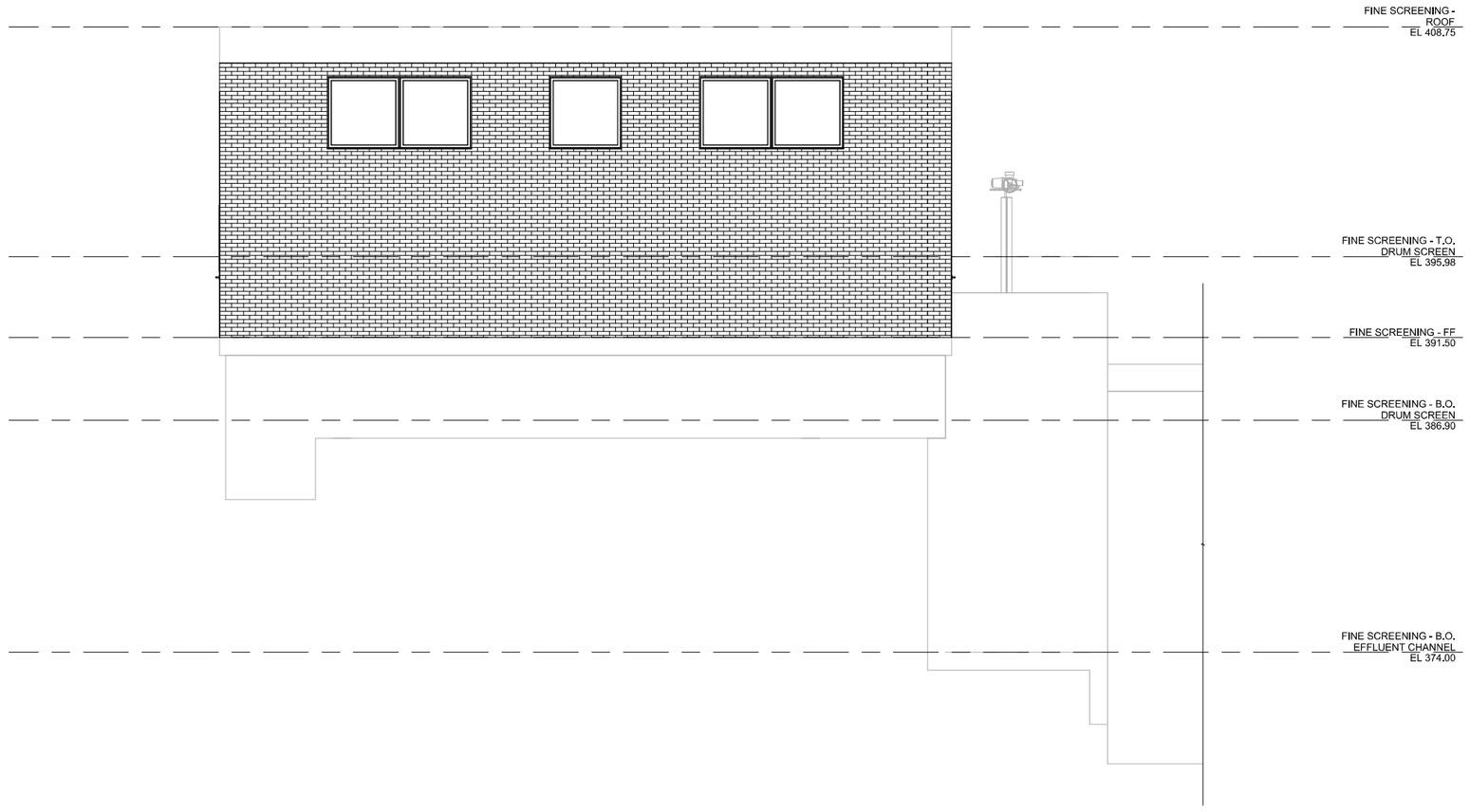
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
ARCHITECTURAL
FINE SCREENING - PLAN AT EL. 395.98'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30A02
SHEET NO. 21 OF 251

PLOT DATE: 6/10/2025 10:43:14 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-A-3D-101.rvt



EAST ELEVATION

1 / 30A01 **ELEVATION**

SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

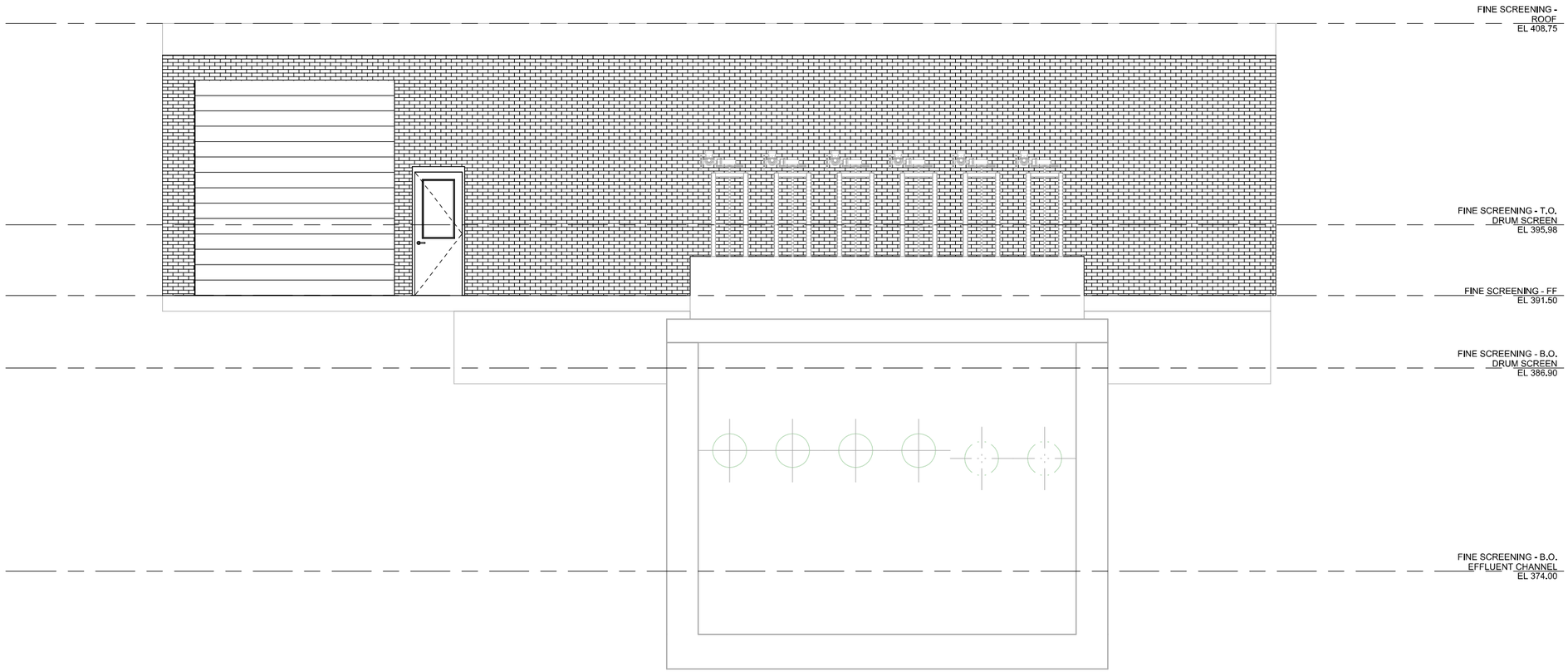
FINE SCREENING - EAST ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30A03
SHEET NO. 22 OF 251

PLOT DATE: 6/10/2025 10:44:09 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-A-3D-101.rvt



NORTH ELEVATION

2 / 30A01 **ELEVATION**

SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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CHECKED T. SHIMADA
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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

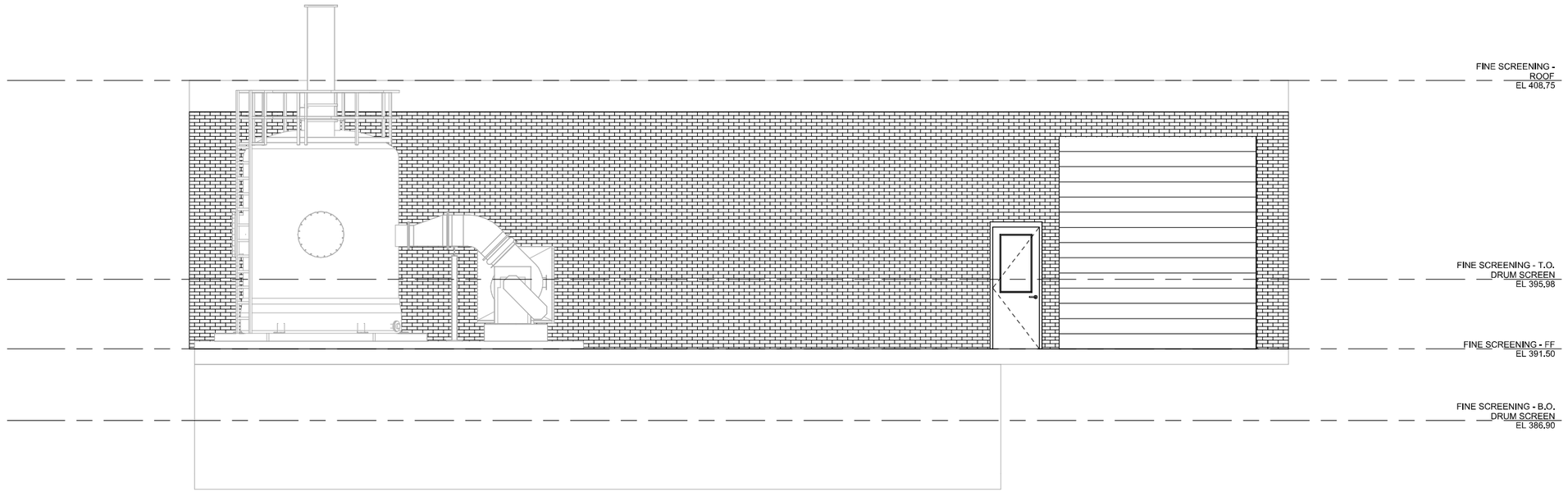
FINE SCREENING - NORTH ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30A04
SHEET NO. 23 OF 251

PLOT DATE: 6/10/2025 10:48:41 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-A-3D-101.rvt



SOUTH ELEVATION

3 / 30A01 **ELEVATION**

SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
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CHECKED T. SHIMADA
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ARCHITECTURAL

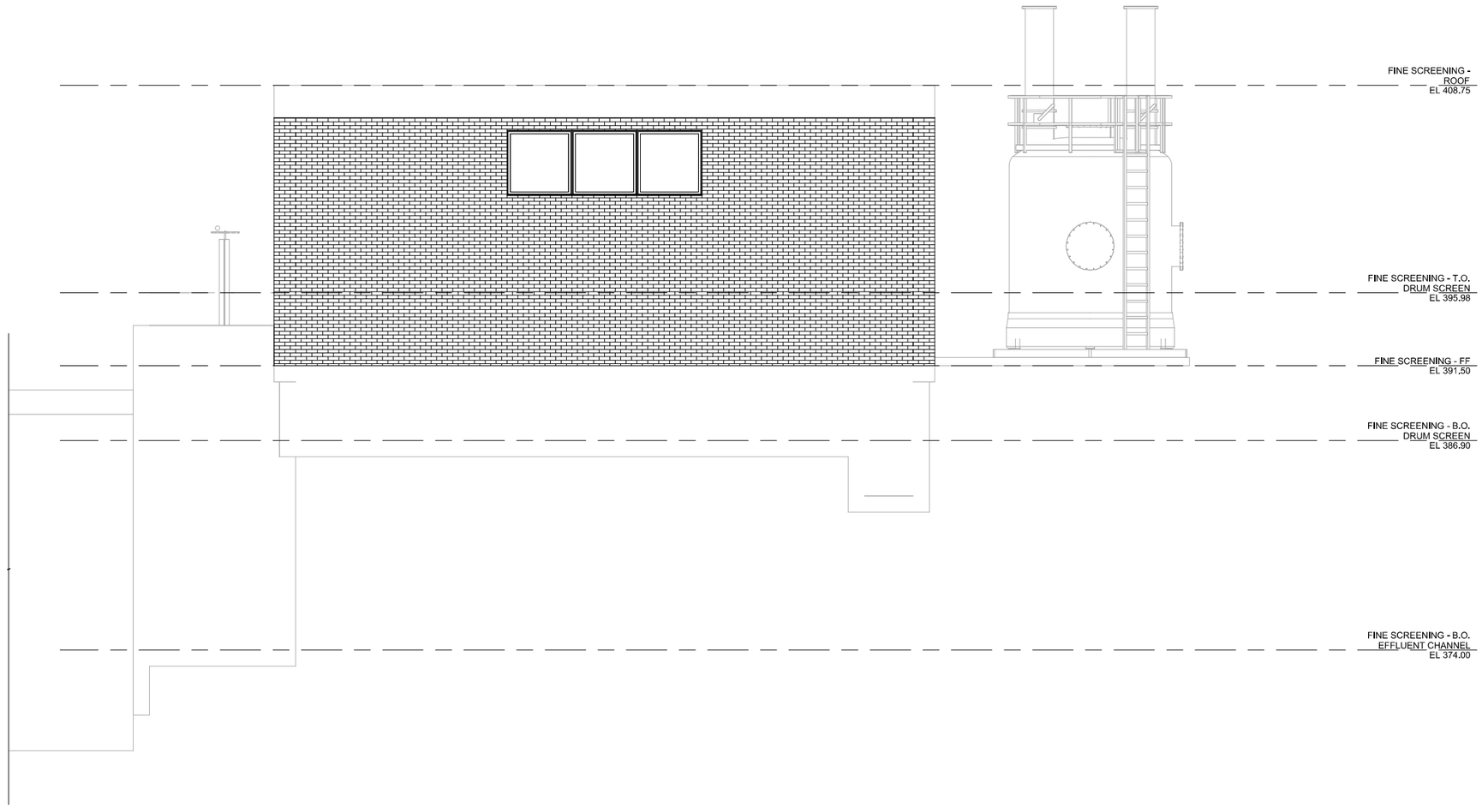
FINE SCREENING - SOUTH ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30A05
SHEET NO. 24 OF 251

PLOT DATE: 6/10/2025 10:50:50 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-A-3D-101.rvt



WEST ELEVATION

4 / 30A01 **ELEVATION**

SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

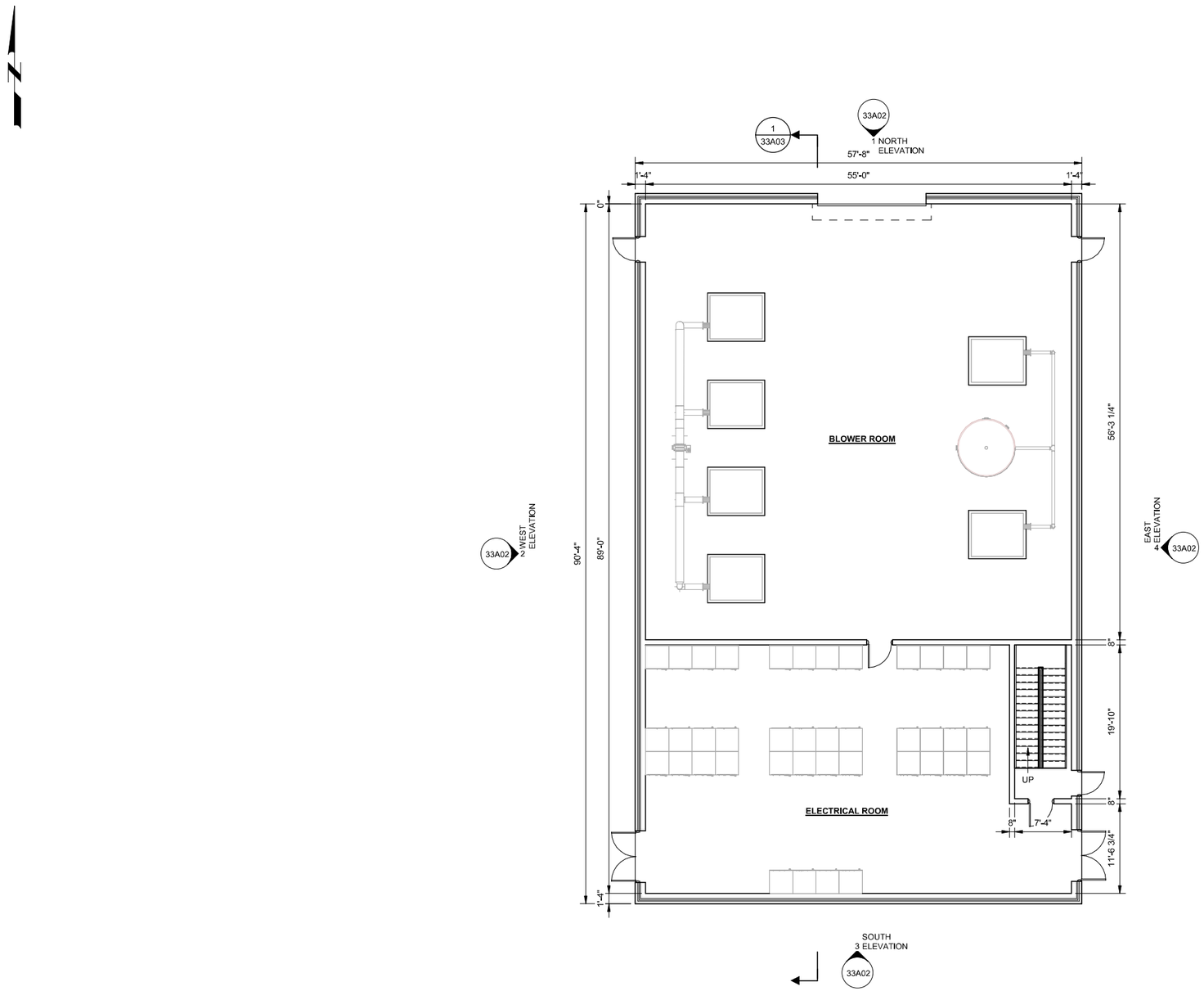
FINE SCREENING - WEST ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30A06
SHEET NO. 25 OF 251

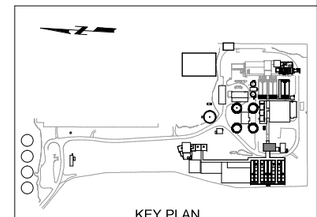
PLOT DATE: 6/10/2025 10:51:43 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-A-3D-101.rvt



1 PLAN

SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

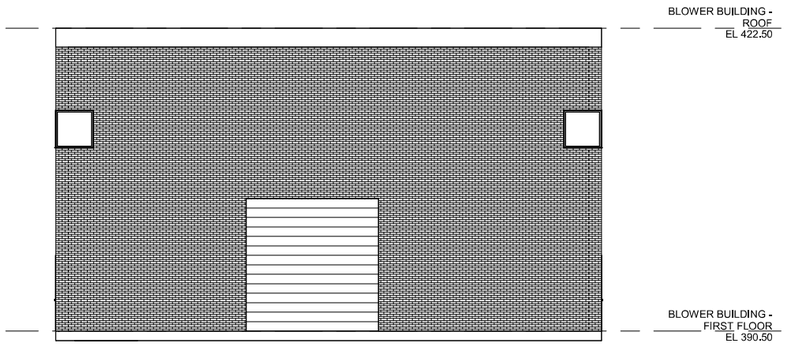
BLOWER BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 33A01
SHEET NO. 26 OF 251

PLOT DATE: 6/10/2025 1:12:50 PM

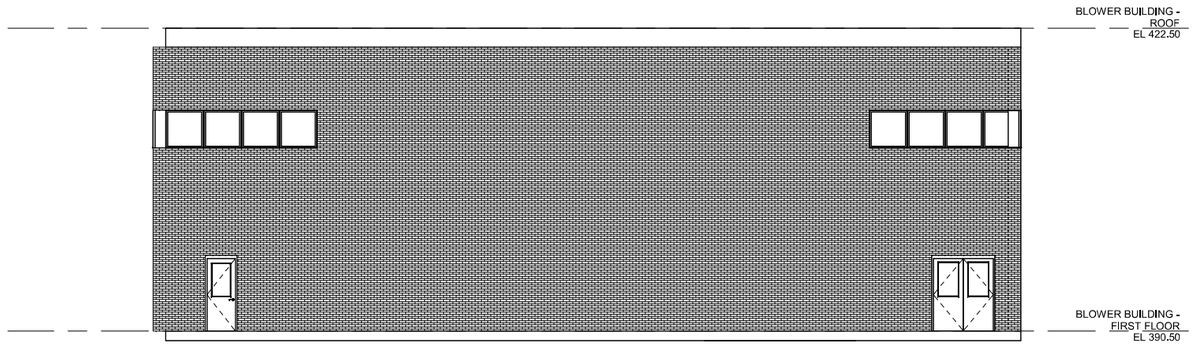
FILE NAME: Autodesk Docs://OCDWEP 203580/33-A-3D-101.rvt



NORTH ELEVATION

1 ELEVATION (33A01)

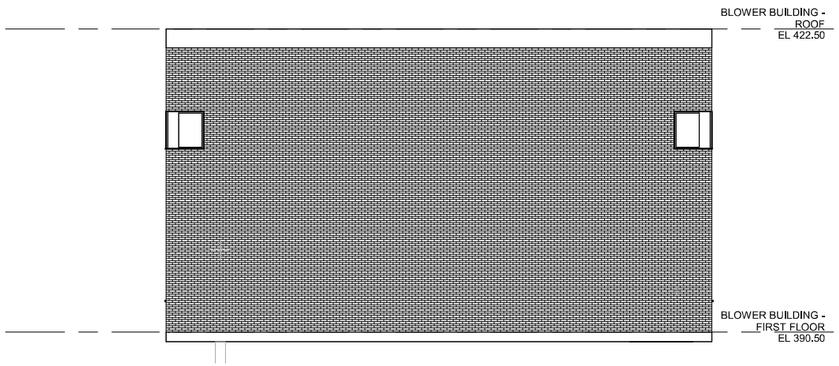
SCALE: 1/8" = 1'-0"



WEST ELEVATION

2 ELEVATION (33A01)

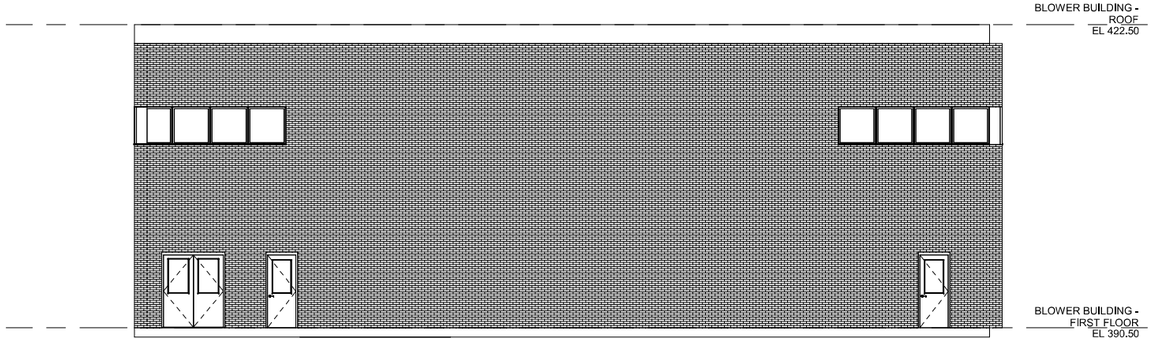
SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

3 ELEVATION (33A01)

SCALE: 1/8" = 1'-0"



EAST ELEVATION

4 ELEVATION (33A01)

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

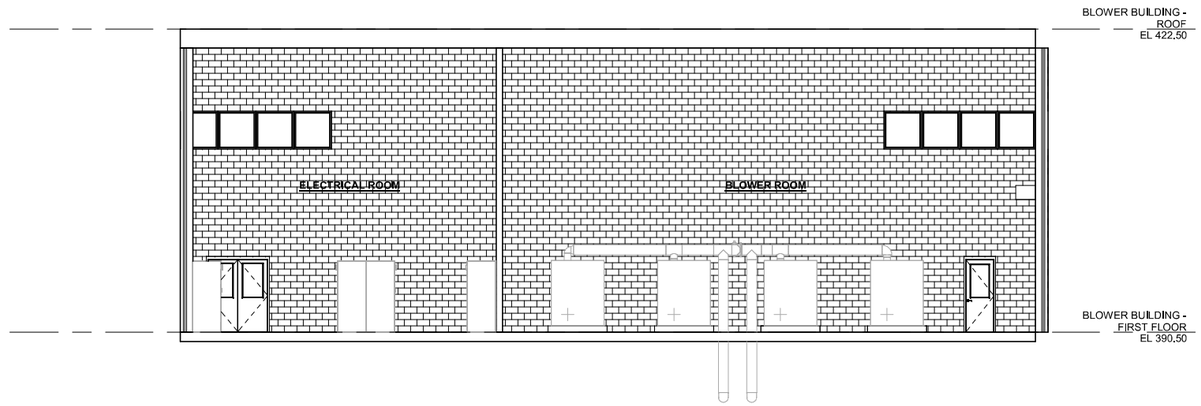
BLOWER BUILDING - ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 33A02
SHEET NO. 27 OF 251

PLOT DATE: 6/10/2025 1:13:21 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/33-A-3D-101.rvt



1 / 33A01 **SECTION**
SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
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CHECKED T. SHIMADA
DATE JULY 2025

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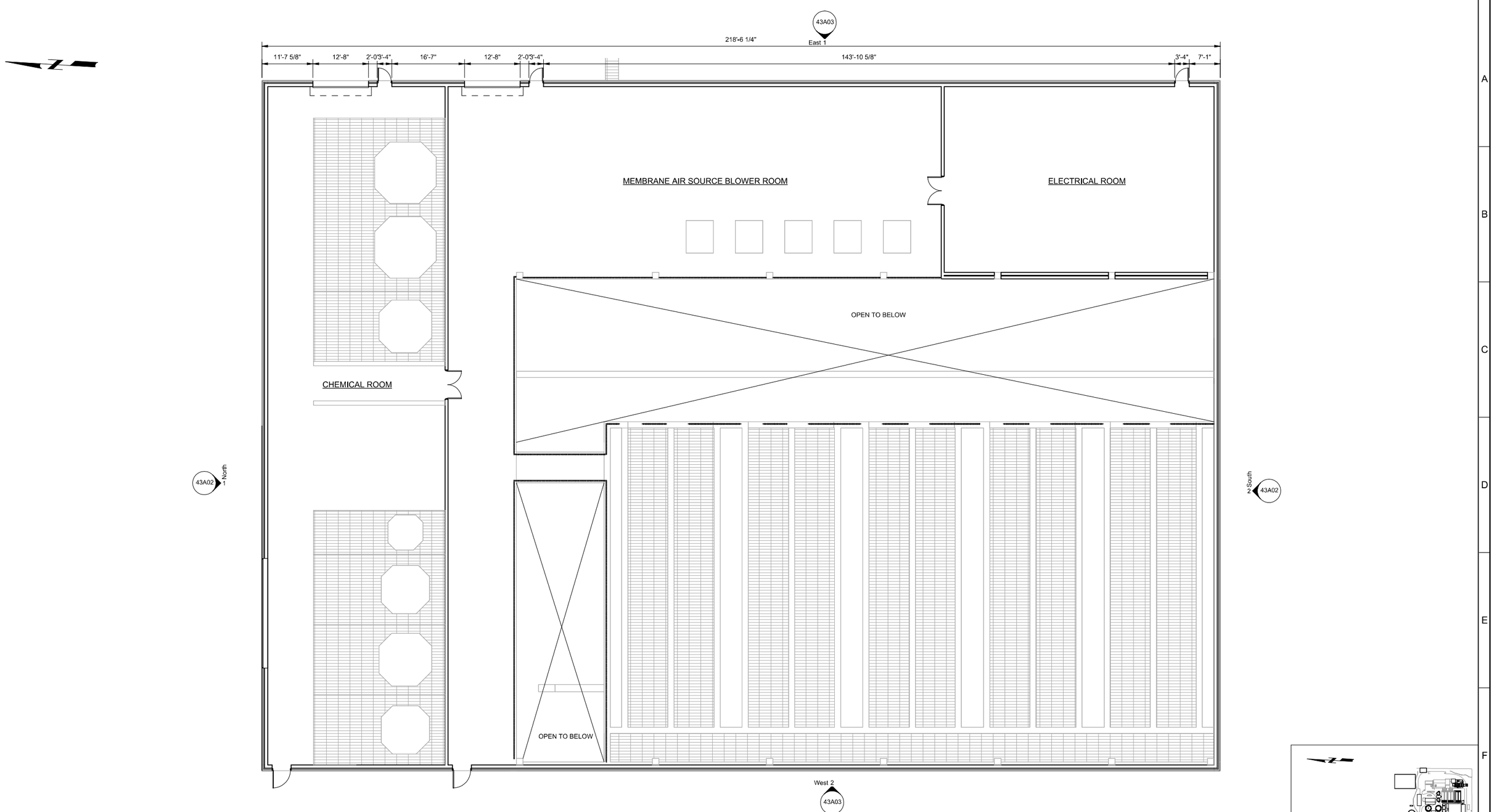
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
BLOWER BUILDING - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 33A03
SHEET NO. 28 OF 251

PLOT DATE: 6/10/2025 1:13:53 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/33-A-3D-101.rvt



1 PLAN

SCALE: 3/32" = 1'-0"

KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACITY

ARCHITECTURAL

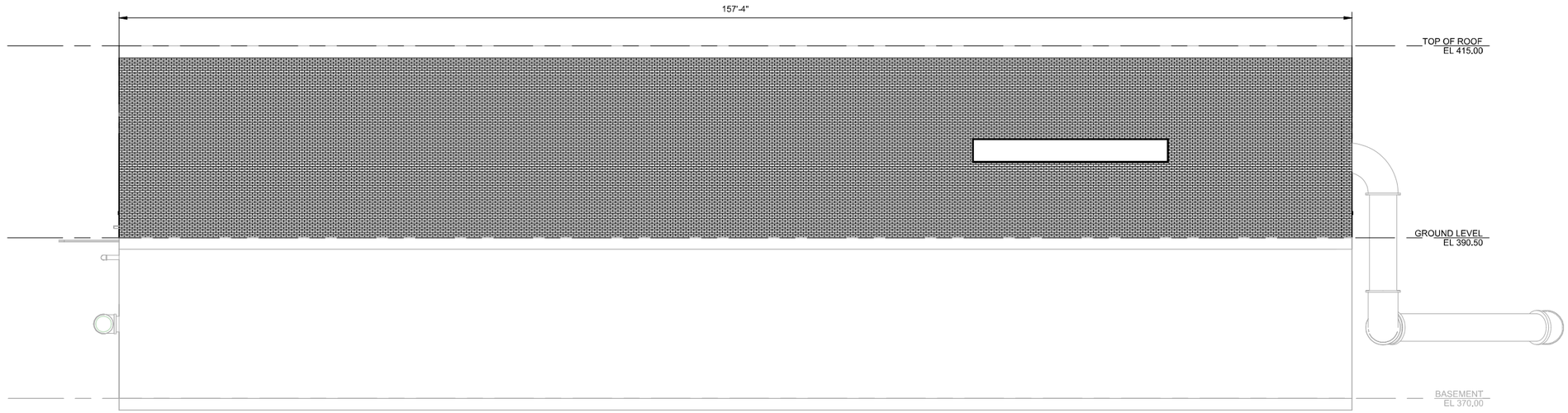
MEMBRANE BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 43A01
SHEET NO. 29 OF 251

PLOT DATE: 6/27/2025 2:15:29 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/43-A-3D-101.rvt

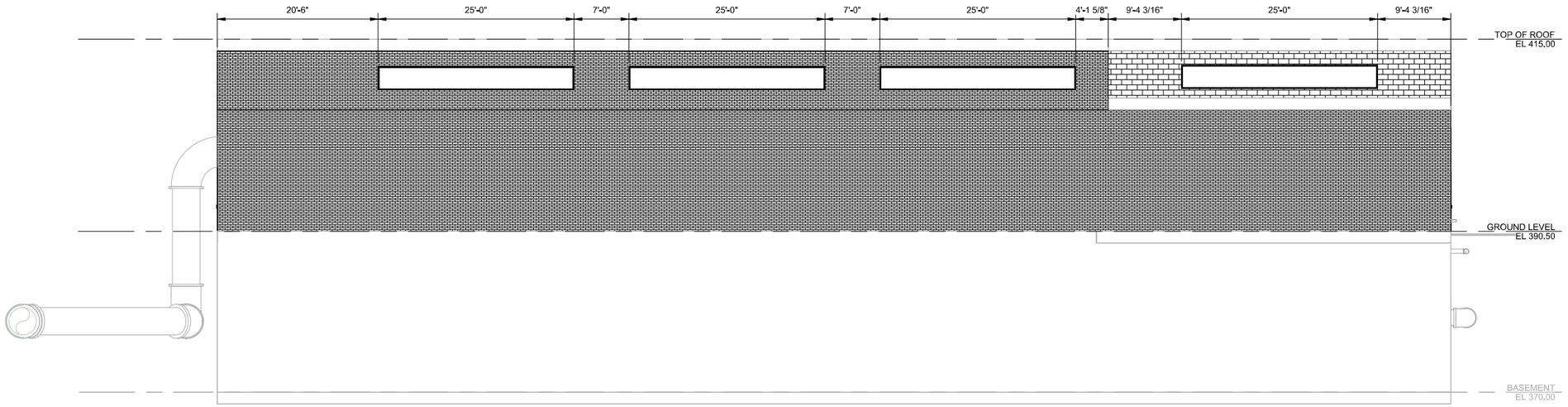


NORTH ELEVATION

1 ELEVATION

43A01

SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

2 ELEVATION

43A01

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACITY

ARCHITECTURAL

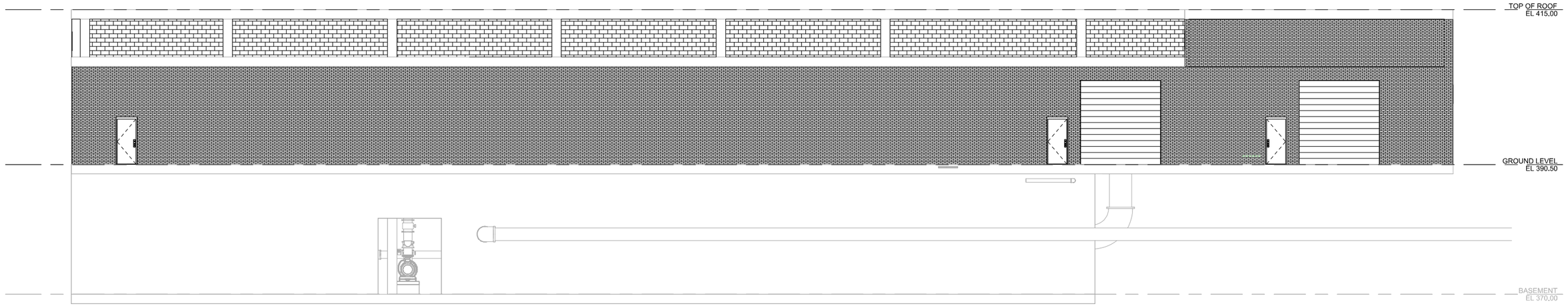
MEMBRANE BUILDING - NORTH AND SOUTH ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 43A02
SHEET NO. 30 OF 251

PLOT DATE: 6/27/2025 2:17:46 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/43-A-3D-101.rvt



EAST ELEVATION

1 / 43A01 **ELEVATION**

SCALE: 1/8" = 1'-0"



WEST ELEVATION

2 / 43A01 **ELEVATION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACITY

ARCHITECTURAL

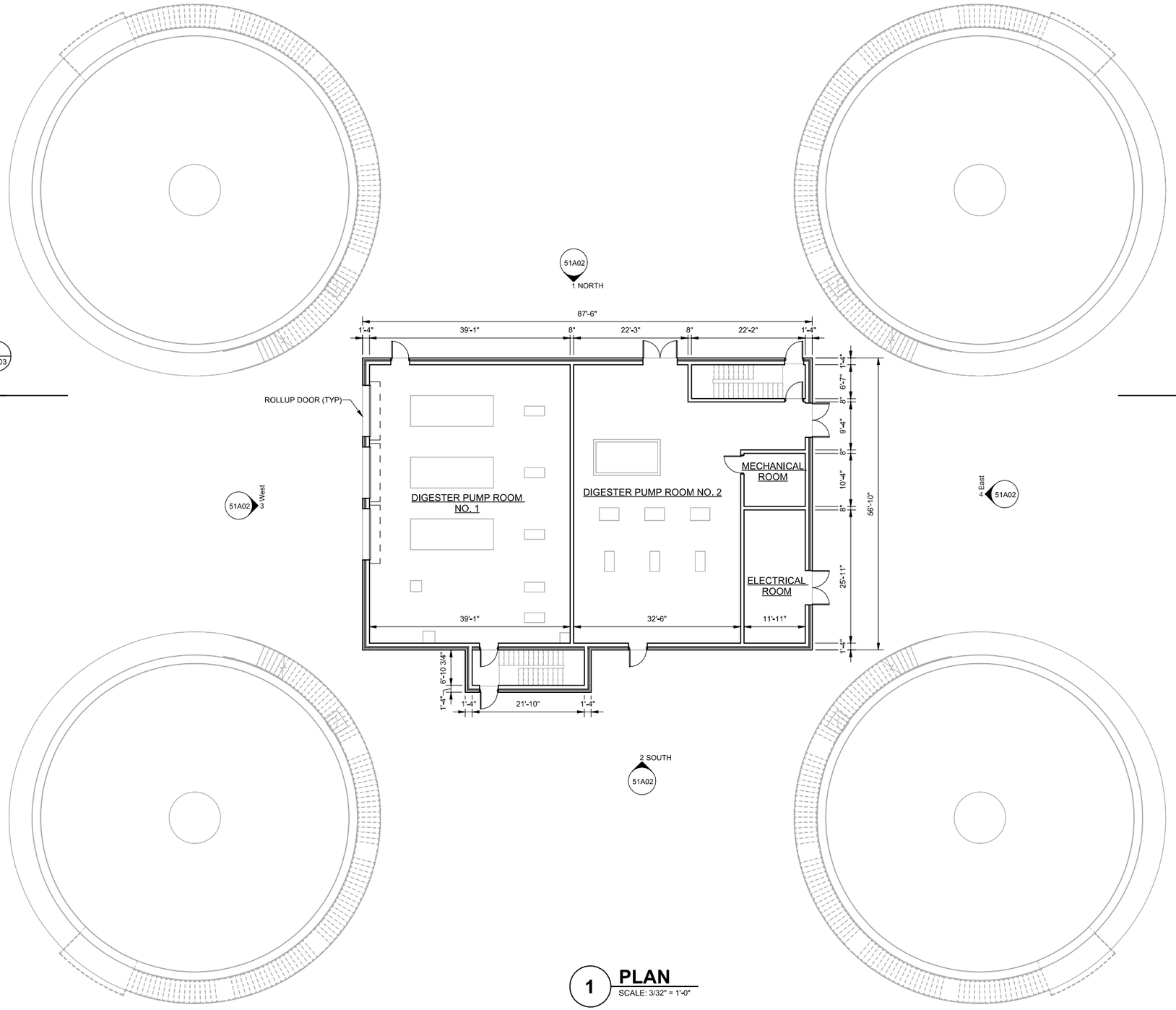
MEMBRANE BUILDING - EAST AND WEST ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 43A03
SHEET NO. 31 OF 251

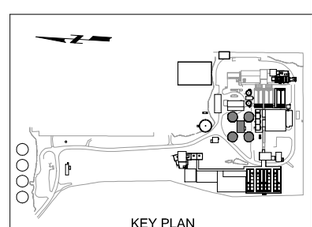
PLOT DATE: 6/27/2025 2:20:02 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/43-A-3D-101.rvt



1 PLAN

SCALE: 3/32" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ARCHITECTURAL

DIGESTER COMPLEX - PLAN AT EL. 394.21'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
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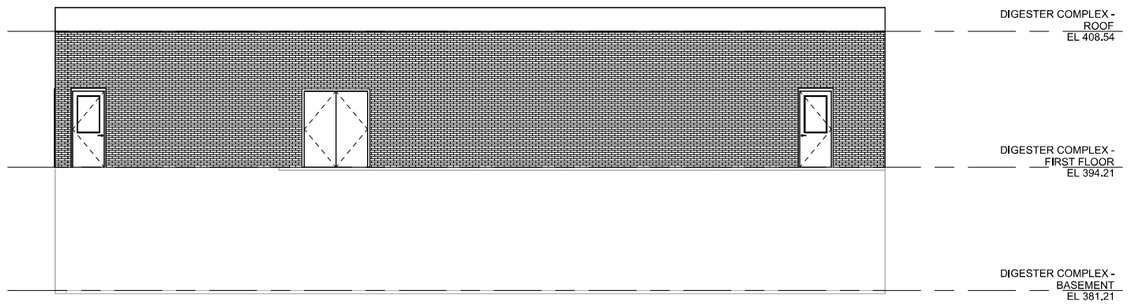
JOB NO. 203580
DRAWING NO. 51A01
SHEET NO. 32 OF 251

PLOT DATE: 6/20/2025 4:06:34 PM

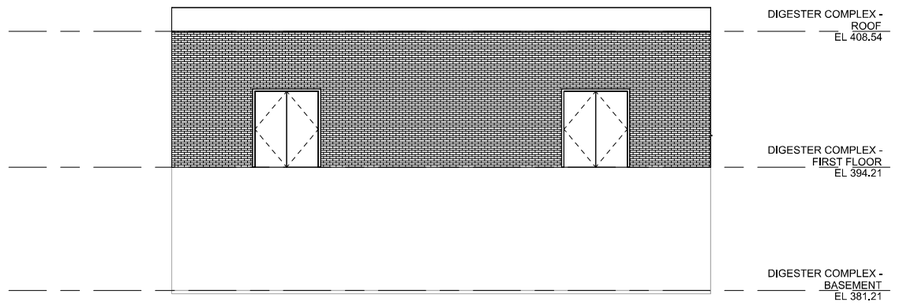
FILE NAME: Autodesk Docs://OCDWEP 203580/51-A-3D-101.rvt



NORTH ELEVATION

1 / 51A01 ELEVATION

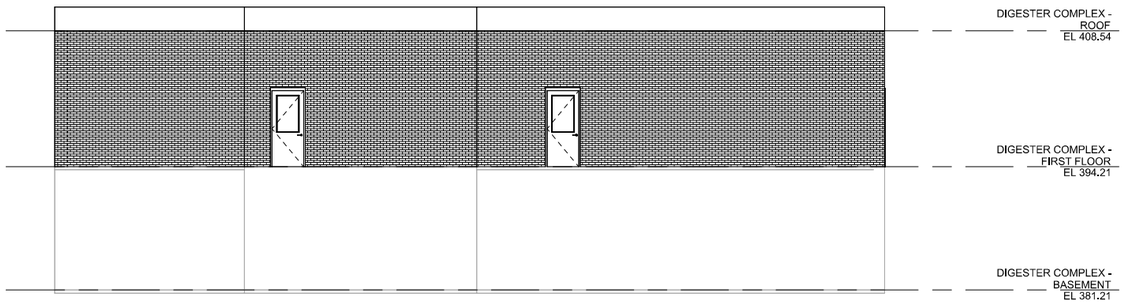
SCALE: 1/8" = 1'-0"



EAST ELEVATION

4 / 51A01 ELEVATION

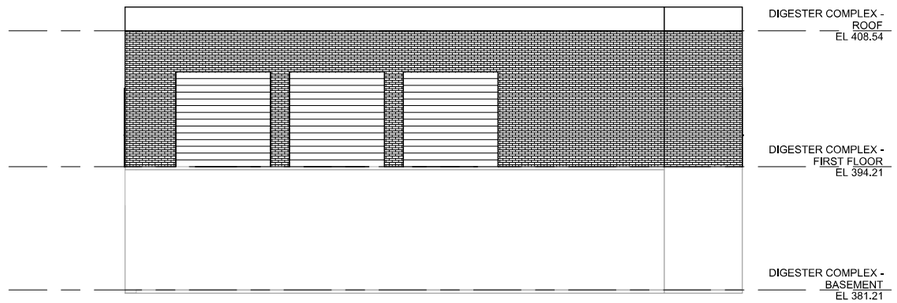
SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

2 / 51A01 ELEVATION

SCALE: 1/8" = 1'-0"



WEST ELEVATION

3 / 51A01 ELEVATION

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
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CHECKED R. GUPTA
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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ARCHITECTURAL

DIGESTER COMPLEX - ELEVATIONS

VERIFY SCALES
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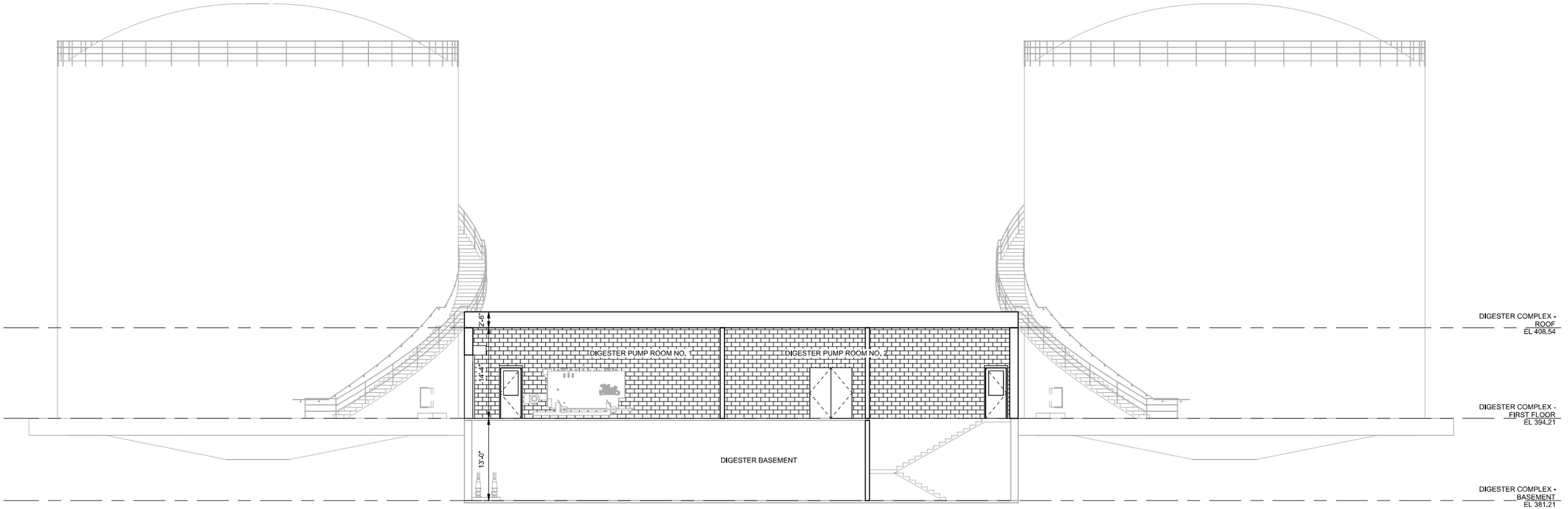
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 51A02
SHEET NO. 33 OF 251

PLOT DATE: 6/10/2025 1:31:24 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/51-A-3D-101.rvt



1 SECTION
51A01

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ARCHITECTURAL

DIGESTER COMPLEX - SECTION

VERIFY SCALES
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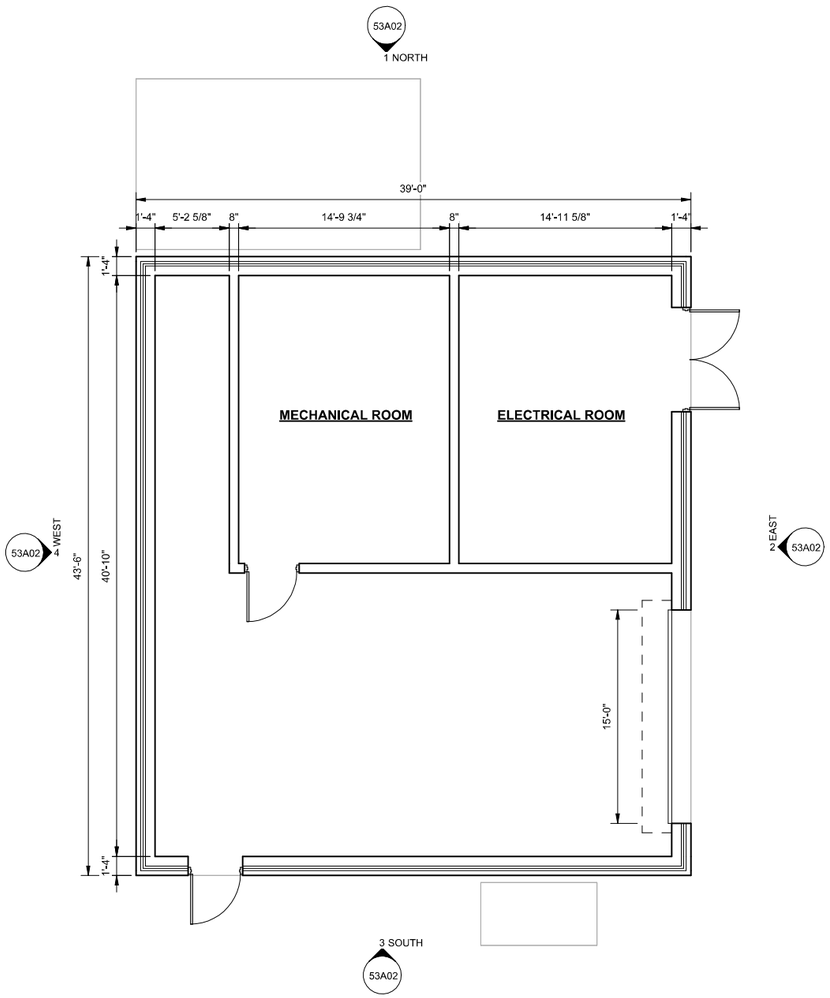
JOB NO. 203580
DRAWING NO. 51A03
SHEET NO. 34 OF 251

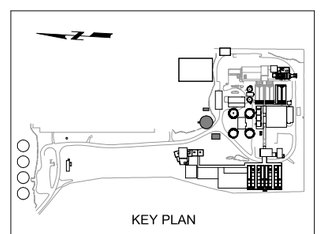
PLOT DATE: 6/25/2025 8:34:15 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/51-A-3D-101.rvt



1 PLAN

SCALE: 3/16" = 1'-0"



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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CHECKED R. GUPTA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ARCHITECTURAL

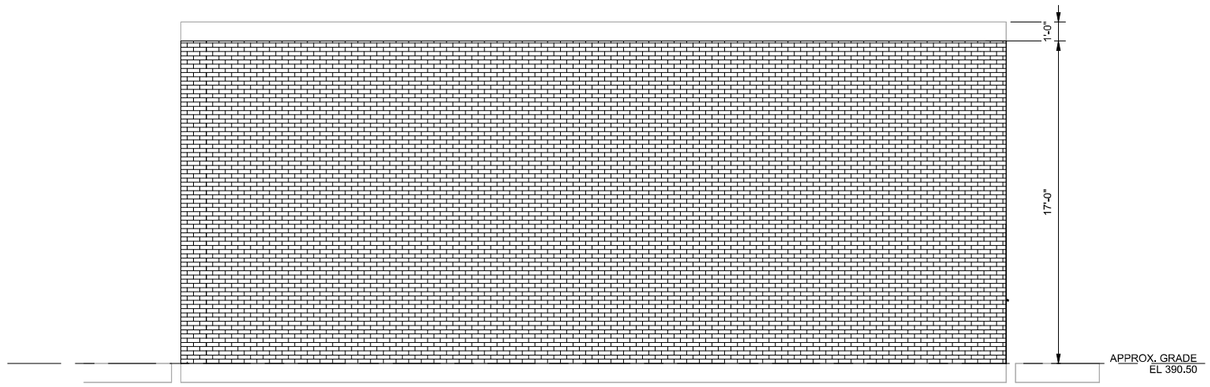
BIOGAS CONDITIONING SYSTEM BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 53A01
SHEET NO. 35 OF 251

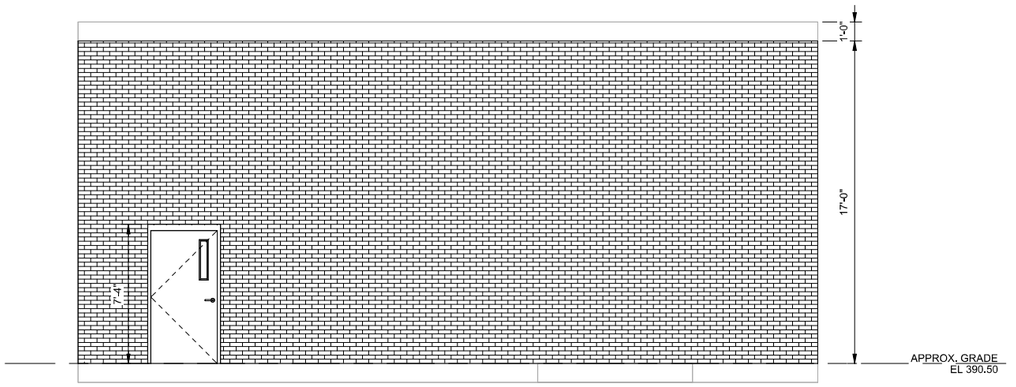
PLOT DATE: 6/25/2025 8:39:32 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/53-A-3D-101.rvt



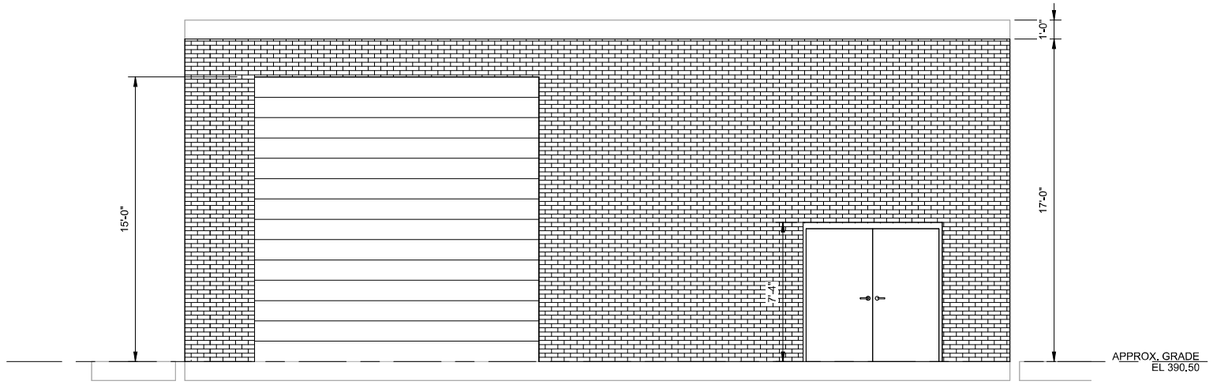
WEST ELEVATION

4 ELEVATION
53A01 SCALE: 1/4" = 1'-0"



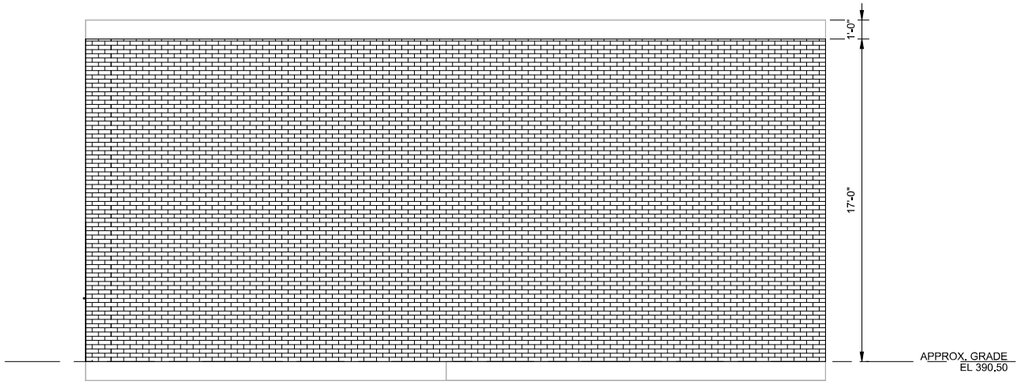
SOUTH ELEVATION

3 ELEVATION
53A01 SCALE: 1/4" = 1'-0"



EAST ELEVATION

2 ELEVATION
53A01 SCALE: 1/4" = 1'-0"



NORTH ELEVATION

1 ELEVATION
53A01 SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
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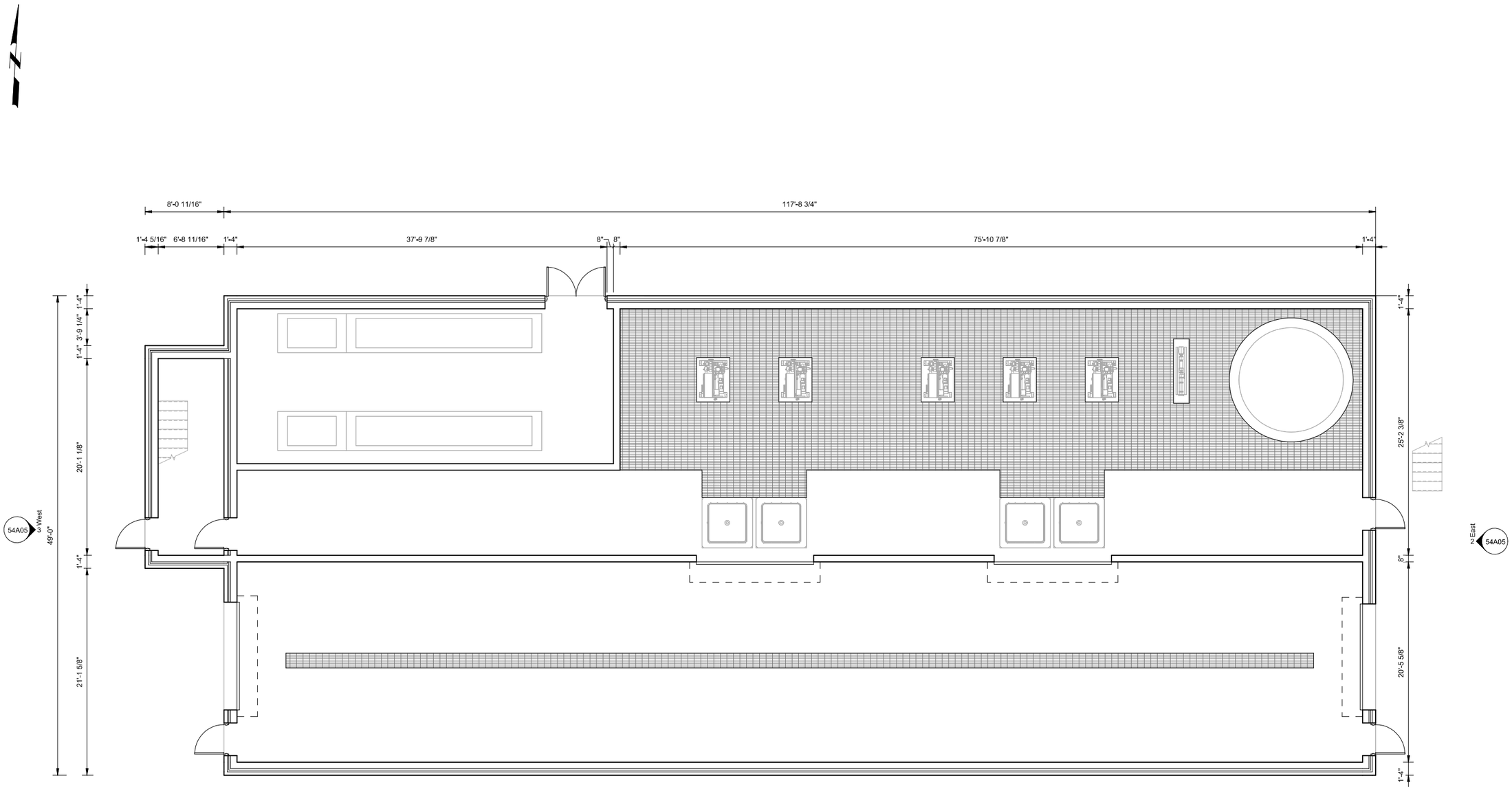
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ARCHITECTURAL
BIOGAS CONDITIONING SYSTEM BUILDING - ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 53A02
SHEET NO. 36 OF 251

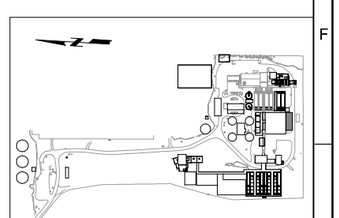
PLOT DATE: 6/25/2025 8:41:13 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/53-A-3D-101.rvt



1 PLAN

SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

THICKENING/DEWATERING - PLAN AT EL. 393.58'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54A01
SHEET NO. 37 OF 251

PLOT DATE: 6/29/2025 5:58:23 PM

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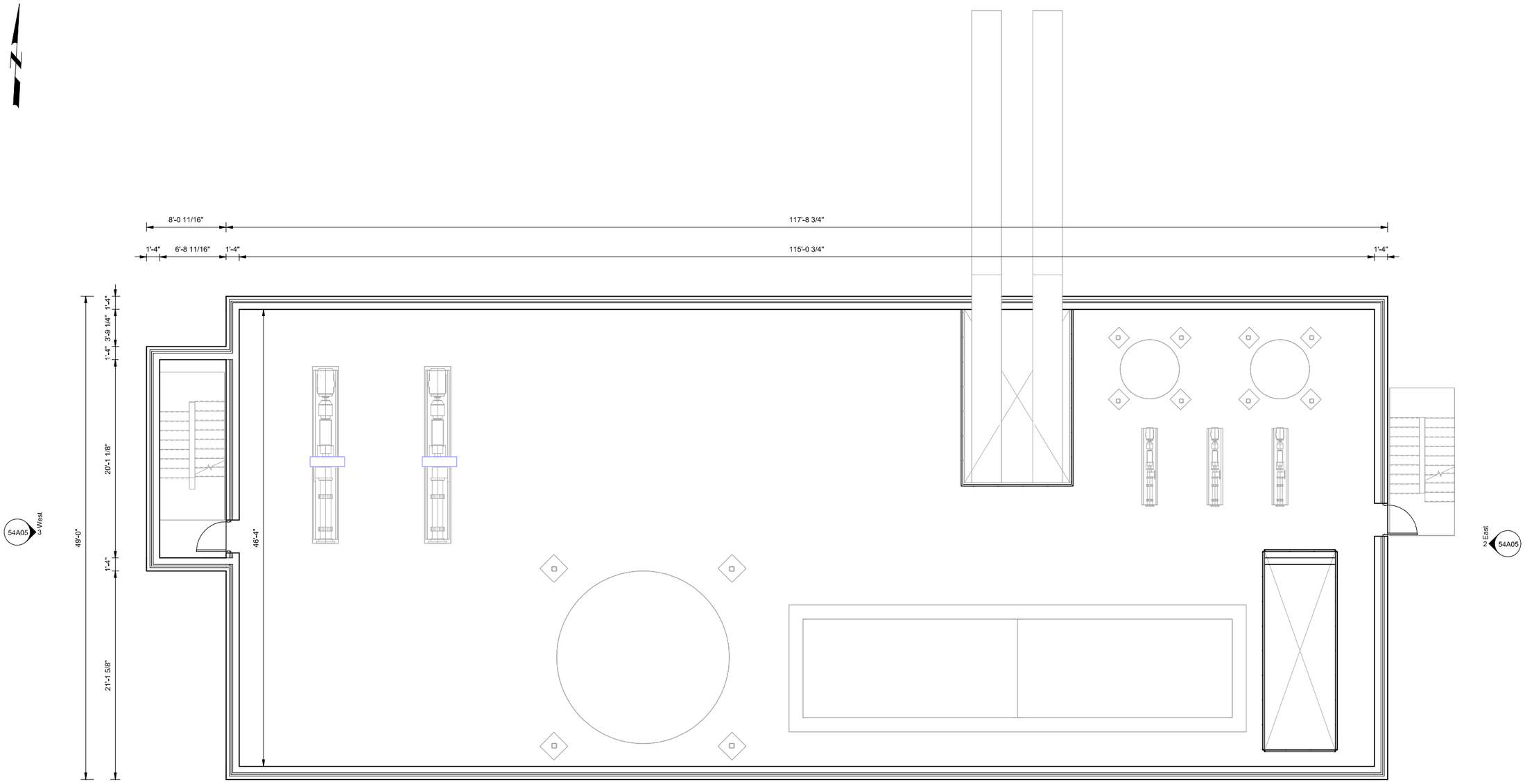

2 **PLAN**
SCALE: 3/16" = 1'-0"

KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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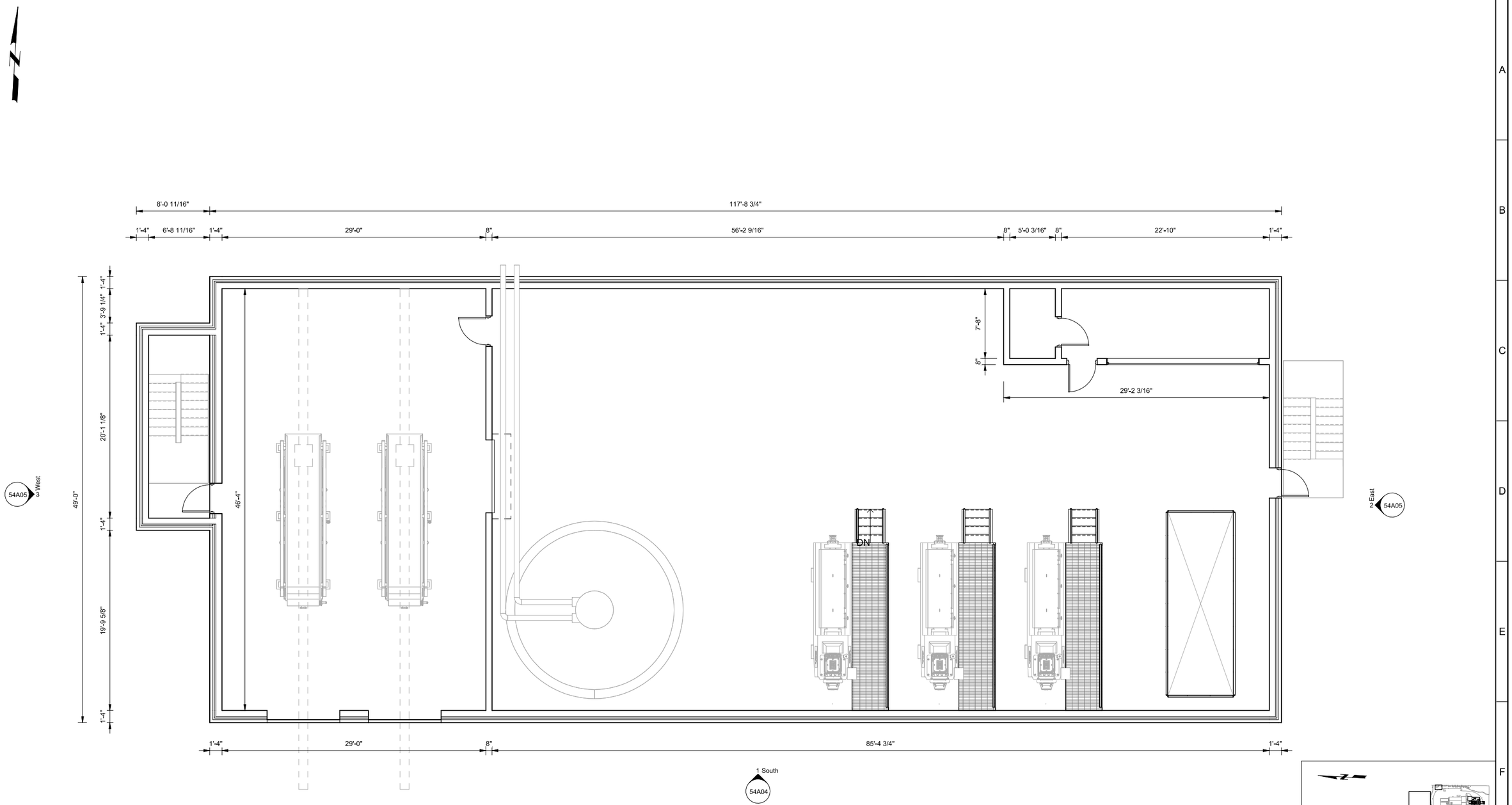
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
ARCHITECTURAL
THICKENING/DEWATERING - PLAN AT EL. 414.58'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54A02
SHEET NO. 38 OF 251

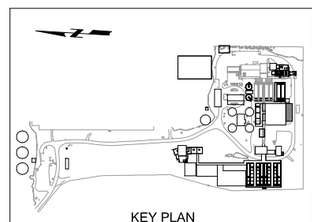
PLOT DATE: 6/23/2025 5:59:51 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-A-3D-101.rvt



3 PLAN

SCALE: 3/16" = 1'-0"



REV	DATE	BY	DESCRIPTION
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DESIGNED D. GIOVINE
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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

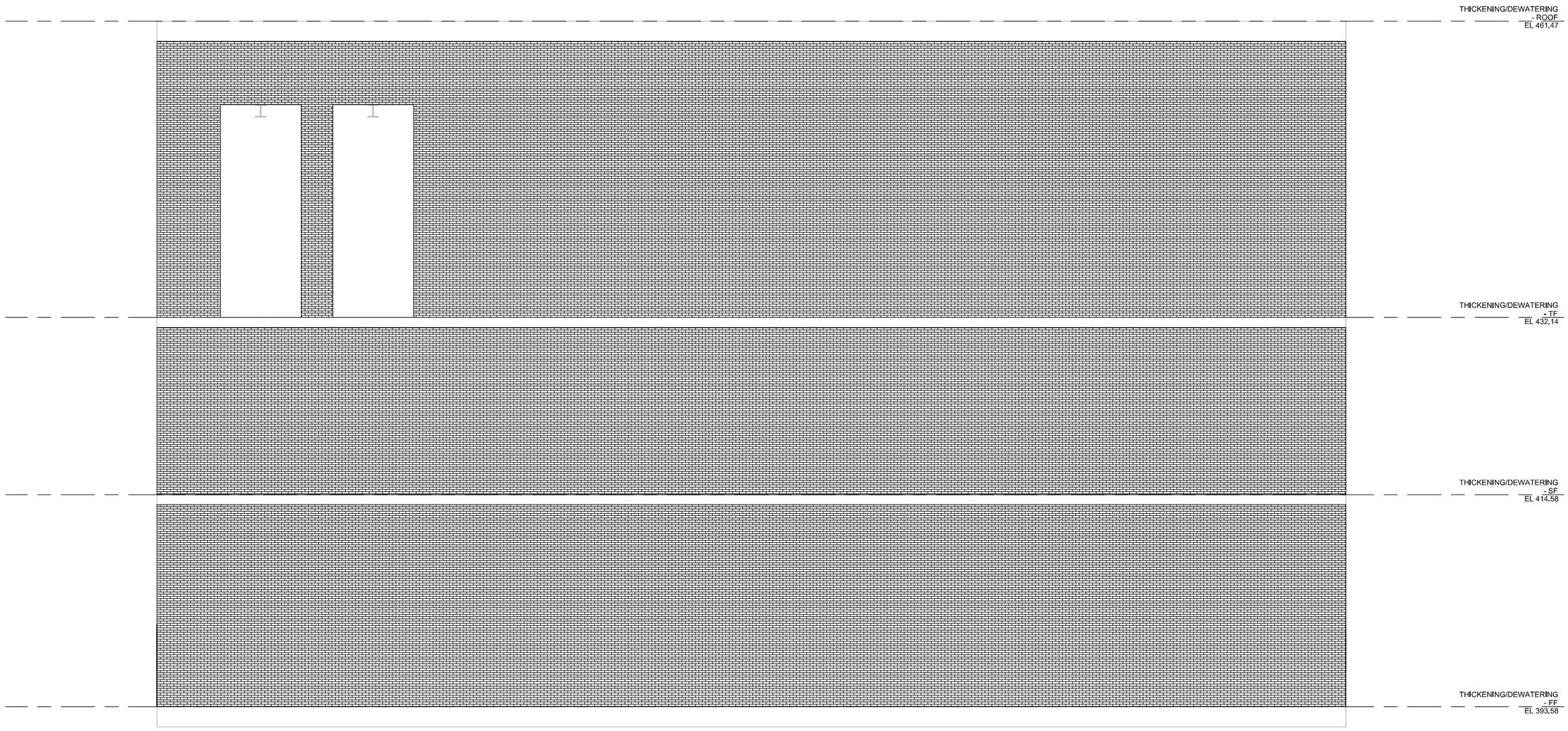
THICKENING/DEWATERING - PLAN AT EL. 432.14'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54A03
SHEET NO. 39 OF 251

PLOT DATE: 6/23/2025 6:02:39 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-A-3D-101.rvt



SOUTH ELEVATION

1 / 54A01 **ELEVATION**

SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

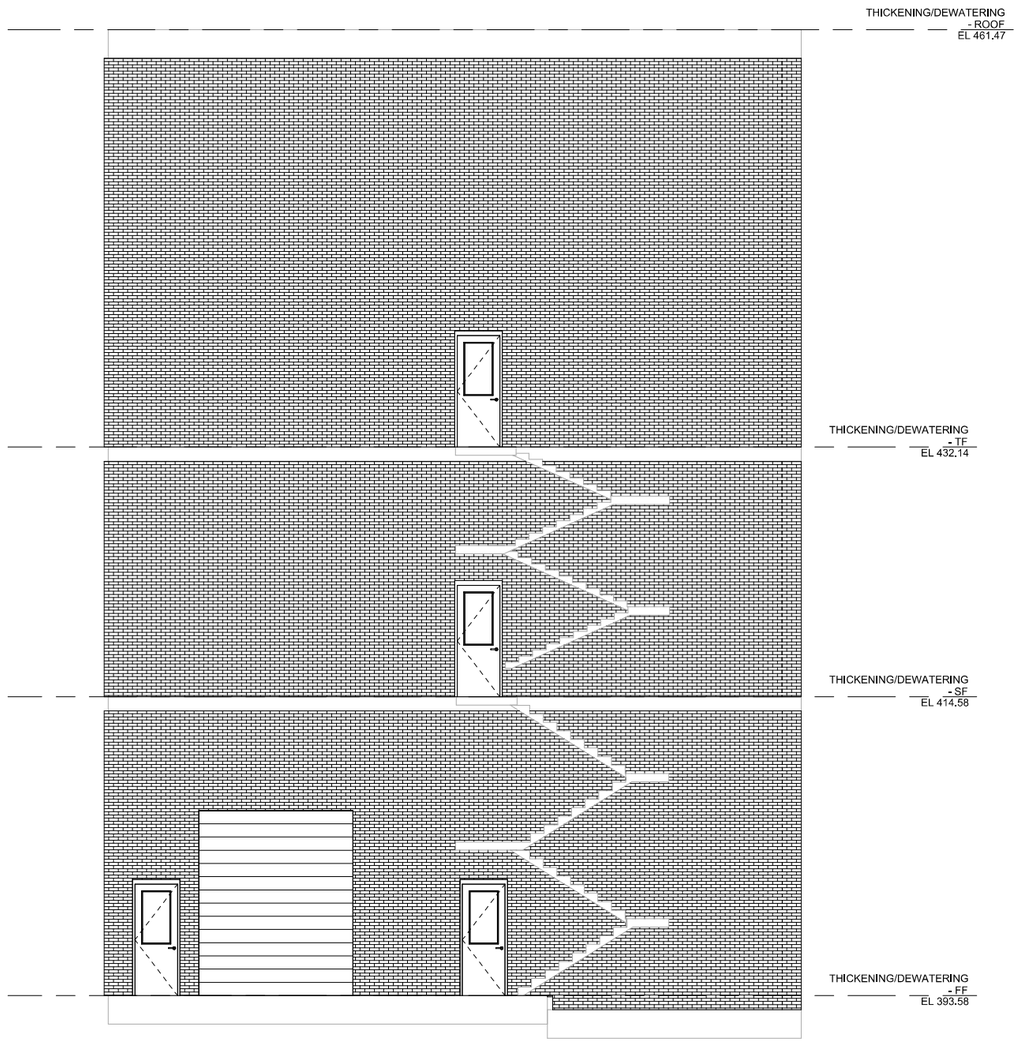
THICKENING/DEWATERING - SOUTH ELEVATION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54A04
SHEET NO. 40 OF 251

PLOT DATE: 6/23/2025 6:03:15 PM

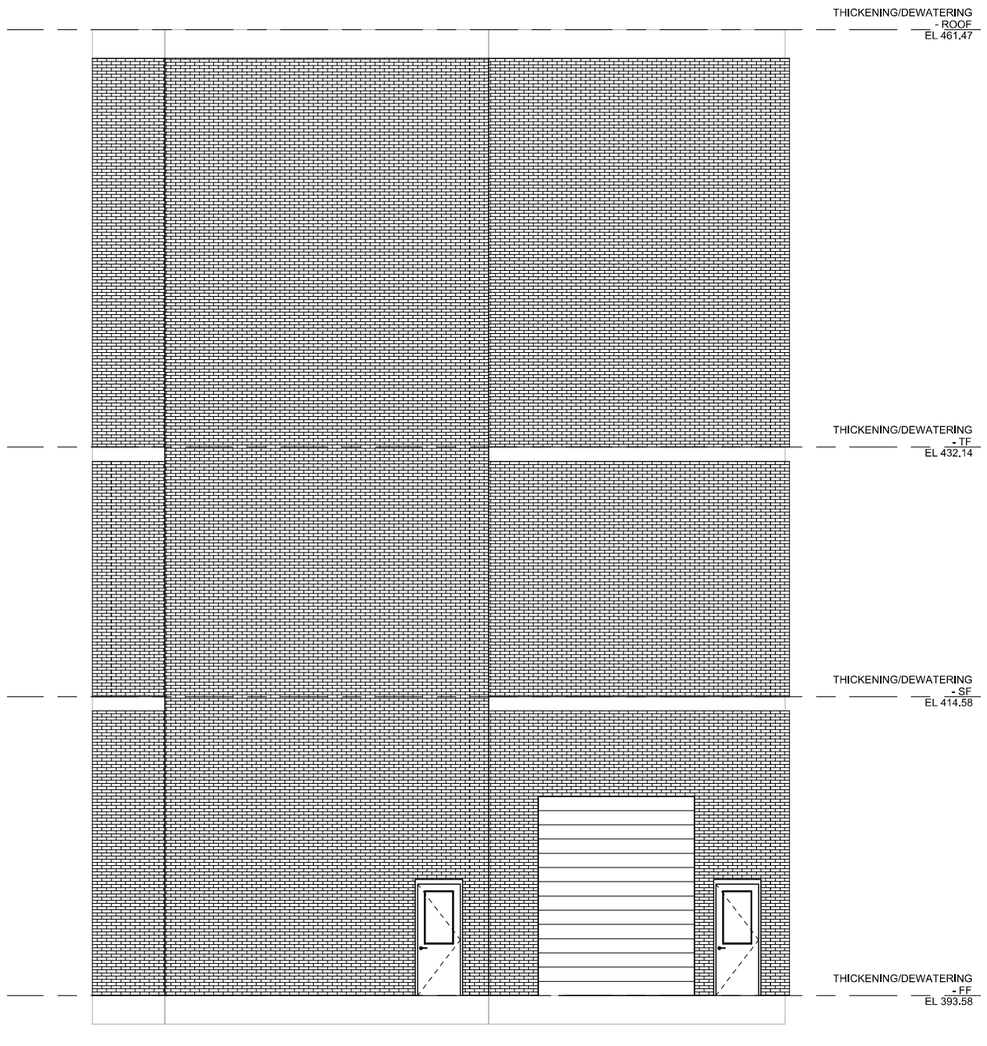
FILE NAME: Autodesk Docs://OCDWEP 203580/54-A-3D-101.rvt



EAST ELEVATION

2 ELEVATION (54A01)

SCALE: 3/16" = 1'-0"



WEST ELEVATION

3 ELEVATION (54A01)

SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

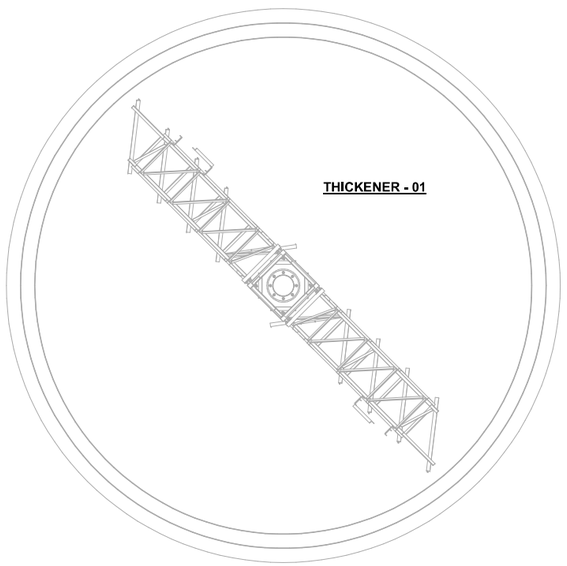
THICKENING/DEWATERING - EAST AND WEST ELEVATIONS

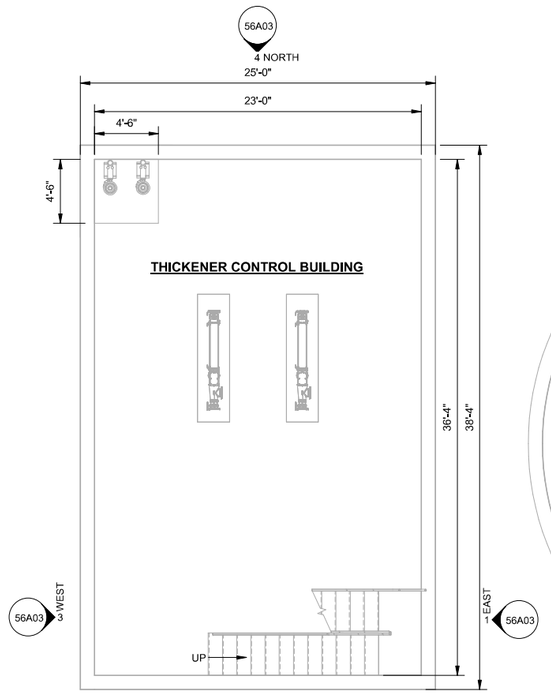
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

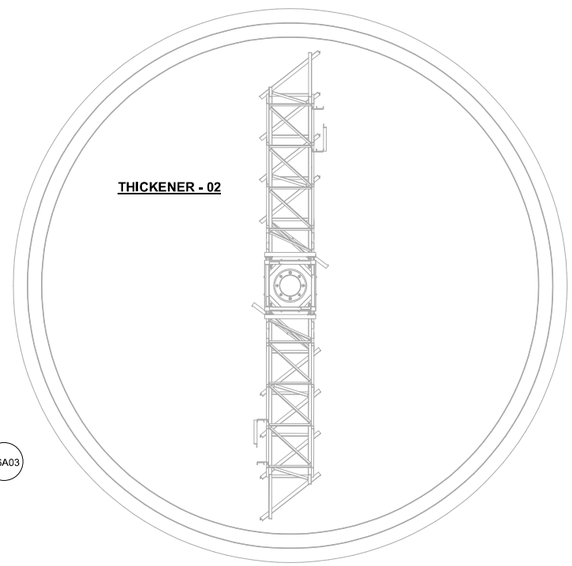
JOB NO. 203580
DRAWING NO. 54A05
SHEET NO. 41 OF 251

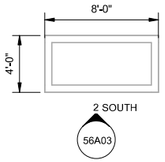
PLOT DATE: 6/23/2025 6:03:49 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-A-3D-101.rvt

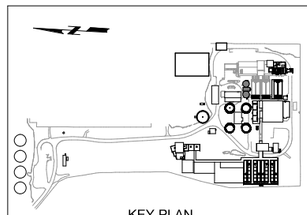








1 **PLAN**
SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ARCHITECTURAL

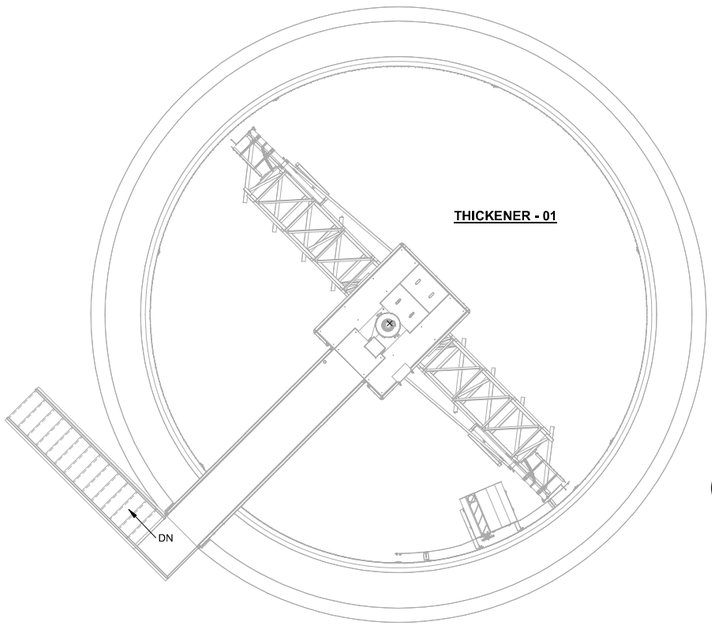
PRIMARY SLUDGE GRAVITY THICKENERS - BASEMENT FLOOR PLAN AT EL. 376.42'

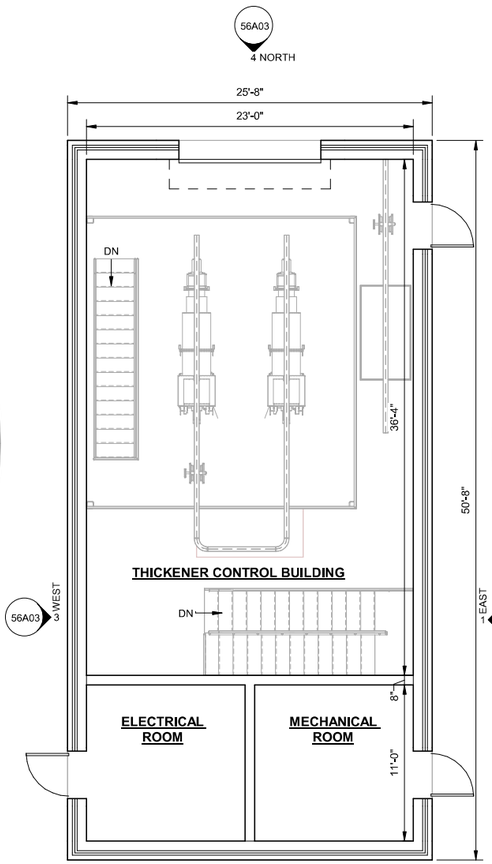
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

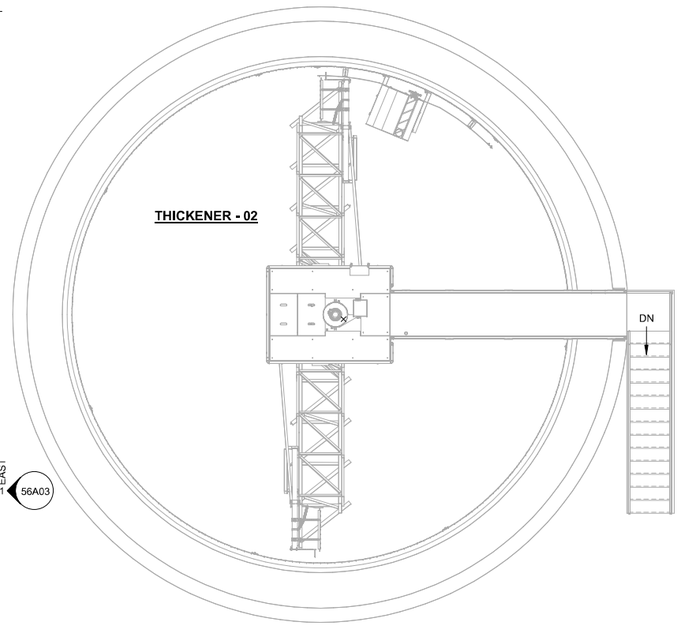
JOB NO. 203580
DRAWING NO. 56A01
SHEET NO. 42 OF 251

PLOT DATE: 6/20/2025 9:52:11 AM

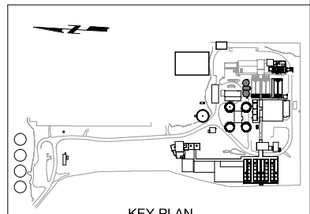
FILE NAME: Autodesk Docs://OCDWEP 203580/56-A-3D-101.rvt







2 PLAN
SCALE: 3/16" = 1'-0"


KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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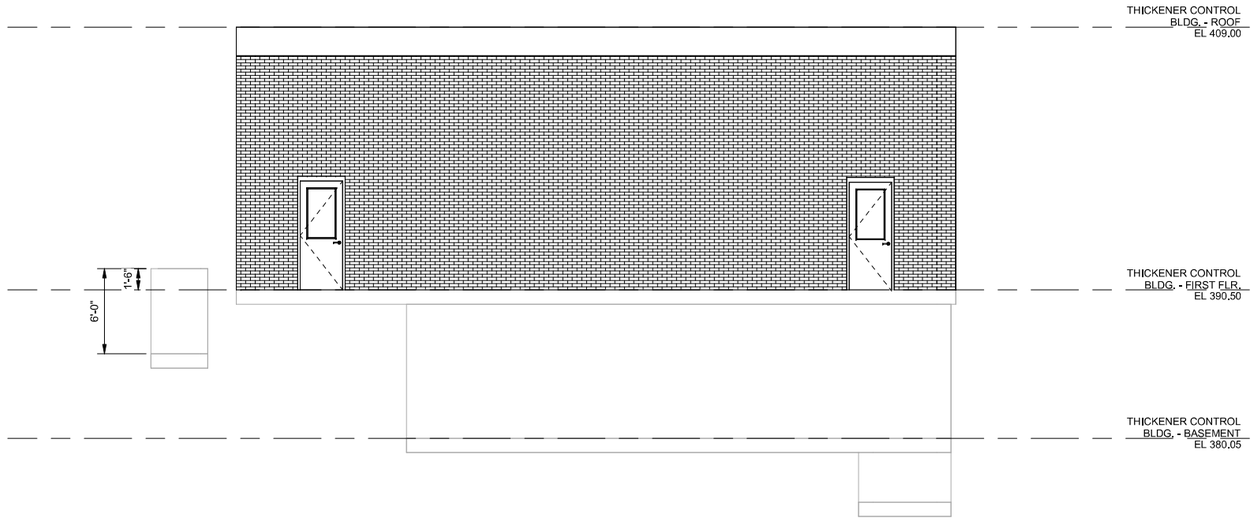
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ARCHITECTURAL
PRIMARY SLUDGE GRAVITY THICKENERS - FIRST FLOOR PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 56A02
SHEET NO. 43 OF 251

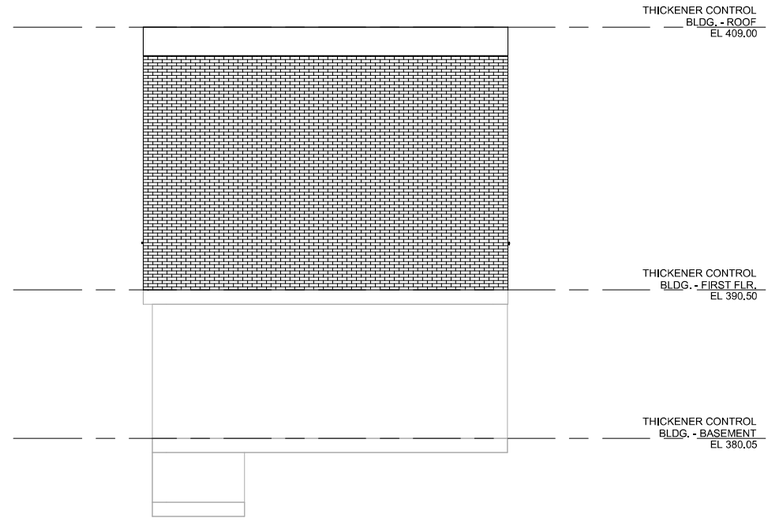
PLOT DATE: 6/20/2025 9:52:44 AM
FILE NAME: Autodesk Docs://OCDWEP 203580/56-A-3D-101.rvt



EAST ELEVATION

1 ELEVATION

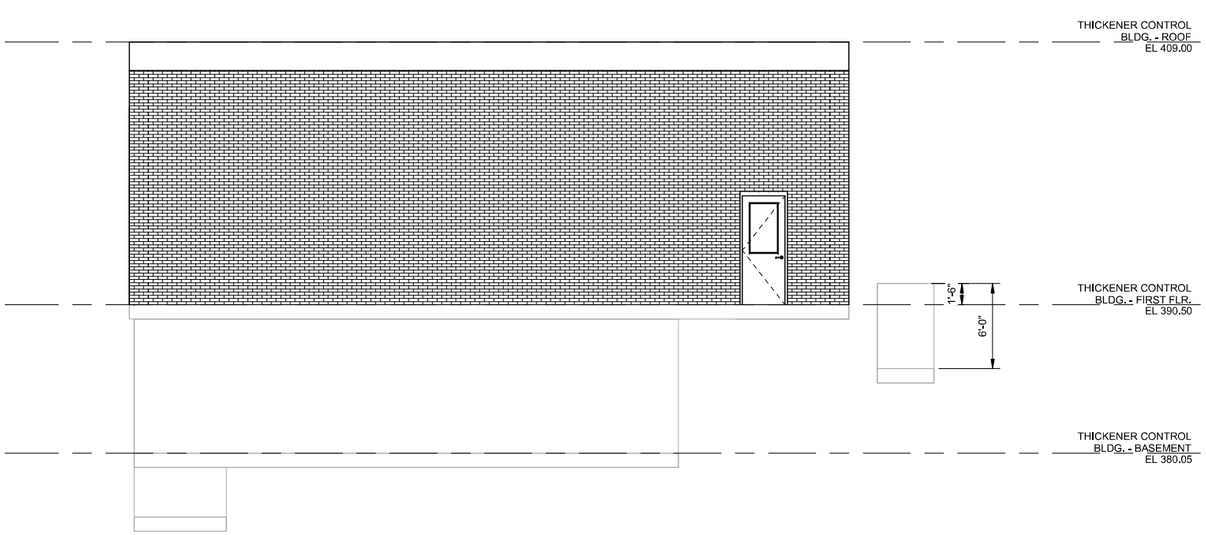
56A01 SCALE: 3/16" = 1'-0"



SOUTH ELEVATION

2 ELEVATION

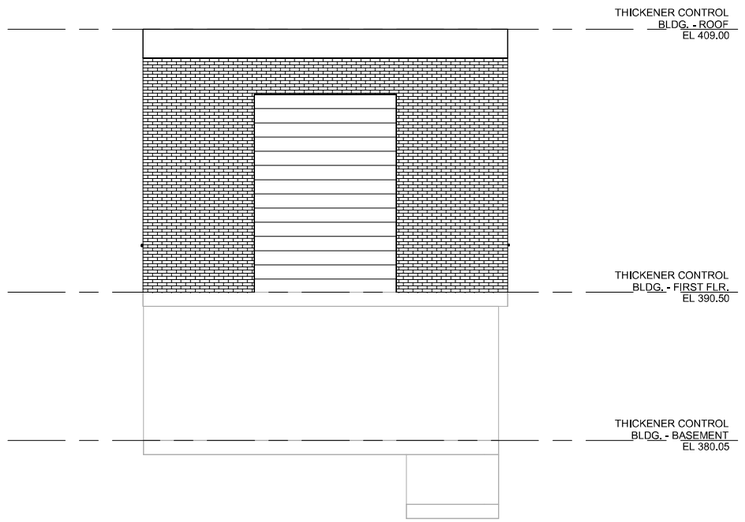
56A01 SCALE: 3/16" = 1'-0"



WEST ELEVATION

3 ELEVATION

56A01 SCALE: 3/16" = 1'-0"



NORTH ELEVATION

4 ELEVATION

56A01 SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ARCHITECTURAL

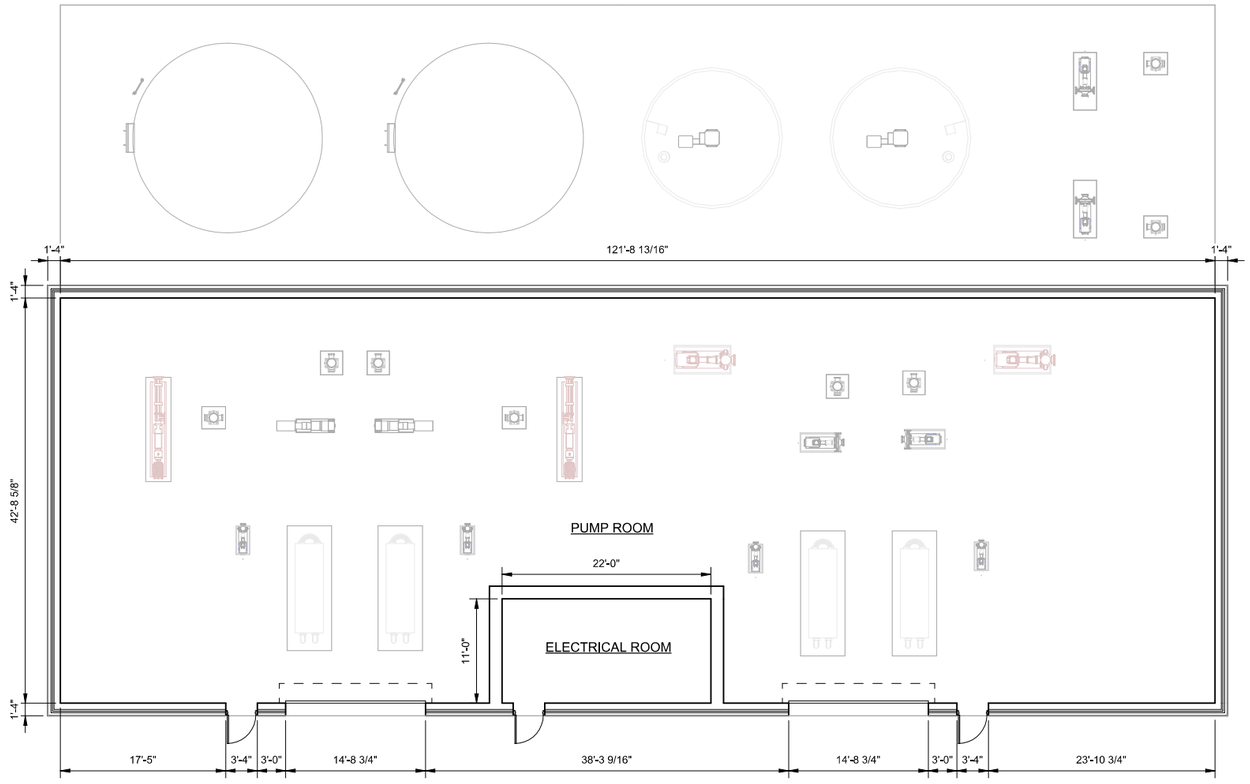
PRIMARY SLUDGE GRAVITY THICKENERS - ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

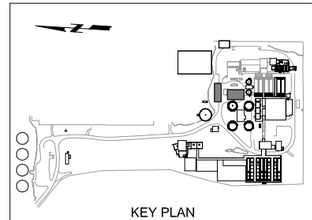
JOB NO. 203580
DRAWING NO. 56A03
SHEET NO. 44 OF 251

PLOT DATE: 6/20/2025 9:53:06 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/56-A-3D-101.rvt



1 PLAN
SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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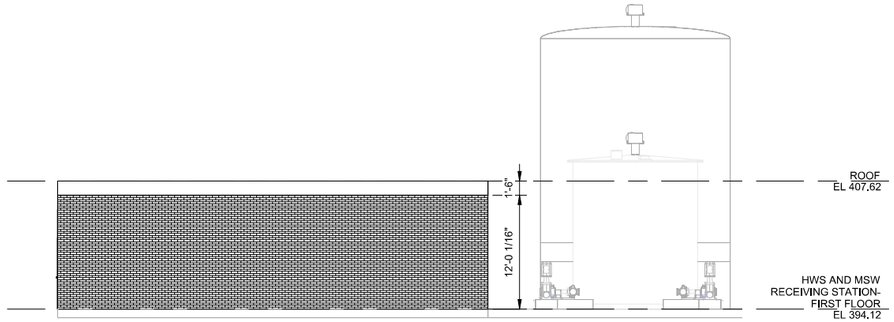
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ARCHITECTURAL
HSW AND MSW RECEIVING STATIONS - PLAN AT EL. 393.20

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 57A01
SHEET NO. 45 OF 251

PLOT DATE: 6/26/2025 3:31:55 PM

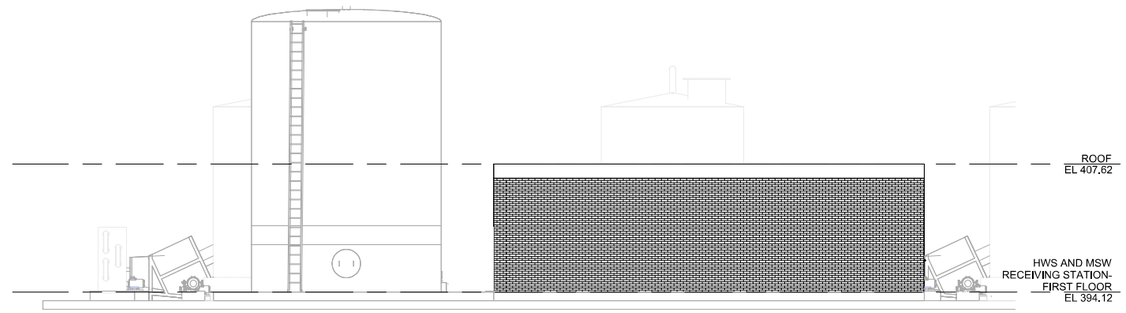
FILE NAME: Autodesk Docs://OCDWEP 203580/57-A-3D-101.rvt



NORTH ELEVATION

1 ELEVATION (57A01)

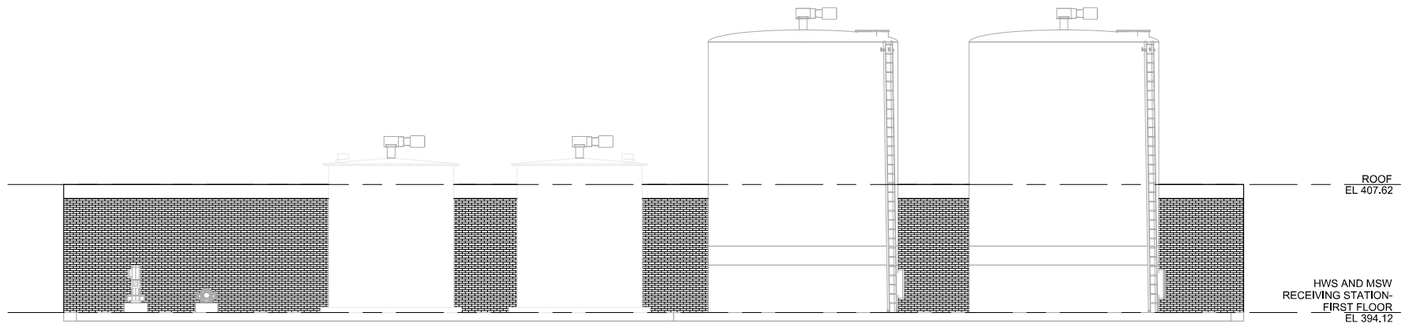
SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

2 ELEVATION (57A01)

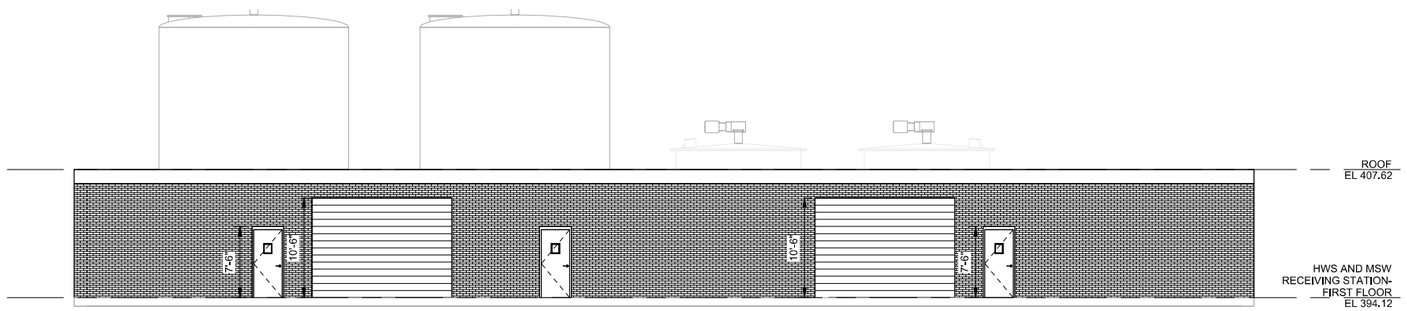
SCALE: 1/8" = 1'-0"



WEST ELEVATION

3 ELEVATION (57A01)

SCALE: 1/8" = 1'-0"



EAST ELEVATION

4 ELEVATION (57A01)

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ARCHITECTURAL

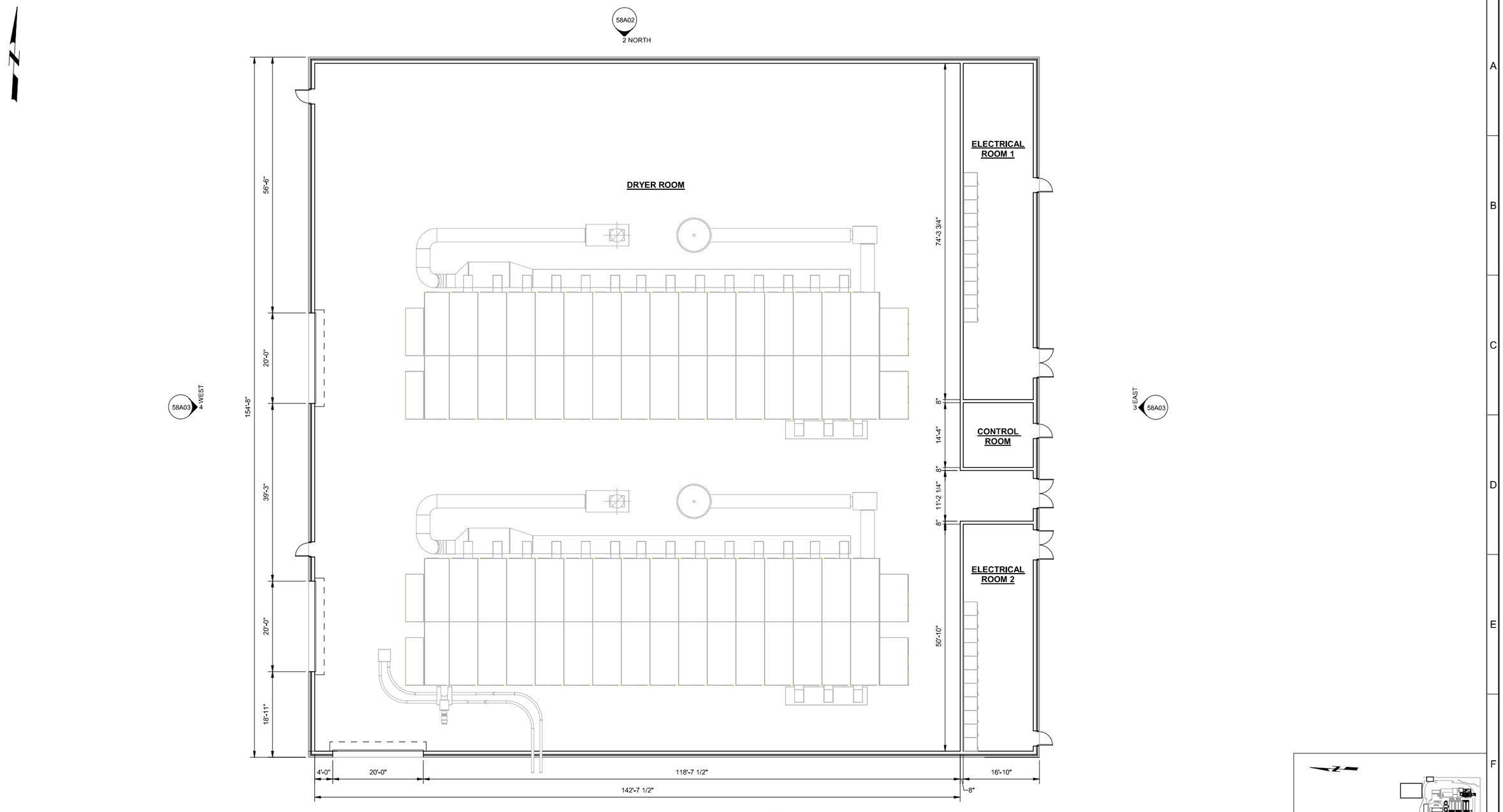
HSW AND MSW RECEIVING STATIONS - ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 57A02
SHEET NO. 46 OF 251

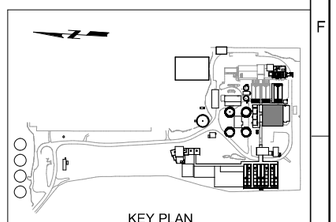
PLOT DATE: 6/26/2025 3:31:57 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/57-A-3D-101.rvt



1 PLAN

SCALE: 3/32" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

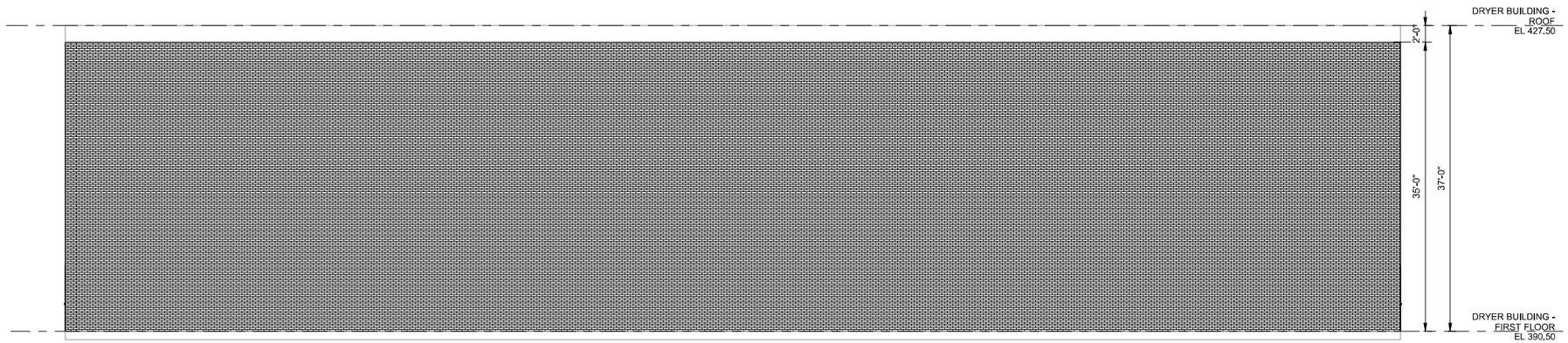
DRYER BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 58A01
SHEET NO. 47 OF 251

PLOT DATE: 6/10/2025 3:10:43 PM

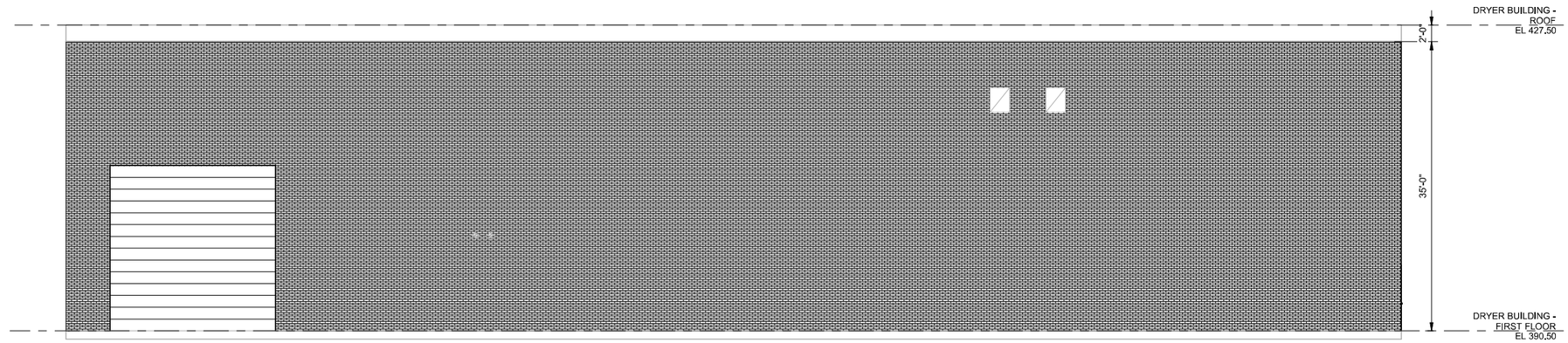
FILE NAME: Autodesk Docs://OCDWEP 203580/58-A-3D-101.rvt



NORTH ELEVATION

2 ELEVATION (58A01)

SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

1 ELEVATION (59A01)

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

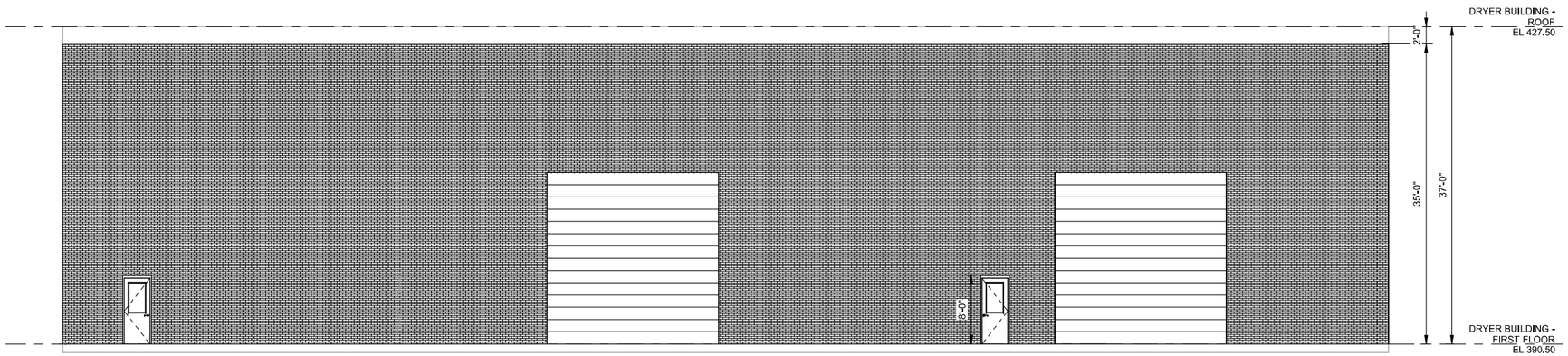
DRYER BUILDING - ELEVATIONS - 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 58A02
SHEET NO. 48 OF 251

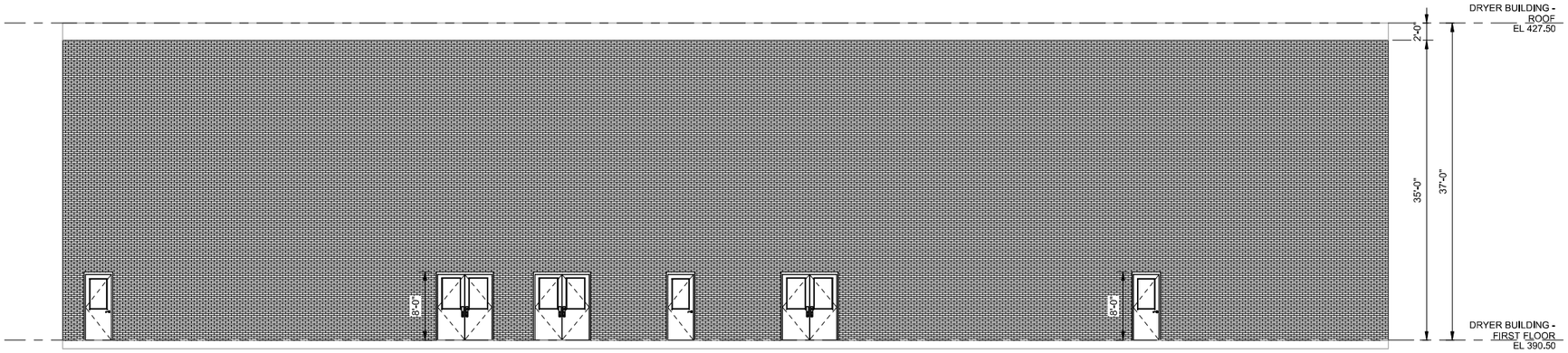
PLOT DATE: 6/10/2025 11:44:41 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/58-A-3D-101.rvt



WEST ELEVATION

4 ELEVATION
58A01 SCALE: 1/8" = 1'-0"



EAST ELEVATION

3 ELEVATION
58A01 SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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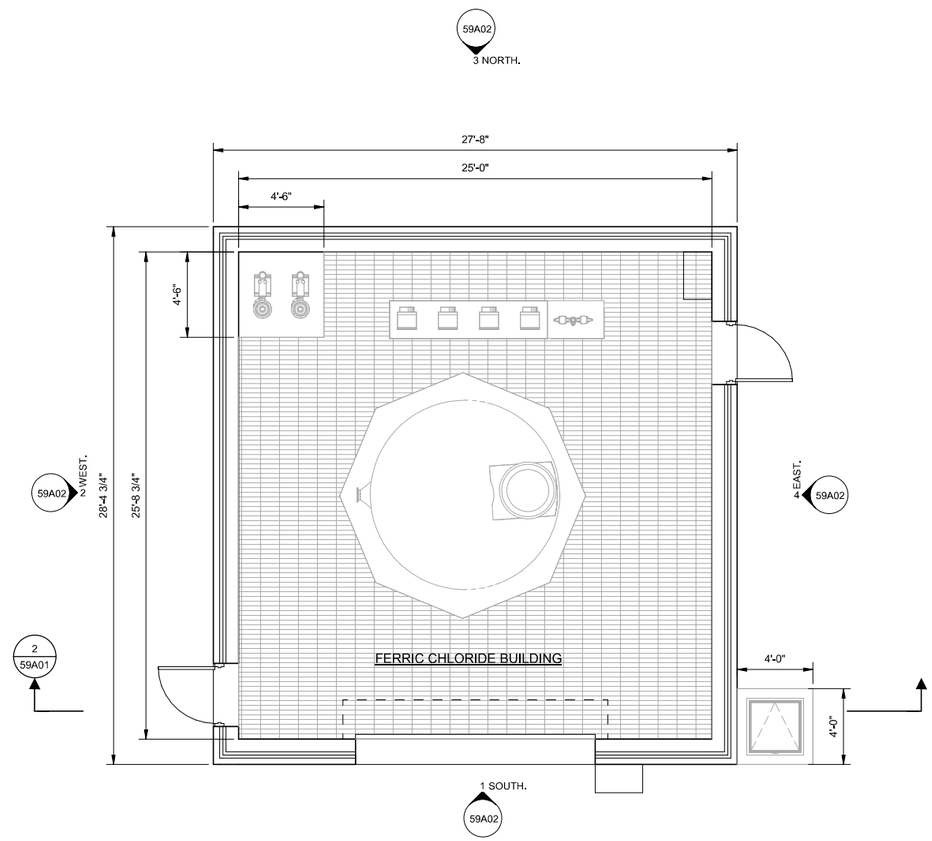
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
ARCHITECTURAL
DRYER BUILDING - ELEVATIONS - 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

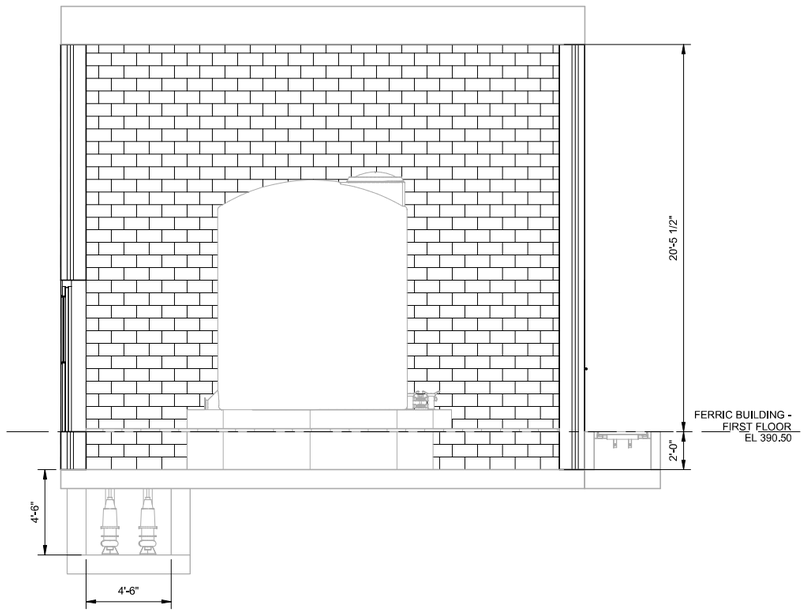
JOB NO. 203580
DRAWING NO. 58A03
SHEET NO. 49 OF 251

PLOT DATE: 6/10/2025 11:45:00 AM

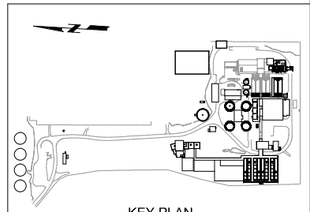
FILE NAME: Autodesk Docs://OCDWEP 203580/58-A-3D-101.rvt



1 PLAN
SCALE: 1/4" = 1'-0"



2 SECTION
59A01 SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

FERRIC CHLORIDE BUILDING - PLAN AT EL. 390.50' AND SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 59A01
SHEET NO. 50 OF 251

PLOT DATE: 6/20/2025 9:59:20 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/58-A-3D-101.rvt

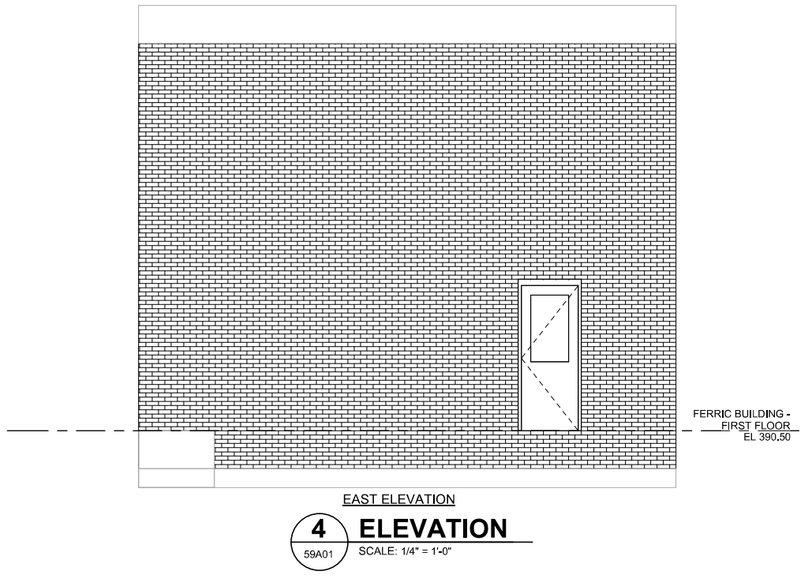


NORTH ELEVATION

3 ELEVATION

59A01

SCALE: 1/4" = 1'-0"

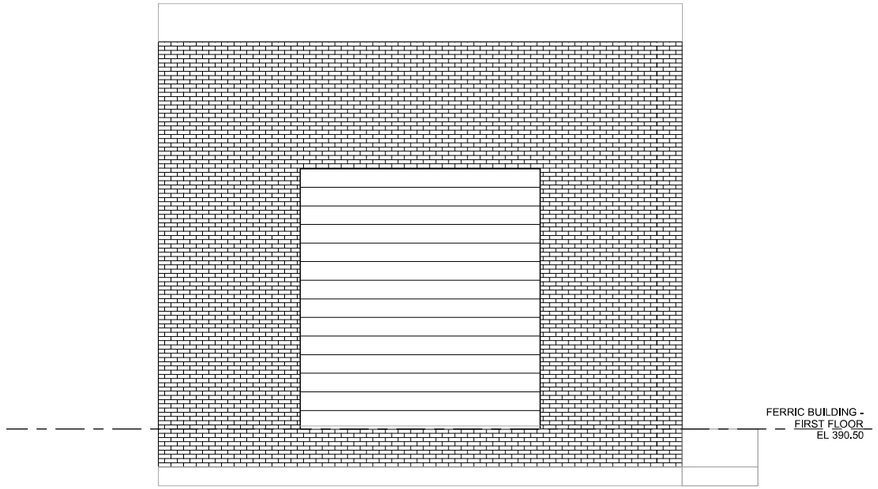


EAST ELEVATION

4 ELEVATION

59A01

SCALE: 1/4" = 1'-0"

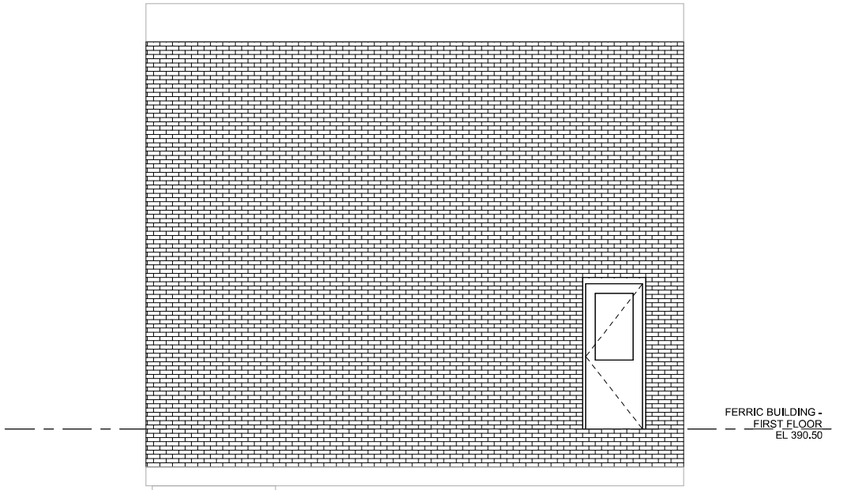


SOUTH ELEVATION

1 ELEVATION

59A01

SCALE: 1/4" = 1'-0"



WEST ELEVATION

2 ELEVATION

59A01

SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

ARCHITECTURAL

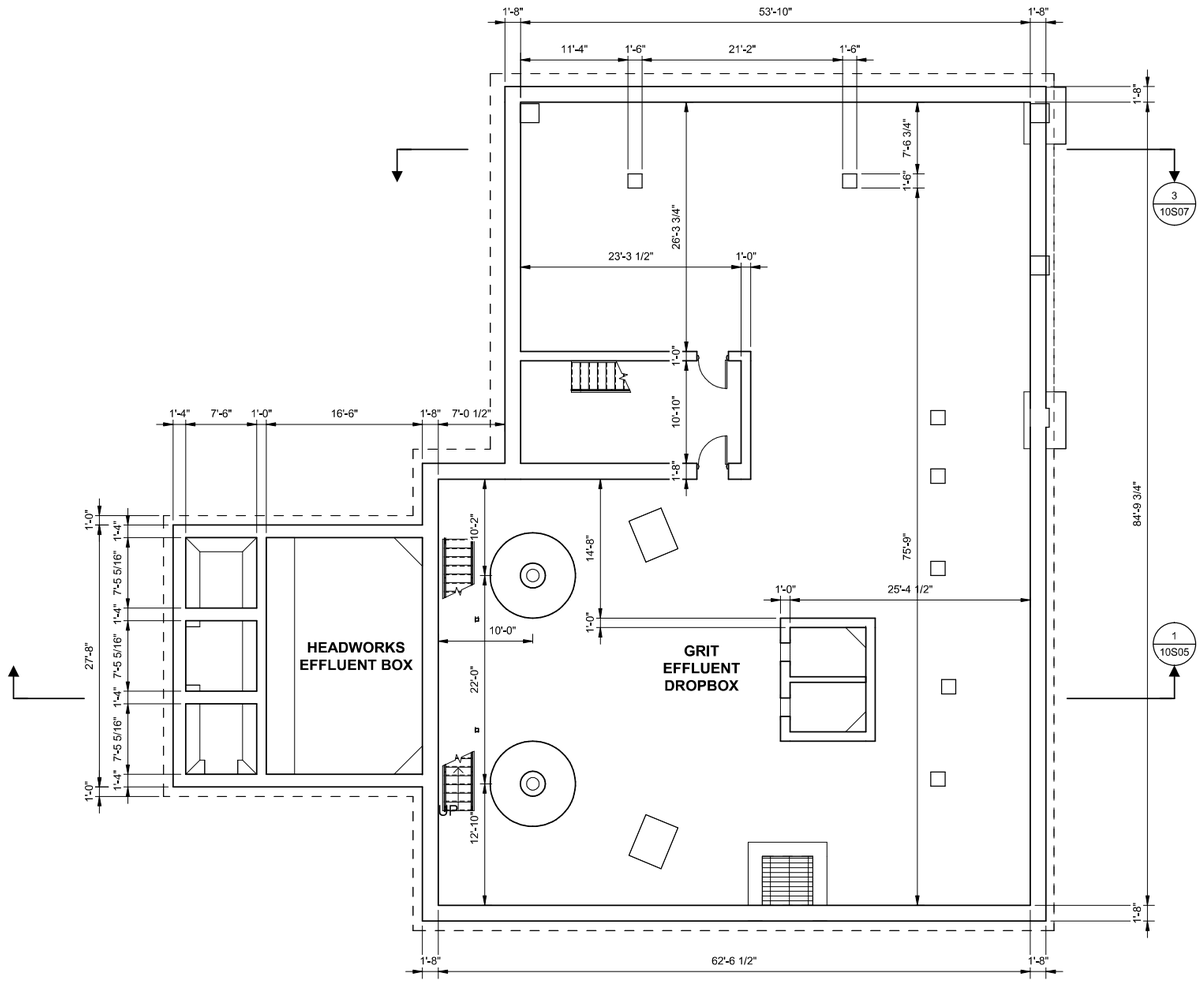
FERRIC CHLORIDE BUILDING - ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 59A02
SHEET NO. 51 OF 251

PLOT DATE: 6/17/2025 4:38:58 PM

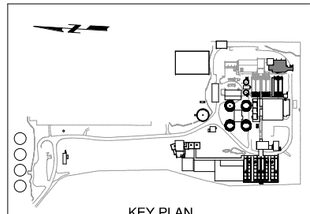
FILE NAME: Autodesk Docs://OCDWEP 203580/58-A-3D-101.rvt



LOWER

1 PLAN

SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

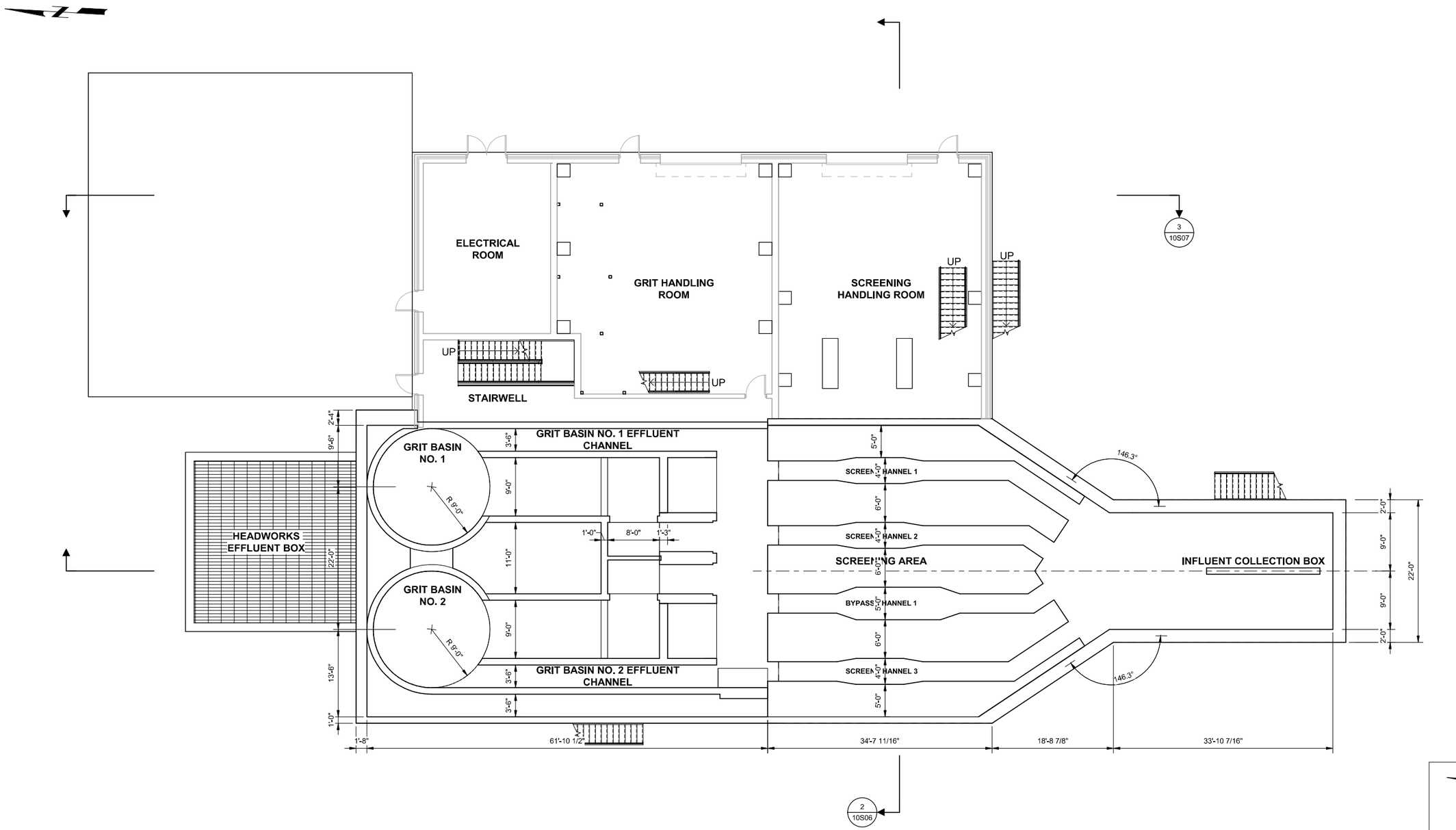
HEADWORKS - BASEMENT PLAN AT EL. 382.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10S01
SHEET NO. 52 OF 251

PLOT DATE: 6/10/2025 3:34:11 PM

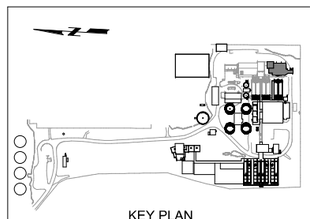
FILE NAME: Autodesk Docs://OCDWEP 203580/10-S-3D-101.rvt



UPPER

2 PLAN

SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

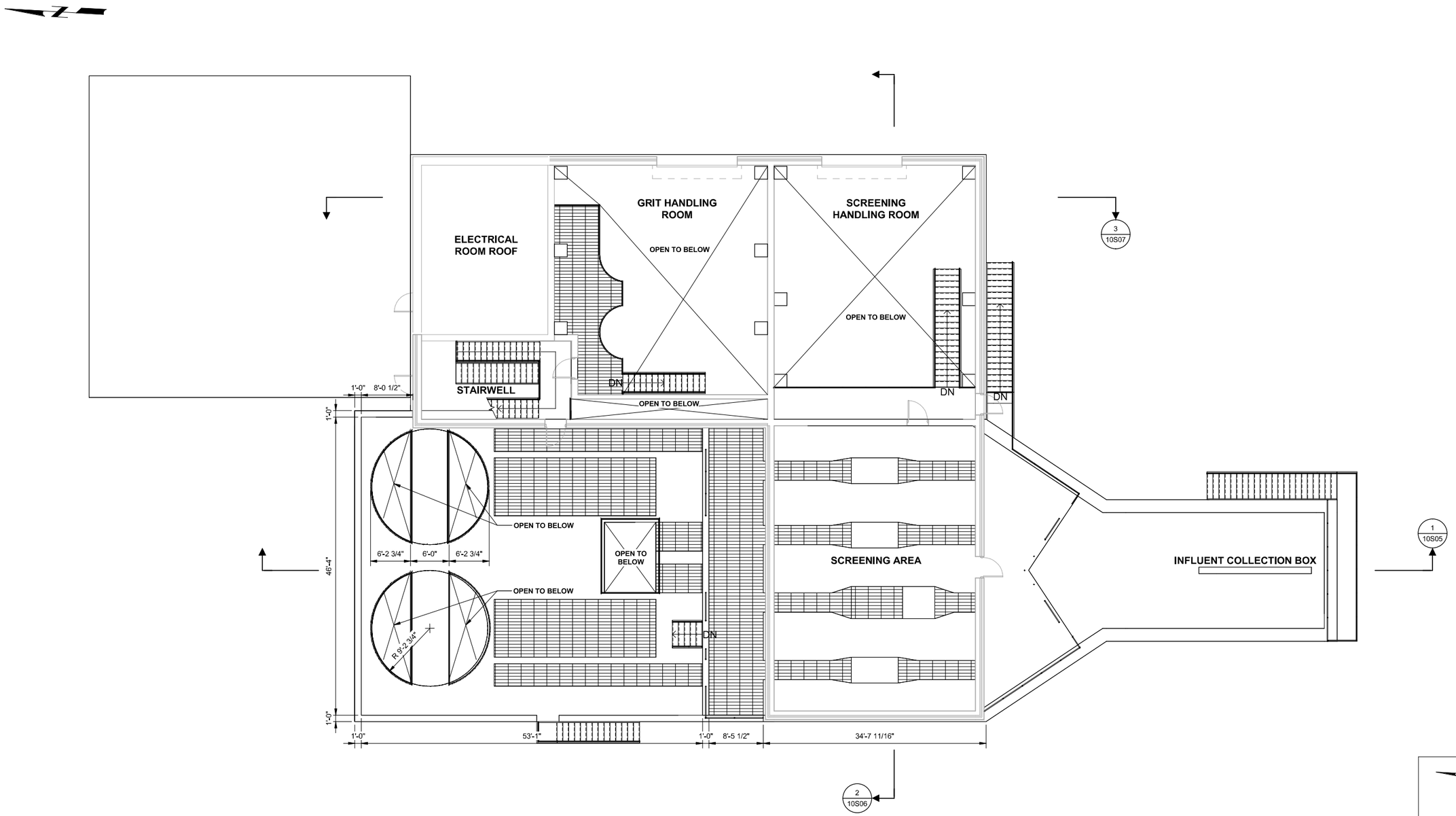
HEADWORKS - OVERALL PLAN AT EL. 395.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

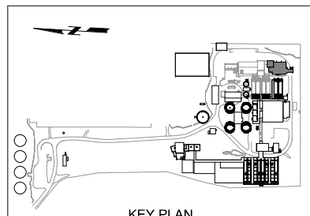
JOB NO. 203580
DRAWING NO. 10S02
SHEET NO. 53 OF 251

PLOT DATE: 6/10/2025 3:34:11 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-S-3D-101.rvt



3 PLAN
SCALE: 1/8" = 1'-0"



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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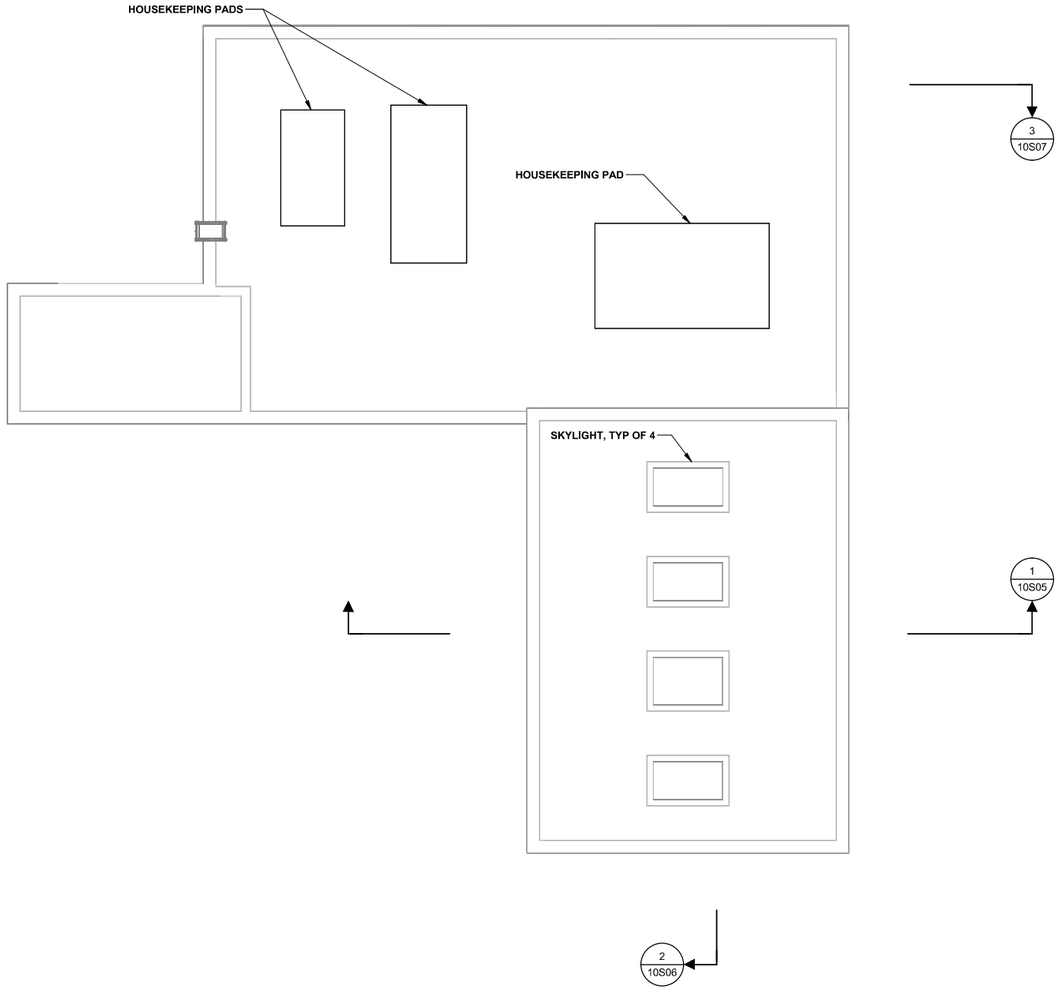
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
STRUCTURAL
HEADWORKS - OVERALL PLAN AT EL. 407.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10S03
SHEET NO. 54 OF 251

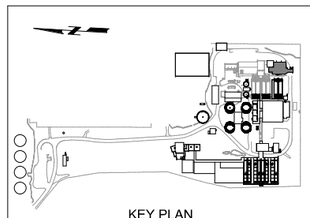
PLOT DATE: 6/10/2025 3:34:12 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-S-3D-101.rvt



4 PLAN

SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

HEADWORKS - ROOF PLAN AT EL. 432.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10S04
SHEET NO. 55 OF 251

PLOT DATE: 6/10/2025 3:34:12 PM

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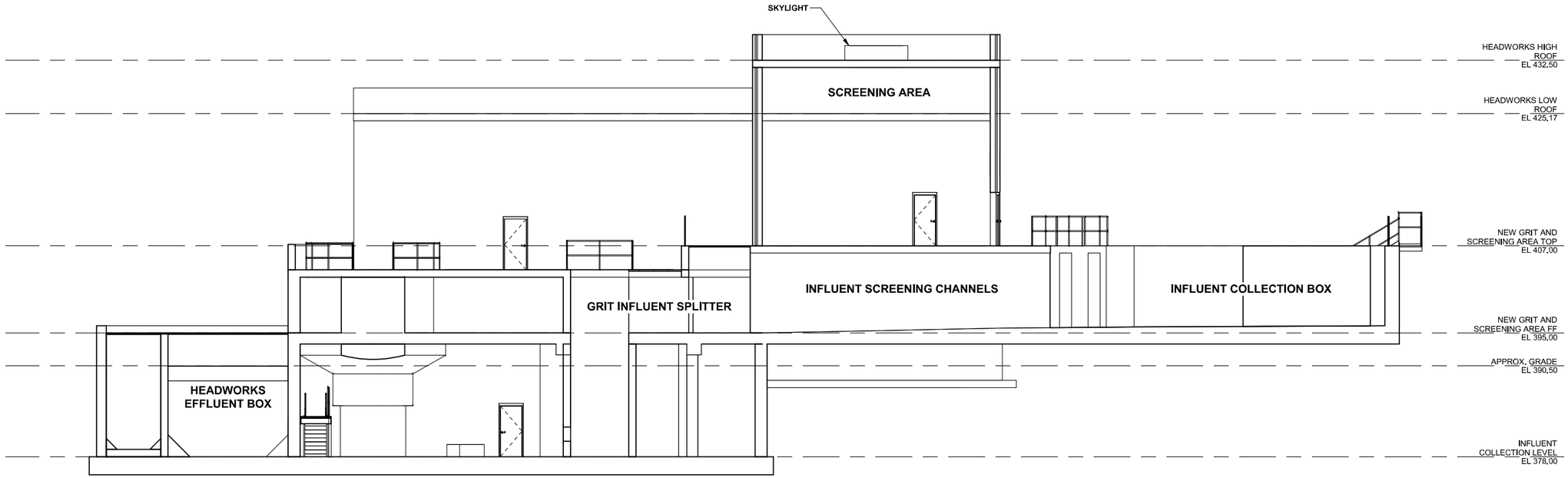

1 / 10S01 **SECTION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

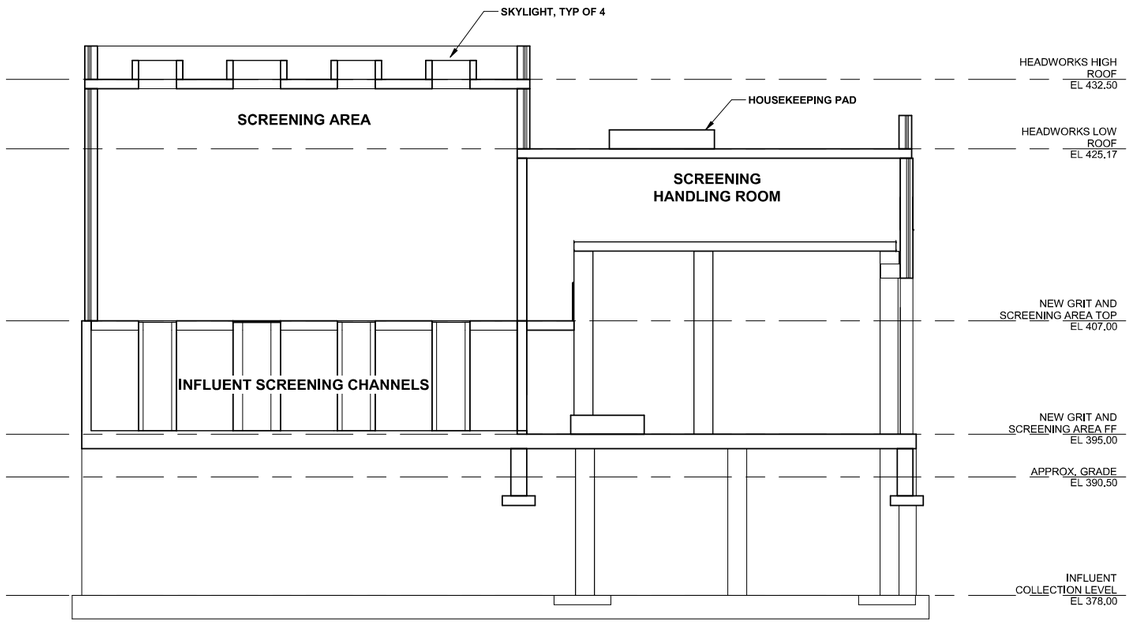
HEADWORKS - SECTION 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10S05
SHEET NO. 56 OF 251

PLOT DATE: 6/10/2025 3:34:13 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-S-3D-101.rvt



2 SECTION

10S02

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

HEADWORKS - SECTION 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10S06
SHEET NO. 57 OF 251

PLOT DATE: 6/10/2025 3:34:13 PM

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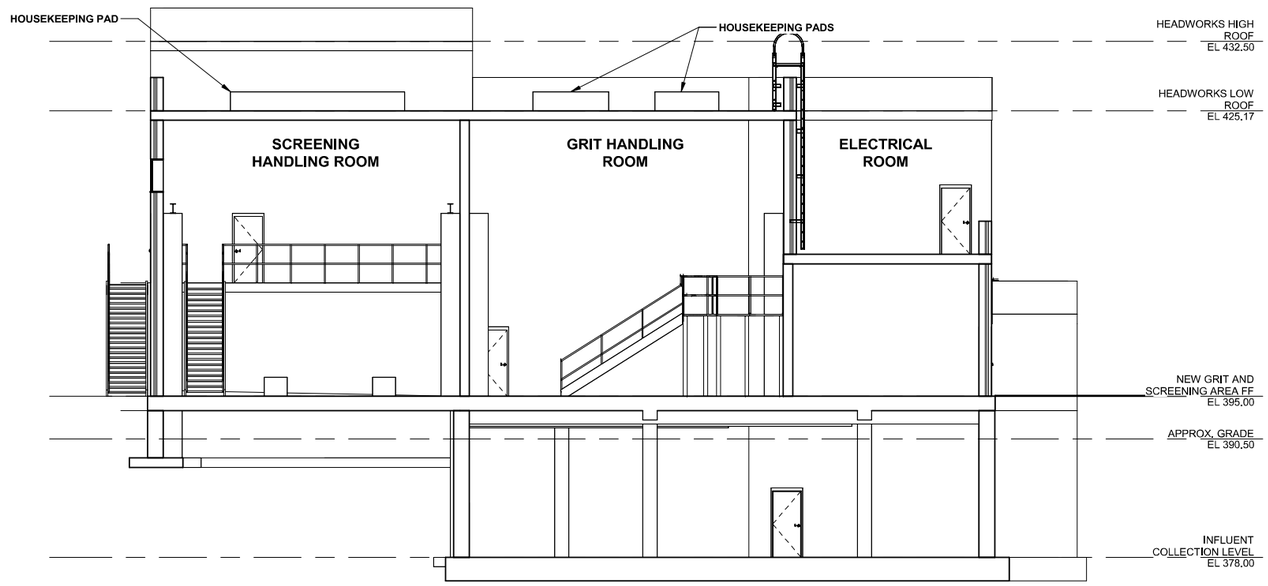

3 / 10S01 **SECTION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

HEADWORKS - SECTION 3

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10S07
SHEET NO. 58 OF 251

PLOT DATE: 6/10/2025 3:34:13 PM

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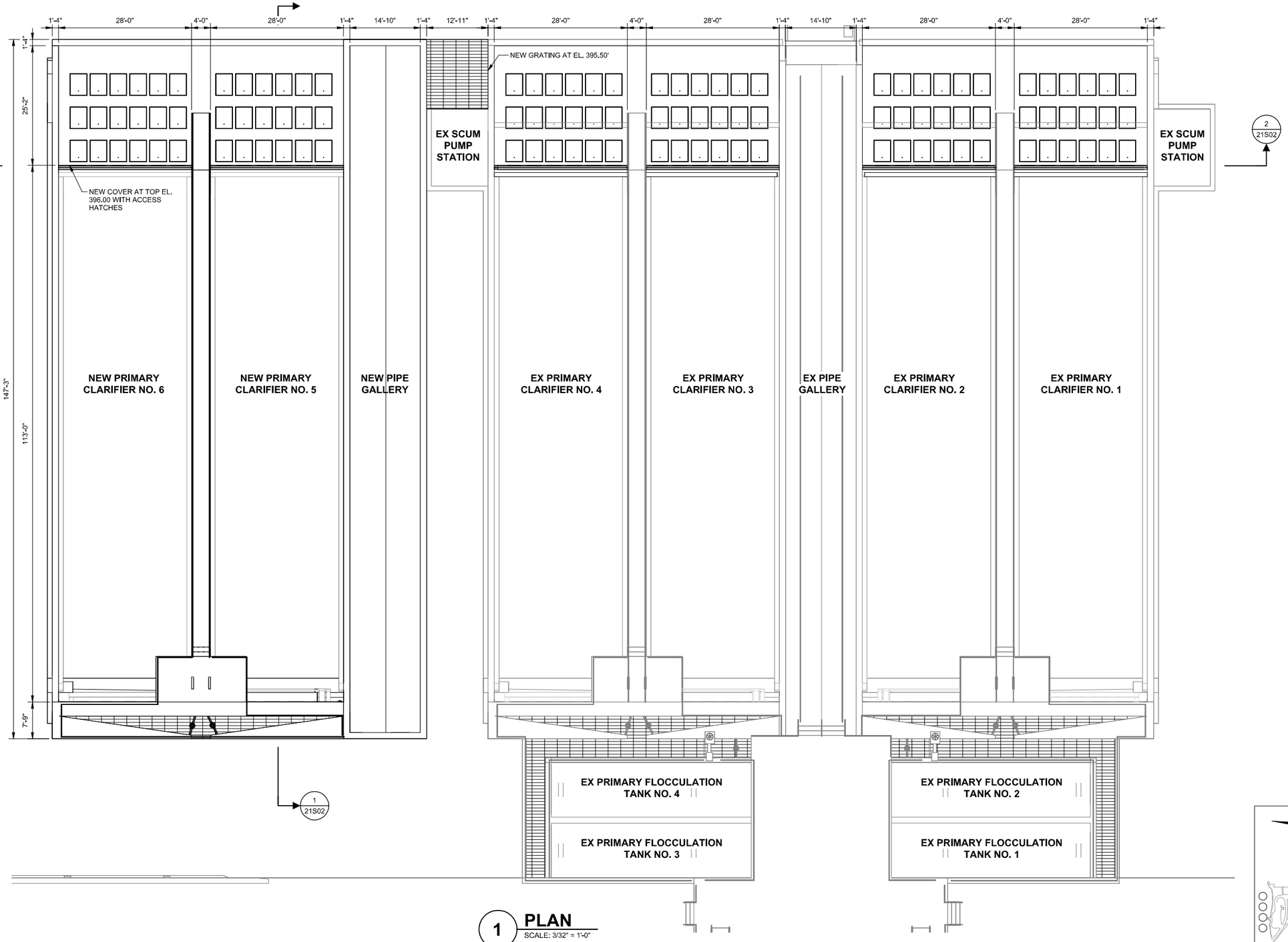
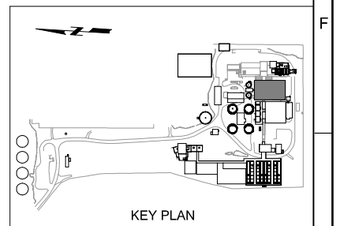


1 PLAN

SCALE: 3/32" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

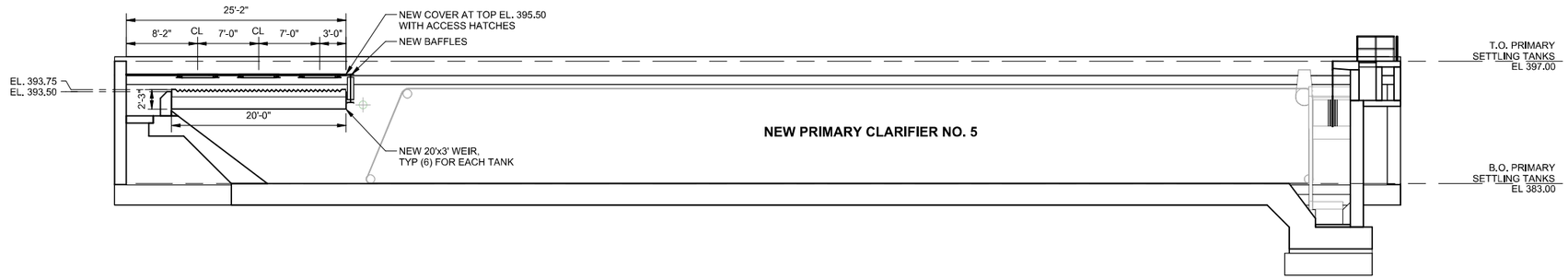
PRIMARY CLARIFIER TANKS - PLAN AT EL. 396.00

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

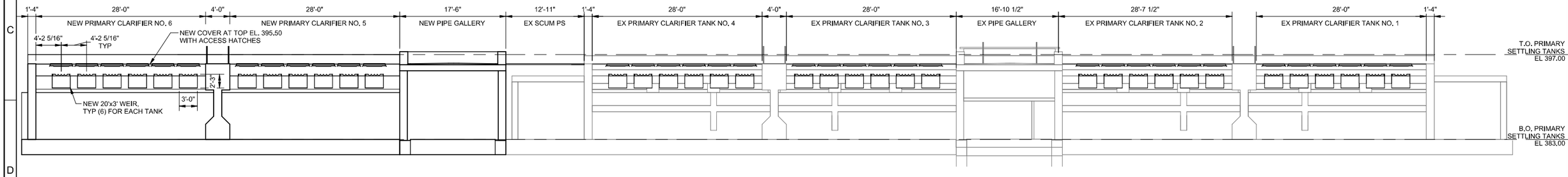
JOB NO. 203580
DRAWING NO. 21S01
SHEET NO. 59 OF 251

PLOT DATE: 6/10/2025 11:46:17 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/21-S-3D-101.rvt



1 SECTION
21S01
SCALE: 1/8" = 1'-0"



2 SECTION
21S01
SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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CHECKED T. SHIMADA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

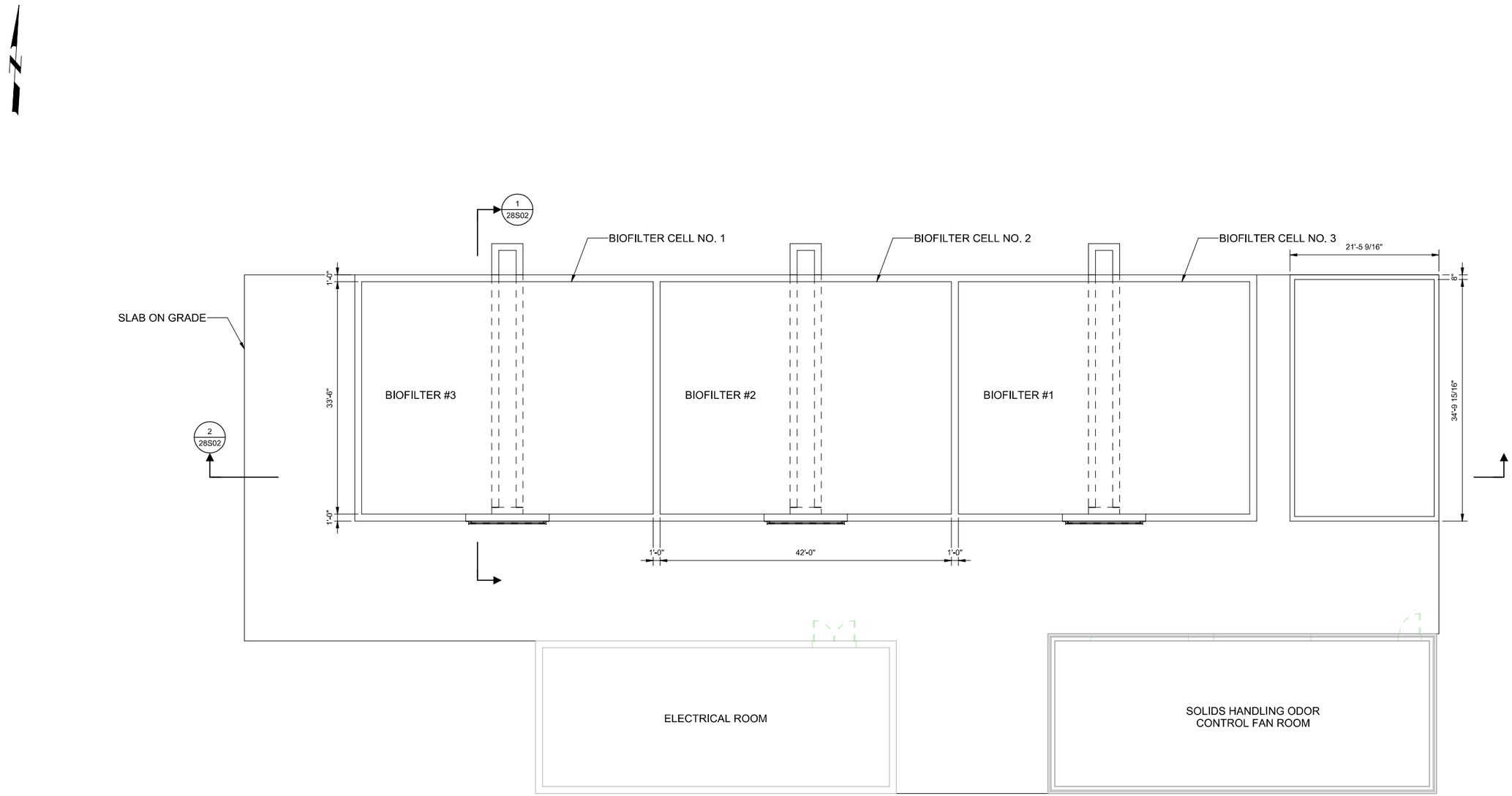
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
PRIMARY CLARIFIER TANKS - SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

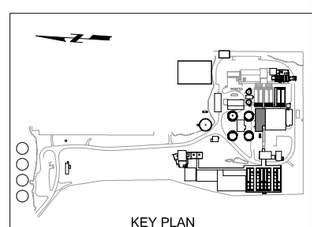
JOB NO. 203580
DRAWING NO. 21S02
SHEET NO. 60 OF 251

PLOT DATE: 6/10/2025 11:51:04 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/21-S-3D-101.rvt



1 **PLAN**
SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION

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DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

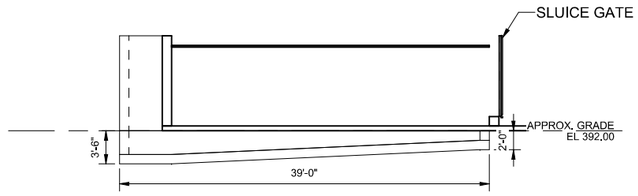
SOLIDS HANDLING ODOR CONTROL - PLAN AT EL. 392.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

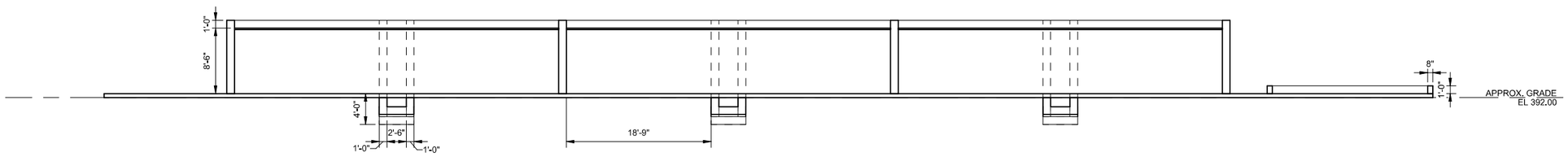
JOB NO. 203580
DRAWING NO. 28S01
SHEET NO. 61 OF 251

PLOT DATE: 6/10/2025 12:34:01 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/28-S-3D-101.rvt



1 SECTION
28S01 SCALE: 1/8" = 1'-0"



2 SECTION
28S01 SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
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DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
SOLIDS HANDLING ODOR CONTROL - BIOFILTER CELL SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

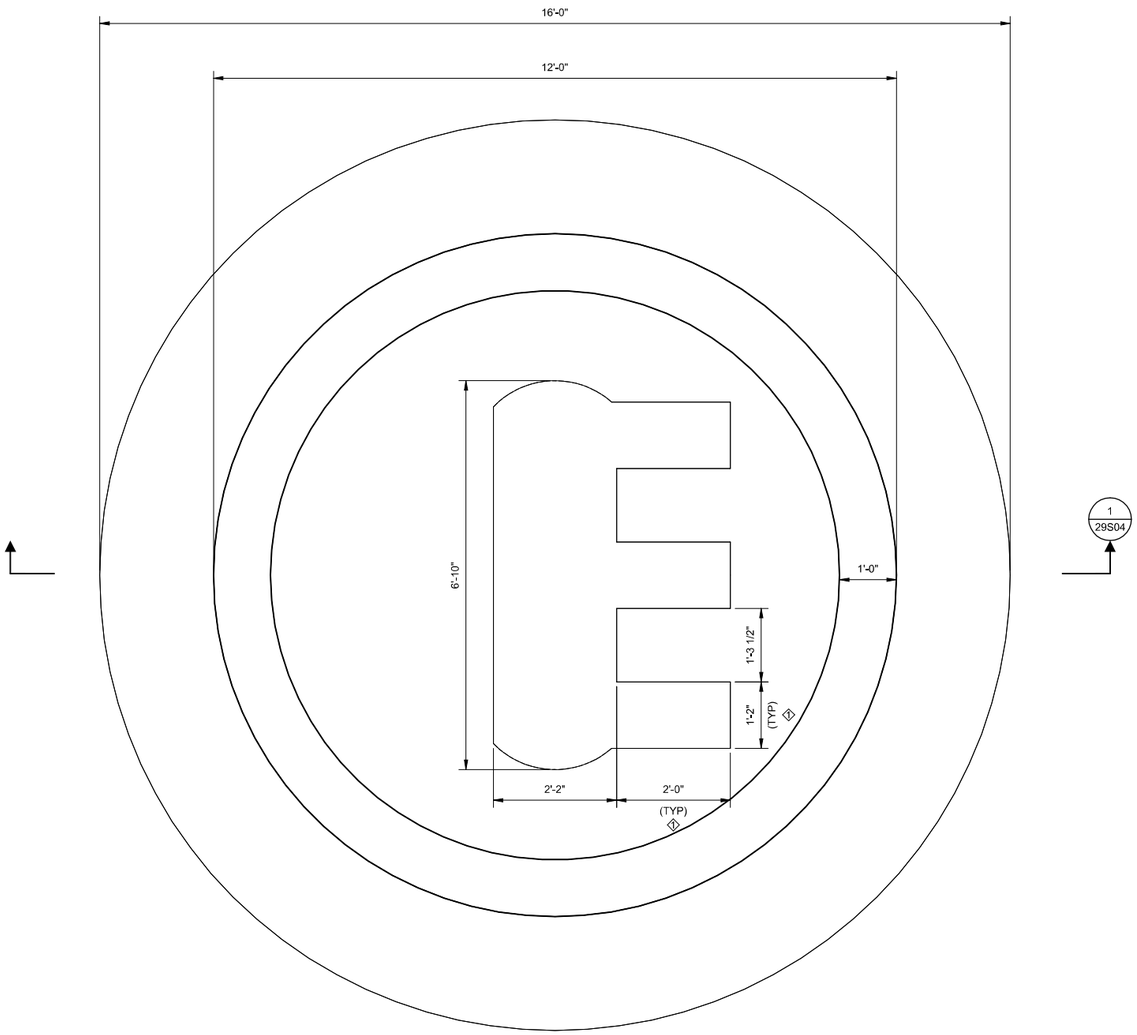
JOB NO. 203580
DRAWING NO. 28S02
SHEET NO. 62 OF 251

PLOT DATE: 6/10/2025 12:34:11 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/28-S-3D-101.rvt

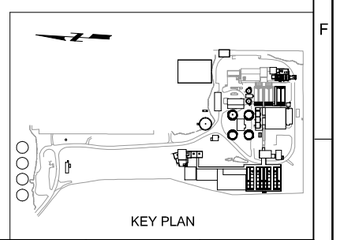
KEYNOTES:

1. BLOCK OUT FOR PUMP DISCHARGE ELBOW AND PIPING. COORDINATE DIMENSIONS WITH PUMP MANUFACTURER



1 PLAN
SCALE: 3/4" = 1'-0"

1
29S04



KEY PLAN

REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
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DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

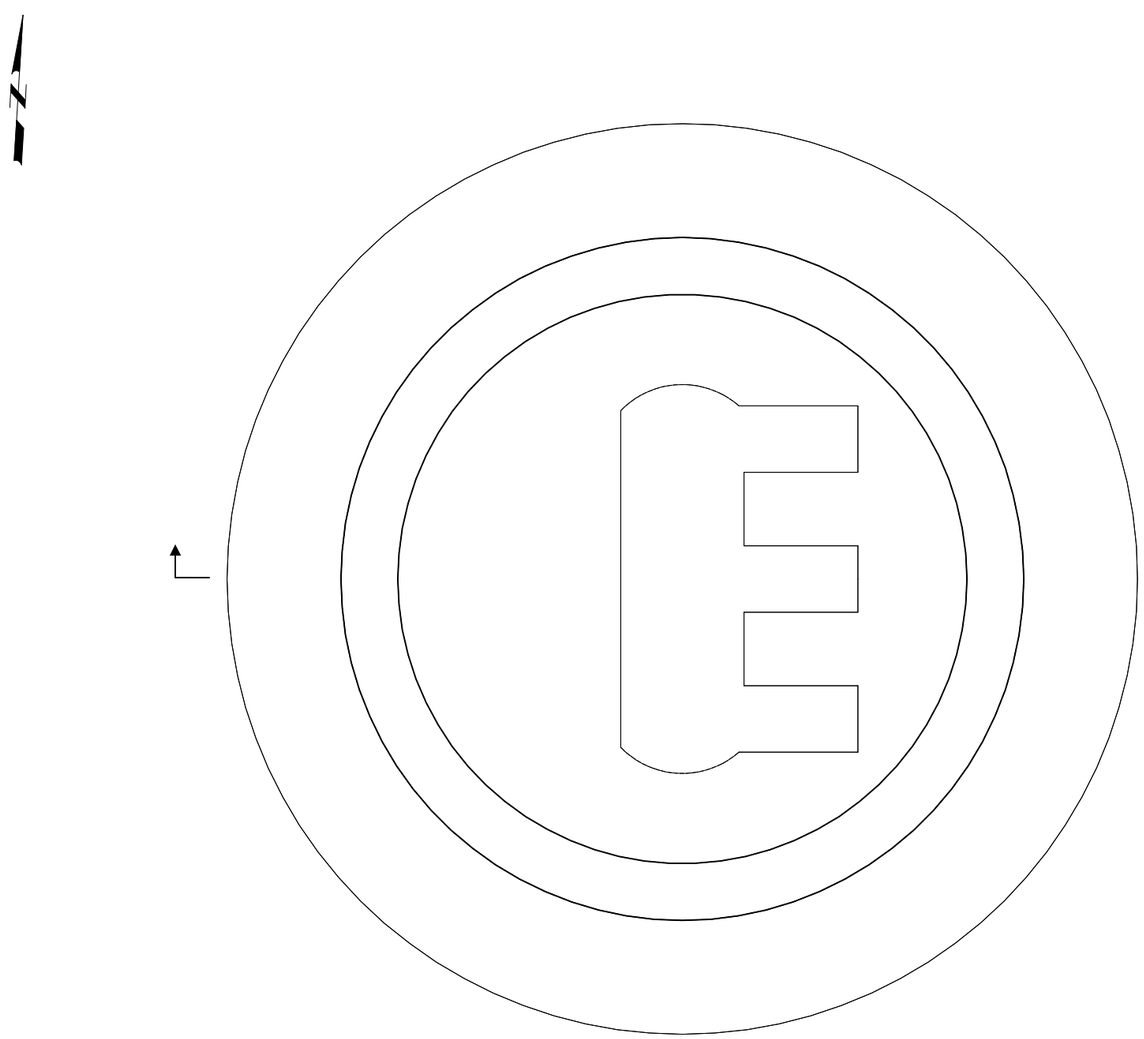
RETURN FLOW PUMP STATION - PLAN AT EL. 374.00'

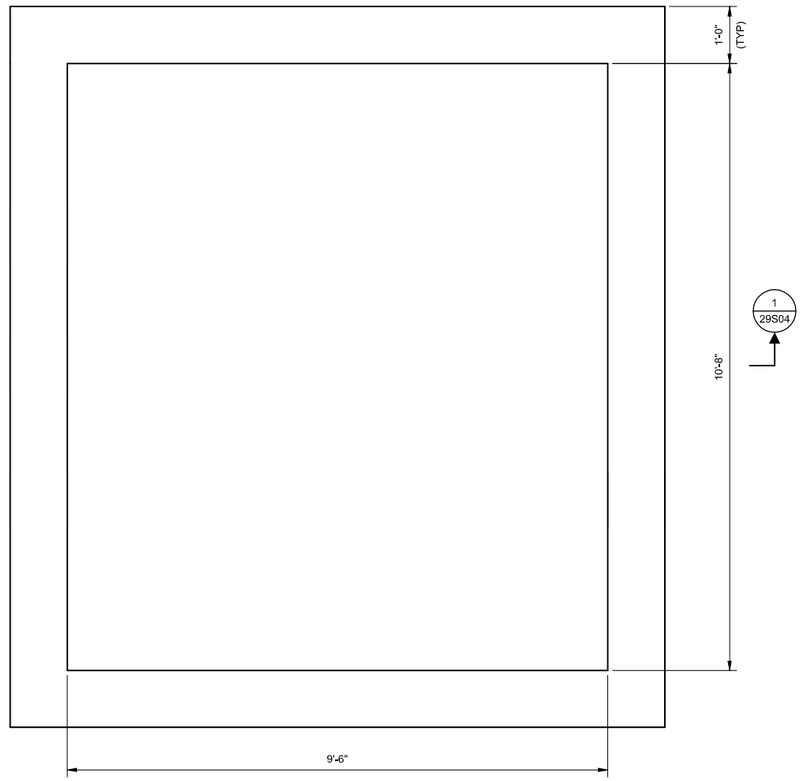
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 29S01
SHEET NO. 63 OF 251

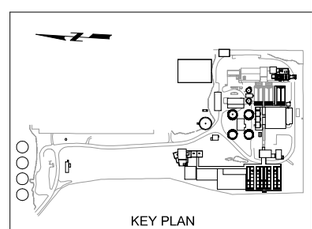
PLOT DATE: 6/10/2025 11:29:48 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/29-S-3D-101.rvt





1 **PLAN**
SCALE: 3/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

RETURN FLOW PUMP STATION - PLAN AT EL. 384.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 29S02
SHEET NO. 64 OF 251

PLOT DATE: 6/10/2025 11:30:23 AM

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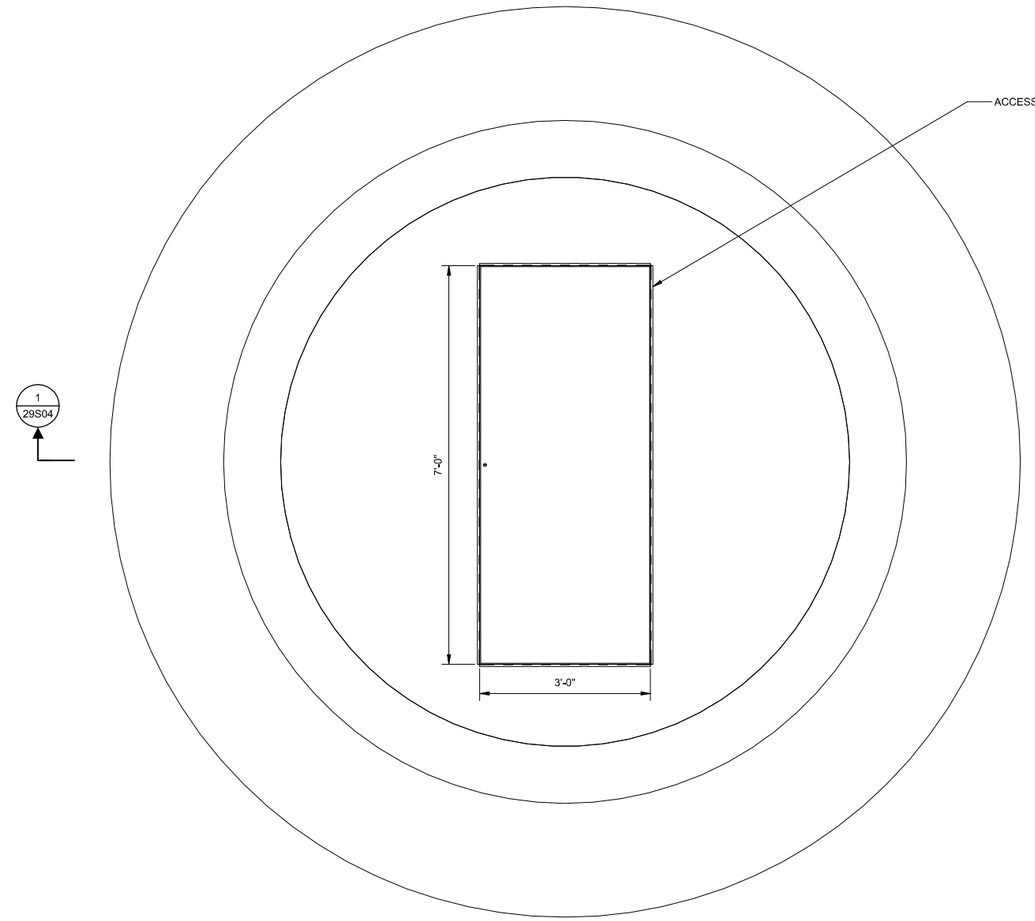

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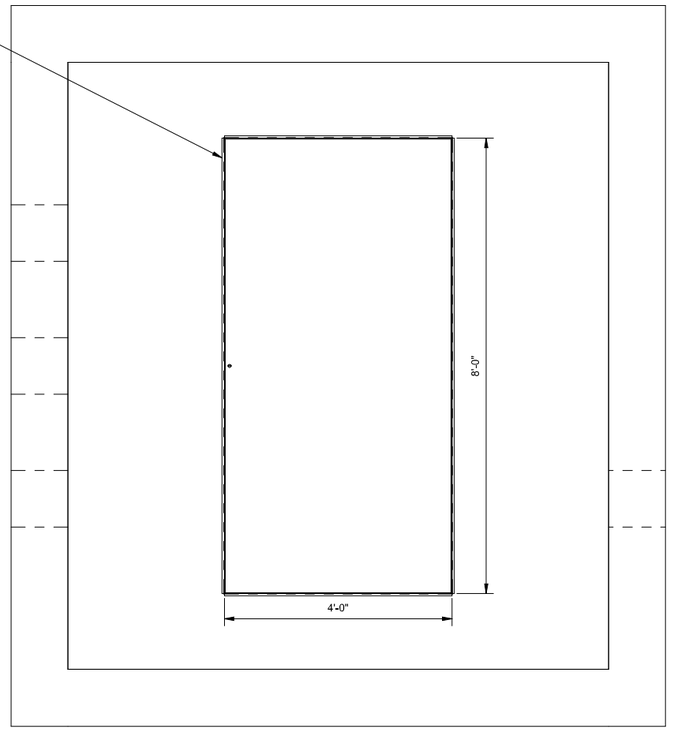
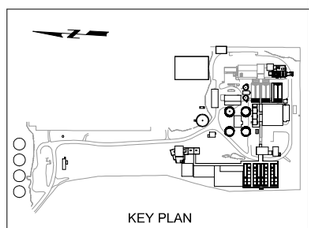
29S04



1 PLAN

SCALE: 3/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

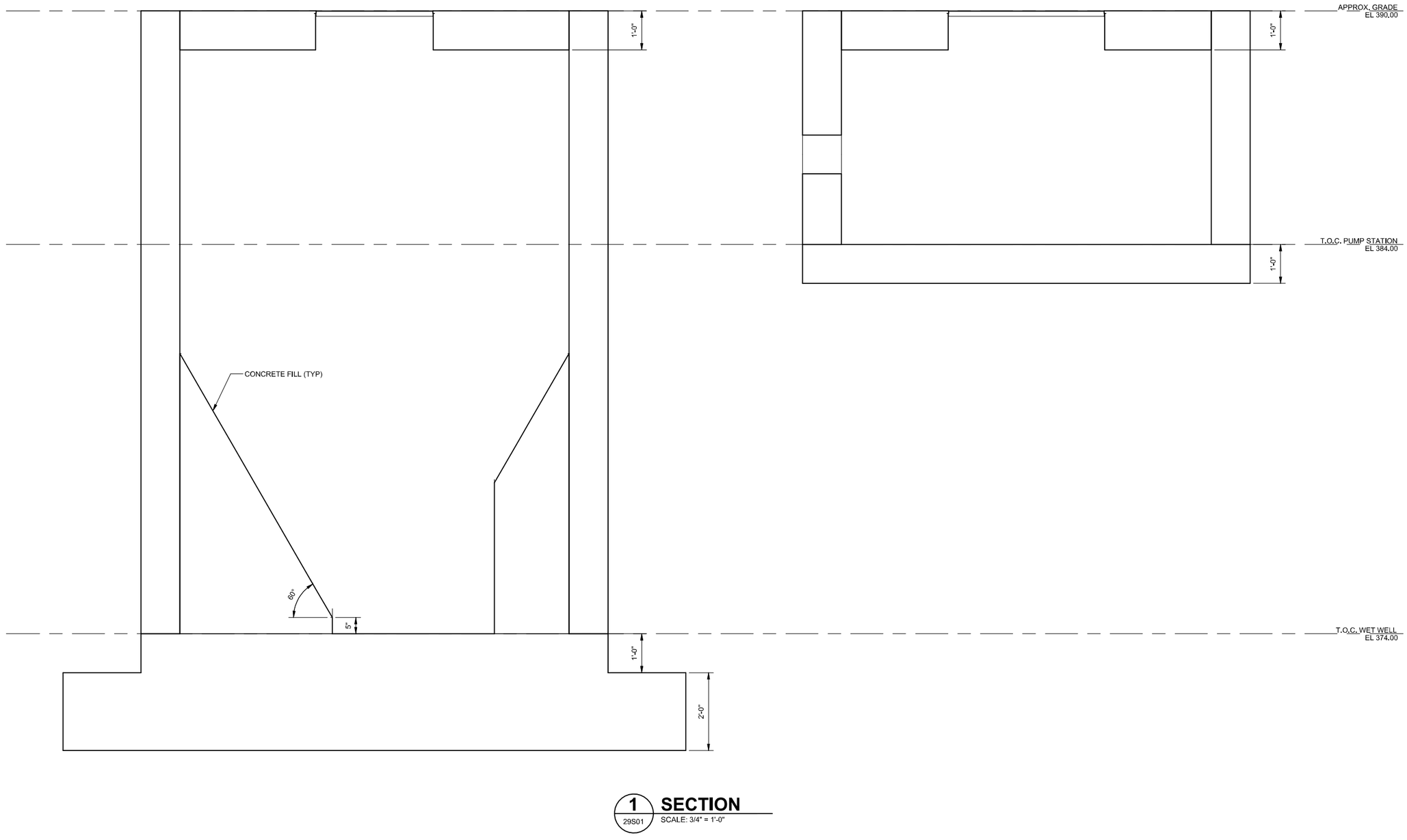
RETURN FLOW PUMP STATION - PLAN AT EL. 390.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 29S03
SHEET NO. 65 OF 251

PLOT DATE: 6/10/2025 11:30:43 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/29-S-3D-101.rvt



1 / 29S01 **SECTION**

SCALE: 3/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

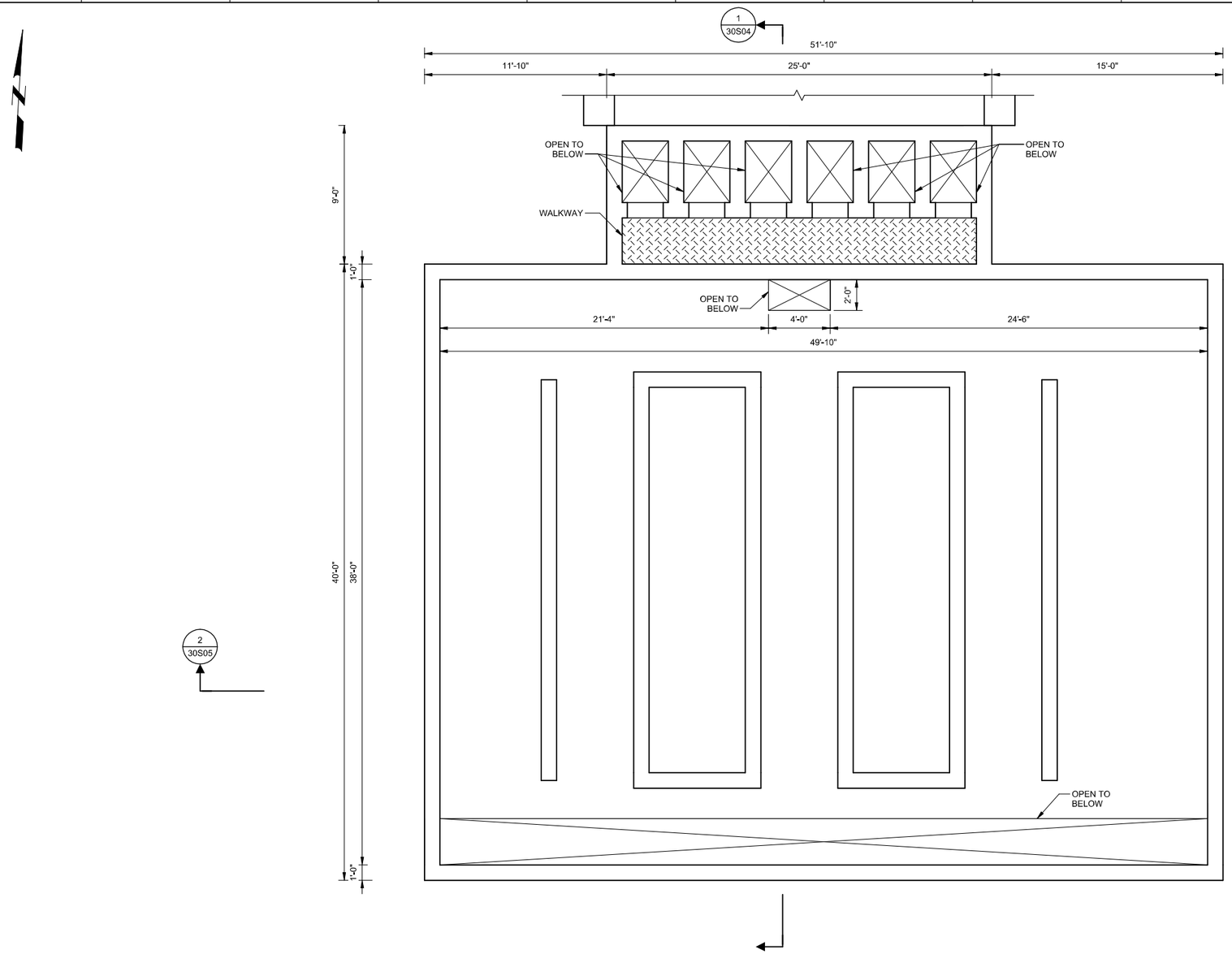
RETURN FLOW PUMP STATION - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 29S04
SHEET NO. 66 OF 251

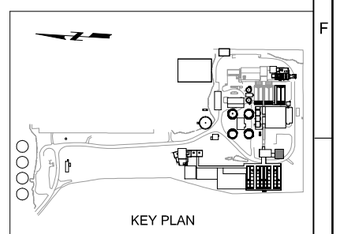
PLOT DATE: 6/10/2025 11:31:05 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/29-S-3D-101.rvt



1 PLAN

SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

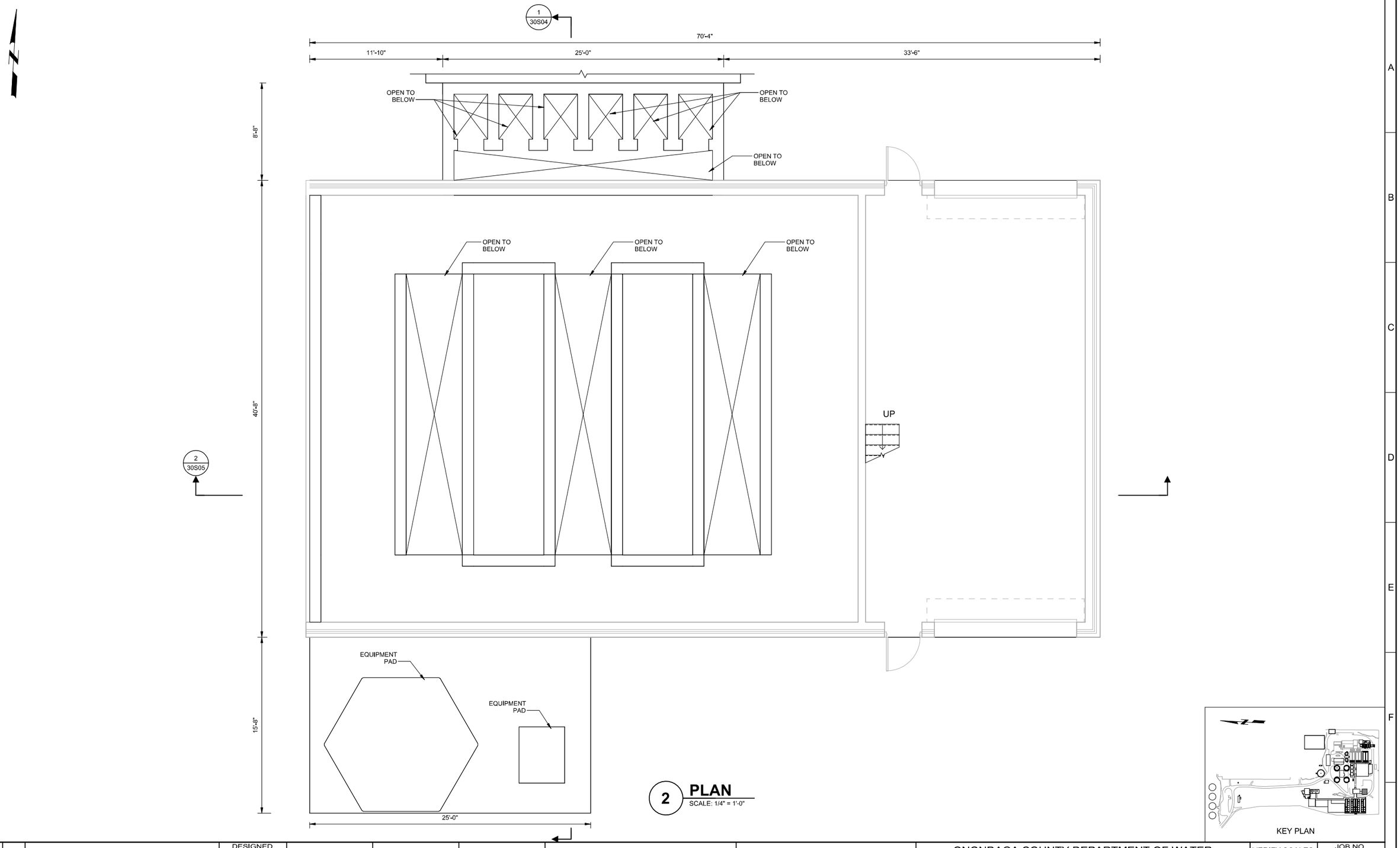
FINE SCREENING - PLAN AT EL. 386.90'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30S01
SHEET NO. 67 OF 251

PLOT DATE: 6/10/2025 11:22:50 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-S-3D-101.rvt



2 **PLAN**
SCALE: 1/4" = 1'-0"

KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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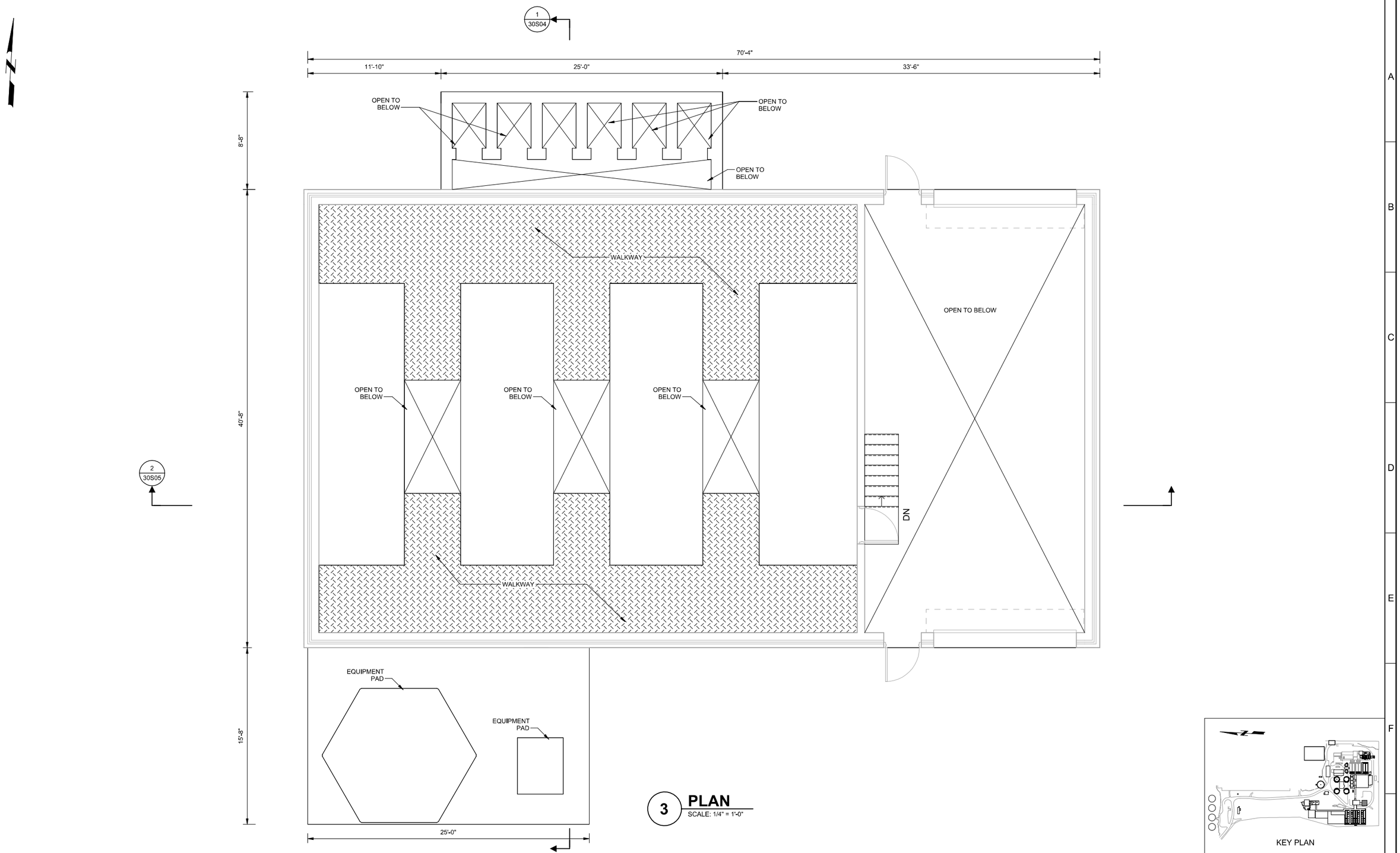
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
FINE SCREENING - PLAN AT EL. 391.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30S02
SHEET NO. 68 OF 251

PLOT DATE: 6/10/2025 11:23:53 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-S-3D-101.rvt



3 **PLAN**
SCALE: 1/4" = 1'-0"

KEY PLAN

REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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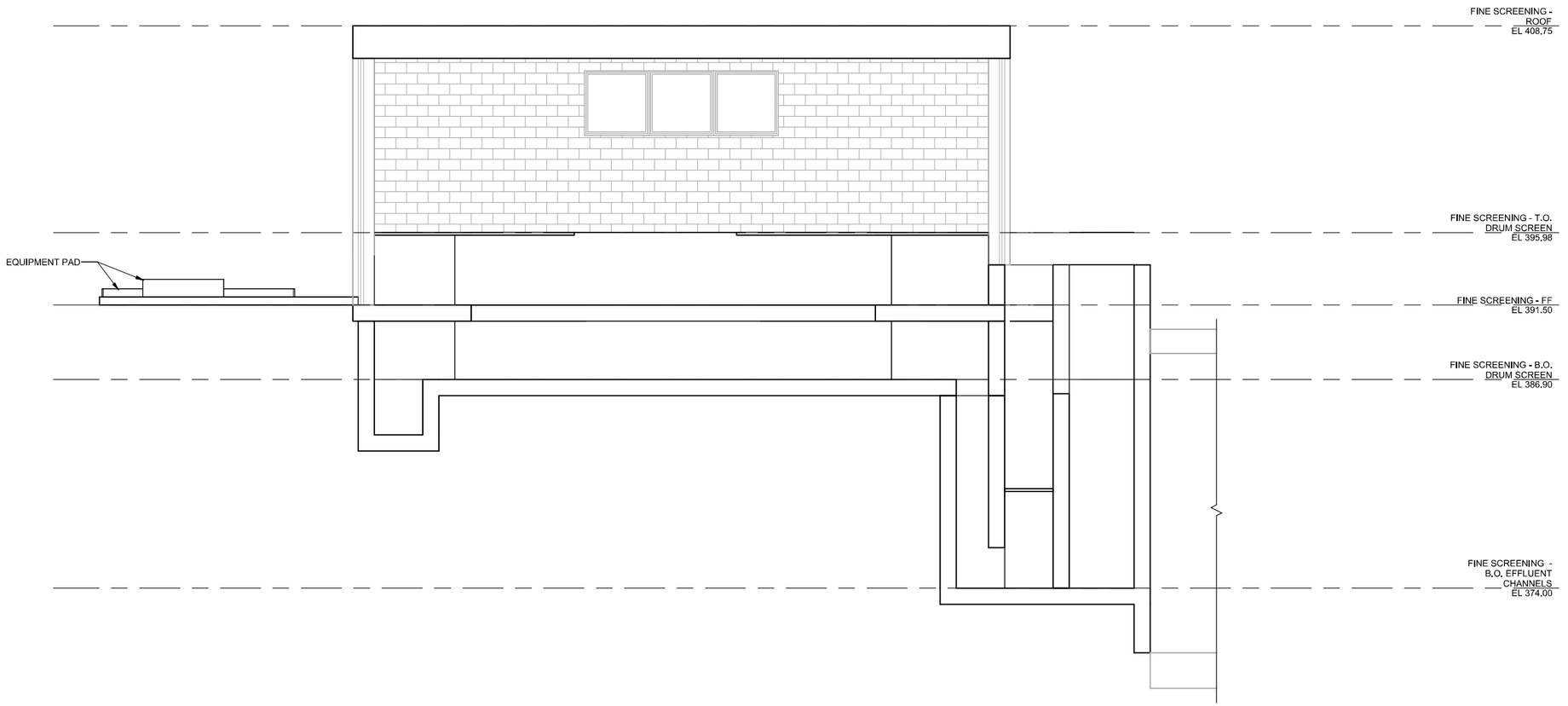
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
FINE SCREENING - PLAN AT EL. 395.98'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30S03
SHEET NO. 69 OF 251

PLOT DATE: 6/10/2025 11:24:39 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-S-3D-101.rvt



1 SECTION
30S01

SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

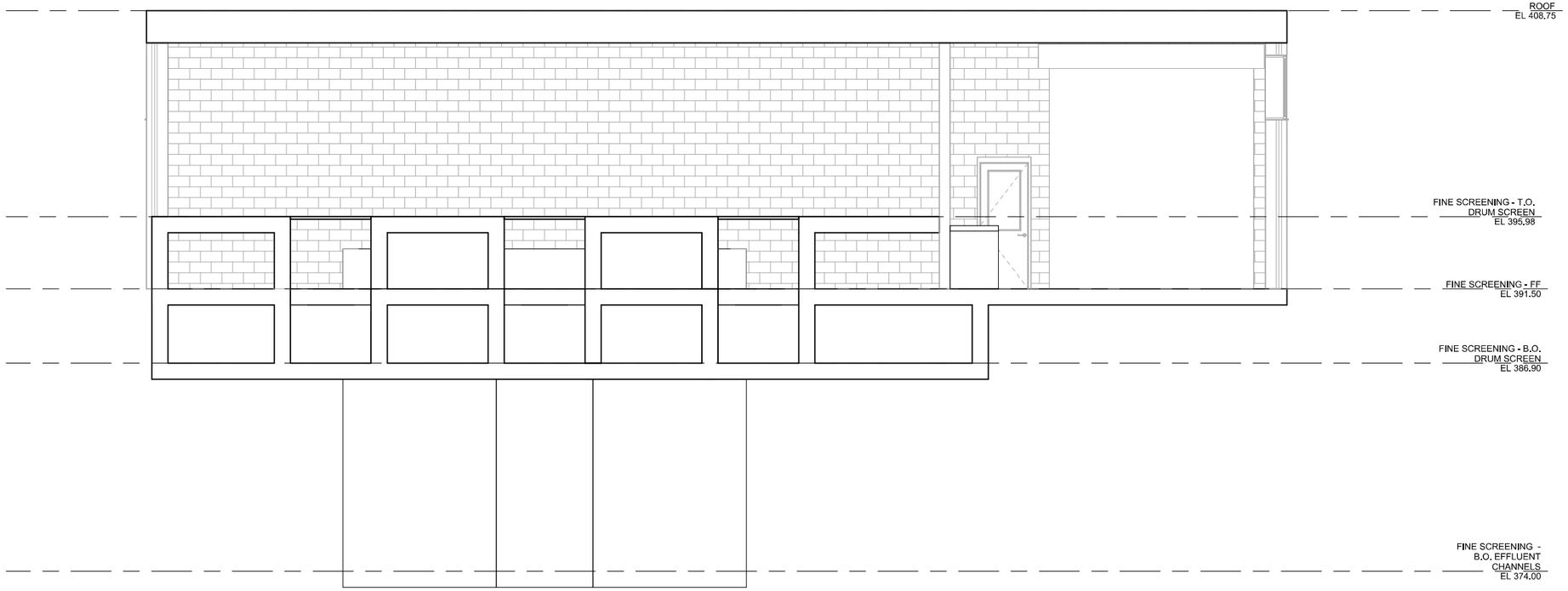
FINE SCREENING - SECTION 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30S04
SHEET NO. 70 OF 251

PLOT DATE: 6/10/2025 11:25:43 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-S-3D-101.rvt



2 SECTION (30S01)
SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
FINE SCREENING - SECTION 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30S05
SHEET NO. 71 OF 251

PLOT DATE: 6/10/2025 11:26:43 AM
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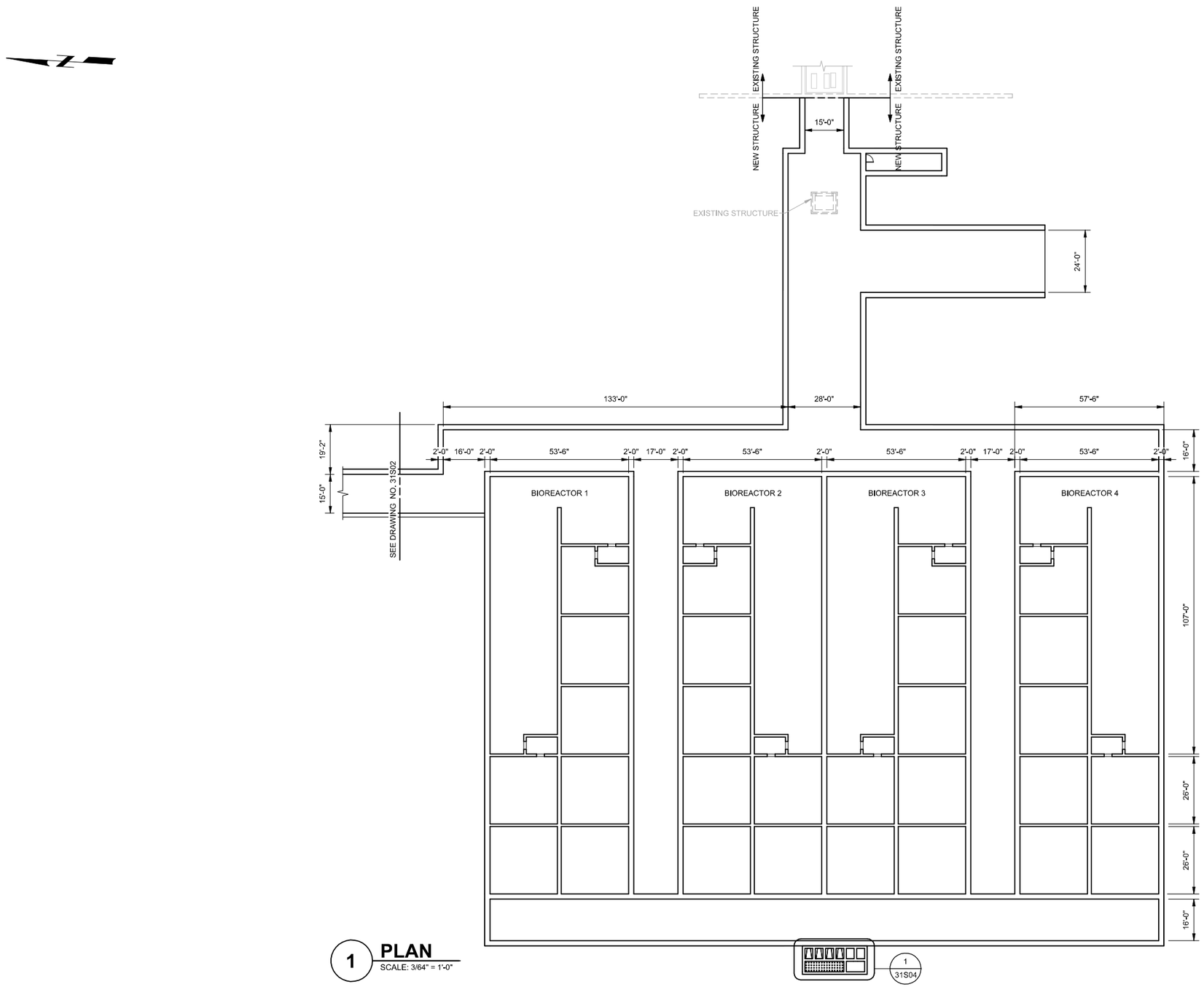
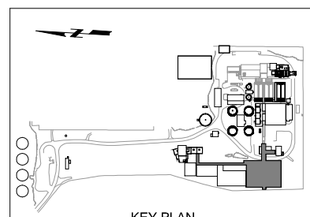


1 PLAN
SCALE: 3/64" = 1'-0"



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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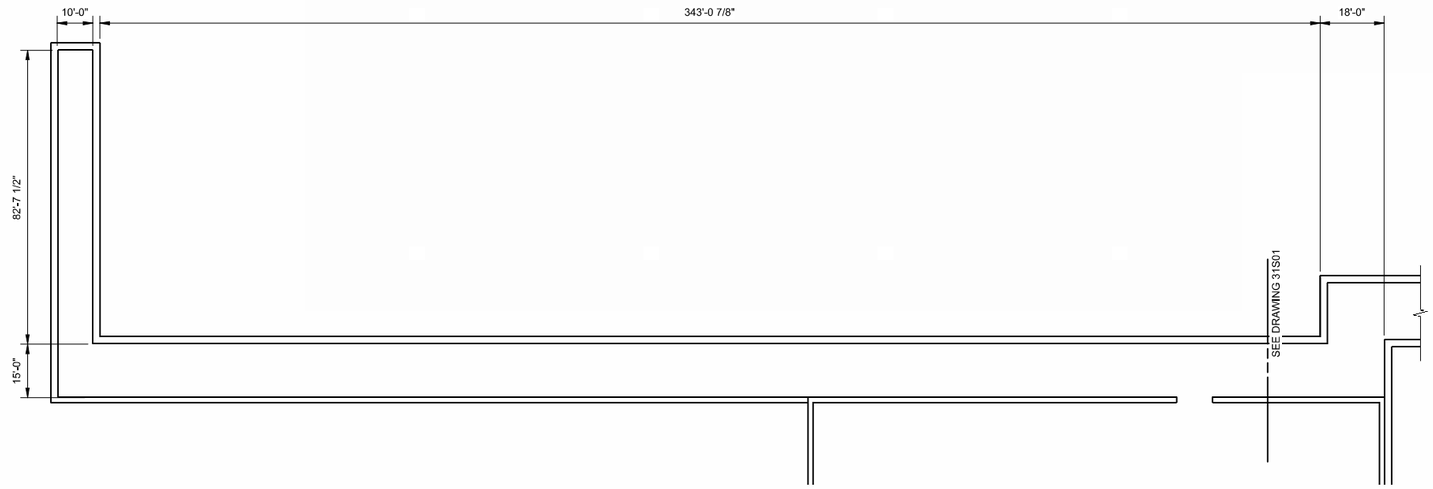
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
BIOREACTORS - PLAN AT EL. 370.00' - 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

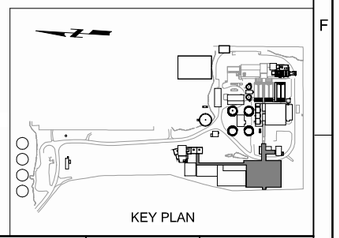
JOB NO. 203580
DRAWING NO. 31S01
SHEET NO. 72 OF 251

PLOT DATE: 6/10/2025 1:02:49 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/31-S-3D-101.rvt



2 PLAN
SCALE: 3/64" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

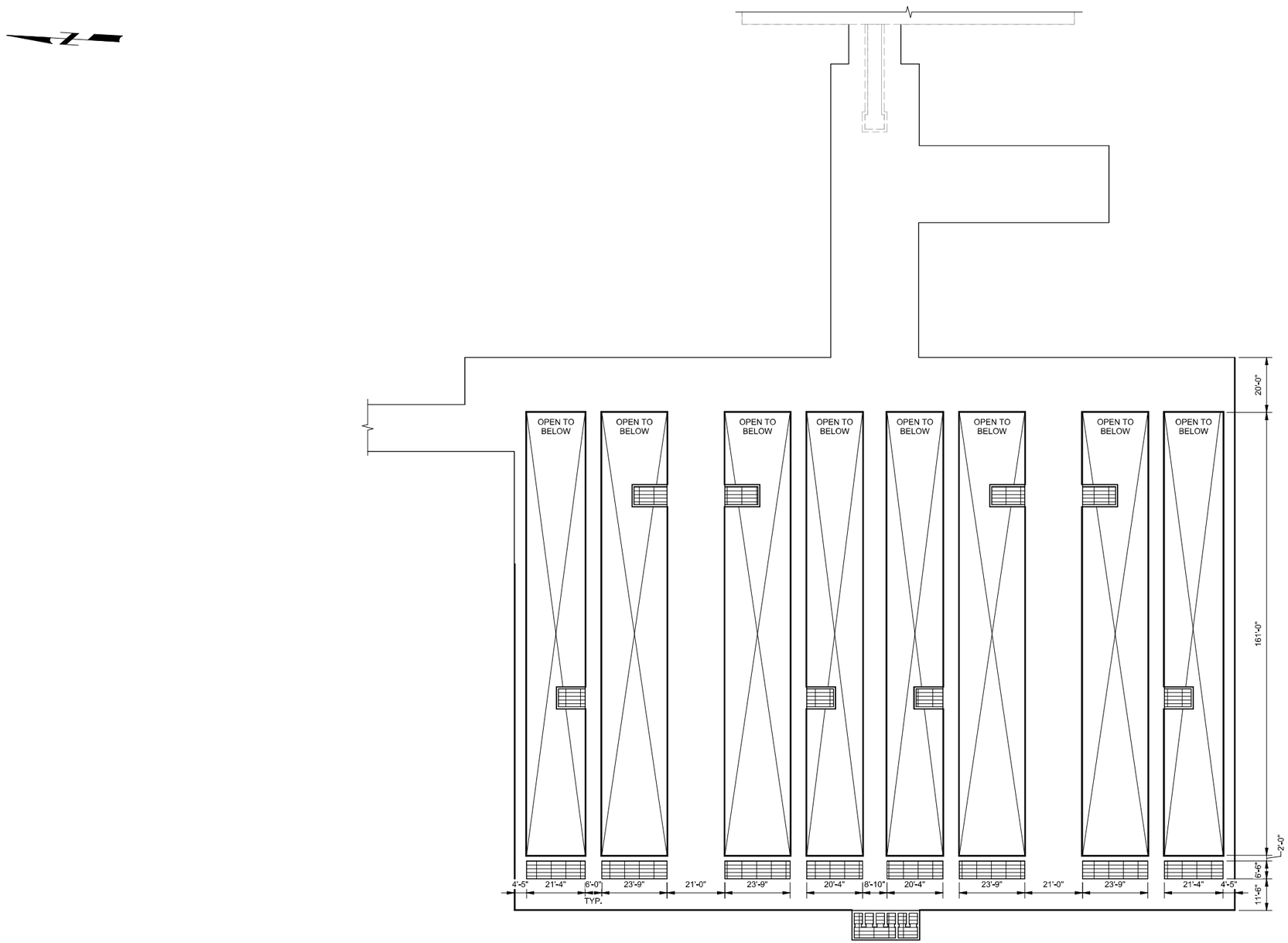
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
BIOREACTORS - PLAN AT EL. 370.00' - 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

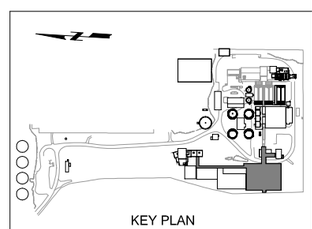
JOB NO. 203580
DRAWING NO. 31S02
SHEET NO. 73 OF 251

PLOT DATE: 6/10/2025 12:54:03 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/31-S-3D-101.rvt



3 **PLAN**
SCALE: 3/64" = 1'-0"



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

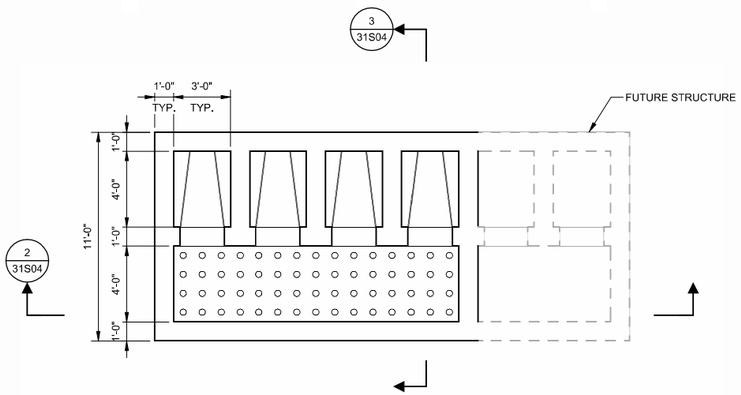
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
BIOREACTORS - PLAN AT EL. 390.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

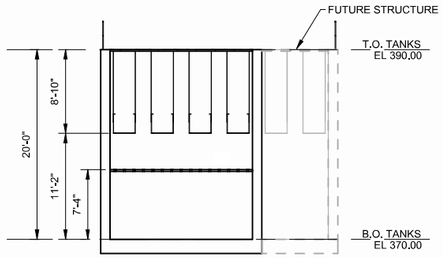
JOB NO. 203580
DRAWING NO. 31S03
SHEET NO. 74 OF 251

PLOT DATE: 6/10/2025 1:05:16 PM

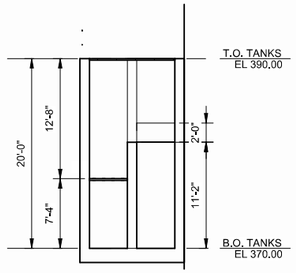
FILE NAME: Autodesk Docs://OCDWEP 203580/31-S-3D-101.rvt



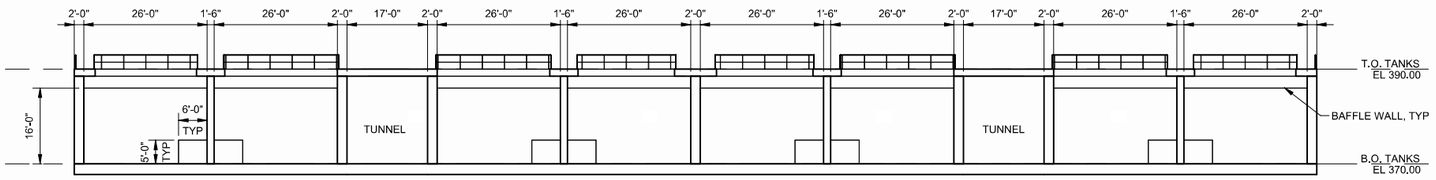
1 PLAN
SCALE: 1/4" = 1'-0"



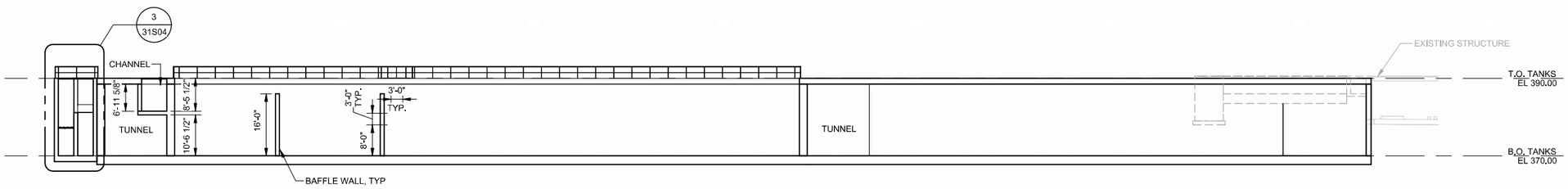
2 SECTION
31S04
SCALE: 1/8" = 1'-0"



3 SECTION
31S04
SCALE: 1/8" = 1'-0"



4 SECTION
SCALE: 1/16" = 1'-0"



5 SECTION
SCALE: 1/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
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DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
BIOREACTORS - ENLARGED PLAN & SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 31S04
SHEET NO. 75 OF 251

PLOT DATE: 6/10/2025 1:10:56 PM

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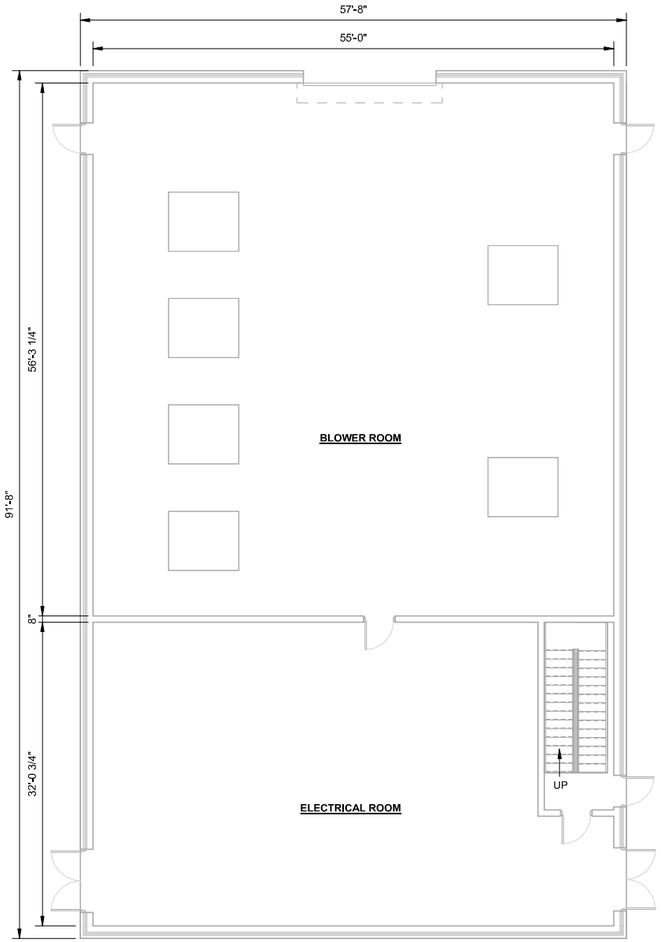
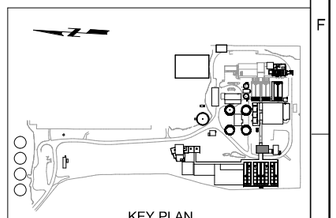


1 **PLAN**
SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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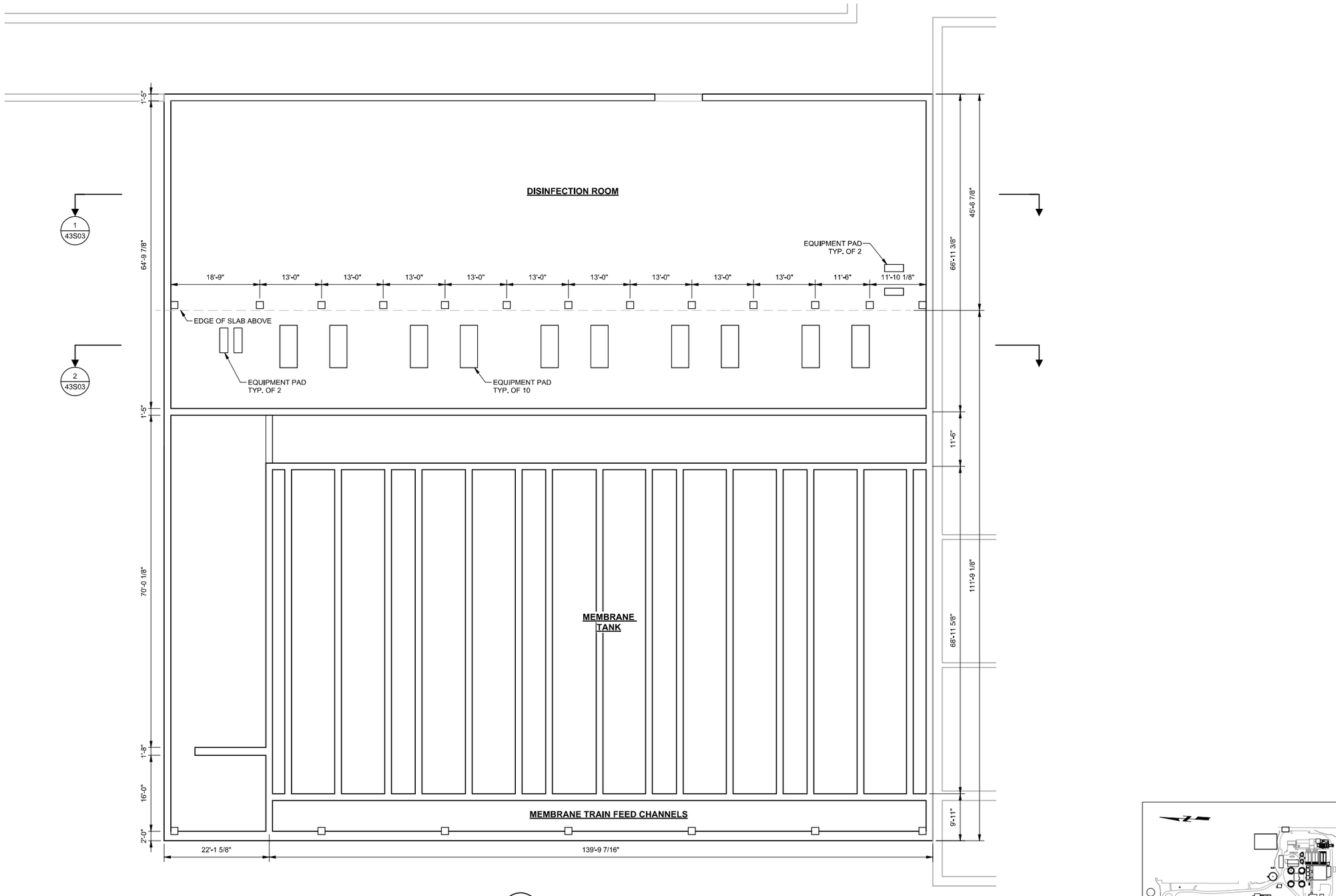
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
BLOWER BUILDING - PLAN AT EL. 390.50

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 33S01
SHEET NO. 76 OF 251

PLOT DATE: 6/10/2025 1:04:42 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/33-S-3D-101.rvt



2 PLAN

SCALE: 3/32" = 1'-0"

KEY PLAN

PLOT DATE: 6/27/2025 2:42:59 PM

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACITY

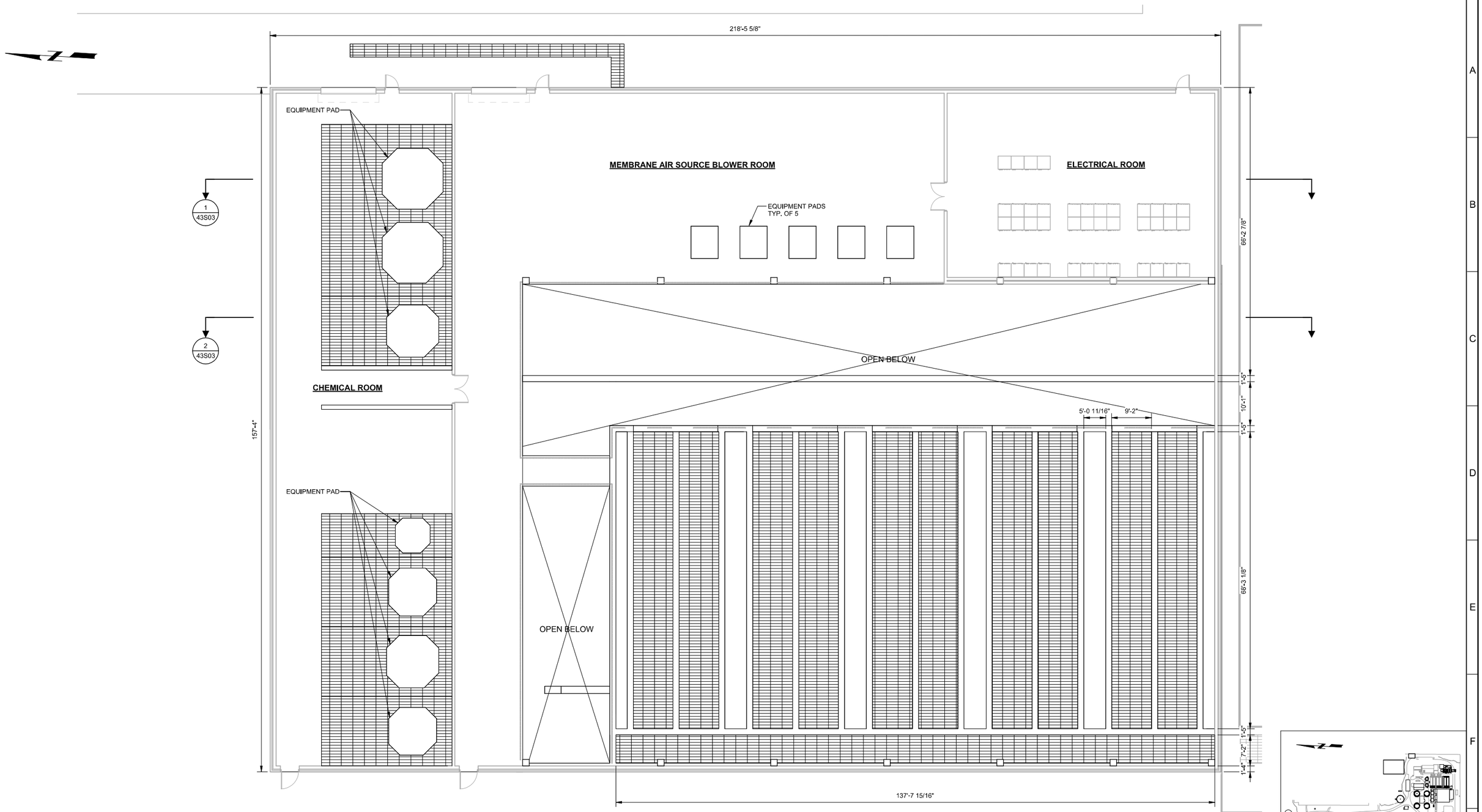
STRUCTURAL

MEMBRANE BUILDING - PLAN AT EL. 373.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 43S01
SHEET NO. 77 OF 251

FILE NAME: Autodesk Docs://OCDWEP 203580/43-S-3D-101.rvt



1 PLAN

SCALE: 3/32" = 1'-0"

KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACITY

STRUCTURAL

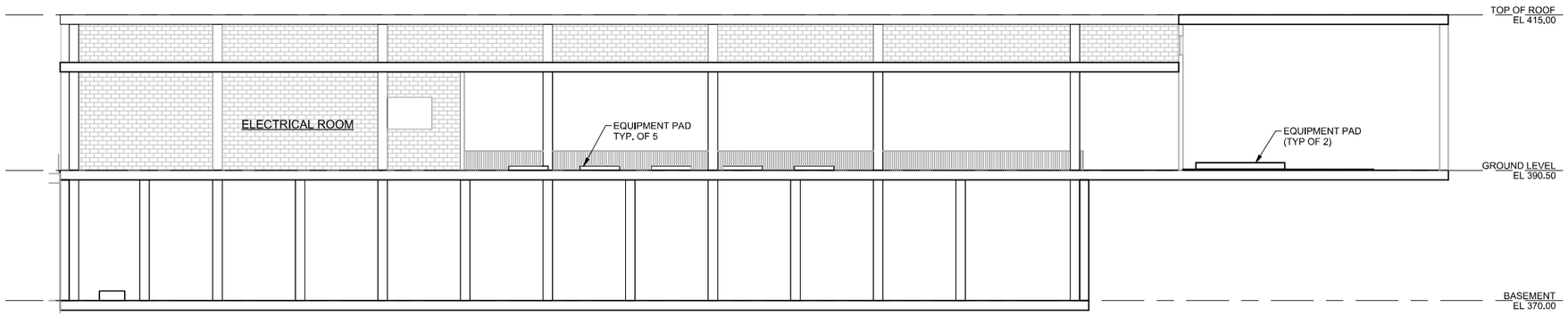
MEMBRANE BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

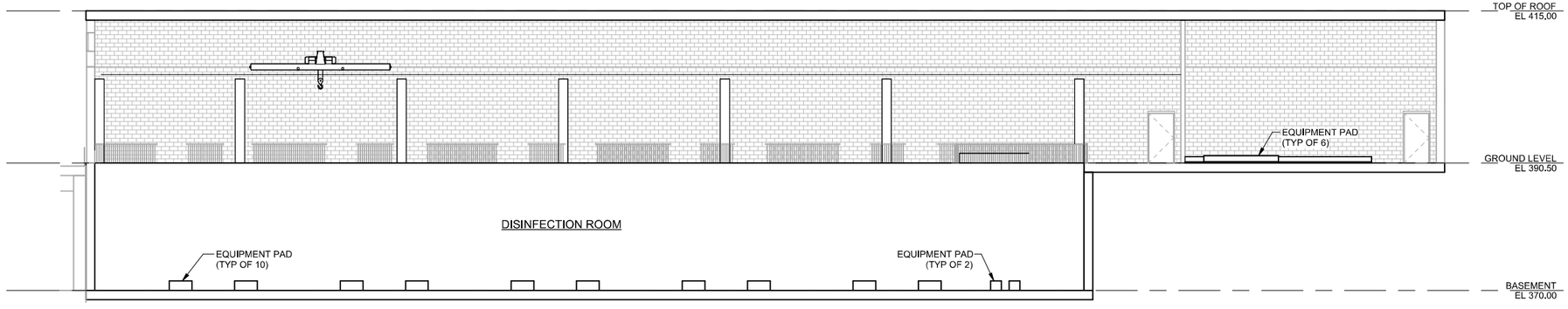
JOB NO. 203580
DRAWING NO. 43S02
SHEET NO. 78 OF 251

PLOT DATE: 6/27/2025 2:44:19 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/43-S-3D-101.rvt



1 SECTION
43S01 SCALE: 3/32" = 1'-0"



2 SECTION
43S01 SCALE: 3/32" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACITY

STRUCTURAL

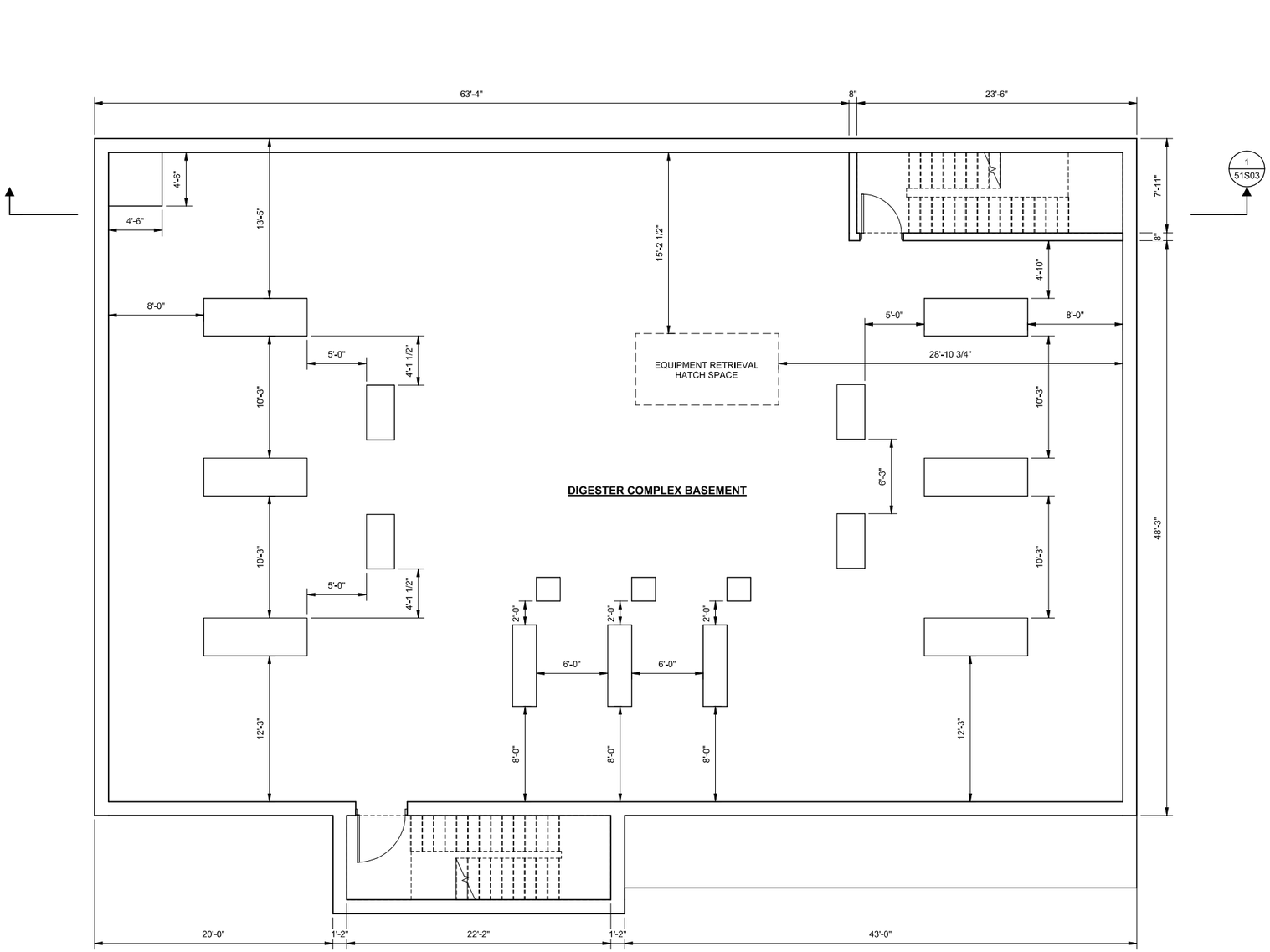
MEMBRANE BUILDING - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

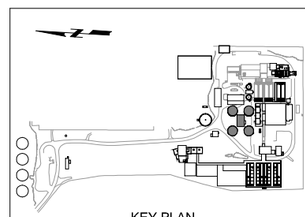
JOB NO. 203580
DRAWING NO. 43S03
SHEET NO. 79 OF 251

PLOT DATE: 6/27/2025 2:47:46 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/43-S-3D-101.rvt



1 PLAN
SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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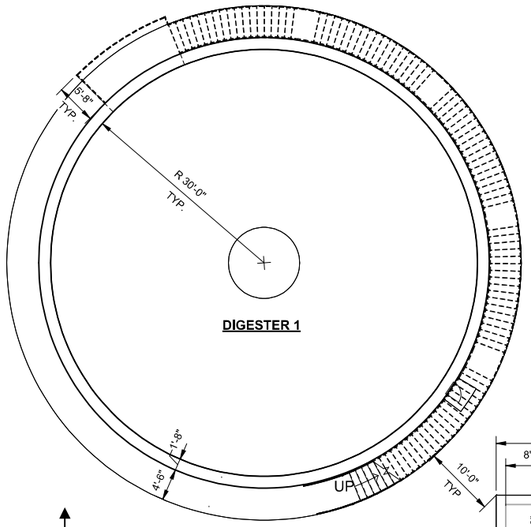
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
STRUCTURAL
DIGESTER COMPLEX - PLAN AT EL. 381.21'

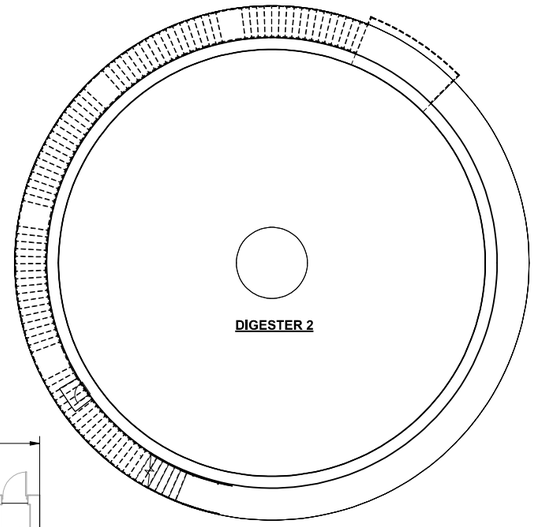
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

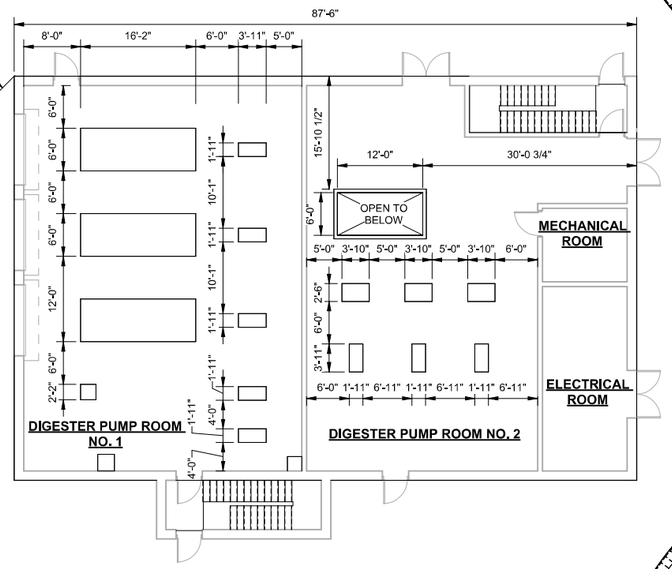
JOB NO. 203580
DRAWING NO. 51S01
SHEET NO. 80 OF 251

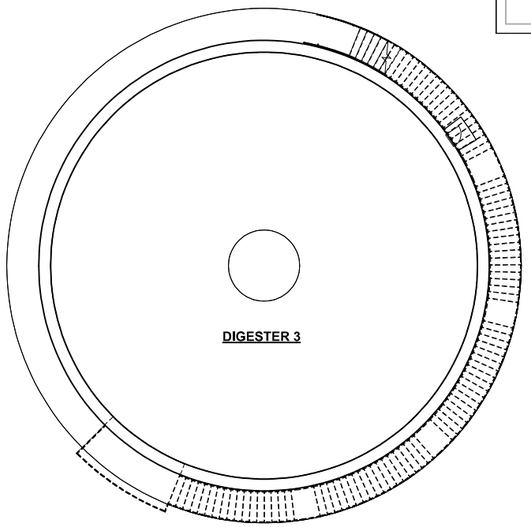
PLOT DATE: 6/20/2025 4:07:33 PM

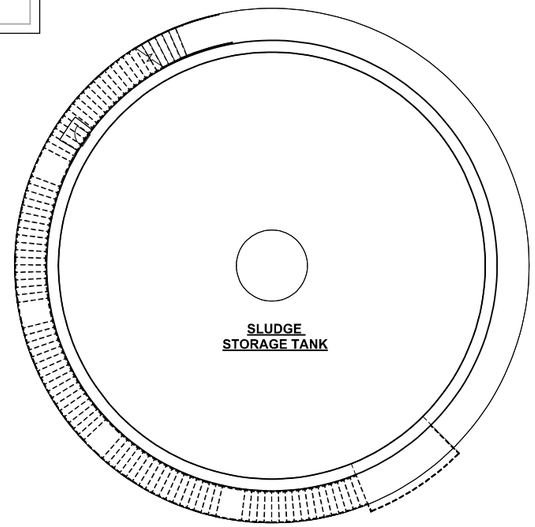
FILE NAME: Autodesk Docs://OCDWEP 203580/51-S-3D-101.rvt



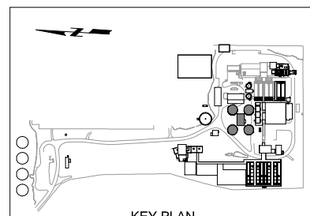








1 PLAN
SCALE: 3/32" = 1'-0"



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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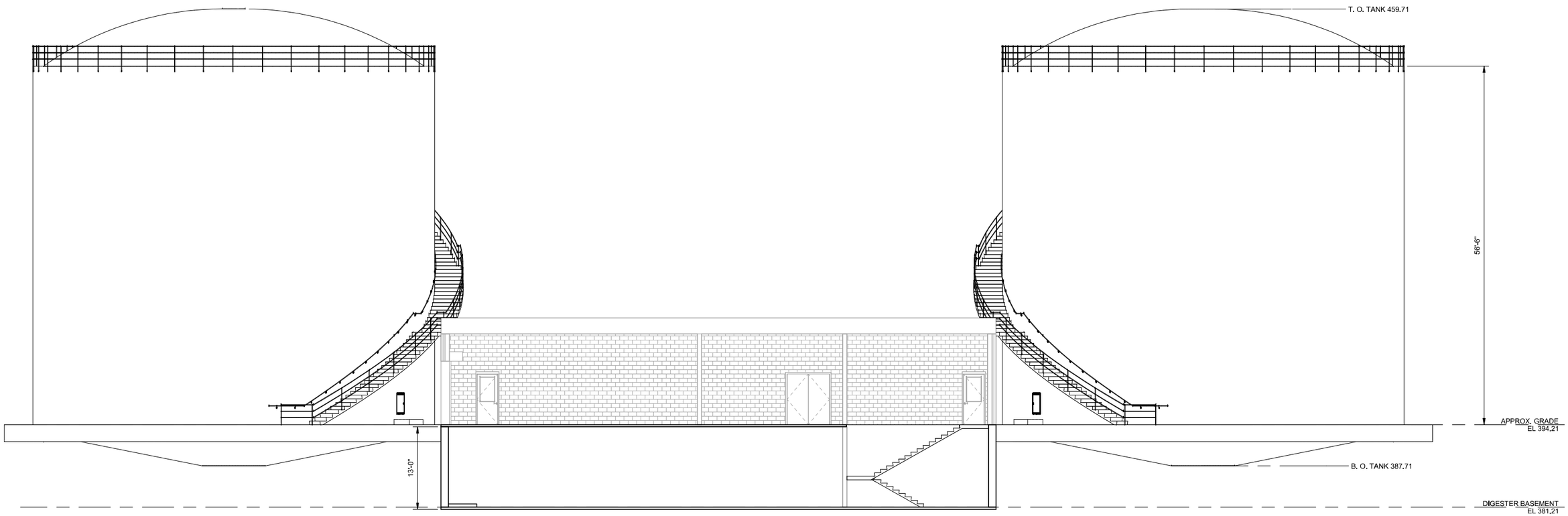
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
STRUCTURAL
DIGESTER COMPLEX - PLAN AT EL. 394.21'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 51S02
SHEET NO. 81 OF 251

PLOT DATE: 6/25/2025 8:48:04 PM
FILE NAME: Autodesk Docs://OCDWEP 203580/51-S-3D-101.rvt



1 SECTION

51S01

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

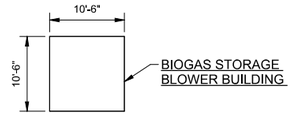
DIGESTER COMPLEX - SECTIONS

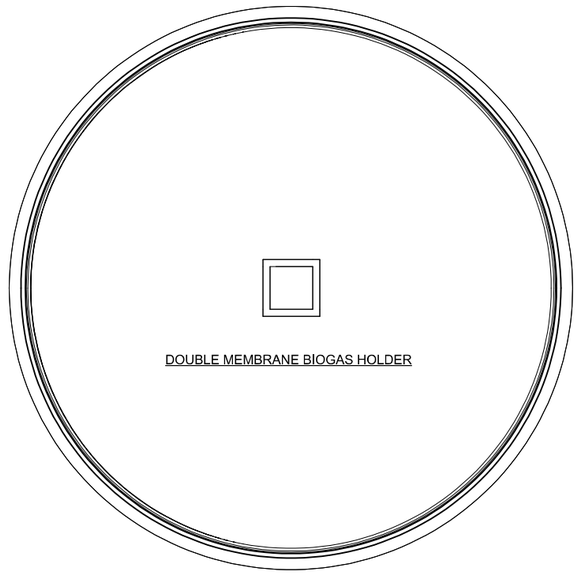
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

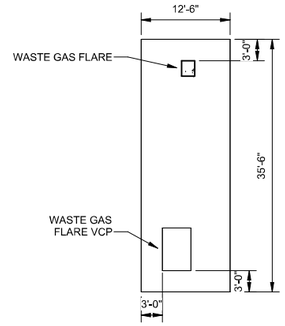
JOB NO. 203580
DRAWING NO. 51S03
SHEET NO. 82 OF 251

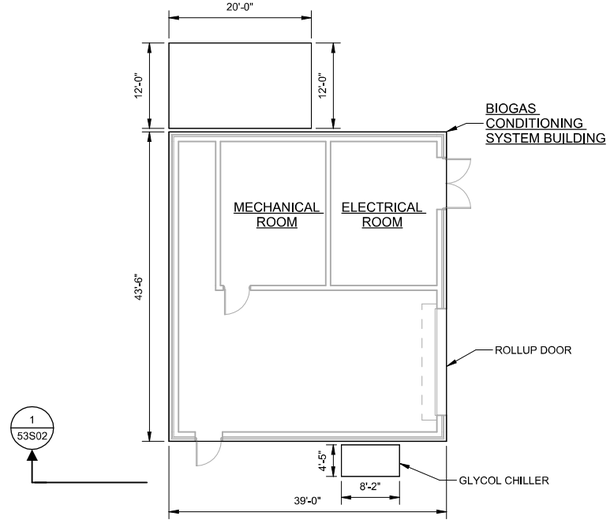
PLOT DATE: 7/2/2025 11:55:12 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/51-S-3D-101.rvt

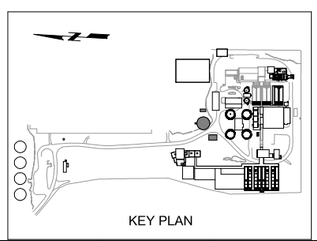








1 PLAN
SCALE: 3/32" = 1'-0"



REV	DATE	BY	DESCRIPTION
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DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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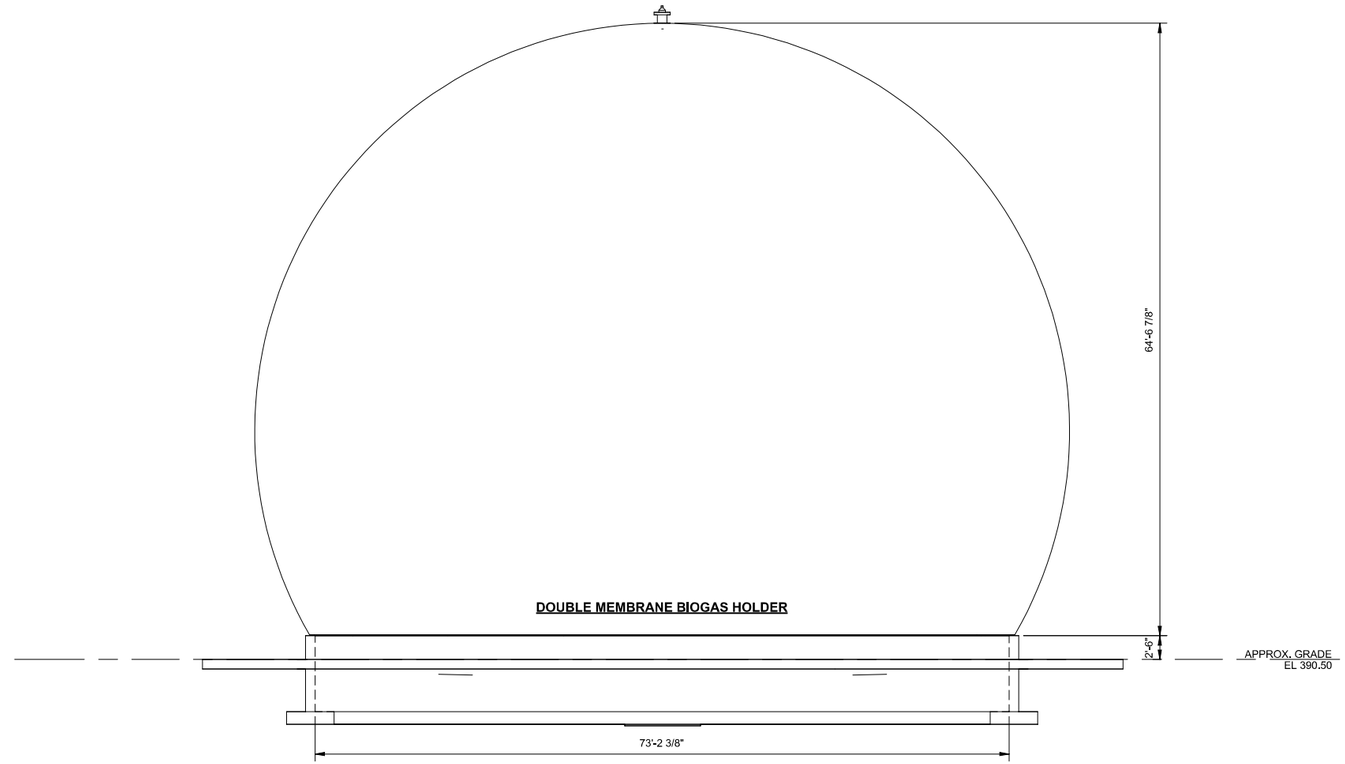
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
STRUCTURAL
DIGESTER GAS HANDLING, STORAGE, AND FLARE - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 53S01
SHEET NO. 83 OF 251

PLOT DATE: 6/25/2025 8:53:28 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/53-S-3D-101.rvt



1 / 53S01 **SECTION**
SCALE: 1/8" = 1'-0"

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
STRUCTURAL
DIGESTER GAS STORAGE - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 53S02
SHEET NO. 84 OF 251

PLOT DATE: 6/27/2025 12:57:13 PM
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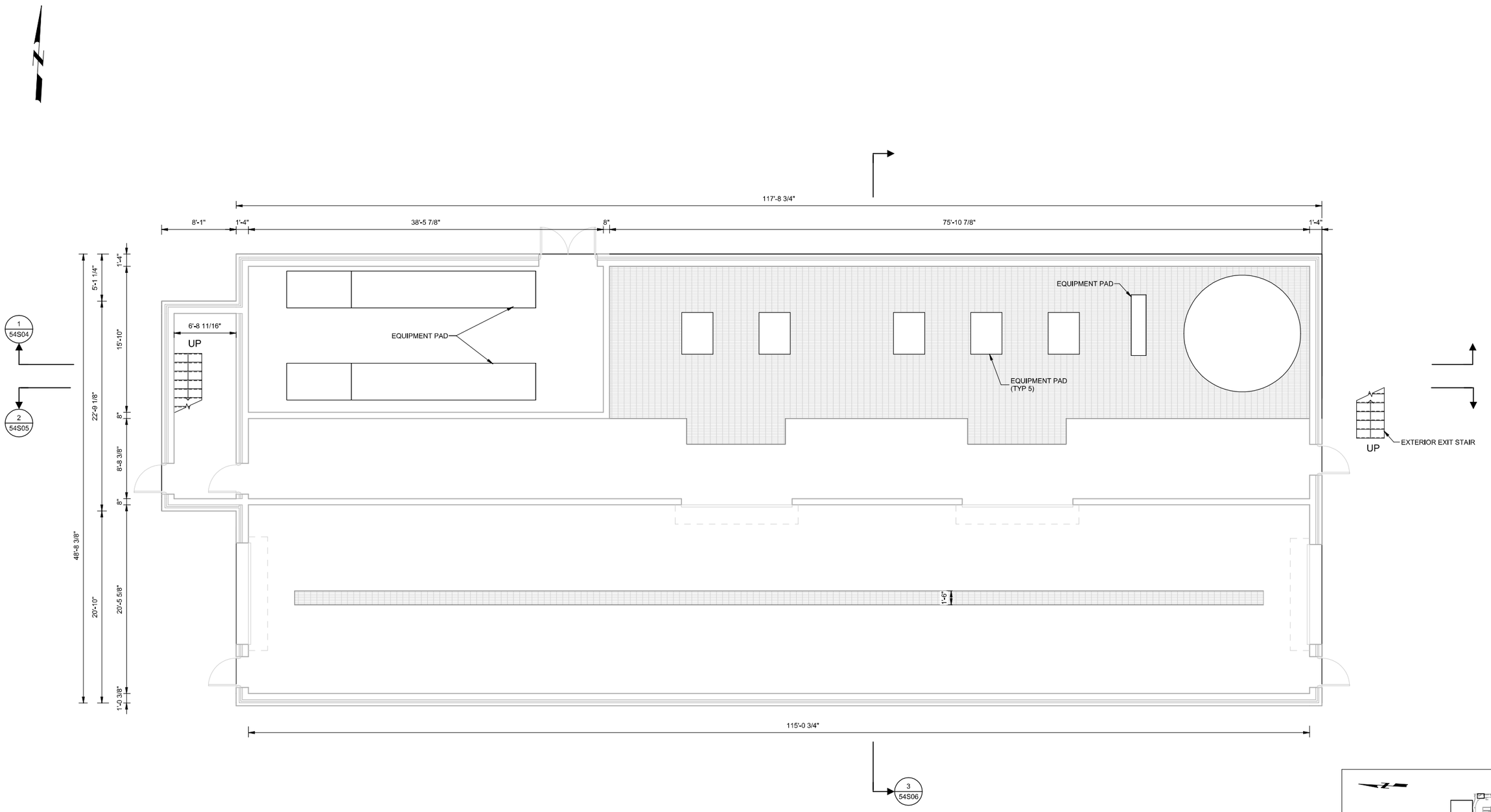
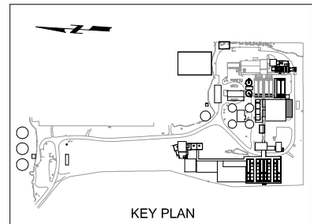


1 **PLAN**
SCALE: 3/16" = 1'-0"



KEY PLAN

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			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
THICKENING/DEWATERING - PLAN AT EL. 393.58'

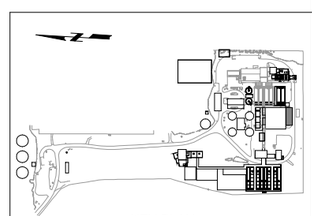
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54S01
SHEET NO. 85 OF 251

PLOT DATE: 6/23/2025 6:07:13 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-S-3D-101.rvt

2 PLAN
SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
THICKENING/DEWATERING - PLAN AT EL. 414.58'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54S02
SHEET NO. 86 OF 251

PLOT DATE: 6/23/2025 6:07:58 PM
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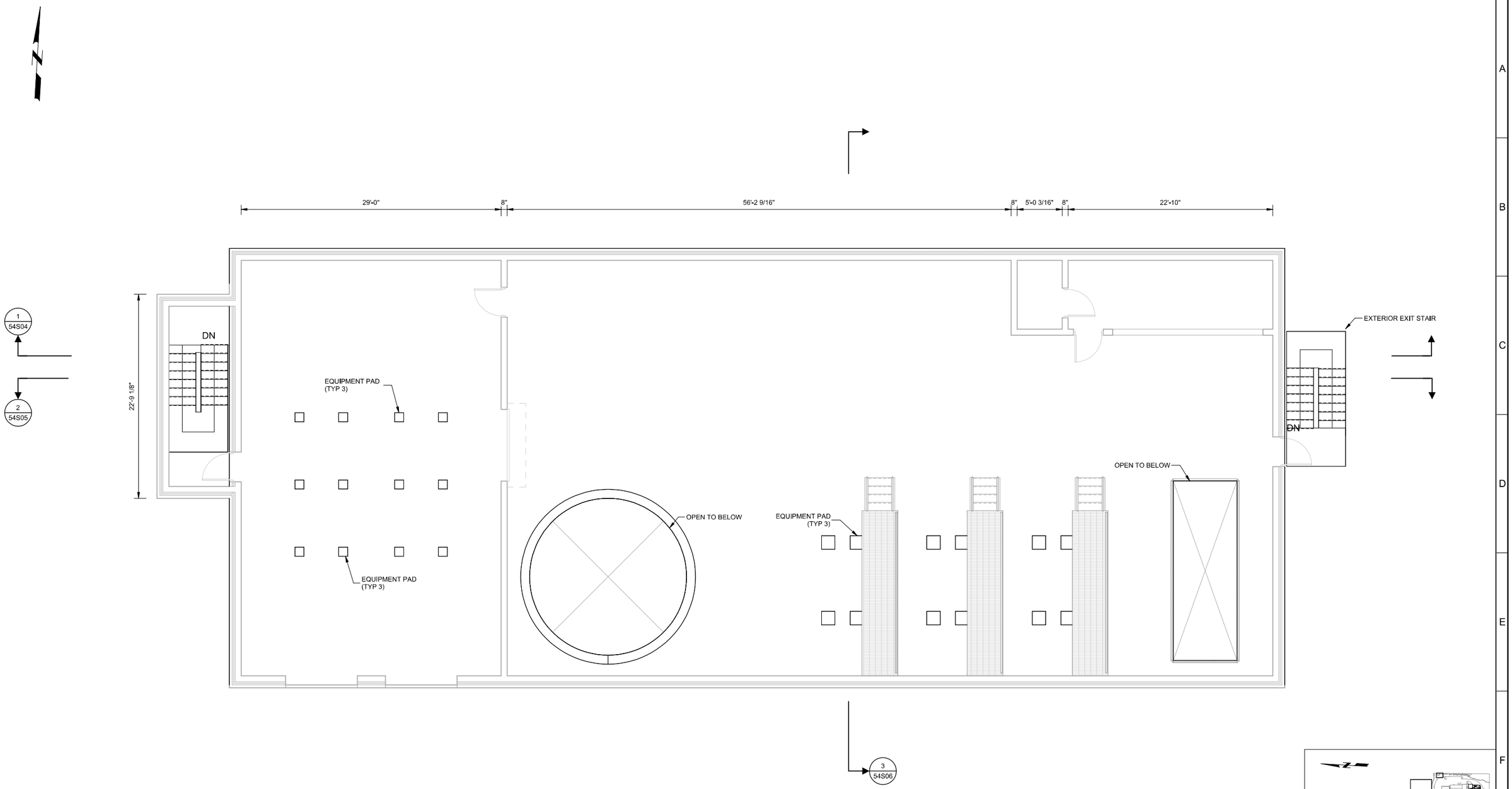
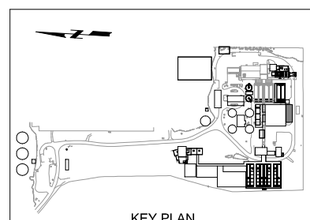


3 PLAN

SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

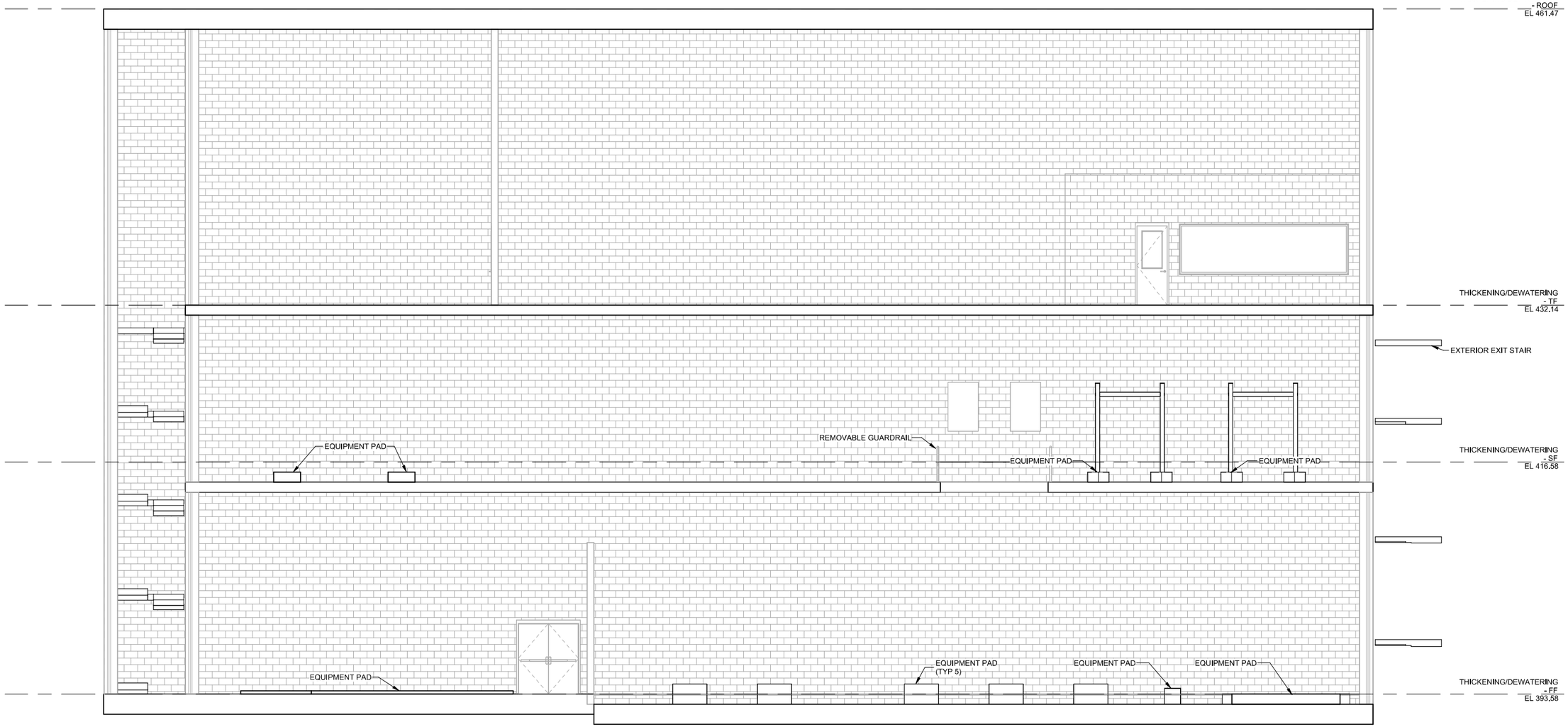
THICKENING/DEWATERING - PLAN AT EL. 432.14'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54S03
SHEET NO. 87 OF 251

PLOT DATE: 6/23/2025 6:08:32 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-S-3D-101.rvt



1 SECTION
54S01 SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
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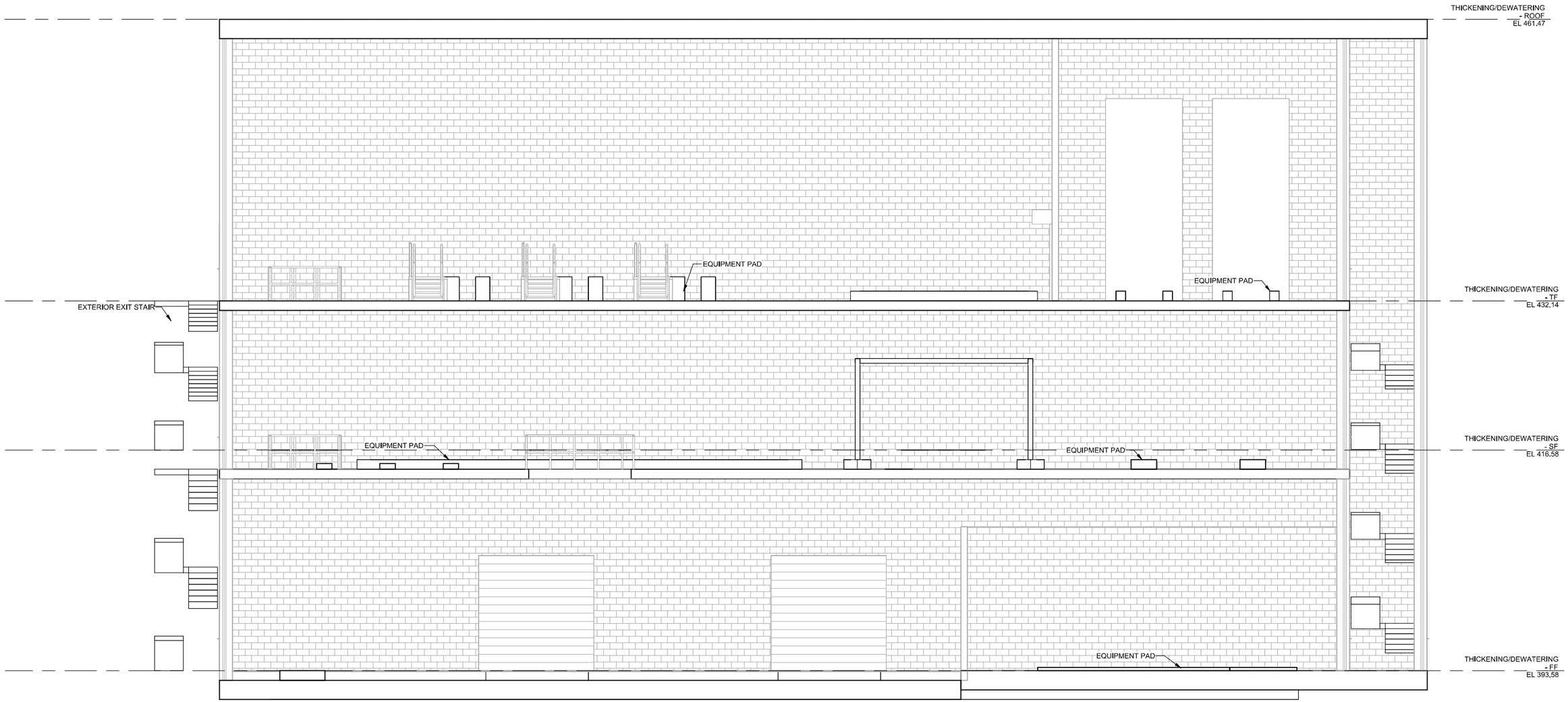
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
THICKENING/DEWATERING - SECTION 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54S04
SHEET NO. 88 OF 251

PLOT DATE: 6/23/2025 6:10:03 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-S-3D-101.rvt



2 SECTION
54S01

SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
THICKENING/DEWATERING - SECTION 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54S05
SHEET NO. 89 OF 251

PLOT DATE: 6/26/2025 12:51:29 PM

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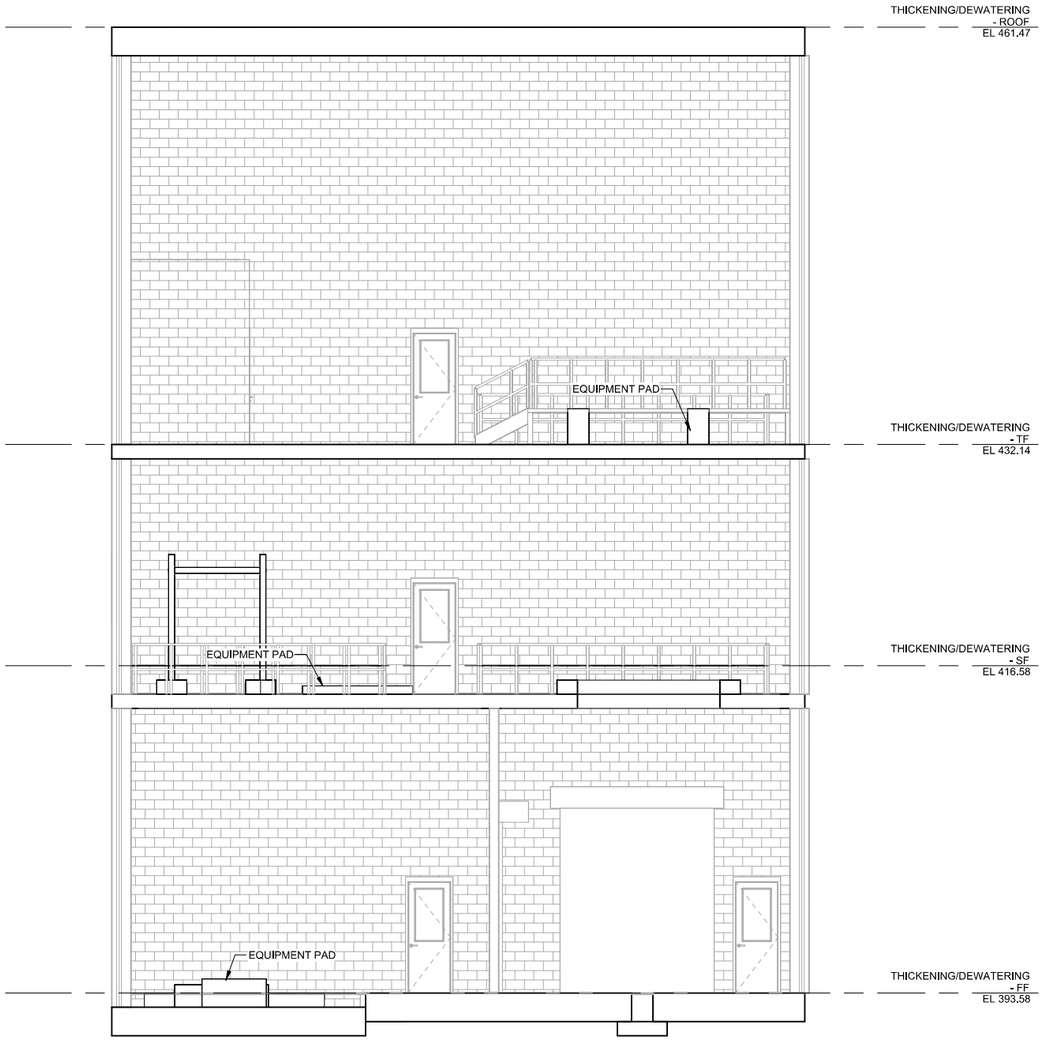

3 SECTION

54S01

SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

STRUCTURAL

THICKENING/DEWATERING - SECTION 3

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54S06
SHEET NO. 90 OF 251

PLOT DATE: 6/26/2025 12:51:30 PM

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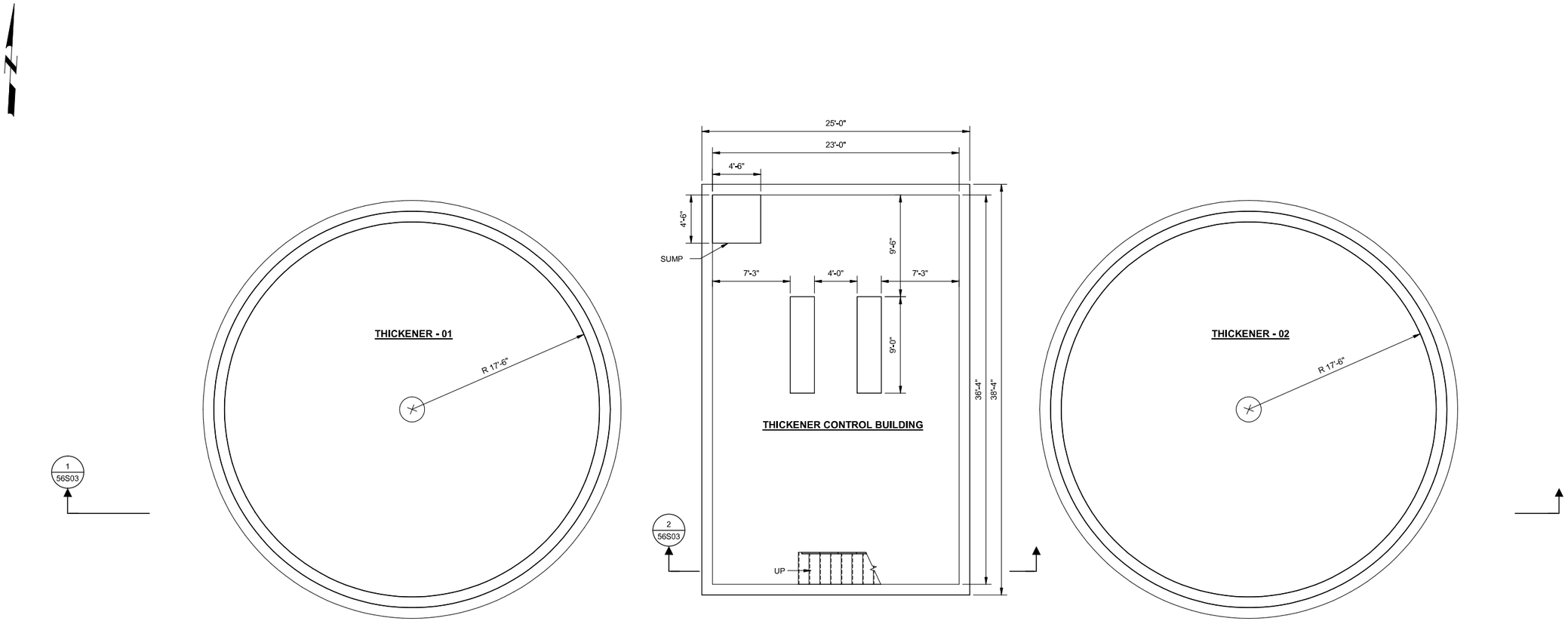
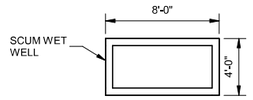
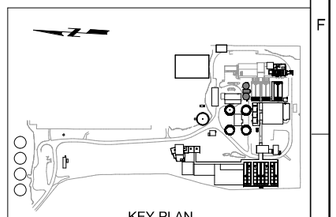




1 PLAN

SCALE: 3/16" = 1'-0"



KEY PLAN

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DRAWN A. CHARDE
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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

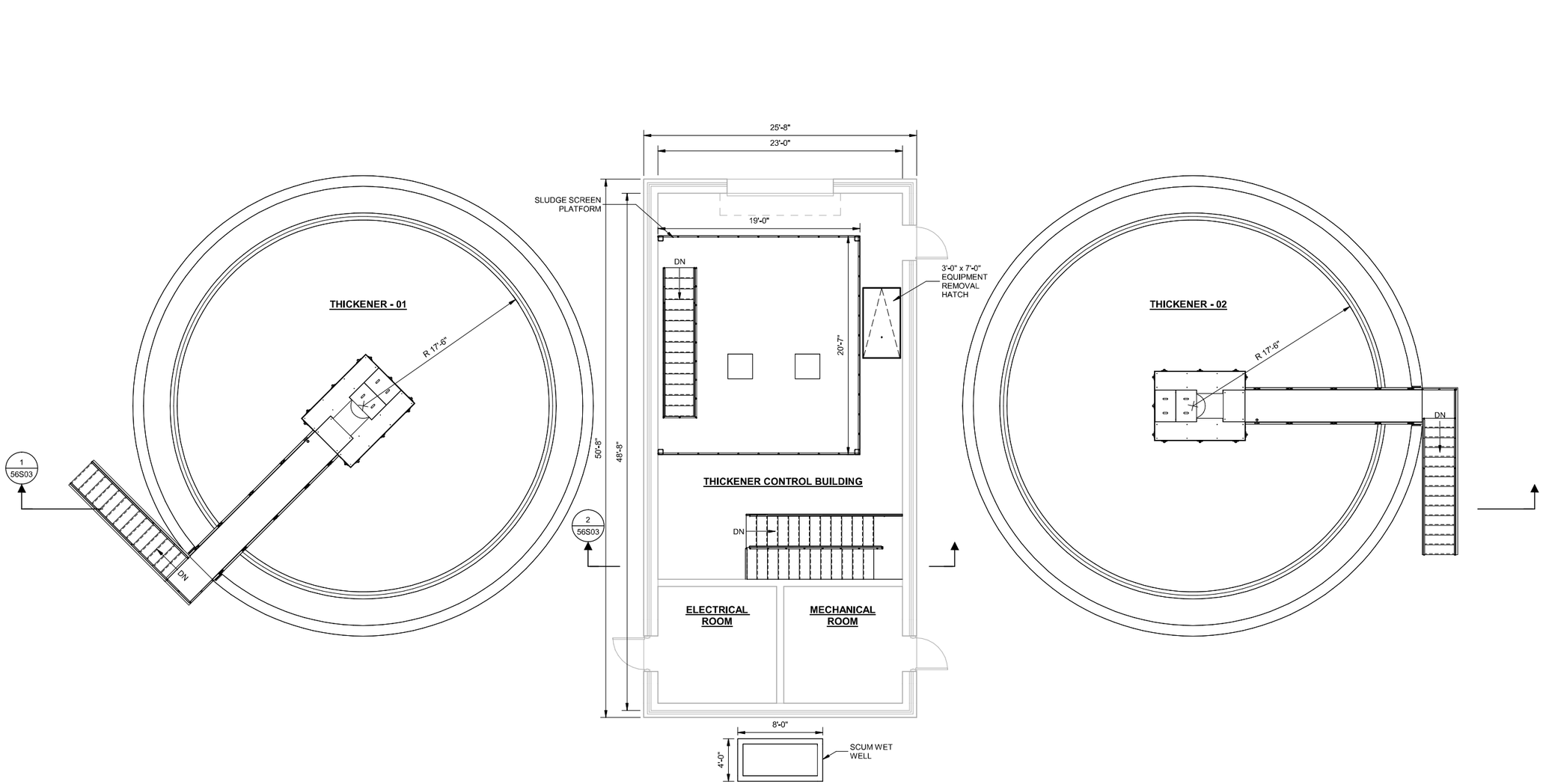
PRIMARY SLUDGE GRAVITY THICKENERS - BASEMENT FLOOR PLAN AT EL. 376.42'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 56S01
SHEET NO. 91 OF 251

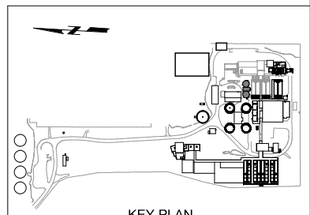
PLOT DATE: 6/17/2025 4:17:08 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/56-S-3D-101.rvt



2 PLAN

SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
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DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

STRUCTURAL

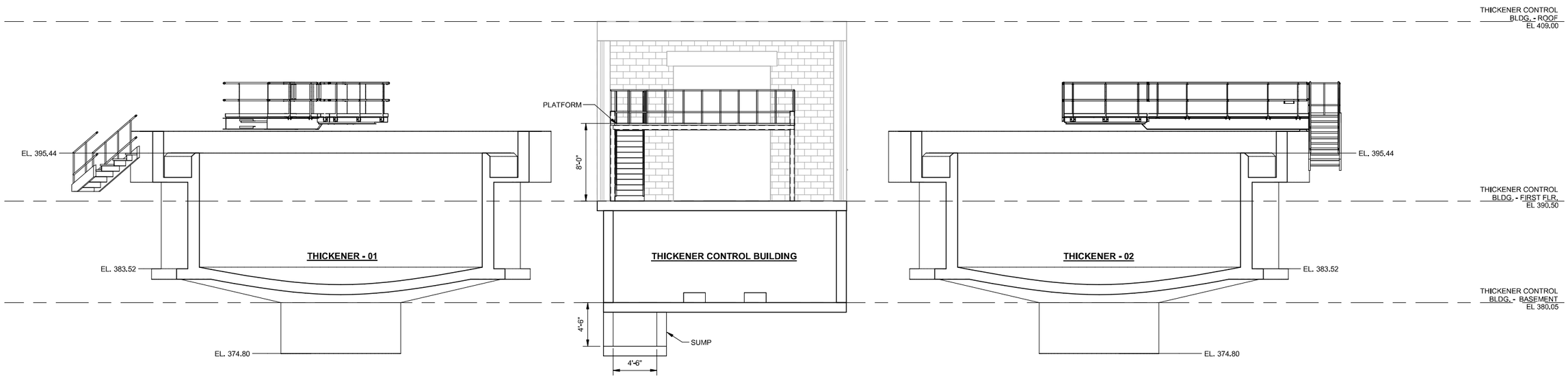
PRIMARY SLUDGE GRAVITY THICKENERS - FIRST FLOOR PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

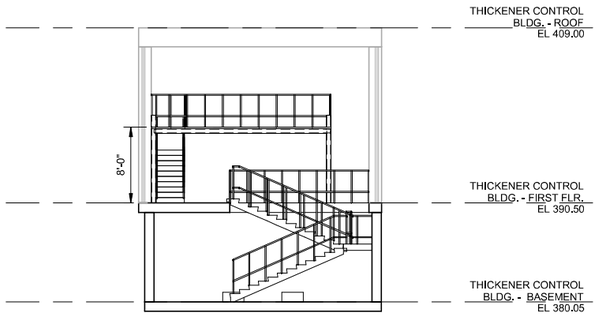
JOB NO. 203580
DRAWING NO. 56S02
SHEET NO. 92 OF 251

PLOT DATE: 6/17/2025 4:17:33 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/56-S-3D-101.rvt



1 SECTION
56S01 SCALE: 3/16" = 1'-0"



THICKENER CONTROL BUILDING

2 SECTION
56S01 SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
STRUCTURAL
PRIMARY SLUDGE GRAVITY THICKENERS - SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 56S03
SHEET NO. 93 OF 251

PLOT DATE: 6/17/2025 4:17:50 PM
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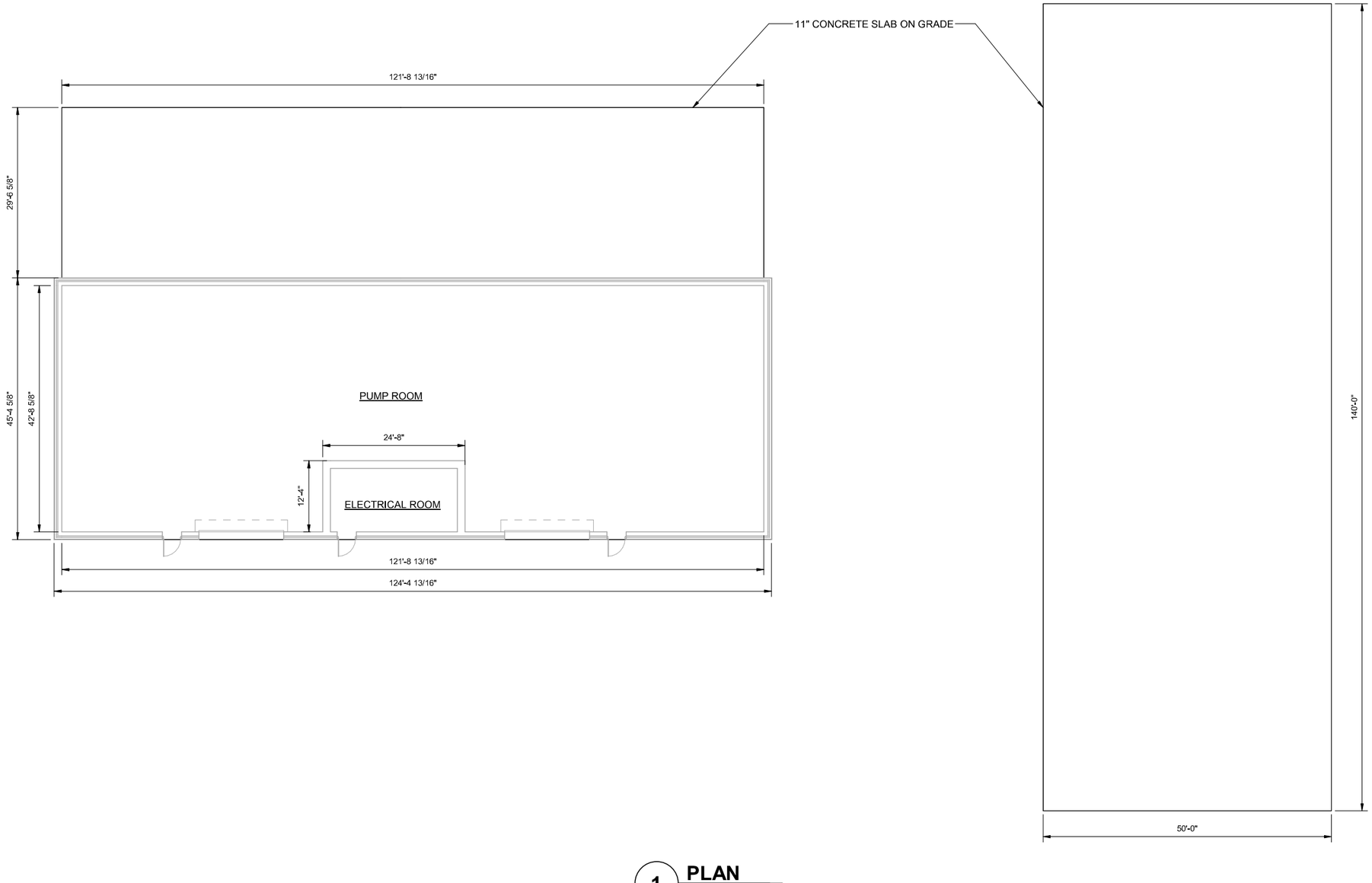
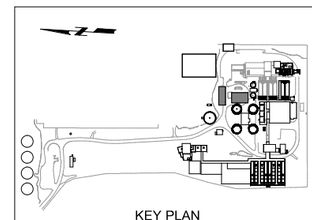


1 **PLAN**
SCALE: 1" = 10'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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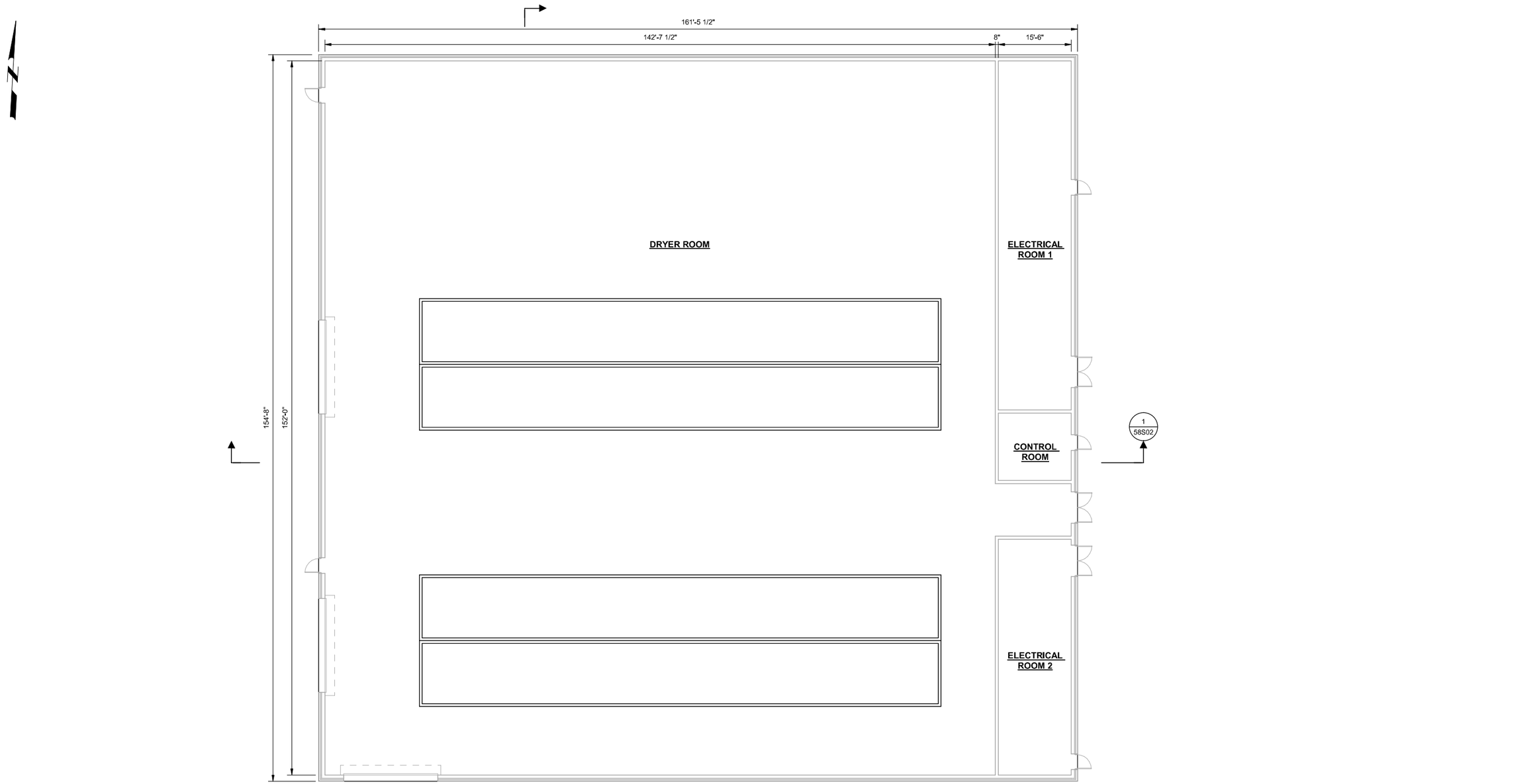
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
STRUCTURAL
HSW AND MSW RECEIVING STATIONS - PLAN AT EL. 393.20

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

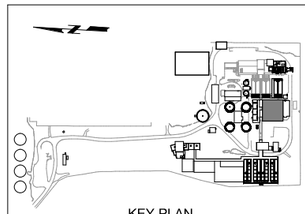
JOB NO. 203580
DRAWING NO. 57S01
SHEET NO. 94 OF 251

PLOT DATE: 6/10/2025 1:34:24 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/57-S-3D-101.rvt



1 PLAN
SCALE: 3/32" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
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DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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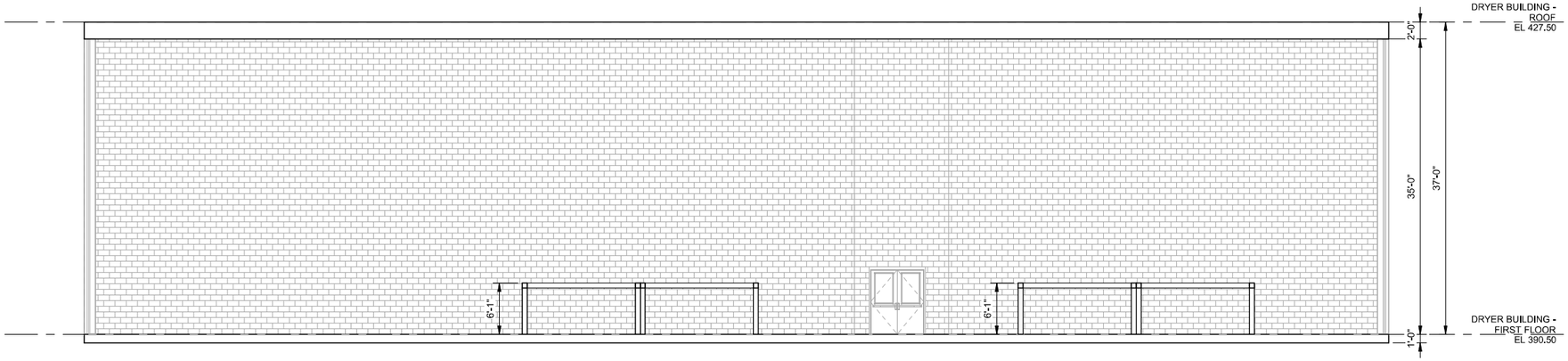
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
DRYER BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

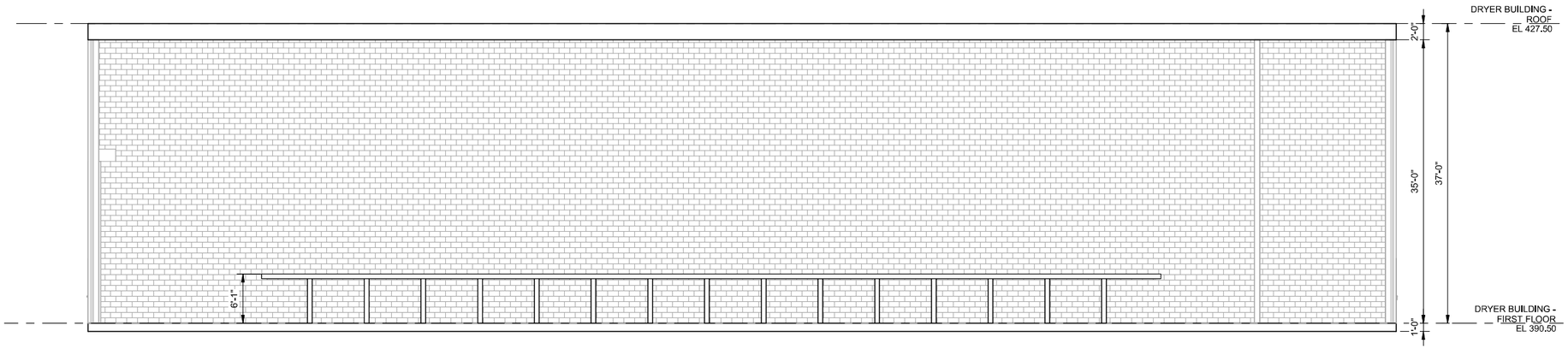
JOB NO. 203580
DRAWING NO. 58S01
SHEET NO. 95 OF 251

PLOT DATE: 6/10/2025 11:40:07 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/58-S-3D-101.rvt



2 SECTION (58S01)
SCALE: 1/8" = 1'-0"



1 SECTION (58S01)
SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
DRYER BUILDING - SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 58S02
SHEET NO. 96 OF 251

PLOT DATE: 6/10/2025 11:40:40 AM

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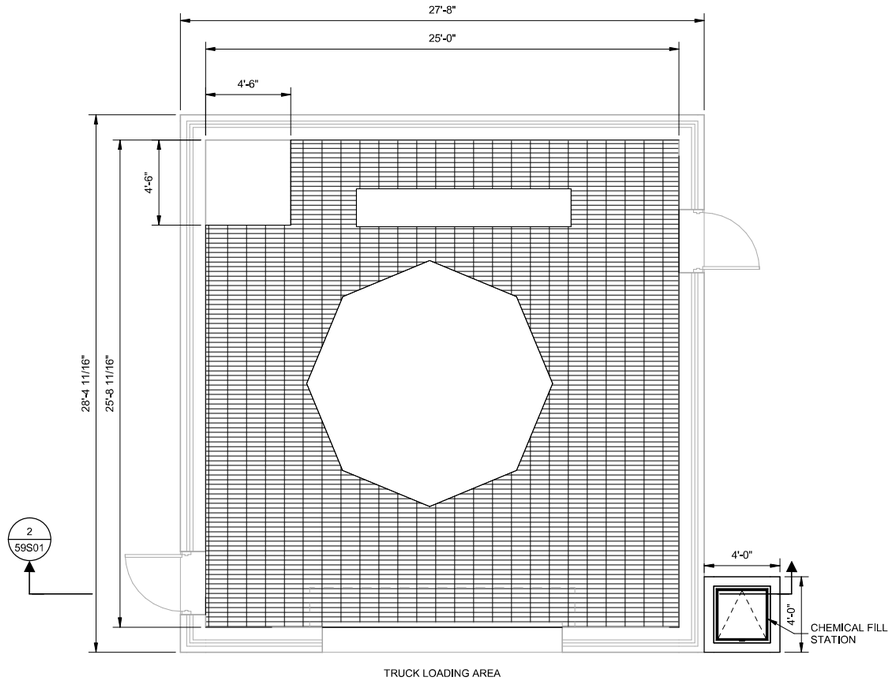
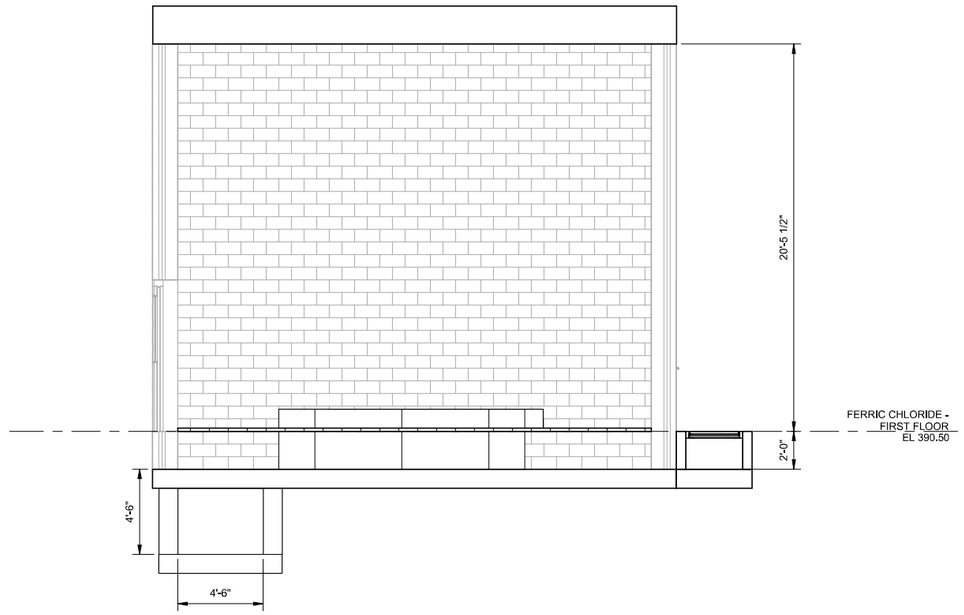
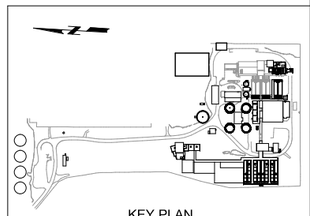


1 PLAN
SCALE: 1/4" = 1'-0"



2 SECTION
59S01
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
STRUCTURAL
FERRIC CHLORIDE BUILDING - PLAN AT EL. 390.50' AND SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 59S01
SHEET NO. 97 OF 251

PLOT DATE: 6/17/2025 4:33:18 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/58-S-3D-101.rvt

PIPING SYMBOLS

DOUBLE LINE	SINGLE LINE	DESCRIPTION
		WELDED JOINT
		GROOVED END JOINT
		FLANGED JOINT
		HUB & SPIGOT JOINT (RUBBER GASKET)
		PUSH-ON JOINT (RESTRAINED)
		ADAPTER SIDE GROOVED END ADAPTER FLANGE
		FLANGED COUPLING ADAPTER
		FLANGED COUPLING ADAPTER WITH THRUST TIES
		FLEXIBLE COUPLING
		FLEXIBLE COUPLING WITH THRUST TIES
		METAL BELLOWS EXP JOINT
		ELASTOMER BELLOWS EXP JOINT
		FLEXIBLE COUPLING ADAPTER
		DISMANTLING JOINT
		EXPANSION COMPENSATOR
		ELBOW UP
		ELBOW DOWN
		TEE UP
		TEE DOWN
		LATERAL UP
		LATERAL DOWN
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER (FOT. FOB)
		UNION
		CAP
		ANCHOR
		ELBOW, 90 DEGREE
		CROSS
		TEE
		ELBOW, 45 DEGREE
		ELBOW, 22.5 DEGREE
		ELBOW, 11.25 DEGREE
		LATERAL

SINGLE LINE	DESCRIPTION
	GATE VALVE
K	KNIFE GATE VALVE
	BUTTERFLY VALVE
V	CHARACTERIZED BALL CONTROL VALVE
	BALL VALVE
	GLOBE VALVE
	3-WAY GLOBE TYPE MIXING VALVE
	FOUR WAY VALVE
	PINCH VALVE
	DIAPHRAGM VALVE
	PLUG VALVE
	LUBRICATED PLUG VALVE
	ECCENTRIC PLUG VALVE
	CONCENTRIC PLUG VALVE
	SWING CHECK VALVE
	WAFER CHECK VALVE
	BALL CHECK VALVE
	DUAL CHECK VALVE
	CHECK BACKFLOW PREVENTER
	HOSE VALVE
	MUD VALVE (PLAN VIEW)
	NEEDLE VALVE
	CONE VALVE
	PRESSURE RELIEF PRESSURE-REDUCING REGULATOR
	TELESCOPING VALVE
	THREE WAY VALVE AIR OPERATED
M	THREE WAY VALVE MOTOR OPERATED
S	THREE WAY VALVE SOLENOID OPERATED
	VACUUM VALVE
	BACKPRESSURE REGULATOR SELF-CONTAINED
	BACKPRESSURE REGULATOR W/ EXTERNAL PRESSURE TAP
	PRESSURE-REDUCING REGULATOR: SELF-CONTAINED
	PRESSURE-REDUCING REGULATOR W/EXTERNAL PRESSURE TAP

MECHANICAL SYMBOLS

SINGLE LINE	DESCRIPTION
	AIR OR CHEMICAL DIFFUSER
	QUICK DISCONNECT HIGH PRESSURE AIR OR FLUSHING
	BATCHMETER
	AIR VENT
	BASKET STRAINER
	BLOWER
	CALIBRATION COLUMN
	COMPRESSOR/TURBINE
	COMPRESSOR: RECIPROCATING
	DIAPHRAGM SEAL
	DRAIN
	EJECTOR OR EDUCTOR
M	ELECTRIC MOTOR
	EQUIPMENT DRAIN
	EXPANSION JOINT, FLEXIBLE VIBRATION JOINT
	FAN: EXHAUST/SUPPLY
	FILTER
	FIRE HYDRANT
	FLAME ARRESTER
	FLAME ARRESTER WITH THERMALLY OPERATED VALVE
	FLOOR DRAIN
	FLOW SWITCH
	GAUGE: PRESSURE
	GAUGE: DIFFERENTIAL PRESSURE
	WEIR
	MIXER
	OIL OR MOISTURE TRAP
	PRIMARY LEVEL ELEMENT: BUBBLER
	PRIMARY LEVEL ELEMENT: ELECTRODE
	PRIMARY LEVEL ELEMENT: FLOAT SWITCH
	PRIMARY LEVEL ELEMENT: FLUID
	PRIMARY LEVEL ELEMENT: INVERTED COLUMN

SINGLE LINE	DESCRIPTION
	PRIMARY LEVEL ELEMENT: RADAR
	PRIMARY LEVEL ELEMENT: ULTRASONIC
	PRIMARY FLOW ELEMENT: FLUME
X	PRIMARY FLOW ELEMENT: X = C - CORIOLIS X = M - MAGNETIC X = P - PROPELLER X = PT - PITOT TUBE X = R - ROTAMETER X = T - TURBINE X = TH - THERMAL X = U - ULTRASONIC X = D - DENSITY
	PRIMARY FLOW ELEMENT: ORIFICE PLATE
	PRIMARY FLOW ELEMENT: VENTURI TUBE
	PRIMARY FLOW ELEMENT: WEIR
	PULSATION DAMPENER
	PUMP: CENTRIFUGAL
	PUMP: DIAPHRAGM
	PUMP: METERING
	PUMP: PLUNGER
	PUMP: PERISTALTIC TUBE METERING
	PUMP: PROGRESSIVE CAVITY
	PUMP: RECIPROCATING
	PUMP: ROTARY
	PUMP: SCREW
	PUMP: SUBMERSIBLE
	PUMP: VERTICAL LIFT
	PIPE REDUCER: CONCENTRIC
	PIPE REDUCER: ECCENTRIC (FOT, FOB)
	ROTARY CHEMICAL FEEDER
	RUPTURE DISK
	SAMPLE PORT
	SIGHT GLASS
	SLIDE GATE
	SLUICE GATE
	STRAINER: WYE TYPE

SINGLE LINE	DESCRIPTION
	STRAINER: WYE TYPE WITH BLOWOFF
	THERMOMETER
	VALVE: ANGLE
	VALVE: AIR RELIEF
	PIPE MATERIAL CHANGE

IDENTIFICATION SYMBOLS

CHEMICAL INJECTION POINT — CHEMICAL / DWG NO.

PIPE DESIGNATOR — PIPE SIZE — FLOW STREAM — X" XXX

CONTINUATION TAG — UNIQUE IDENTIFIER — CONTINUATION FROM DWG NO. — CONTINUATION TO DWG NO. — A B C

EQUIPMENT / VALVE TAG — XXX-XX-XXXX

KEY TAG — X

LINE SYMBOLS

PIPE ABOVE OR BELOW GROUND

PIPE UNDERNEATH SLAB OR STRUCTURE

FUTURE

EXISTING

DEMO

PROCESS LINE SYMBOLS

PRIMARY PROCESS FLOW IN PIPE

SECONDARY PROCESS FLOW IN PIPE

PRIMARY PROCESS FLOW IN CHANNEL

SECONDARY PROCESS FLOW IN CHANNEL

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED S. DAVIS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

MECHANICAL

GENERAL LEGEND AND SYMBOLS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00GM01
SHEET NO. 98 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

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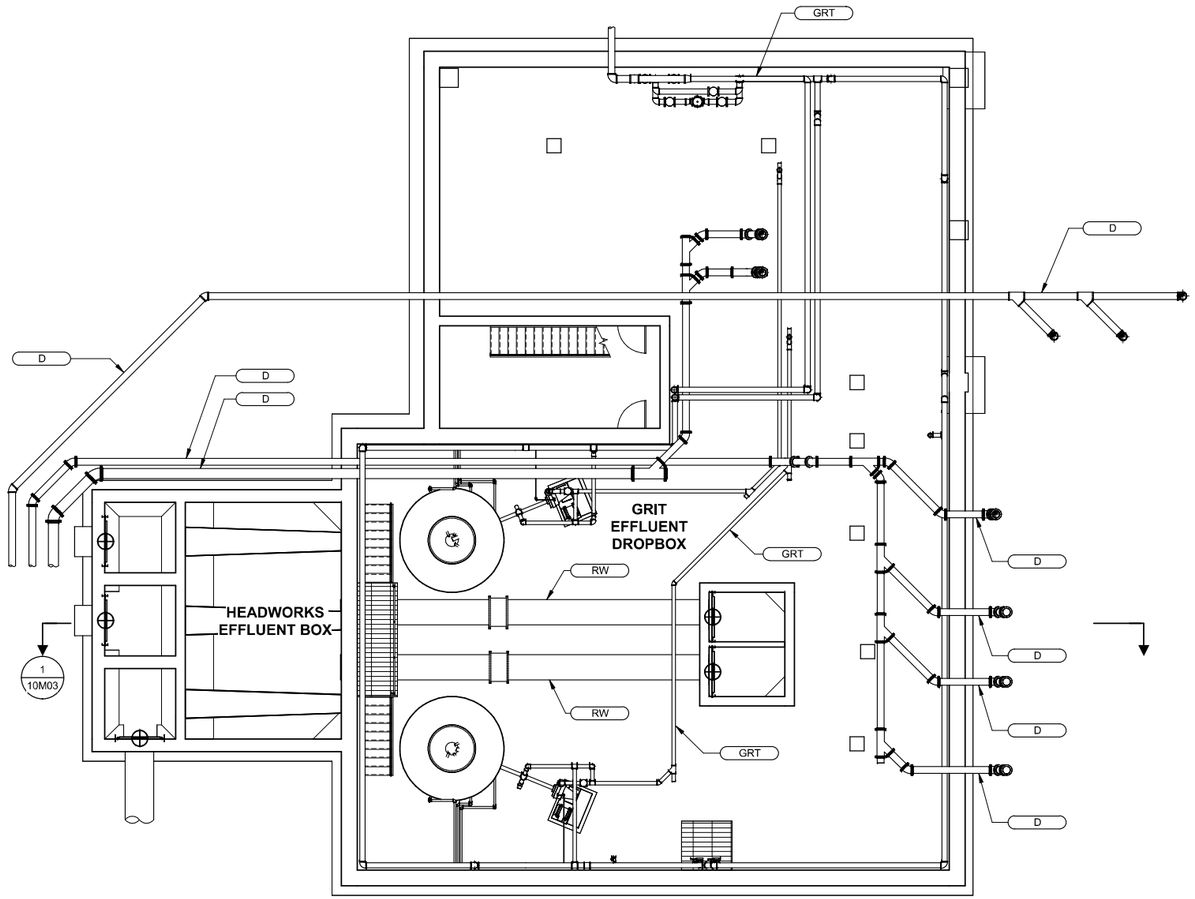
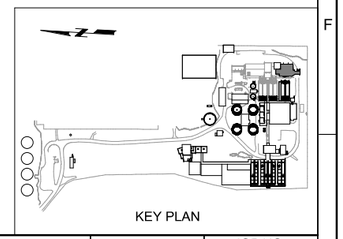


1 **PLAN**
SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			INTERMEDIATE DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. E. ESQUER
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

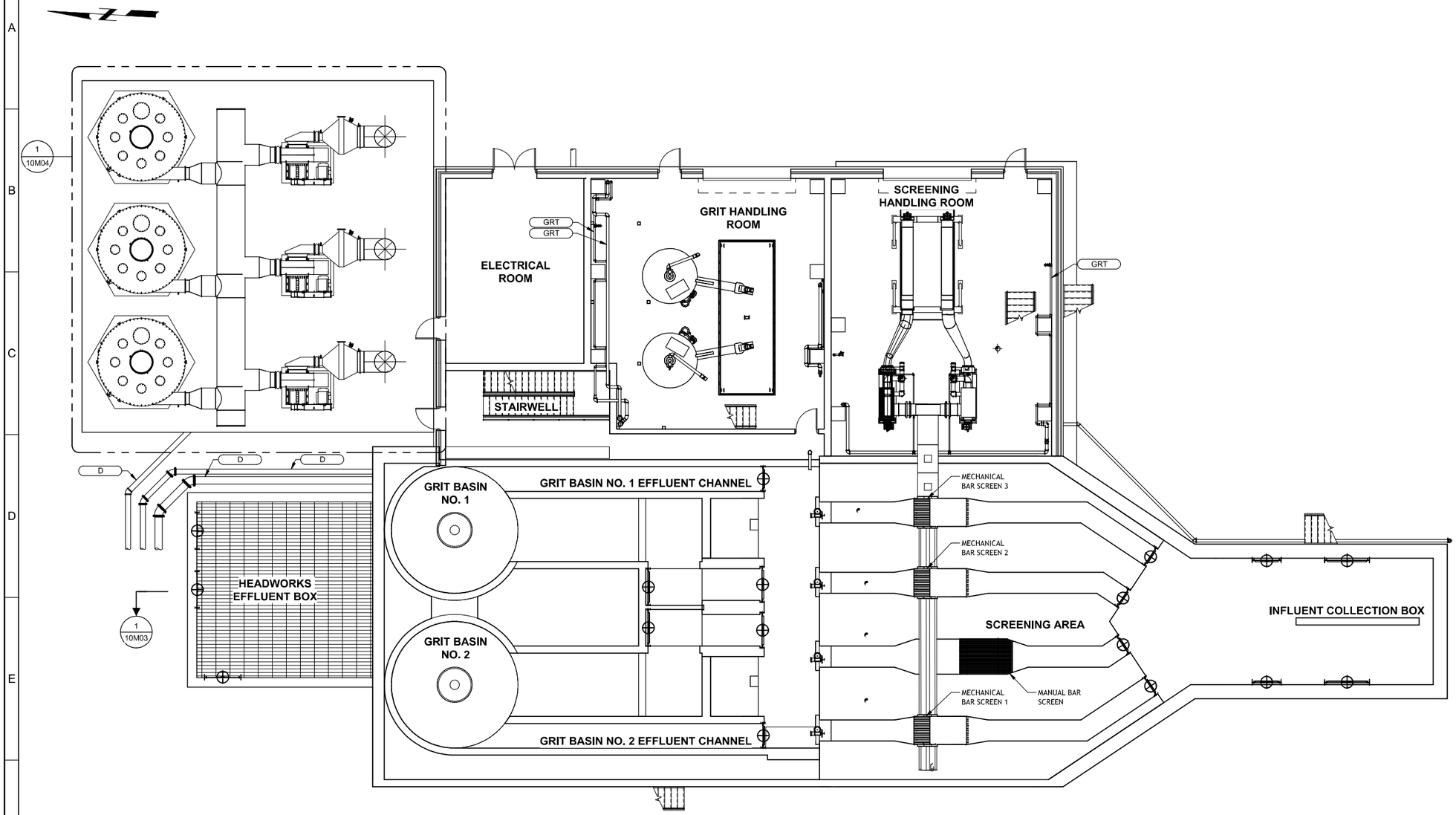
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM
MECHANICAL
HEADWORKS - BASEMENT PLAN AT EL. 382.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10M01
SHEET NO. 99 OF 251

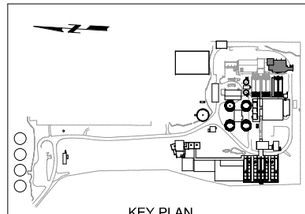
PLOT DATE: 6/10/2025 3:31:02 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-M-3D-101.rvt



2 PLAN

SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION

INTERMEDIATE DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED M. E. ESQUER
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM
MECHANICAL
HEADWORKS - OVERALL PLAN AT EL. 395.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 10M02
SHEET NO. 100 OF 251

PLOT DATE: 7/7/2025 9:01:05 AM

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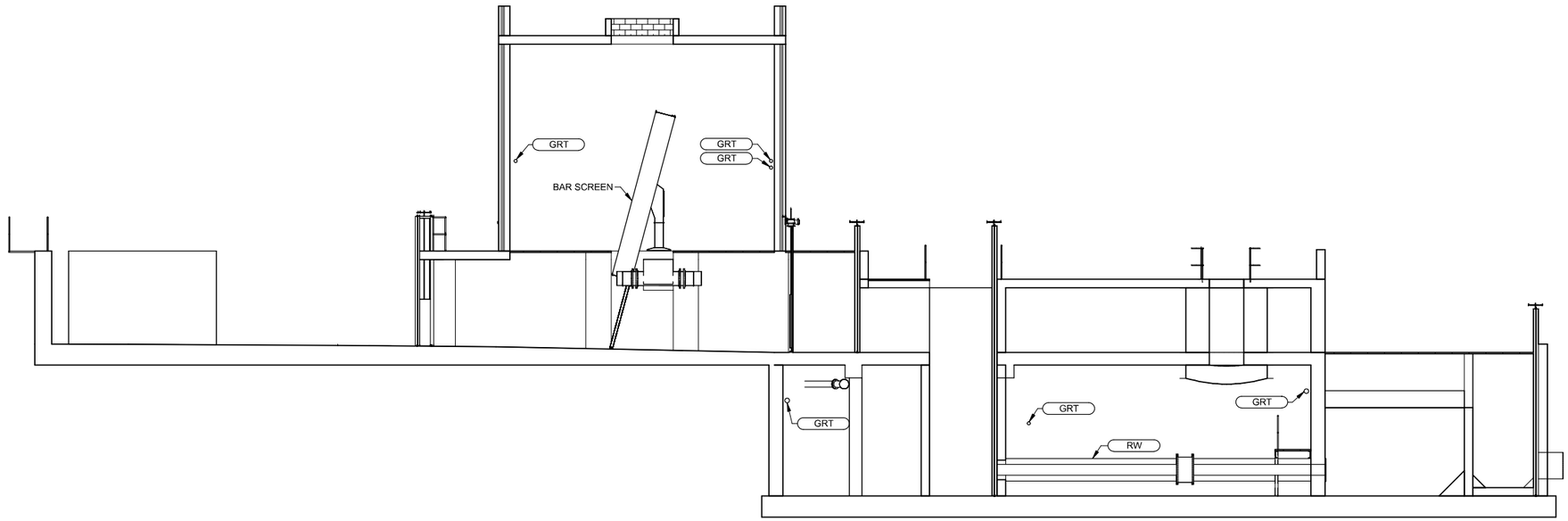

1 (10M01) **SECTION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION

INTERMEDIATE DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED M. E. ESQUER
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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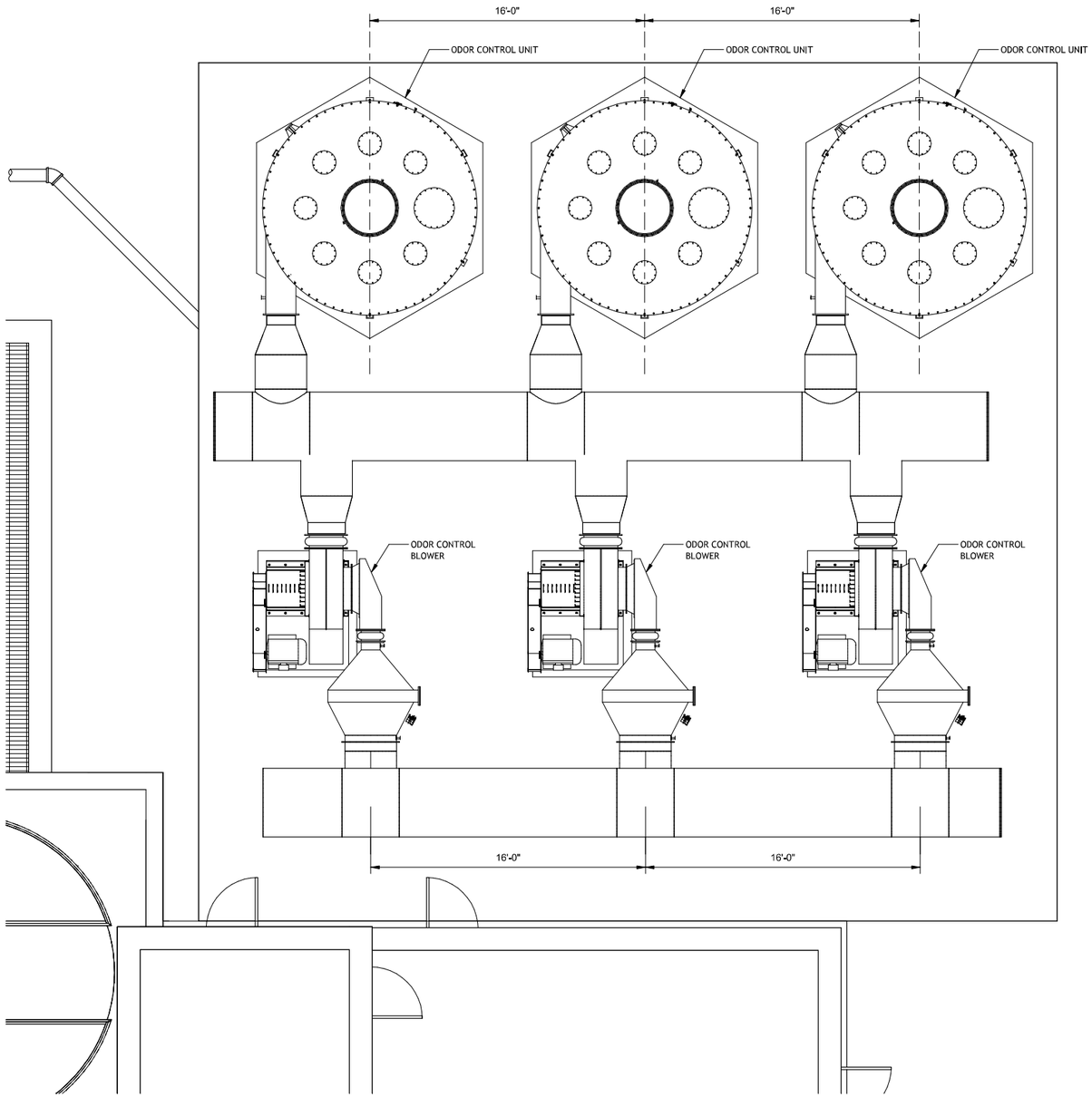
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM
MECHANICAL
HEADWORKS - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

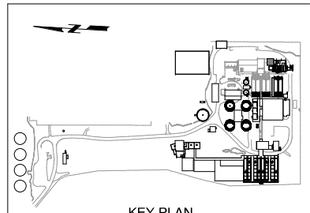
JOB NO. 203580
DRAWING NO. 10M03
SHEET NO. 101 OF 251

PLOT DATE: 6/10/2025 3:31:04 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-M-3D-101.rvt



1 **PLAN**
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			INTERMEDIATE DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED S. BOSWELL
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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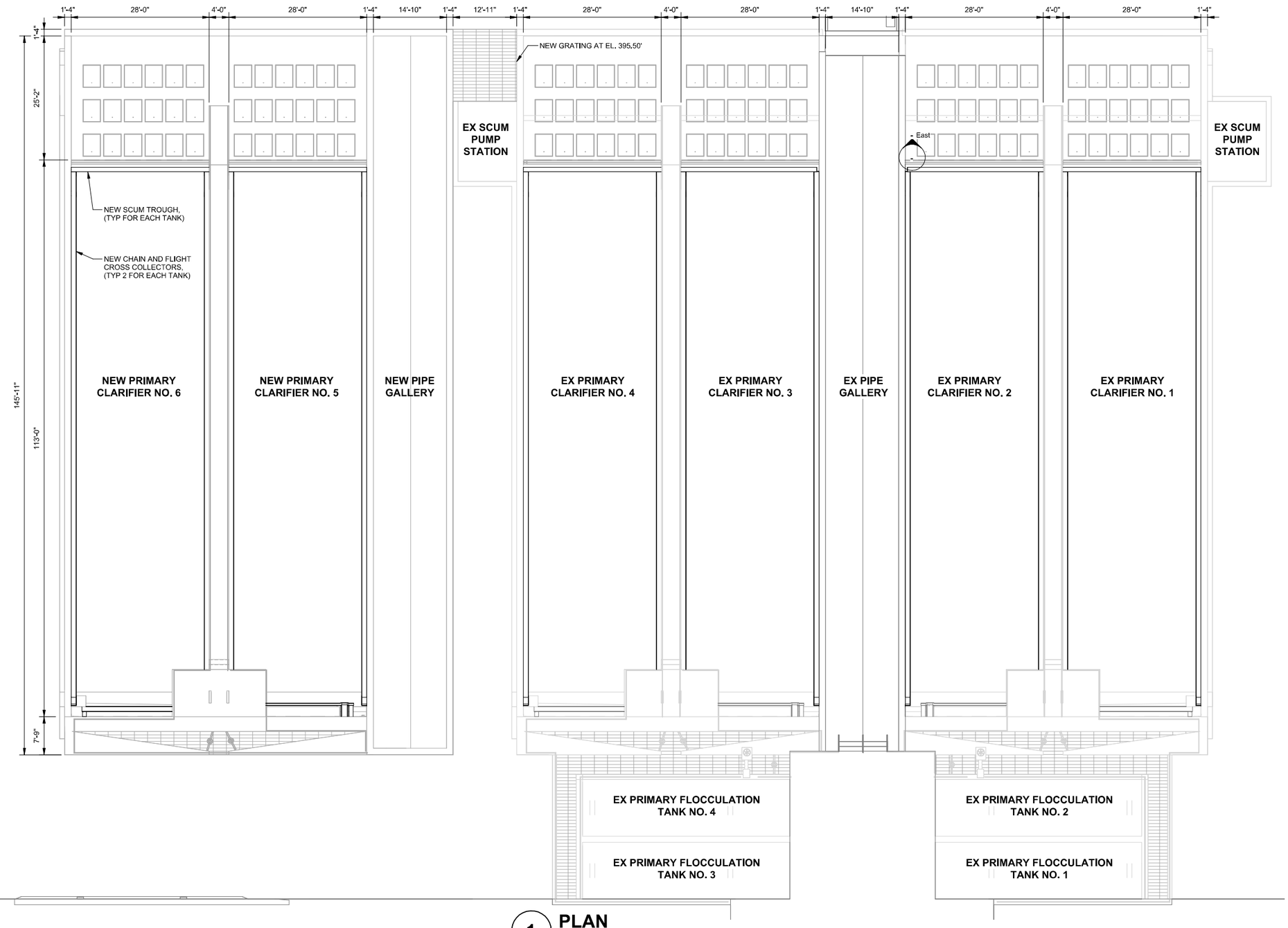
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM
MECHANICAL
HEADWORKS - ODOR CONTROL PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

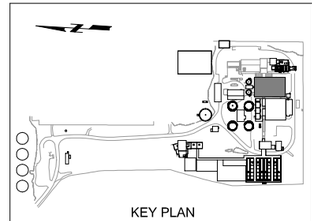
JOB NO. 203580
DRAWING NO. 10M04
SHEET NO. 102 OF 251

PLOT DATE: 7/7/2025 9:01:52 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/10-M-3D-101.rvt



1 **PLAN**
SCALE: 3/32" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED T. LAMAN
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
MECHANICAL
PRIMARY CLARIFIER TANKS - PLAN AT EL. 396.00

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 21M01
SHEET NO. 103 OF 251

PLOT DATE: 6/10/2025 12:03:28 PM

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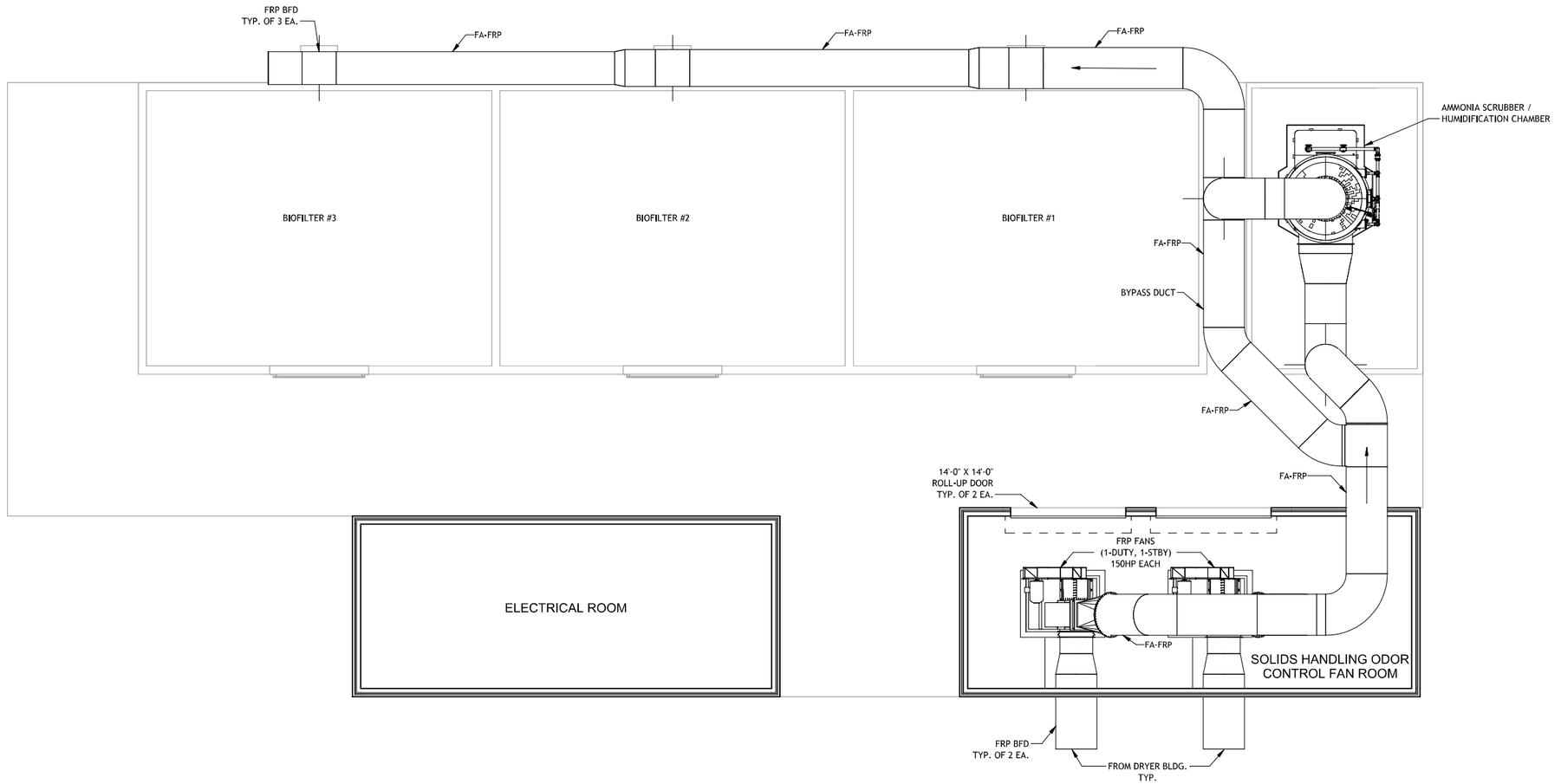
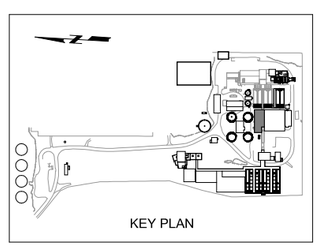


1 **PLAN**
SCALE: 1/8" = 1'-0"



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED S. BOSWELL
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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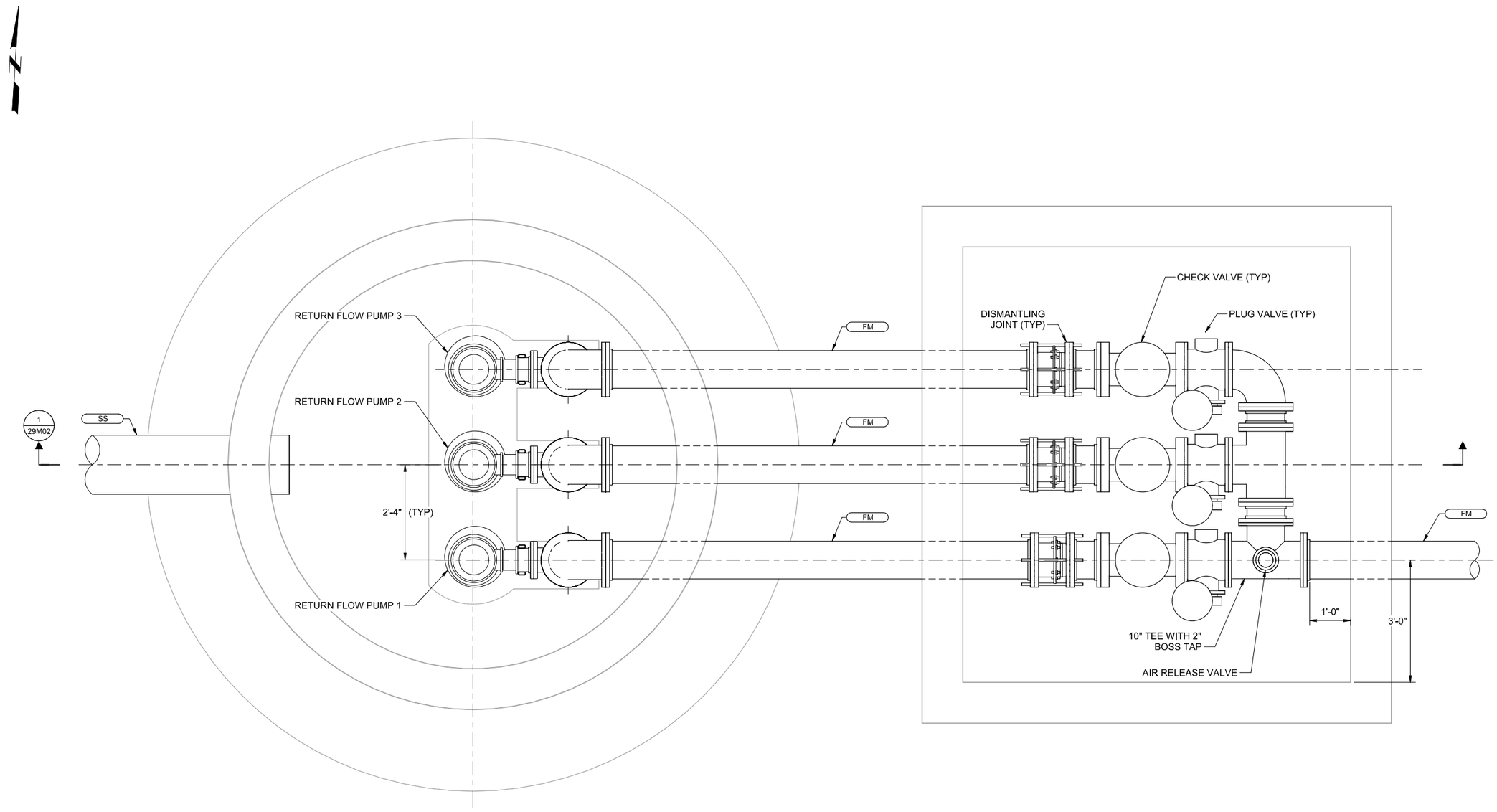
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
MECHANICAL
SOLIDS HANDLING ODOR CONTROL - PLAN AT EL. 392.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 28M01
SHEET NO. 104 OF 251

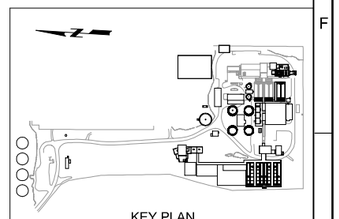
PLOT DATE: 6/10/2025 12:42:06 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/28-M-3D-101.rvt



1 PLAN

SCALE: 3/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M, SPRICK
DRAWN A, CHARDE
CHECKED R, GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

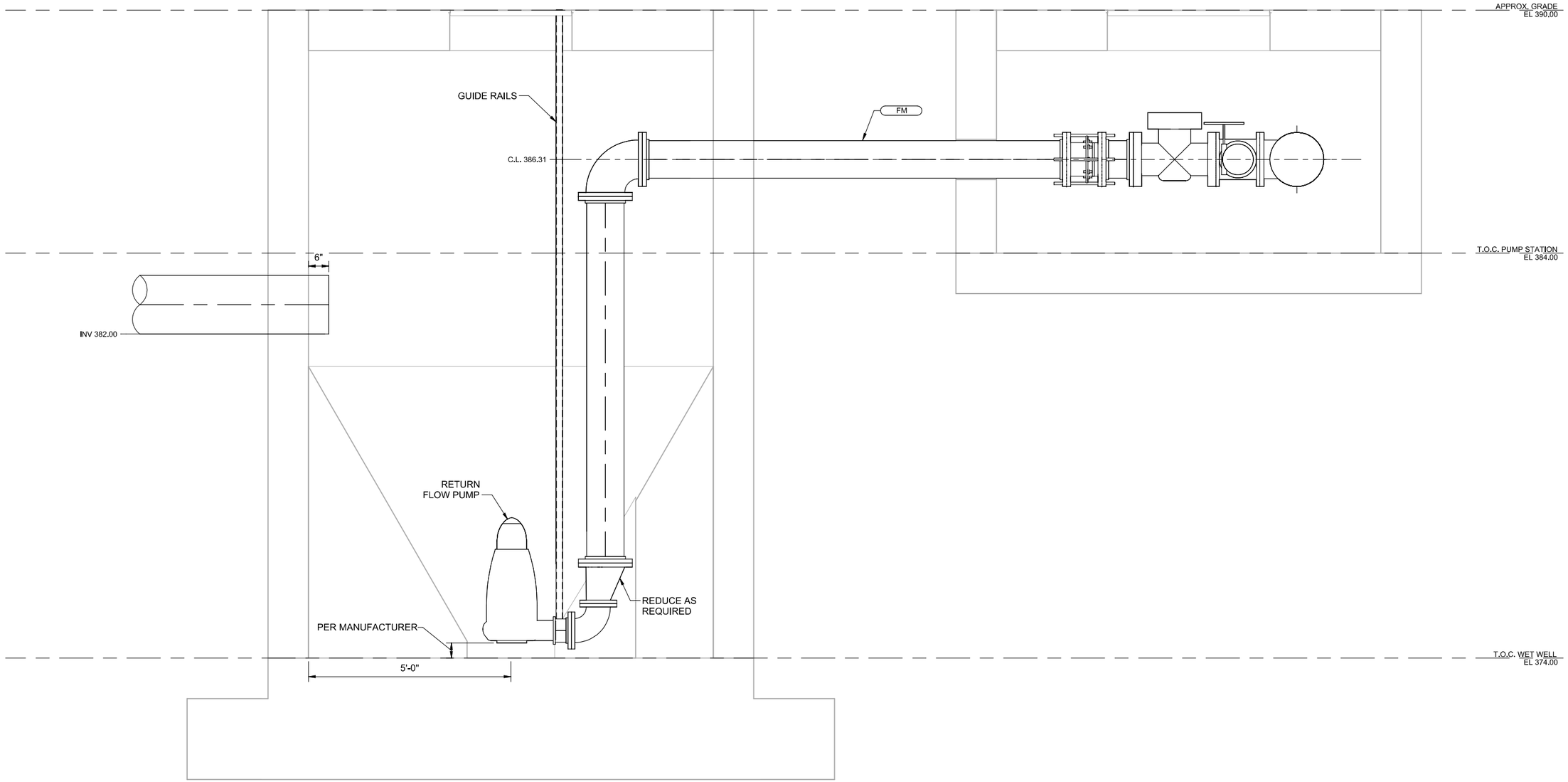
RETURN FLOW PUMP STATION - PLAN AT EL. 384.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 29M01
SHEET NO. 105 OF 251

PLOT DATE: 6/10/2025 11:36:06 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/29-M-3D-101.rvt



1 / 29M01 **SECTION**
SCALE: 3/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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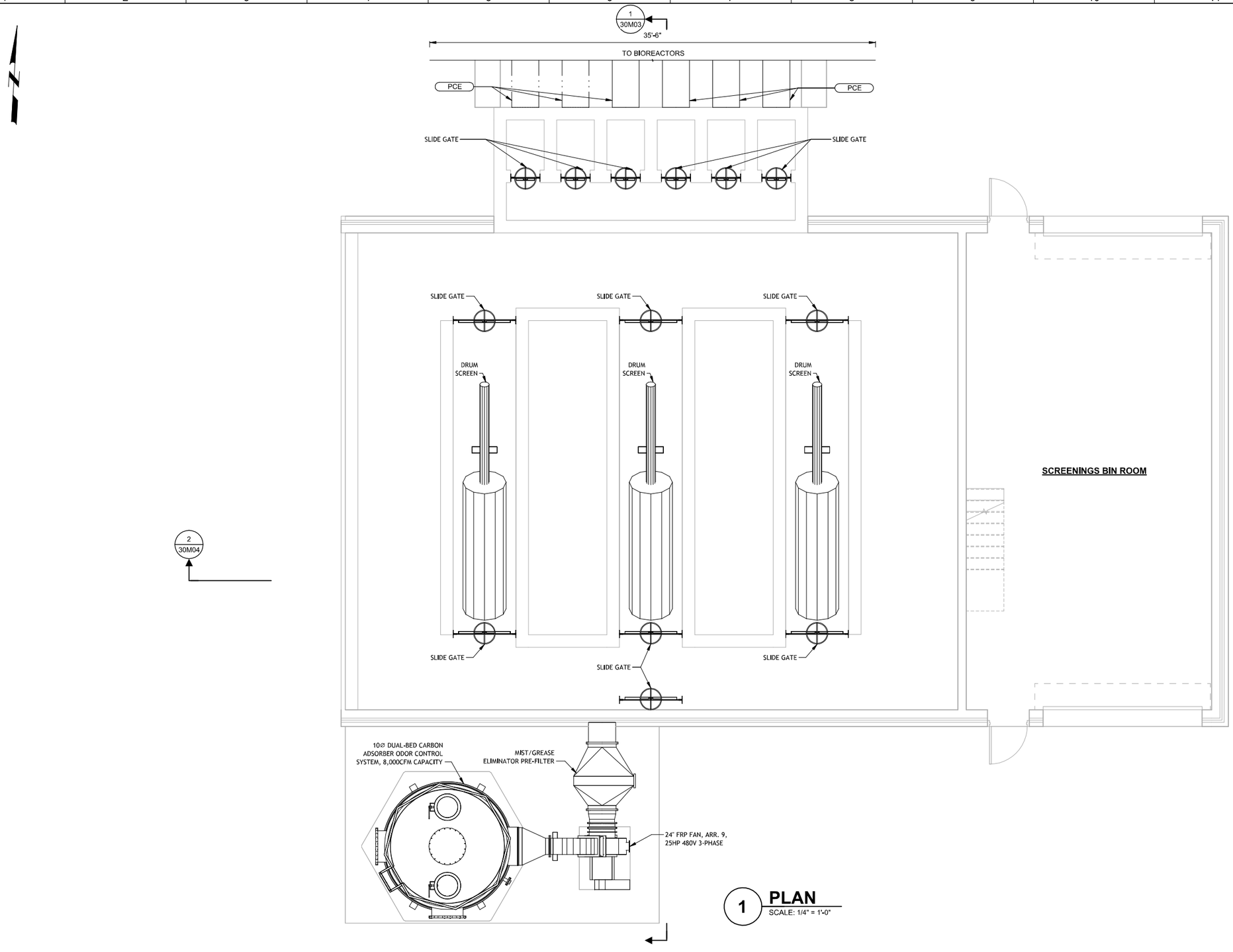
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
MECHANICAL
RETURN FLOW PUMP STATION - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

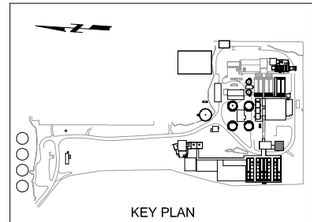
JOB NO. 203580
DRAWING NO. 29M02
SHEET NO. 106 OF 251

PLOT DATE: 6/10/2025 11:36:27 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/29-M-3D-101.rvt



1 **PLAN**
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

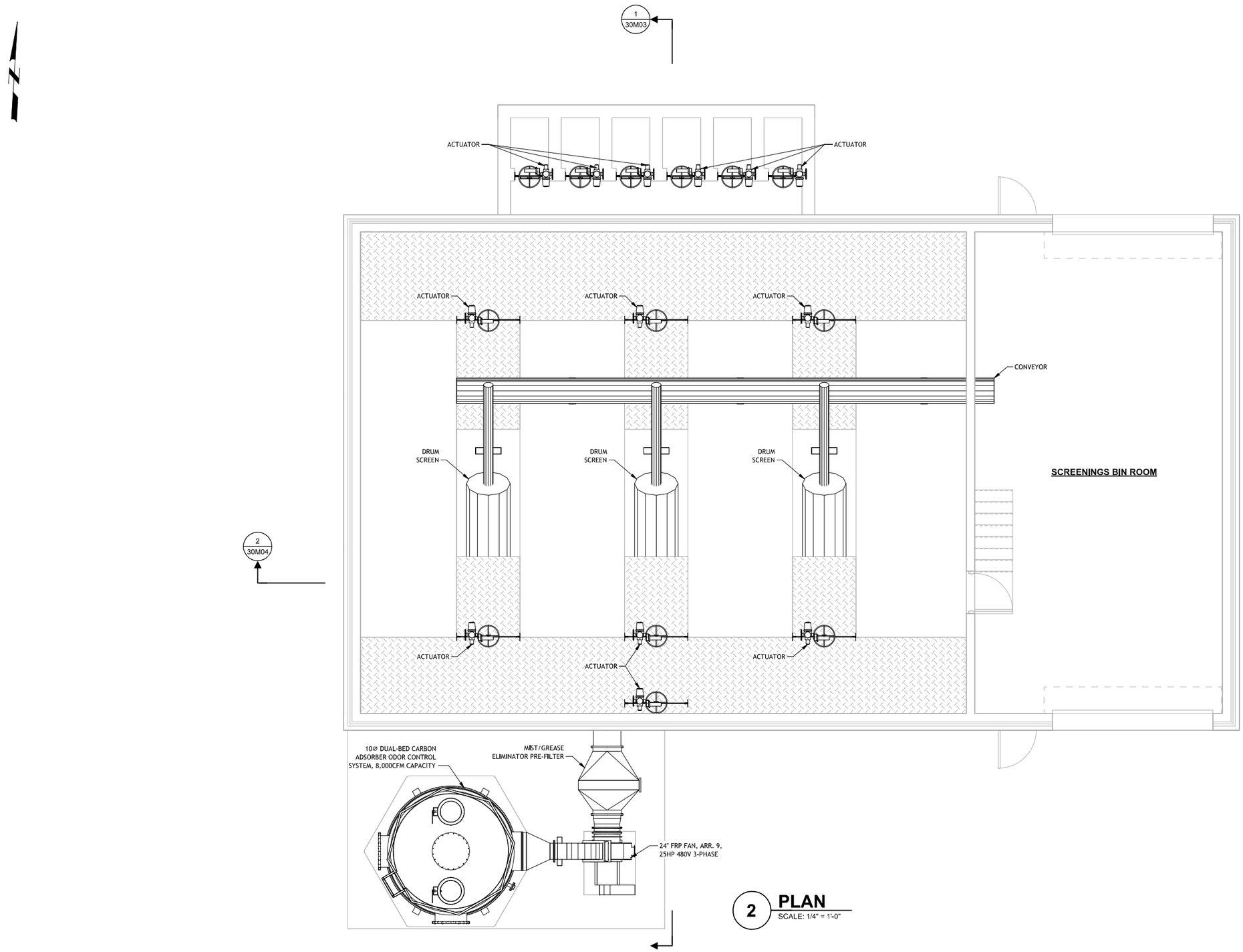
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
MECHANICAL
FINE SCREENING - PLAN AT EL. 391.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

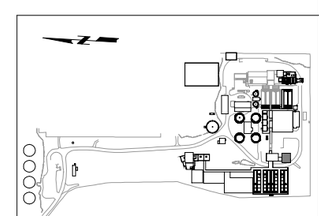
JOB NO. 203580
DRAWING NO. 30M01
SHEET NO. 107 OF 251

PLOT DATE: 6/10/2025 11:36:20 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-M-3D-101.rvt



2 PLAN
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

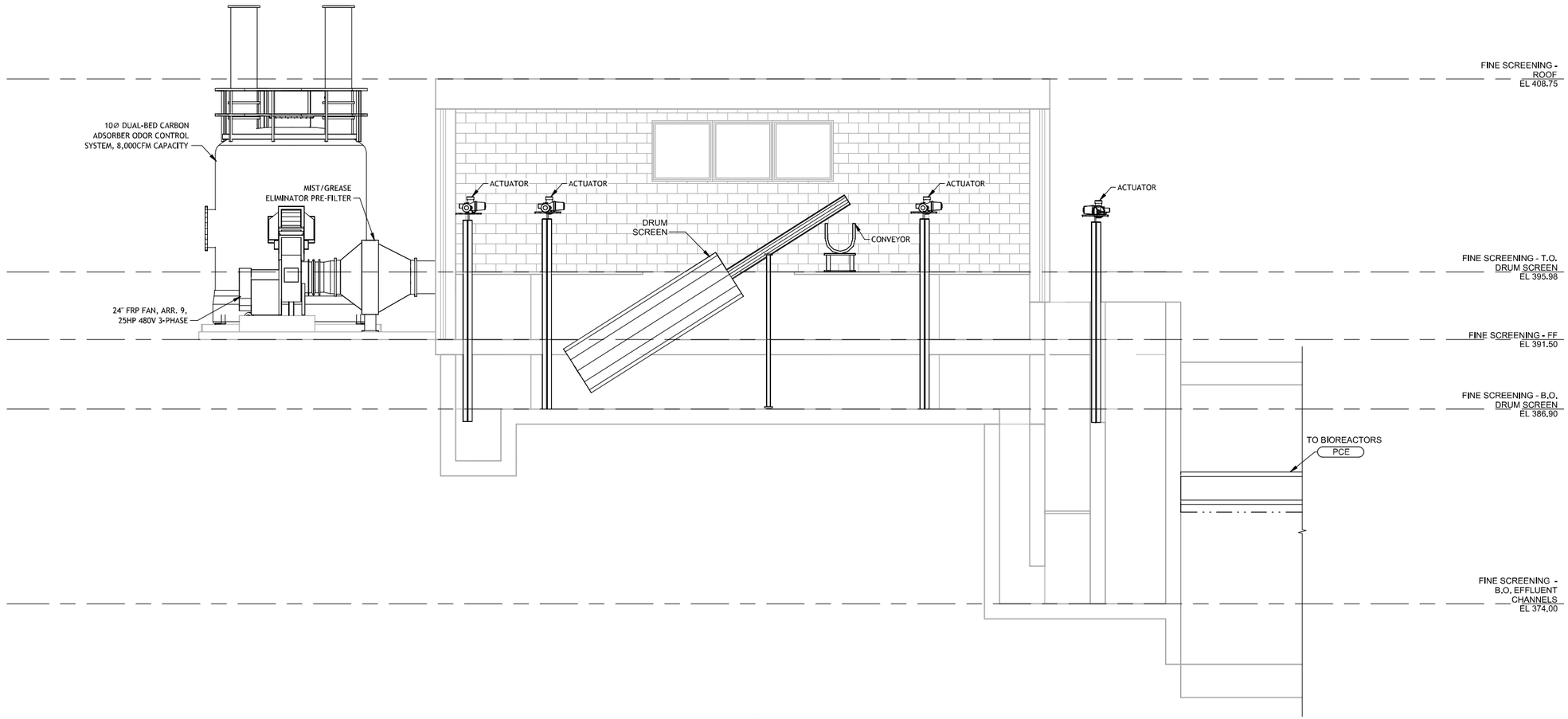
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
MECHANICAL
FINE SCREENING - PLAN AT EL. 395.98'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30M02
SHEET NO. 108 OF 251

PLOT DATE: 6/10/2025 11:37:41 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-M-3D-101.rvt



1 SECTION
30M01

SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

MECHANICAL

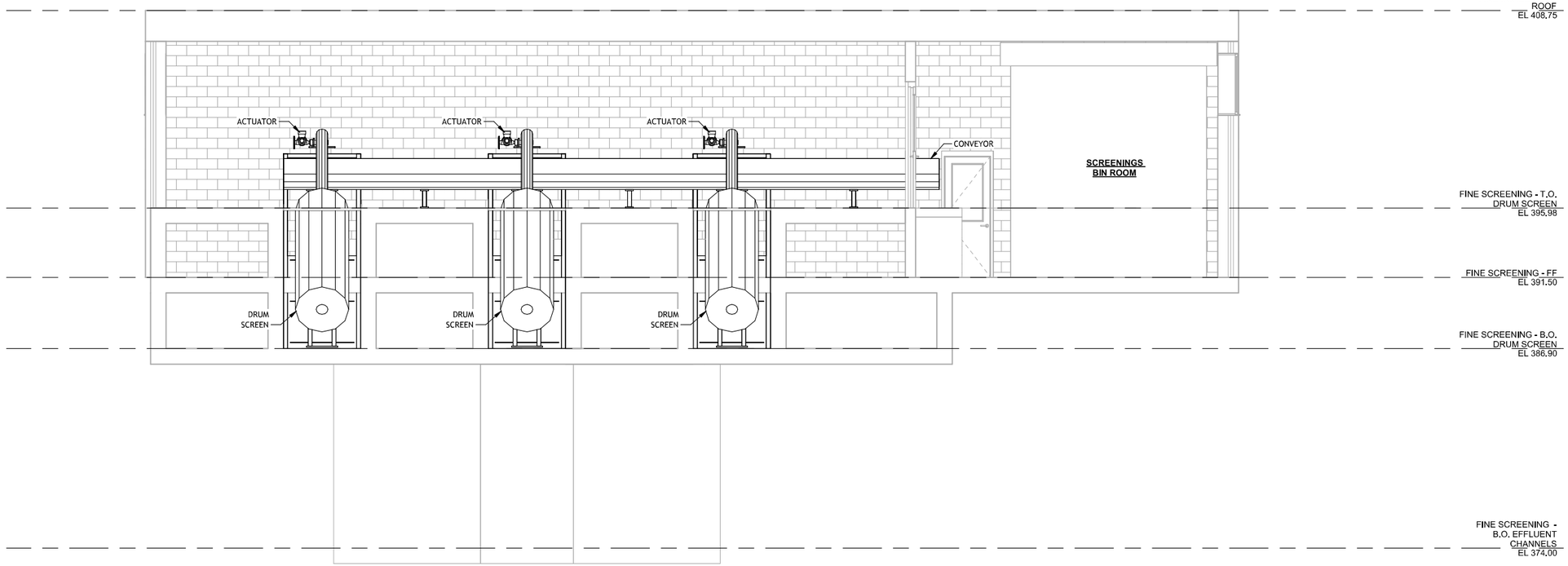
FINE SCREENING - SECTION 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30M03
SHEET NO. 109 OF 251

PLOT DATE: 6/10/2025 11:38:19 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-M-3D-101.rvt



2 SECTION
30M01

SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

MECHANICAL

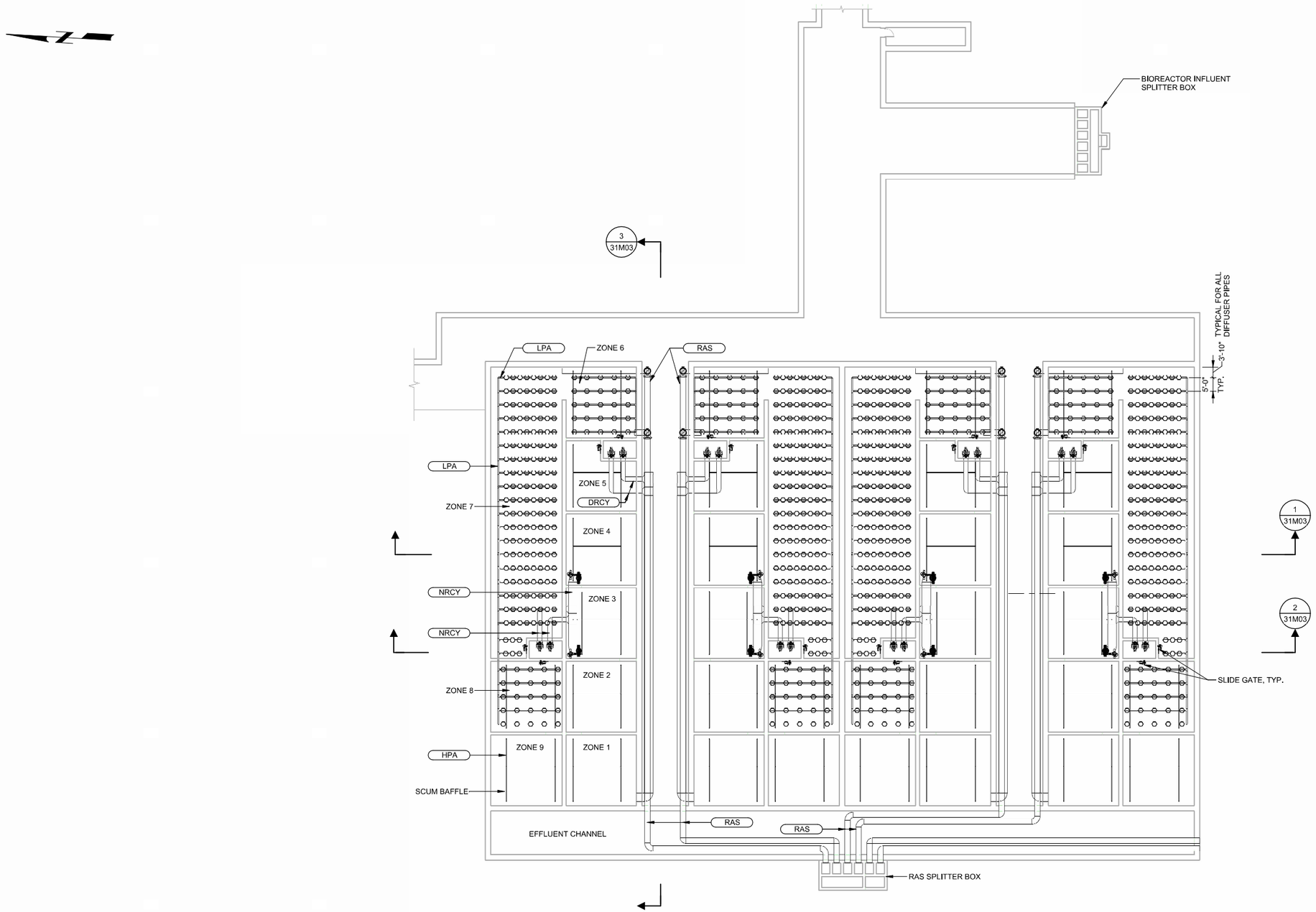
FINE SCREENING - SECTION 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 30M04
SHEET NO. 110 OF 251

PLOT DATE: 6/10/2025 11:39:01 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/30-M-3D-101.rvt



1 PLAN
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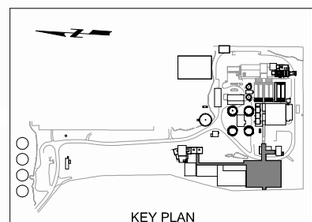

KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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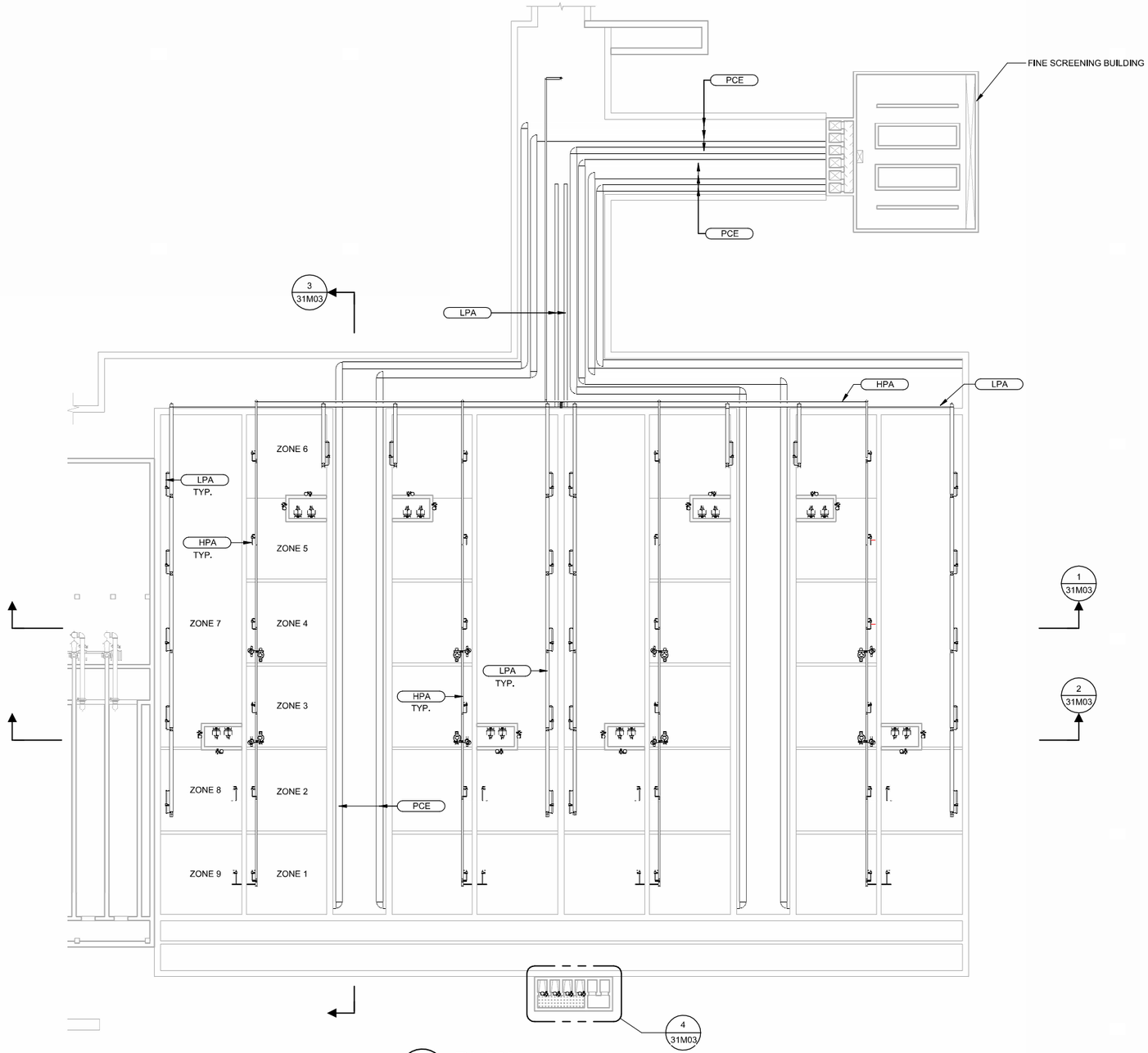
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
MECHANICAL
BIOREACTORS - PLAN AT EL. 370.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 31M01
SHEET NO. 111 OF 251

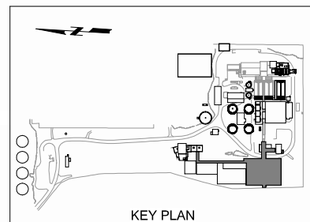
PLOT DATE: 6/10/2025 1:18:22 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/31-M-3D-101.rvt



1 PLAN

SCALE: 1" = 20'-0"



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

MECHANICAL

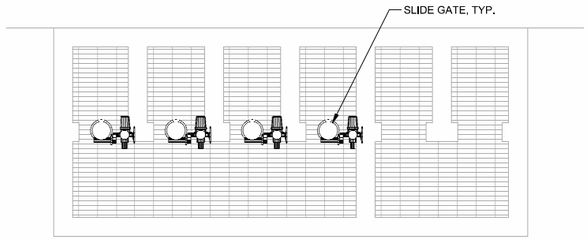
BIOREACTORS - PLAN AT EL. 390.00'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 31M02
SHEET NO. 112 OF 251

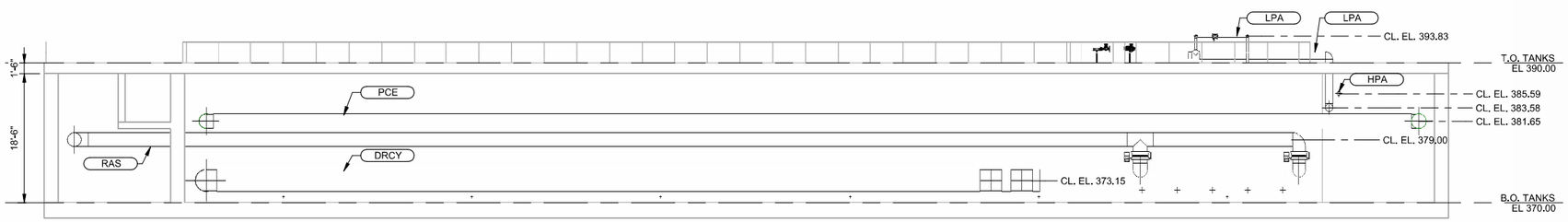
PLOT DATE: 6/10/2025 1:18:59 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/31-M-3D-101.rvt

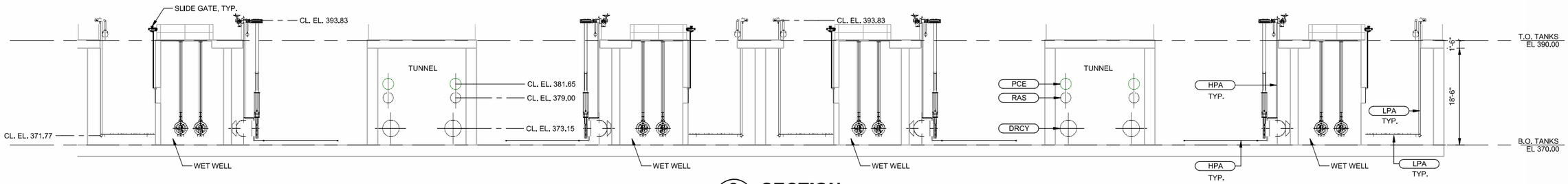


PLAN AT EL. 390.00

4 PLAN
SCALE: 1/4" = 1'-0"



3 SECTION
31M01
SCALE: 1" = 10'-0"



2 SECTION
31M01
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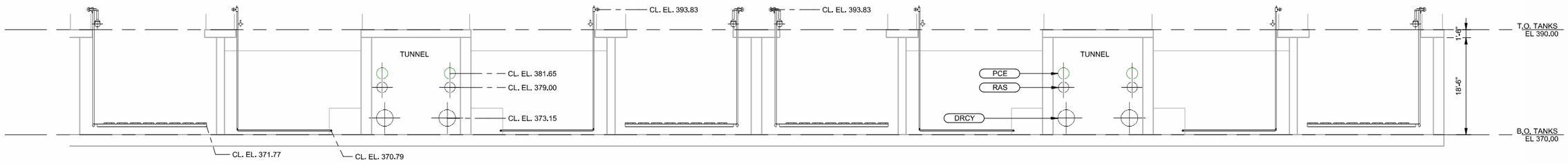

1 SECTION
31M01
SCALE: 1" = 10'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

MECHANICAL

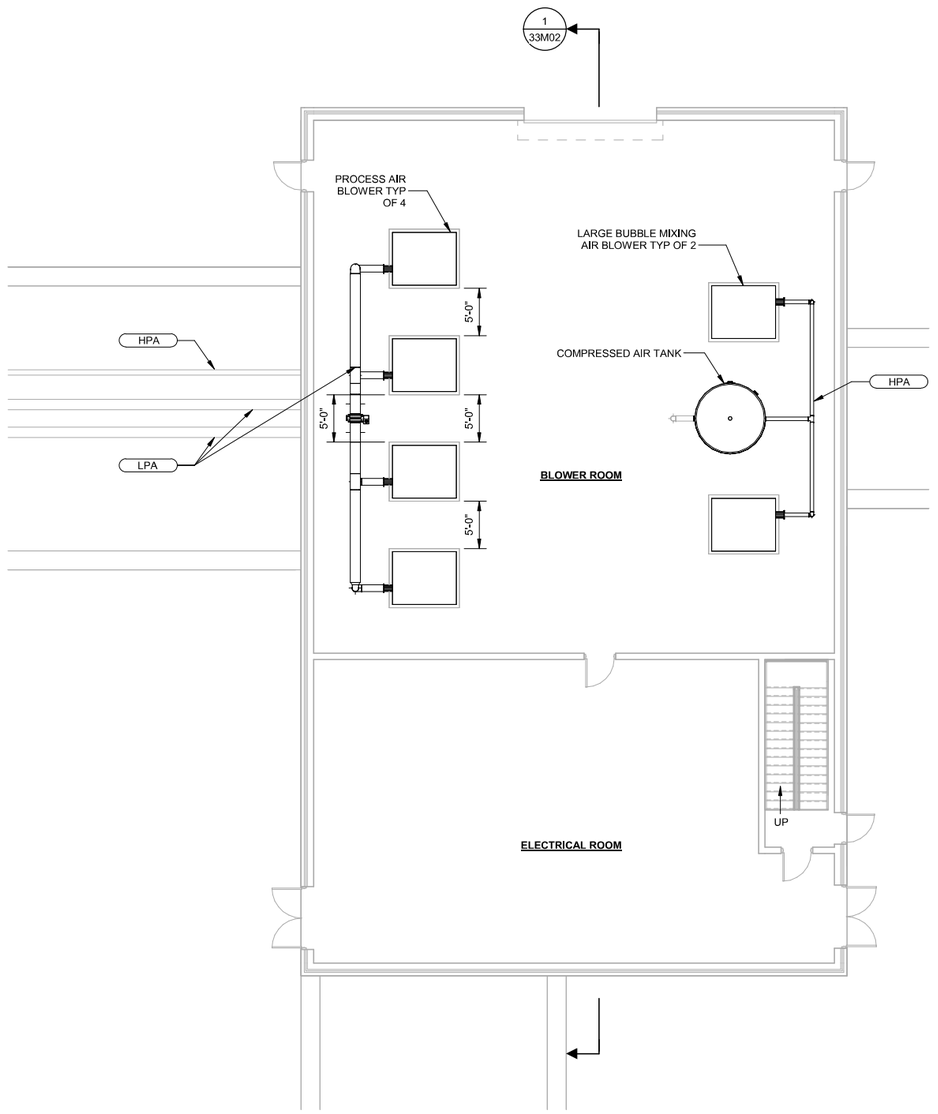
BIOREACTORS - ENLARGED PLAN & SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 31M03
SHEET NO. 113 OF 251

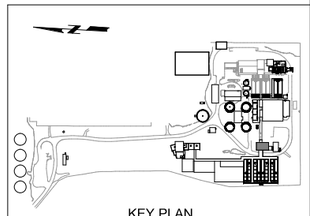
PLOT DATE: 6/10/2025 1:19:59 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/31-M-3D-101.rvt



1 PLAN

SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

MECHANICAL

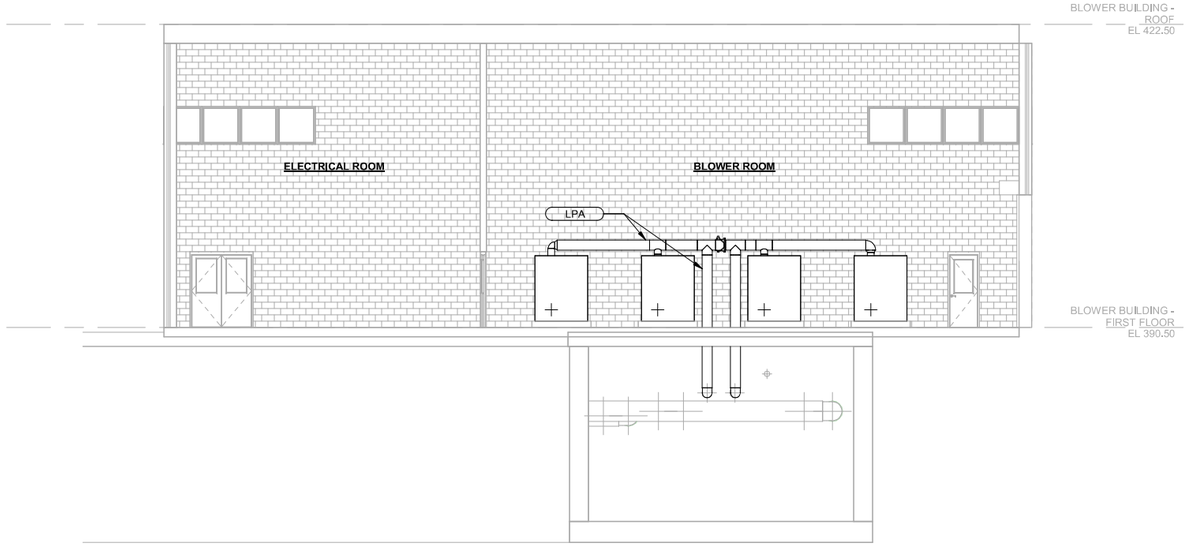
BLOWER BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 33M01
SHEET NO. 114 OF 251

PLOT DATE: 6/10/2025 12:58:31 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/33-M-3D-101.rvt



1 / 33M01 **SECTION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY

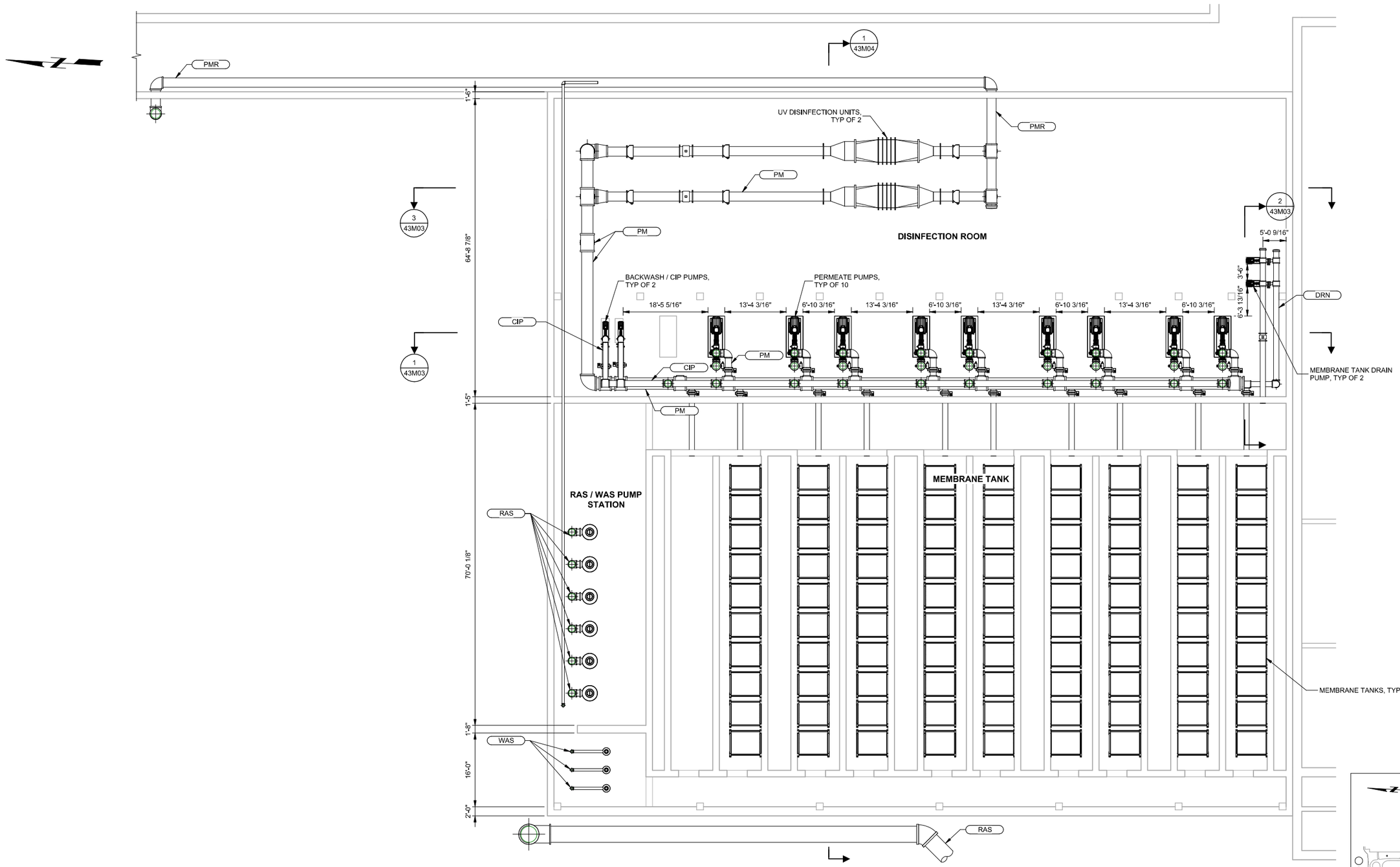
BLOWER BUILDING - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 33M02
SHEET NO. 115 OF 251

PLOT DATE: 6/10/2025 12:57:45 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/33-M-3D-101.rvt



1 PLAN
SCALE: 3/32" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES & BIOSOLIDS FACILITY
MECHANICAL
MEMBRANE BUILDING - PLAN AT EL. 373.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 43M01
SHEET NO. 116 OF 251

PLOT DATE: 6/27/2025 12:53:40 PM
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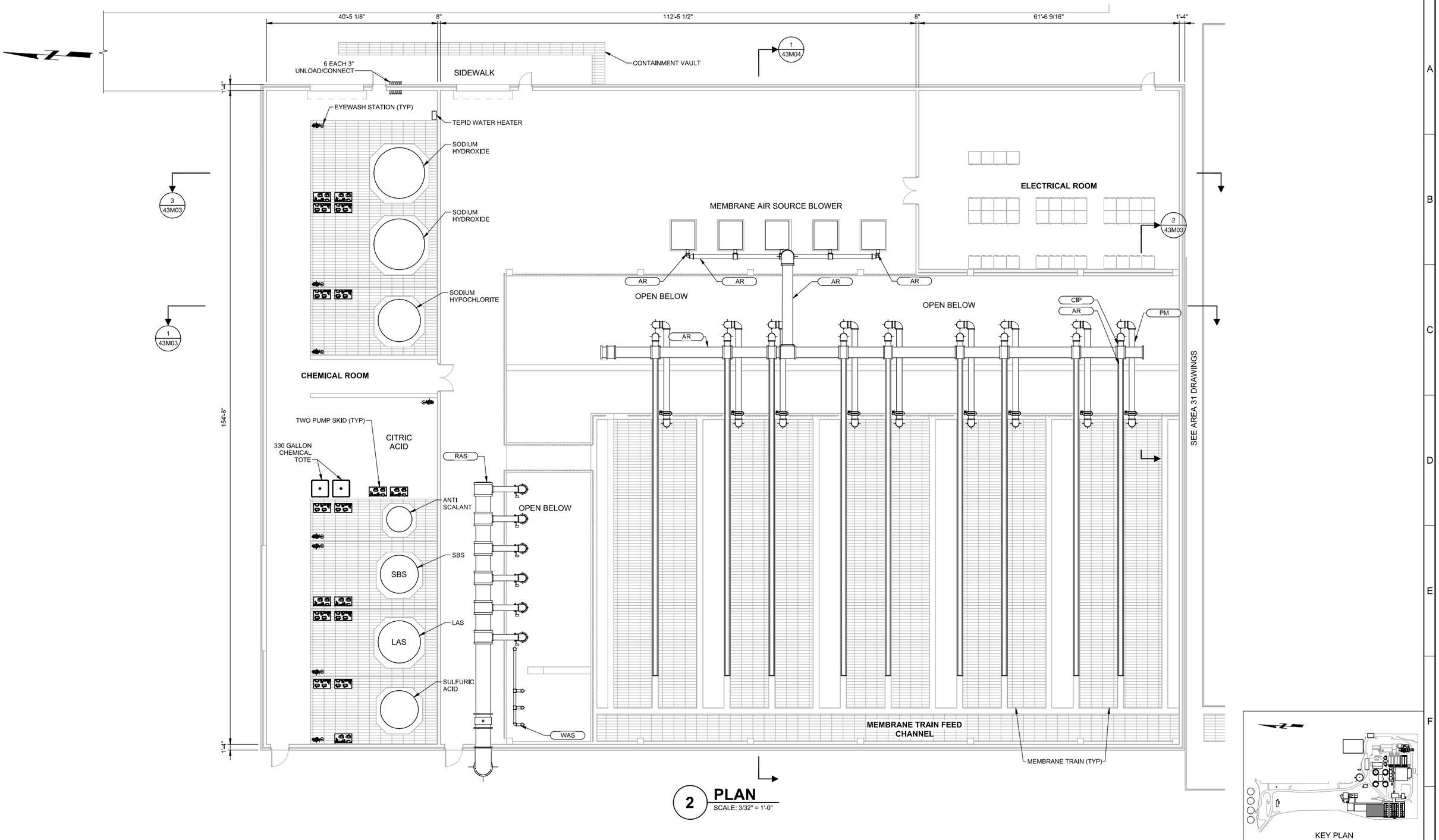

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES & BIOSOLIDS FACILITY

MECHANICAL

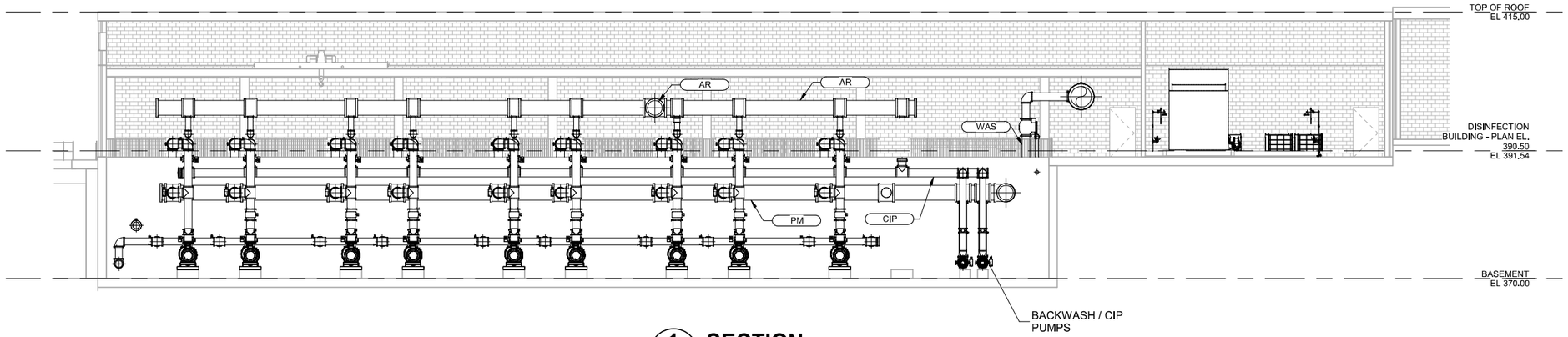
MEMBRANE BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 43M02
SHEET NO. 117 OF 251

PLOT DATE: 6/27/2025 11:01:29 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/43-M-3D-101.rvt



1 SECTION (43M01)
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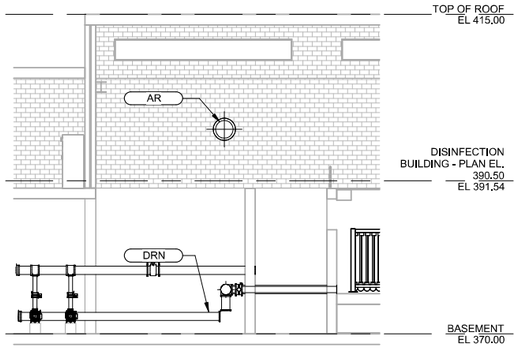

2 SECTION (43M01)
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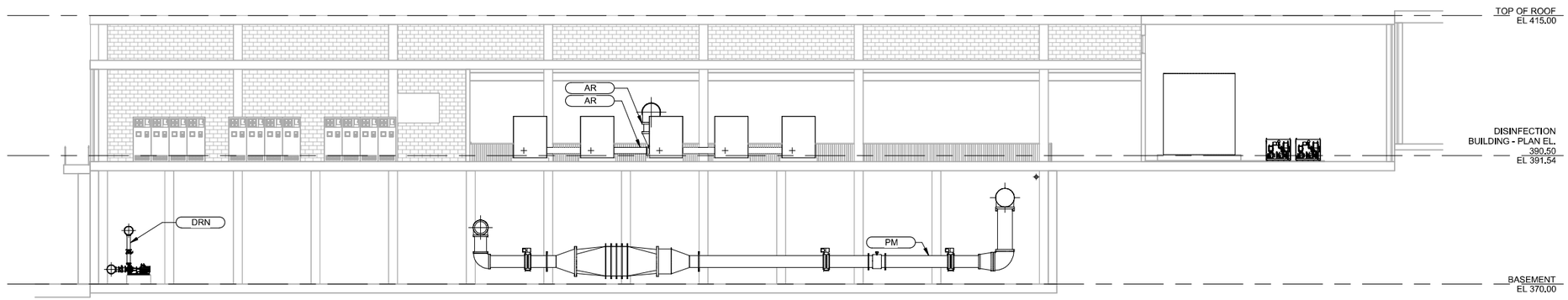

3 SECTION (43M01)
SCALE: 3/32" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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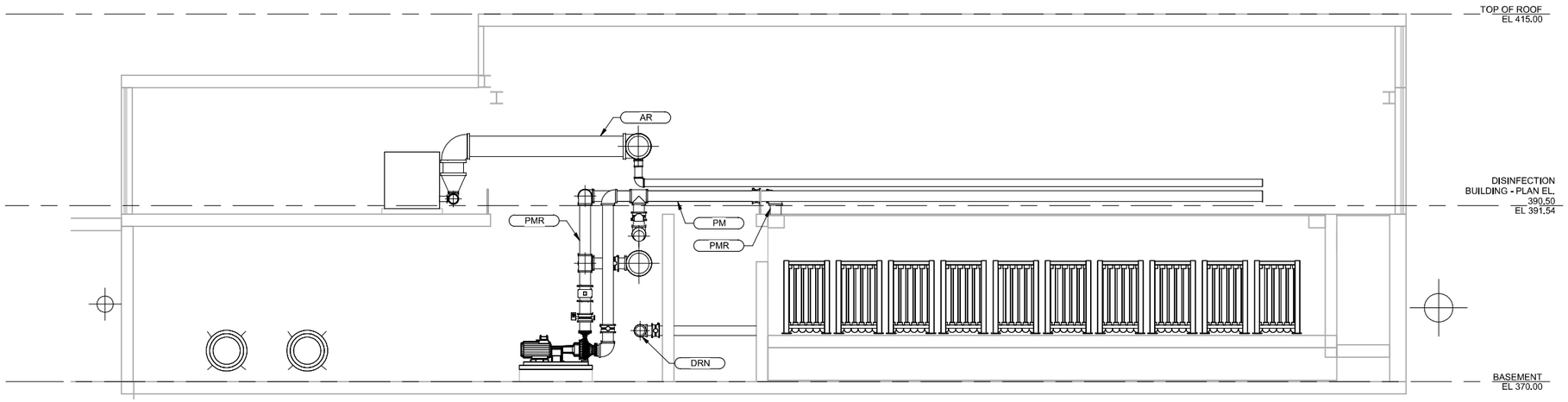
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES & BIOSOLIDS FACILITY
MECHANICAL
MEMBRANE BUILDING - SECTIONS 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 43M03
SHEET NO. 118 OF 251

PLOT DATE: 7/2/2025 11:00:29 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/43-M-3D-101.rvt



1 SECTION
43M01

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED A. GILMORE
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES & BIOSOLIDS FACILITY

MECHANICAL

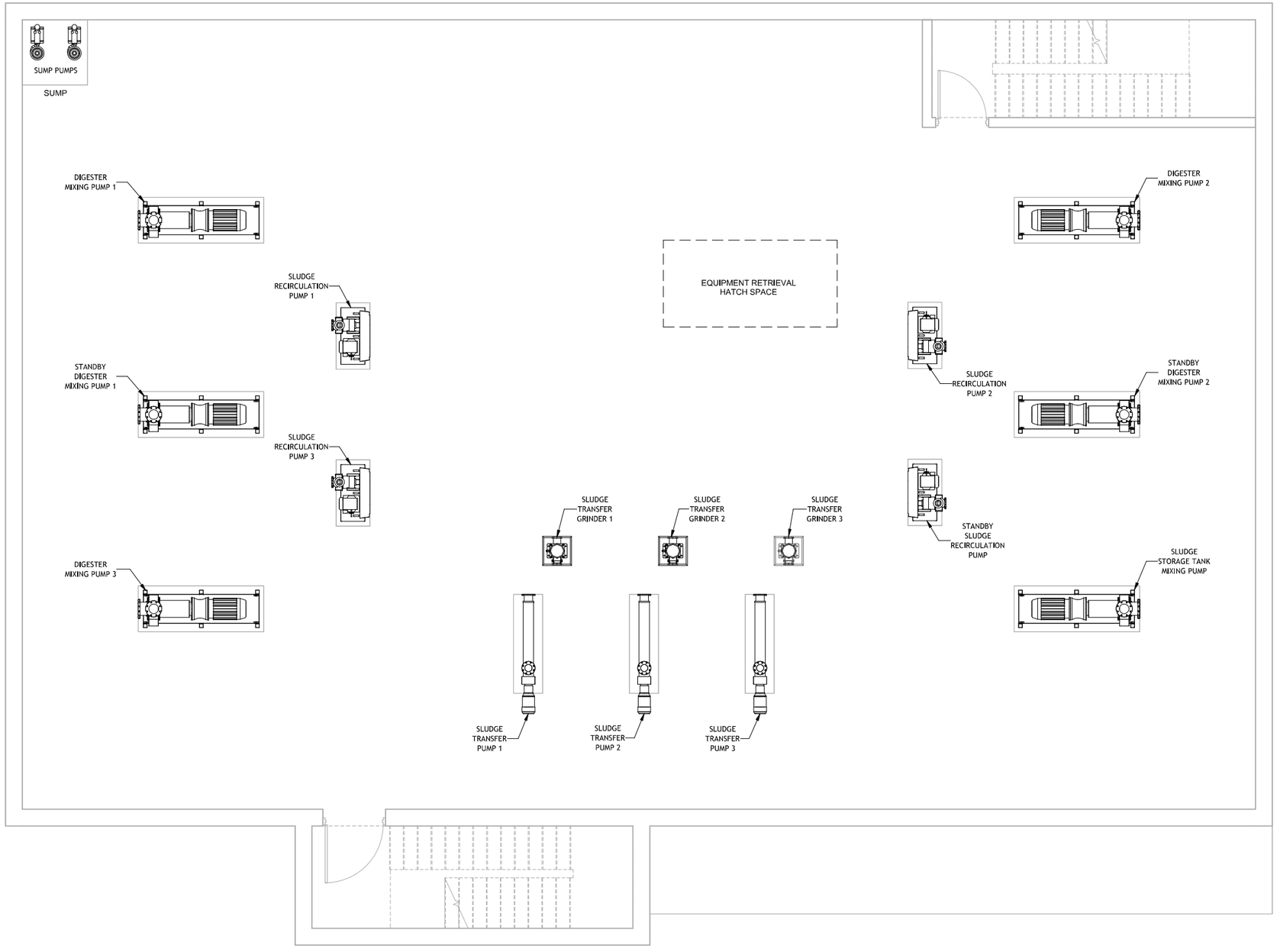
MEMBRANE BUILDING - SECTIONS 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

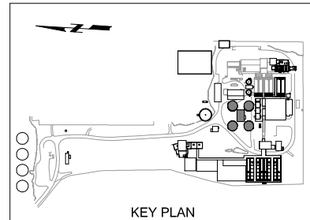
JOB NO. 203580
DRAWING NO. 43M04
SHEET NO. 119 OF 251

PLOT DATE: 7/2/2025 10:59:49 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/43-M-3D-101.rvt



1 **PLAN**
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION

INTERMEDIATE DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED	M. SPRICK
DRAWN	A. CHARDE
CHECKED	R. GUPTA
DATE	JULY 2025

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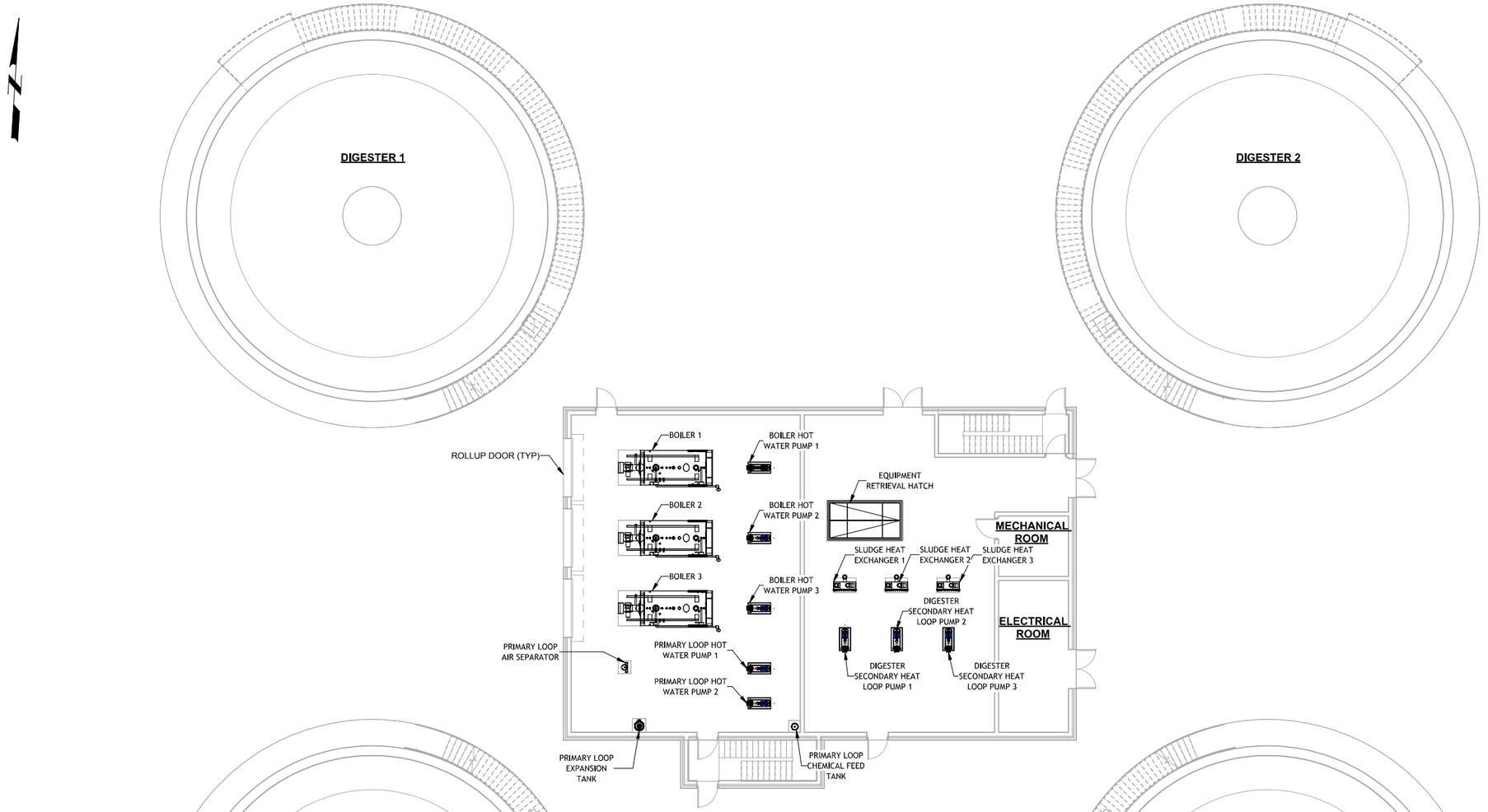
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM
MECHANICAL
DIGESTER COMPLEX - PLAN AT EL. 381.21'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

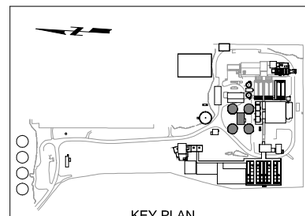
JOB NO. 203580
DRAWING NO. 51M01
SHEET NO. 120 OF 251

PLOT DATE: 8/27/2025 9:43:04 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/51-M-3D-101.rvt



1 PLAN
SCALE: 3/32" = 1'-0"



REV	DATE	BY	DESCRIPTION

INTERMEDIATE DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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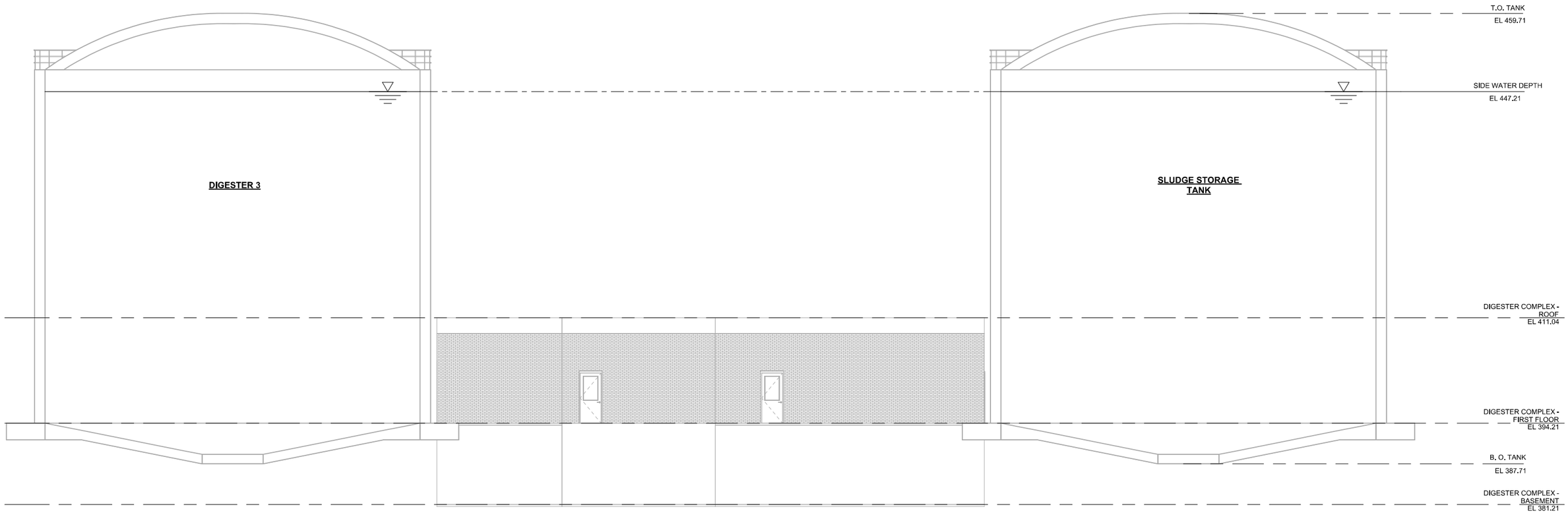
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM
MECHANICAL
DIGESTER COMPLEX - PLAN AT EL. 394.21'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 51M02
SHEET NO. 121 OF 251

PLOT DATE: 6/20/2025 4:08:28 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/51-M-3D-101.rvt



1 / 51M02 **SECTION**
SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			INTERMEDIATE DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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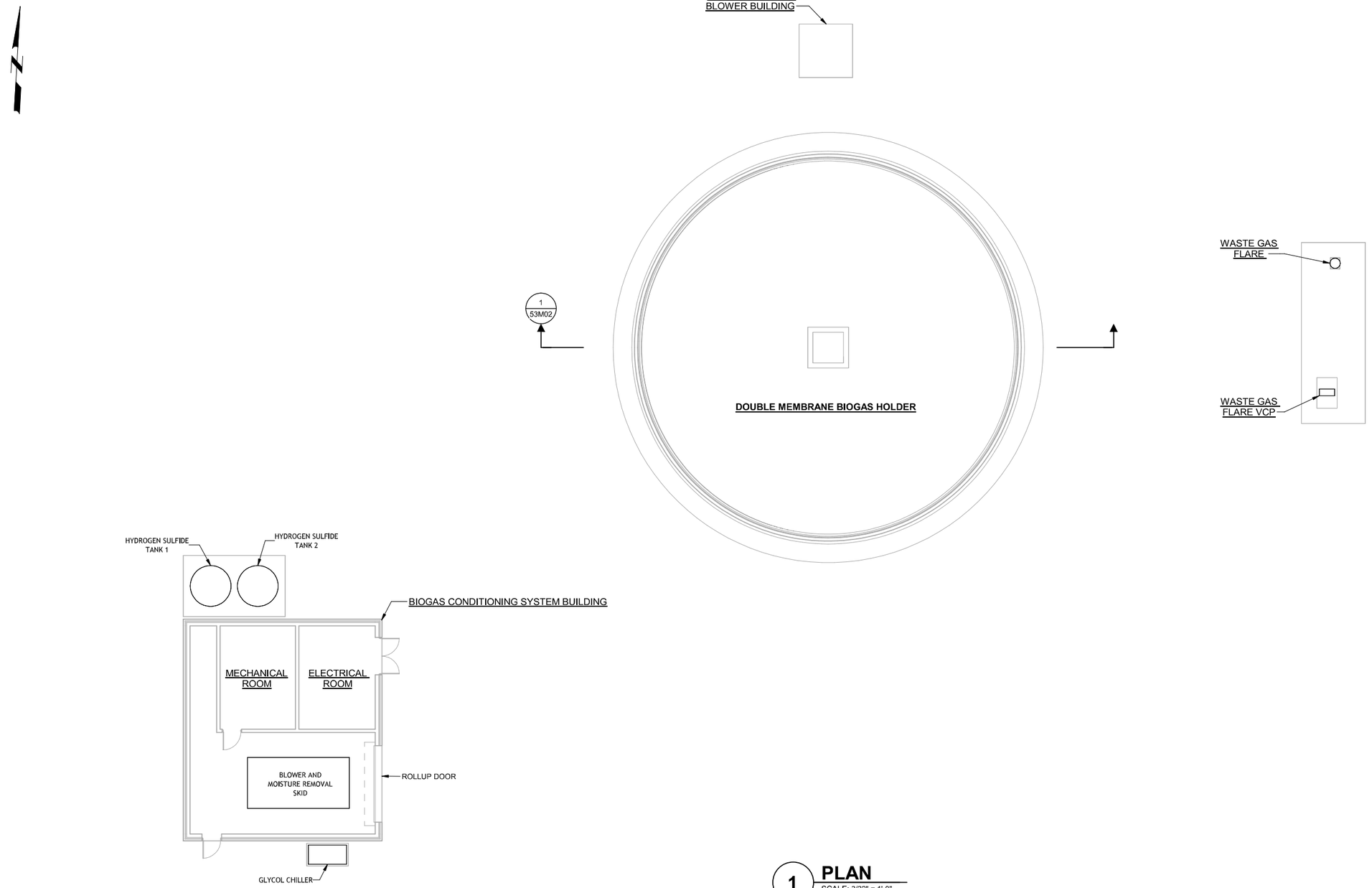
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM
MECHANICAL
DIGESTER COMPLEX - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

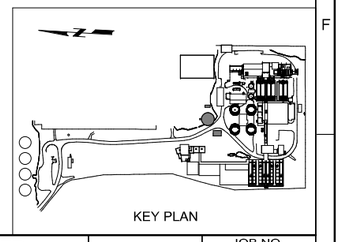
JOB NO. 203580
DRAWING NO. 51M03
SHEET NO. 122 OF 251

PLOT DATE: 6/10/2025 2:22:12 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/51-M-3D-101.rvt



1 **PLAN**
SCALE: 3/32" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

MECHANICAL

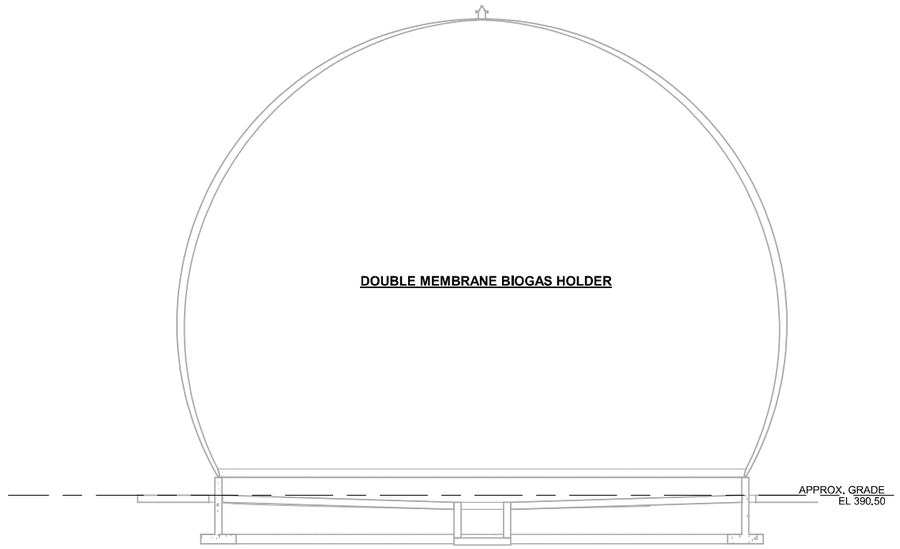
DIGESTER GAS HANDLING, STORAGE, AND FLARE - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 53M01
SHEET NO. 123 OF 251

PLOT DATE: 6/16/2025 3:25:18 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/53-M-3D-101.rvt



1 / 53M01 **SECTION**
SCALE: 3/32" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
MECHANICAL
DIGESTER GAS STORAGE - SECTION

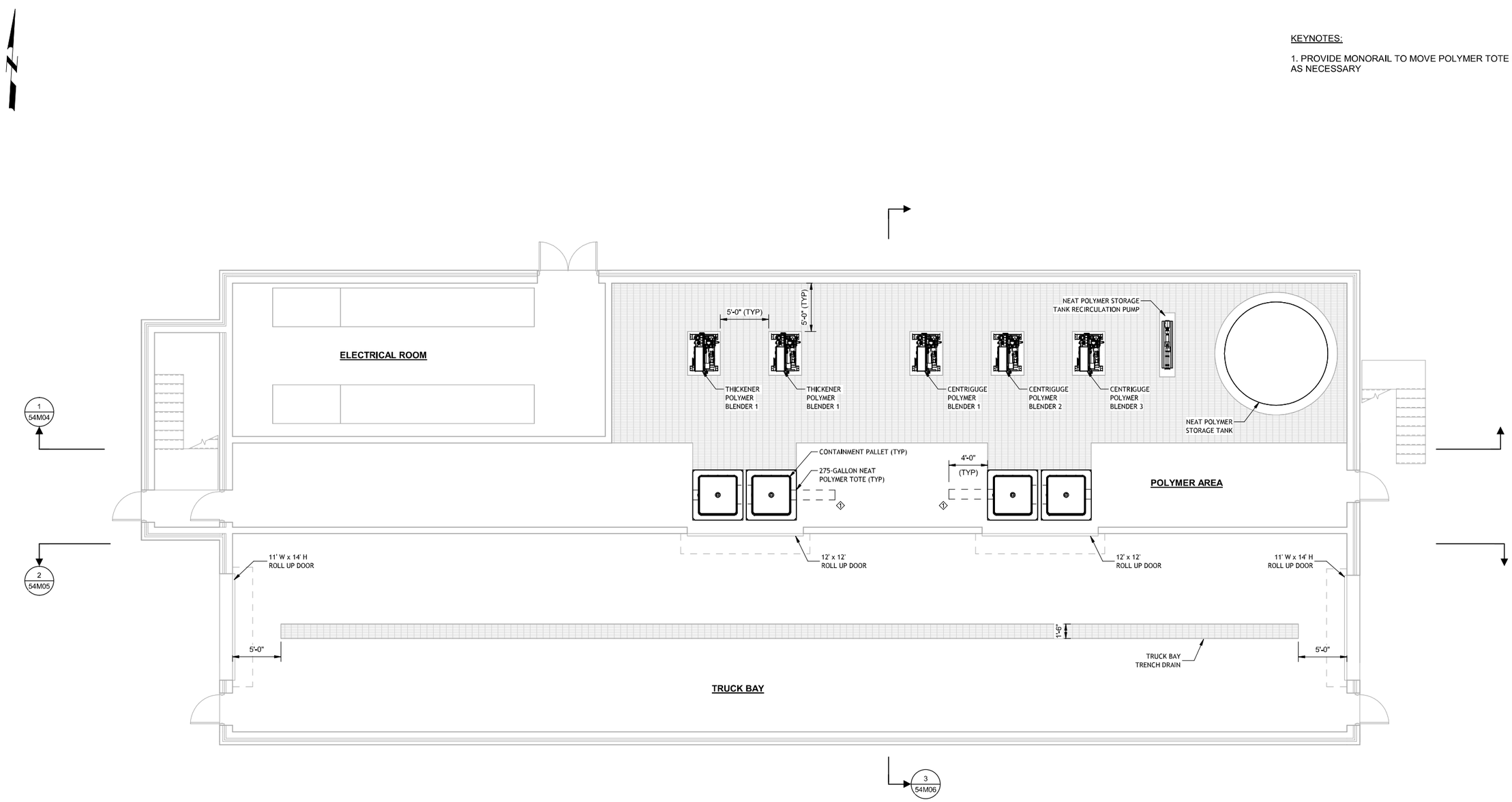
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 53M02
SHEET NO. 124 OF 251

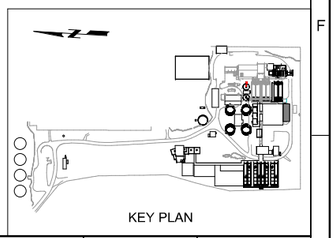
PLOT DATE: 6/16/2025 3:25:44 PM
FILE NAME: Autodesk Docs://OCDWEP 203580/53-M-3D-101.rvt

KEYNOTES:

1. PROVIDE MONORAIL TO MOVE POLYMER TOTE MIXER AS NECESSARY



1 PLAN
SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

THICKENING/DEWATERING - PLAN AT EL. 393.58'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54M01
SHEET NO. 125 OF 251

PLOT DATE: 7/2/2025 11:05:45 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-M-3D-101.rvt

KEYNOTES:

1. PROVIDE MONORAIL TO REMOVE PUMP AND PARTS FROM SERVICE

2. PROVIDE LIFTING EYES TO MOVE/REMOVE PUMP AND PARTS

BELT CONVEYOR W/DRIP TRAY

BELT CONVEYOR W/DRIP TRAY

POLYMER AGING TANK 1

POLYMER AGING TANK 2

SPACE FOR HVAC EQUIPMENT

1
54M04

2
54M05

TWAS PUMP 1

TWAS PUMP 2

DRIED PRODUCT SILO

CENTRIFUGE POLYMER FEED PUMP 3

CENTRIFUGE POLYMER FEED PUMP 2

CENTRIFUGE POLYMER FEED PUMP 1

DEWATERED CAKE HOPPER 1

DEWATERED CAKE HOPPER 2

10'-0"

EQUIPMENT REMOVAL OPENING

3
54M06

2 PLAN
SCALE: 3/16" = 1'-0"

KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

THICKENING/DEWATERING - PLAN AT EL. 414.58'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

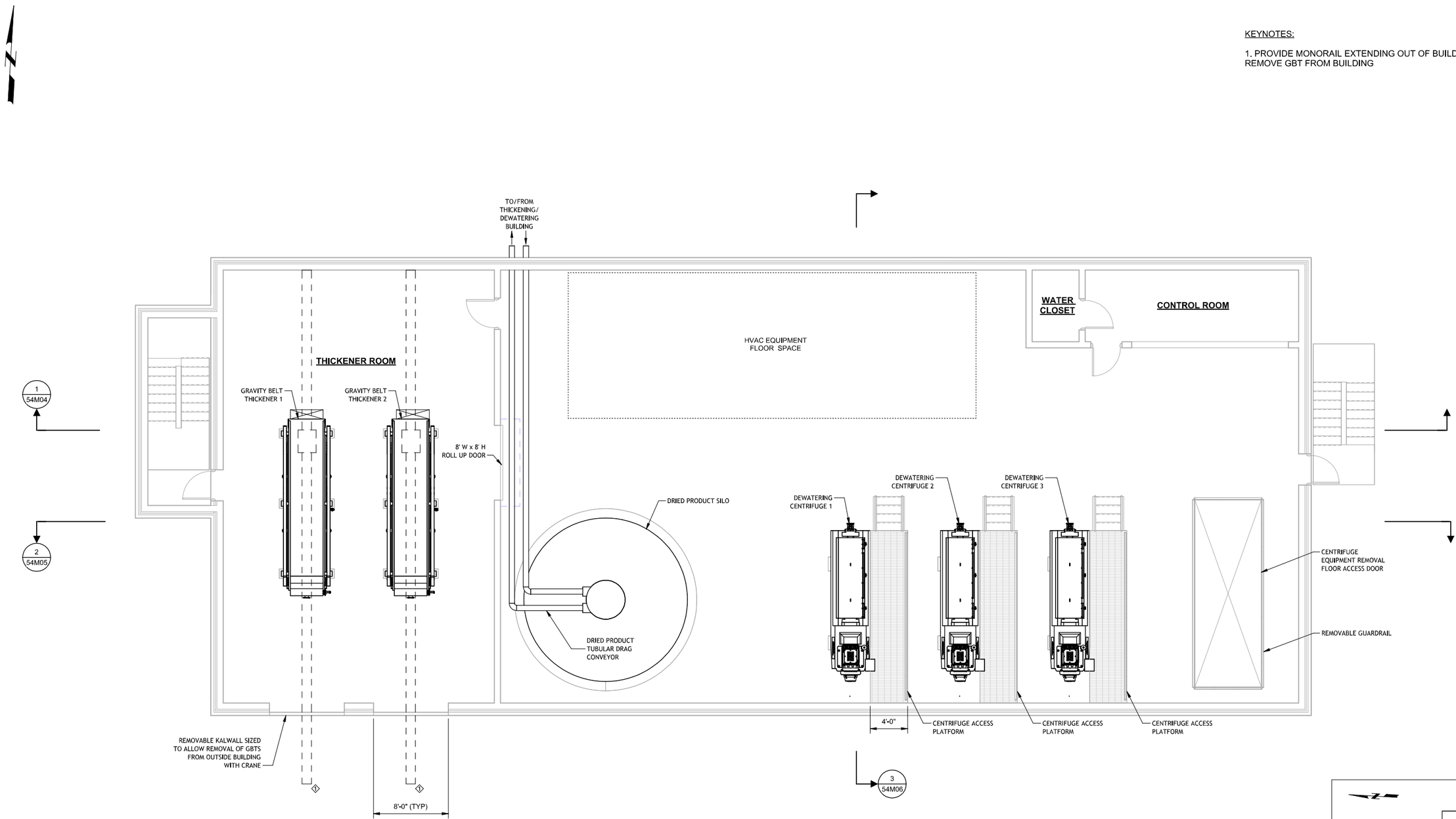
JOB NO. 203580
DRAWING NO. 54M02
SHEET NO. 126 OF 251

PLOT DATE: 6/23/2025 5:49:05 PM

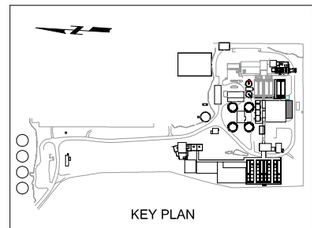
FILE NAME: Autodesk Docs://OCDWEP 203580/54-M-3D-101.rvt

KEYNOTES:

1. PROVIDE MONORAIL EXTENDING OUT OF BUILDING TO REMOVE GBT FROM BUILDING



3 PLAN
SCALE: 3/16" = 1'-0"



KEY PLAN

PLOT DATE: 6/23/2025 5:51:32 PM

REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

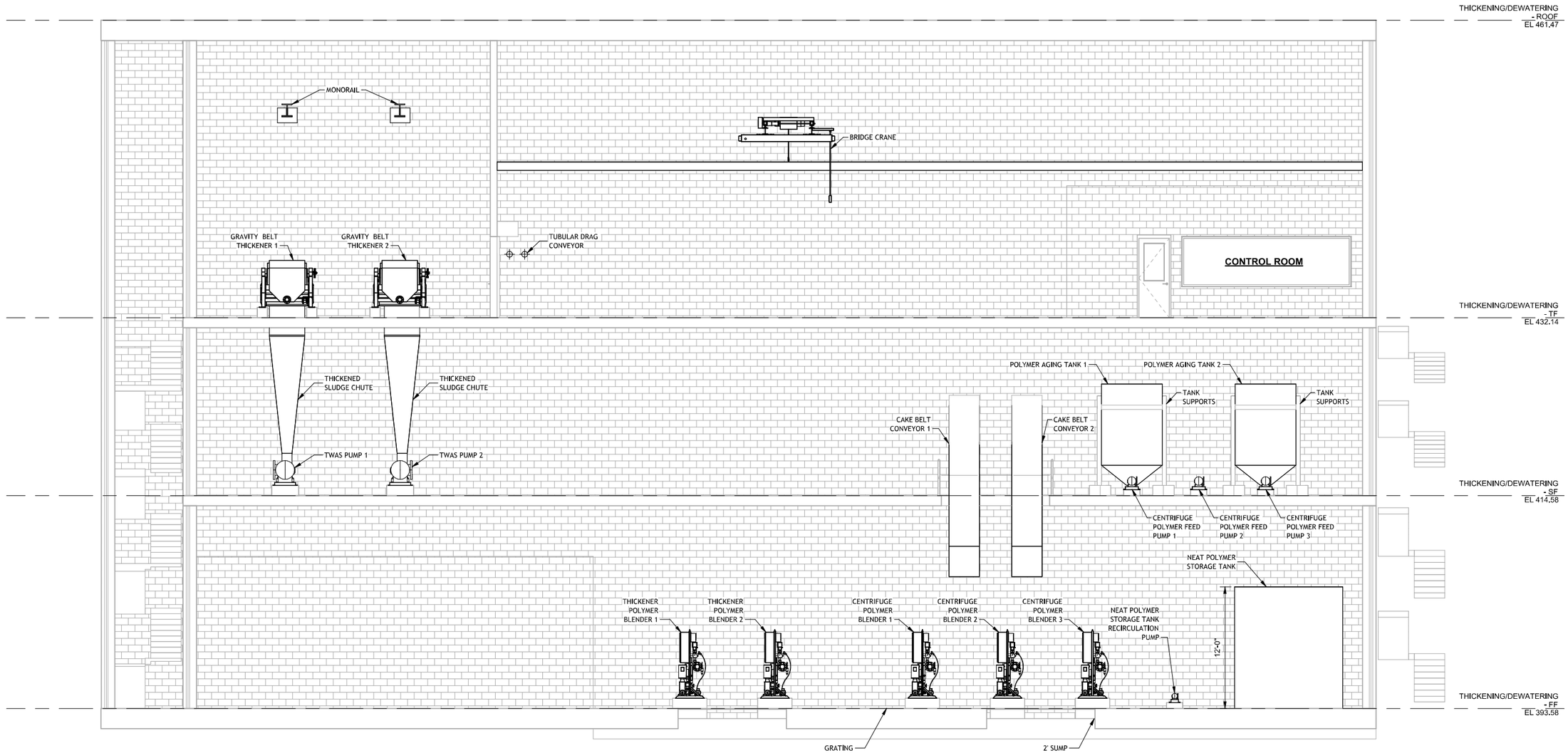
MECHANICAL

THICKENING/DEWATERING - PLAN AT EL. 432.14'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54M03
SHEET NO. 127 OF 251

FILE NAME: Autodesk Docs://OCDWEP 203580/54-M-3D-101.rvt



1 SECTION
54M01

SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

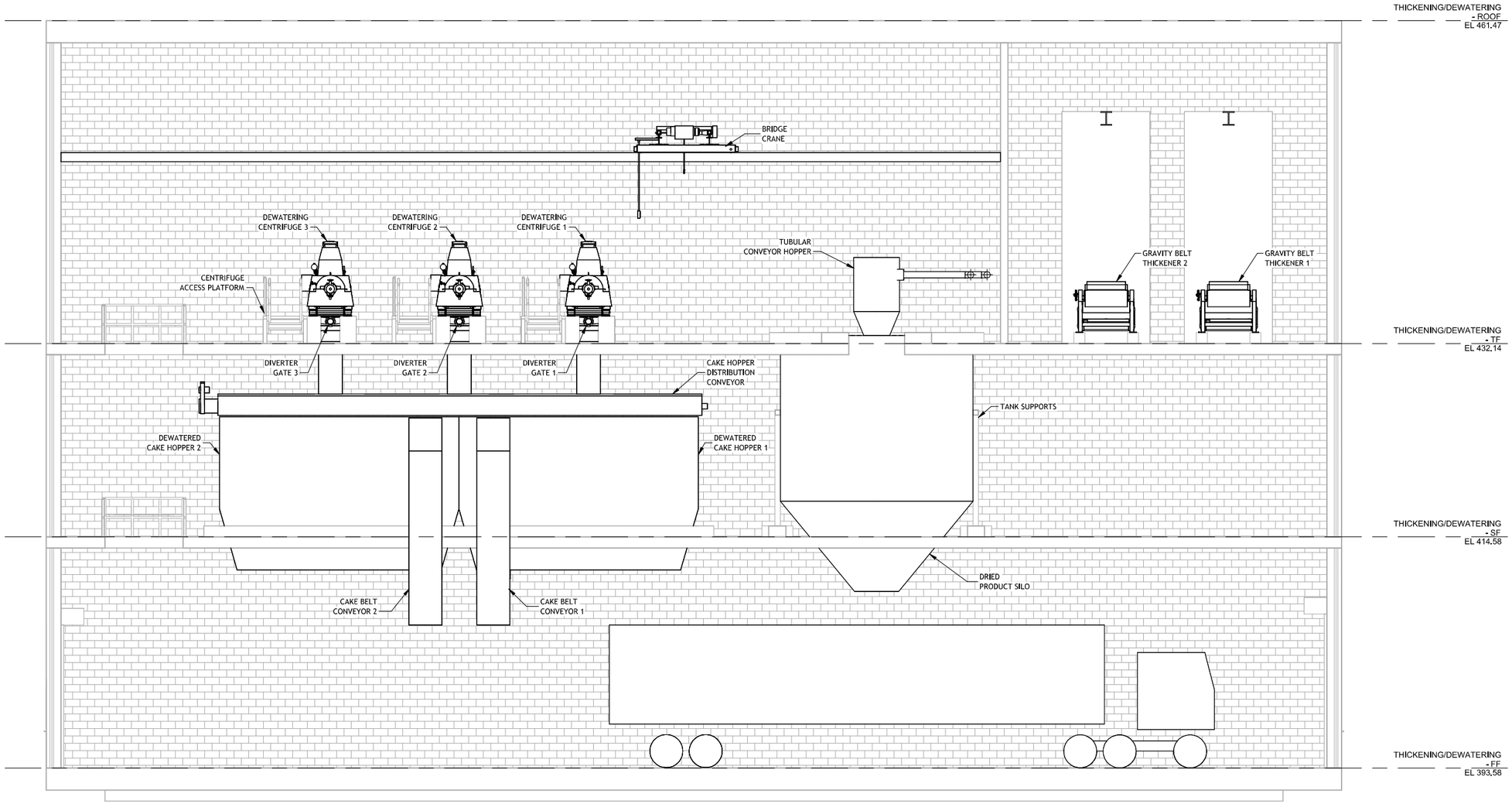
THICKENING/DEWATERING - SECTION 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54M04
SHEET NO. 128 OF 251

PLOT DATE: 6/26/2025 10:52:13 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-M-3D-101.rvt



2 SECTION
54M01

SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

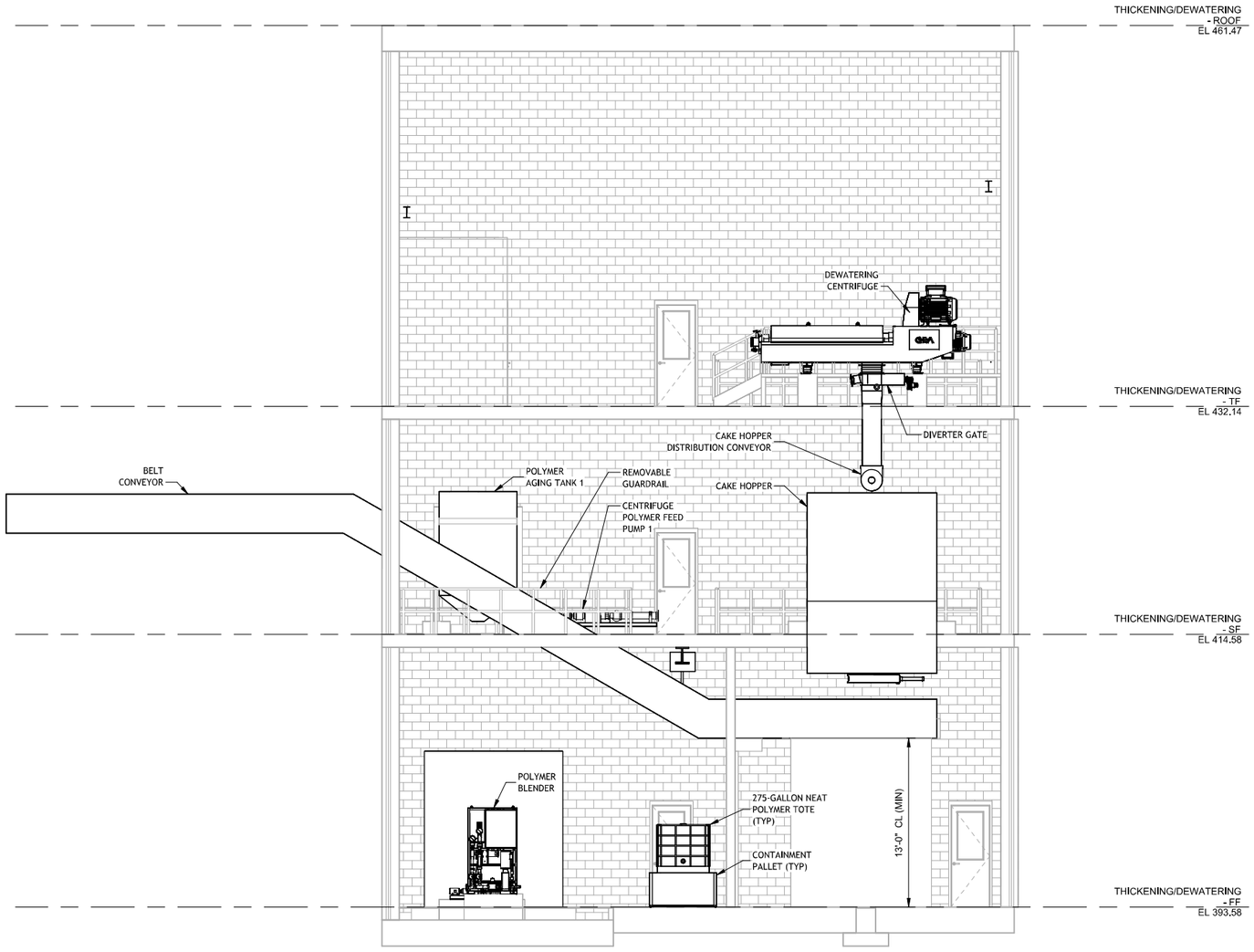
THICKENING/DEWATERING - SECTION 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 54M05
SHEET NO. 129 OF 251

PLOT DATE: 6/26/2025 3:12:17 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/54-M-3D-101.rvt



3 SECTION

54M01

SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

THICKENING/DEWATERING - SECTION 3

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

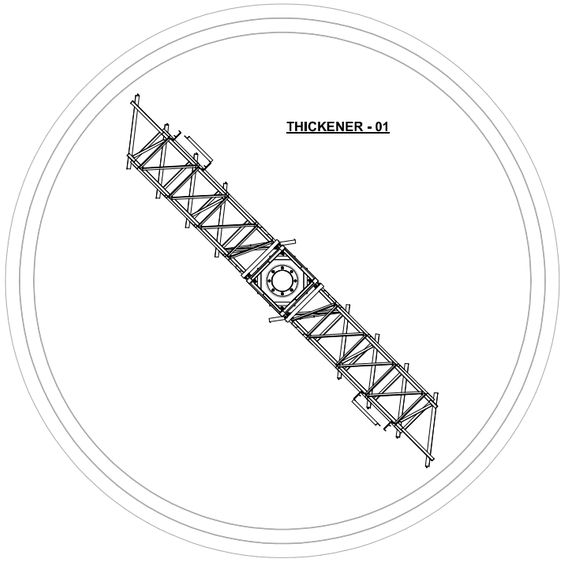
JOB NO. 203580
DRAWING NO. 54M06
SHEET NO. 130 OF 251

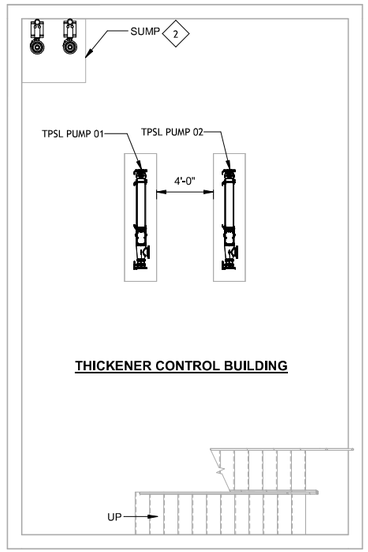
PLOT DATE: 6/26/2025 3:12:19 PM

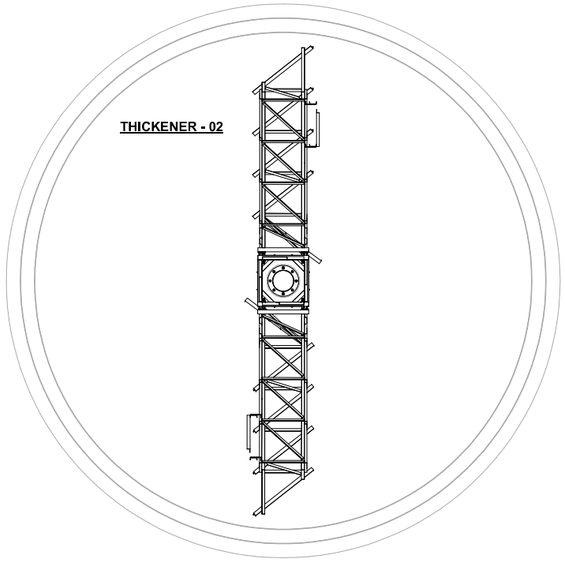
FILE NAME: Autodesk Docs://OCDWEP 203580/54-M-3D-101.rvt

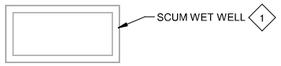
KEY NOTES:

1. SCUM TO BE ROUTED BY GRAVITY FROM THE SCUM WET WELL TO HEADWORKS.
2. 4.5 FOOT BY 4.5 FOOT SUMP WITH DUPLEX SUMP PUMPS.

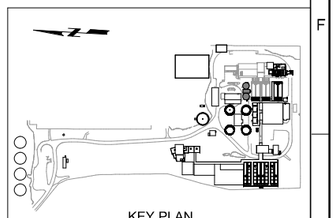








1 PLAN
SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

MECHANICAL

PRIMARY SLUDGE GRAVITY THICKENERS - BASEMENT FLOOR PLAN AT EL. 376.42'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

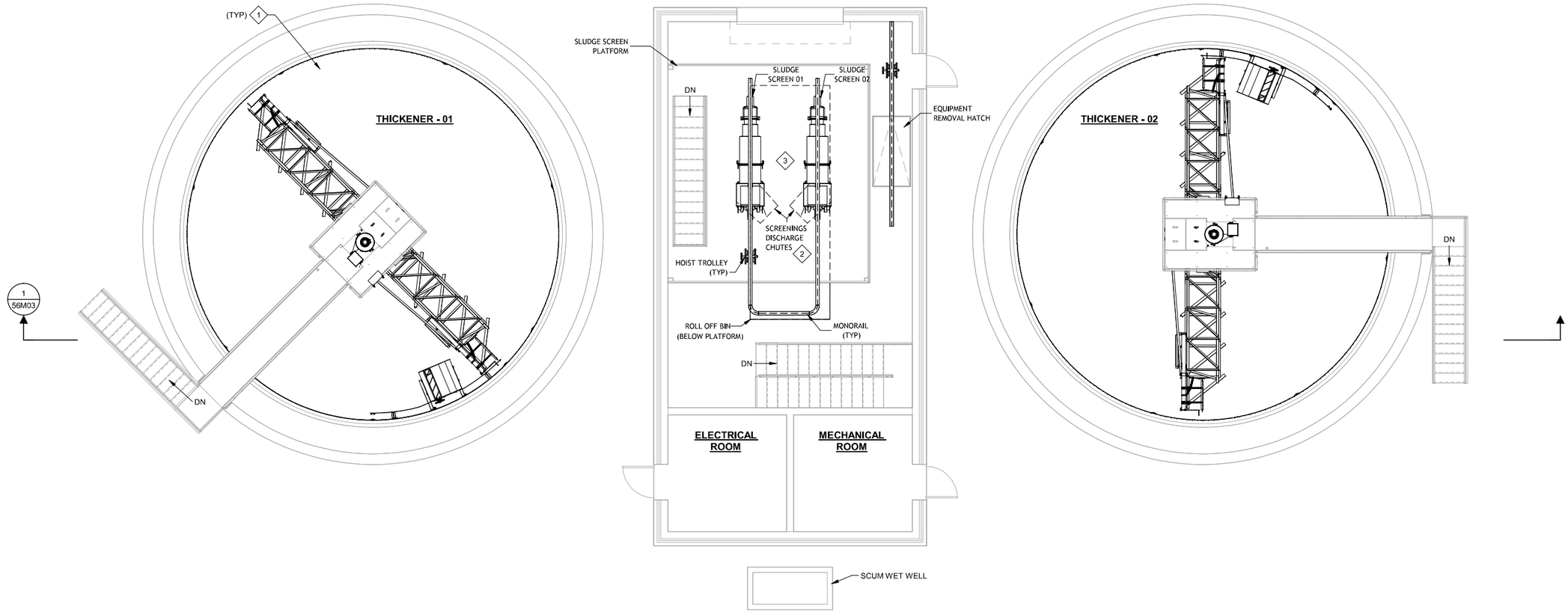
JOB NO. 203580
DRAWING NO. 56M01
SHEET NO. 131 OF 251

PLOT DATE: 6/17/2025 4:09:41 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/56-M-3D-101.rvt

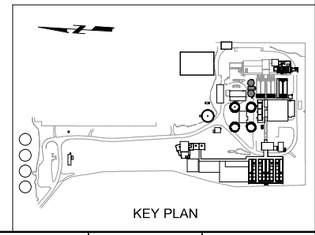
KEY NOTES:

1. GRAVITY THICKENERS TO BE COVERED AND PROVIDED WITH ODOR CONTROL.
2. ANGLE SLUDGE SCREEN DISCHARGE CHUTES TO DISCHARGE INTO ROLL OFF BIN. COORDINATE DISCHARGE LOCATION WITH OWNER.
3. ROLL OFF BIN TO BE COVERED AND ODOR CONTROL TO BE PROVIDED FOR THE SCREENS AND ROLL OFF BIN.



2 PLAN

SCALE: 3/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

MECHANICAL

PRIMARY SLUDGE GRAVITY THICKENERS - FIRST FLOOR PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

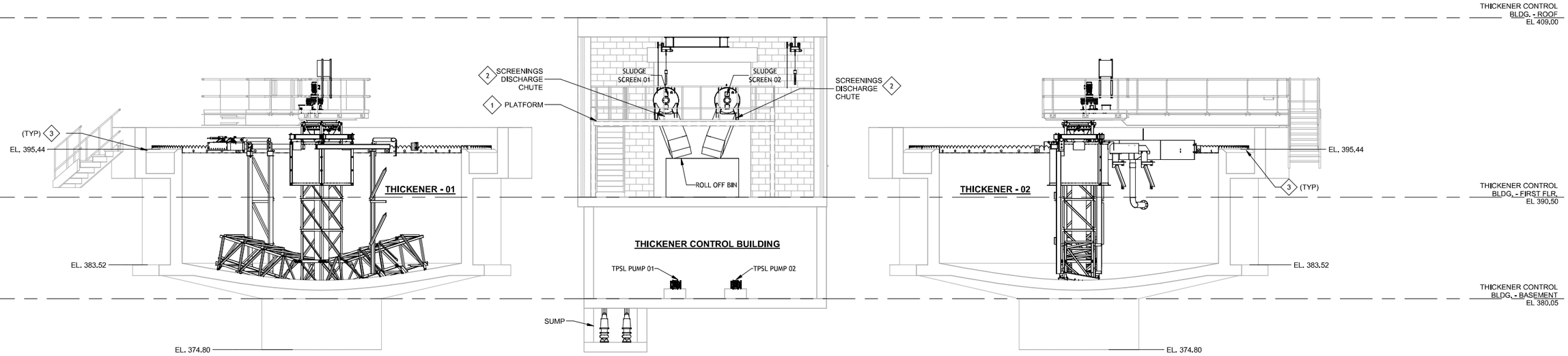
JOB NO. 203580
DRAWING NO. 56M02
SHEET NO. 132 OF 251

PLOT DATE: 6/17/2025 4:10:14 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/56-M-3D-101.rvt

KEY NOTES:

1. PLATFORM FOR SLUDGE SCREENS TO BE CONSTRUCTED EIGHT FEET ABOVE FINISHED FLOOR.
2. ANGLE SLUDGE SCREEN DISCHARGE CHUTE TO DISCHARGE INTO ROLL OFF BIN. COORDINATE DISCHARGE LOCATION WITH OWNER.
3. GRAVITY THICKENER OVERFLOW TO BE ROUTED TO HEADWORKS.



1 SECTION

56M01

SCALE: 3/16" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

MECHANICAL

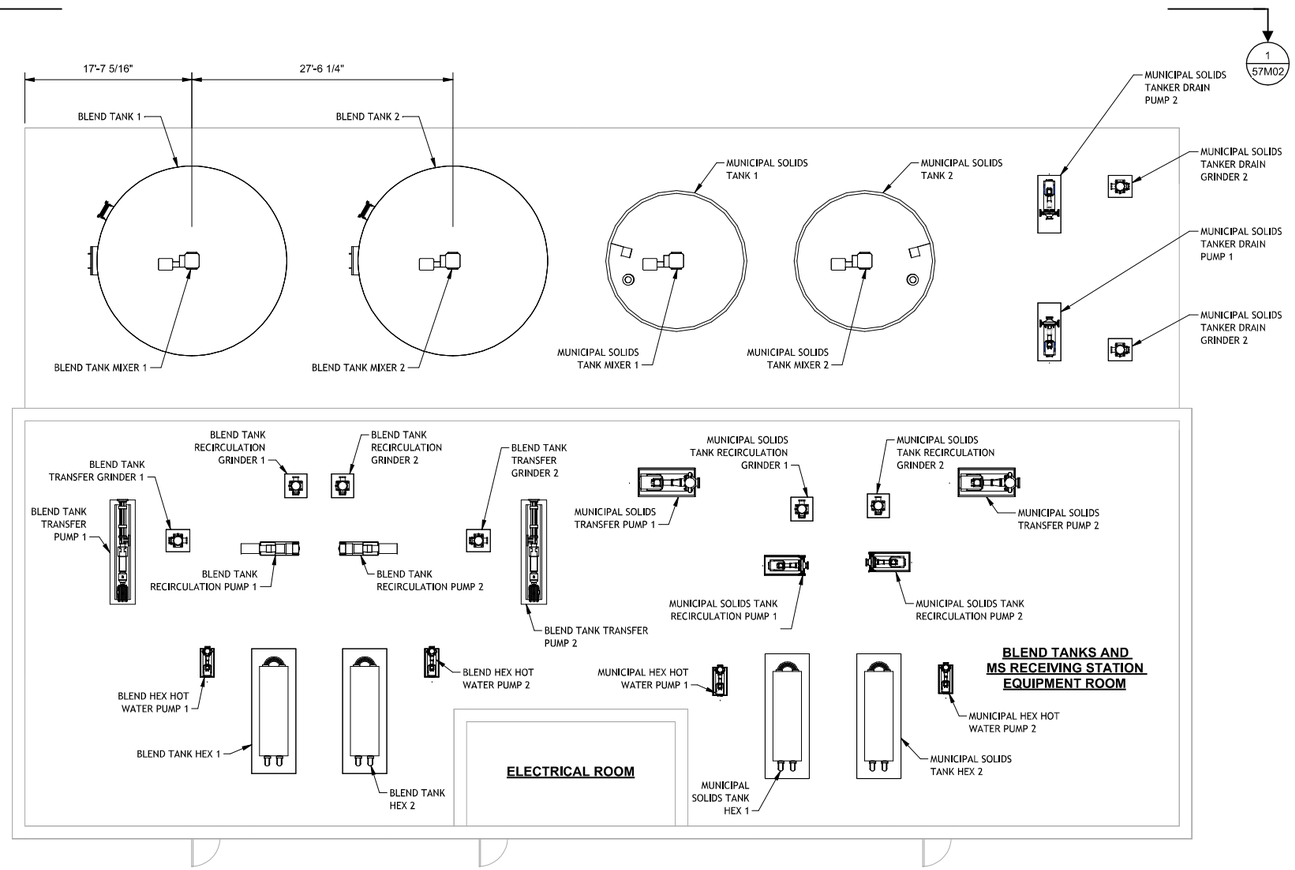
PRIMARY SLUDGE GRAVITY THICKENERS - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 56M03
SHEET NO. 133 OF 251

PLOT DATE: 6/17/2025 4:15:38 PM

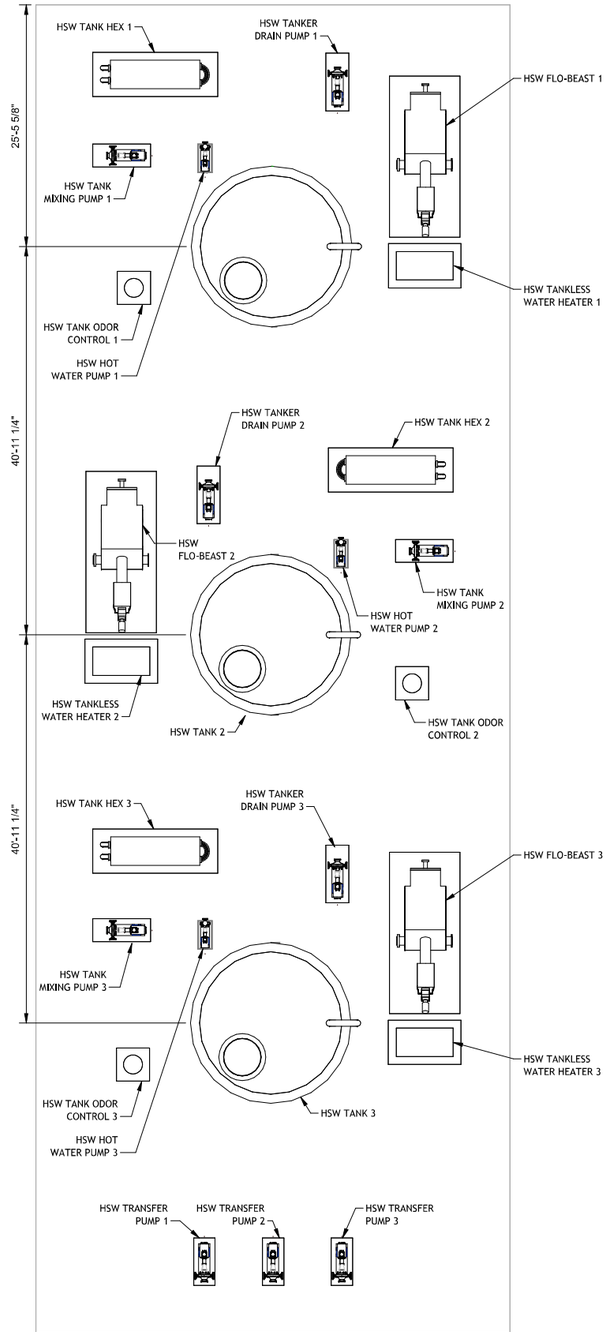
FILE NAME: Autodesk Docs://OCDWEP 203580/56-M-3D-101.rvt



BLEND TANKS AND MS RECEIVING STATION

1 PLAN

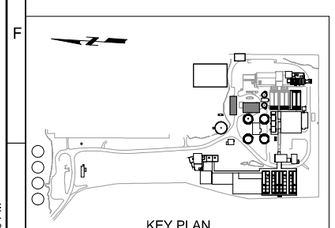
SCALE: 1/8" = 1'-0"



HSW RECEIVING STATION

2 PLAN

SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP UPGRADES AND BIOSOLIDS FACILITY

MECHANICAL

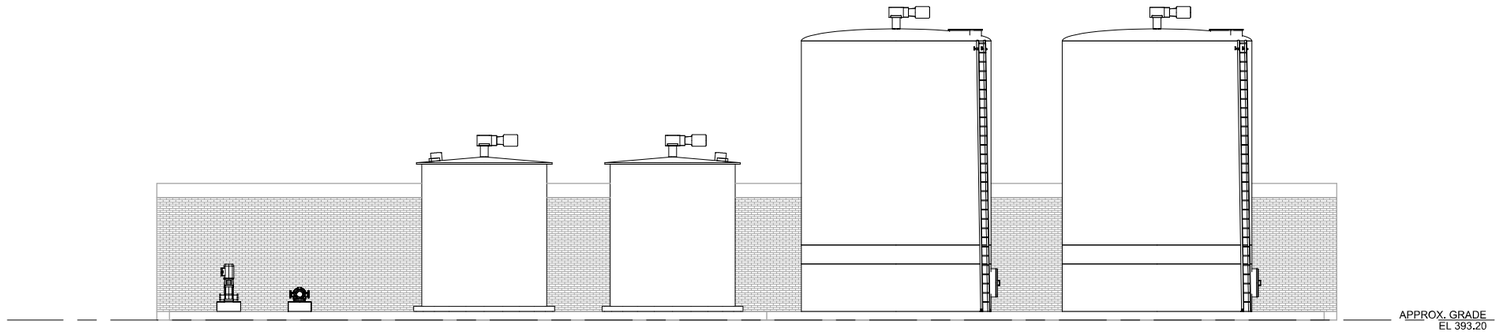
BLEND TANKS, HSW RECEIVING, AND MS RECEIVING STATIONS - PLAN AT EL. 393.20'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

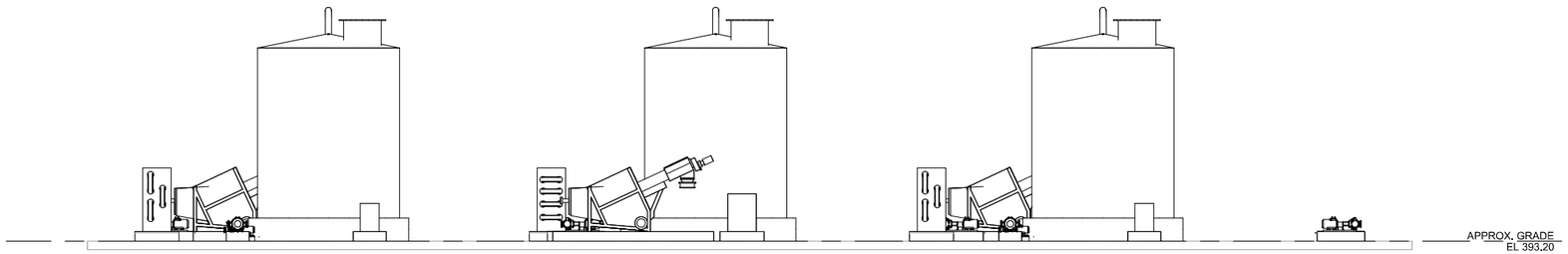
JOB NO. 203580
DRAWING NO. 57M01
SHEET NO. 134 OF 251

PLOT DATE: 6/26/2025 3:32:20 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/57-M-3D-101.rvt



1 SECTION
57M01 SCALE: 1/8" = 1'-0"



2 SECTION
57M01 SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP UPGRADES AND BIOSOLIDS FACILITY
MECHANICAL
BLEND TANKS, HSW RECEIVING, AND MS RECEIVING STATIONS - SECTIONS

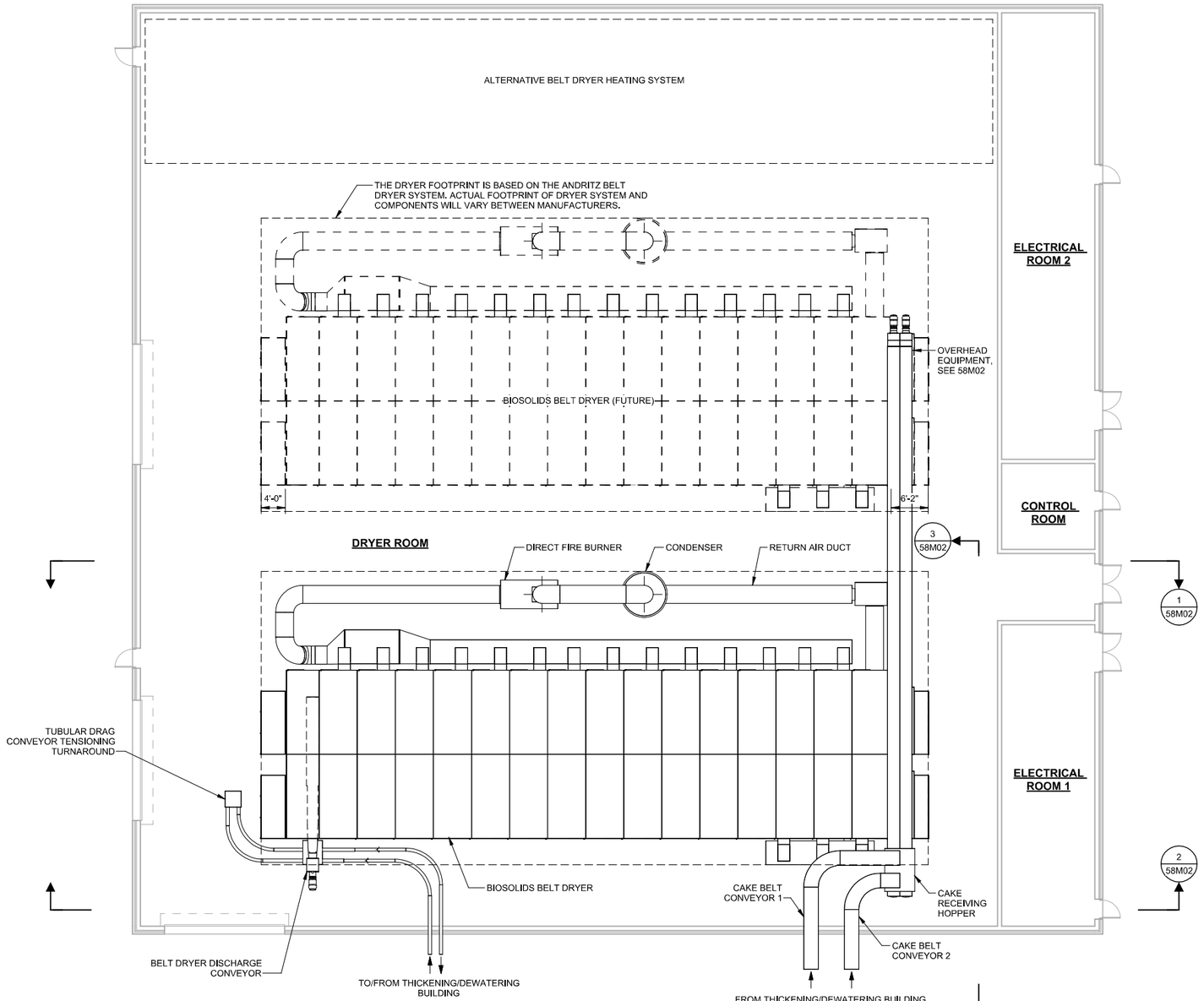
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 57M02
SHEET NO. 135 OF 251

PLOT DATE: 6/26/2025 3:32:21 PM
FILE NAME: Autodesk Docs://OCDWEP 203580/57-M-3D-101.rvt

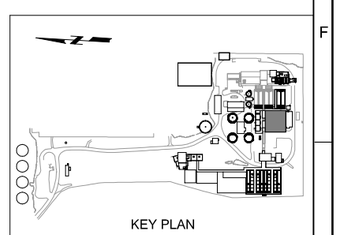
GENERAL NOTES:

1. PROVIDE MINIMUM 10' OF CLEAR ACCESS AROUND DRYER SYSTEM UNLESS OTHERWISE REQUIRED BY THE DRYER MANUFACTURER.



1 PLAN

SCALE: 3/32" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

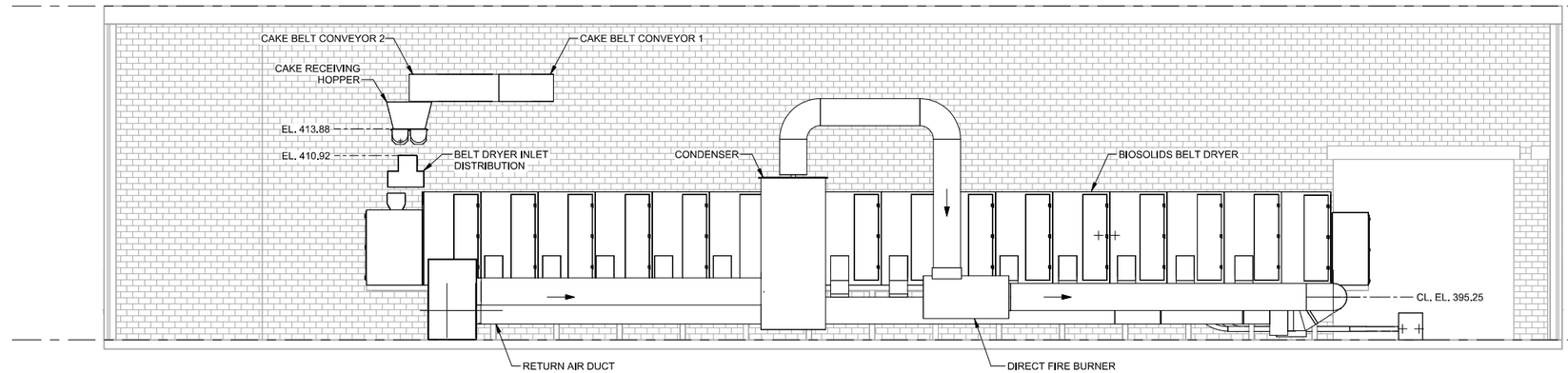
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
MECHANICAL
DRYER BUILDING - PLAN AT EL. 390.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

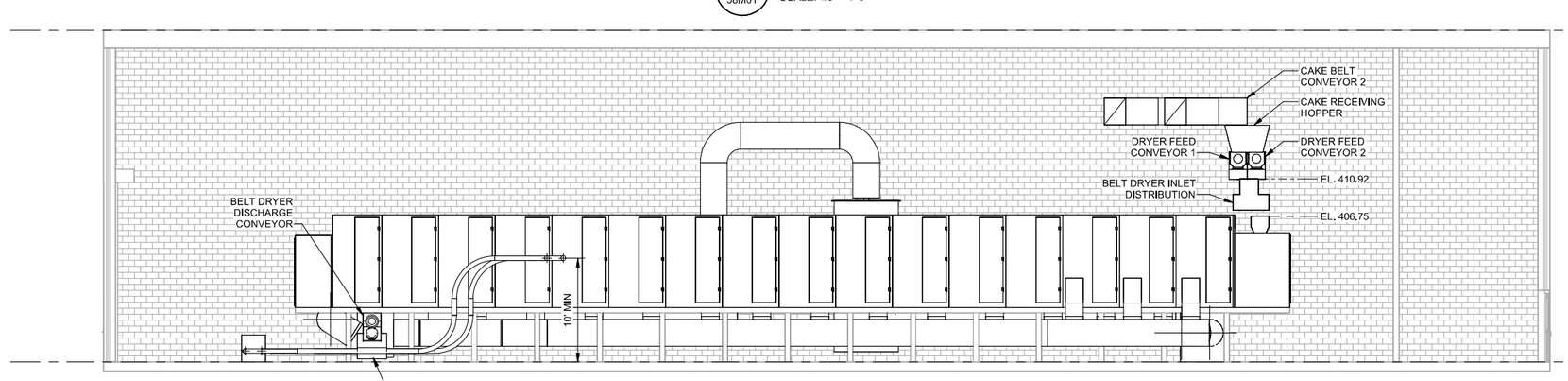
JOB NO. 203580
DRAWING NO. 58M01
SHEET NO. 136 OF 251

PLOT DATE: 6/24/2025 9:51:59 AM

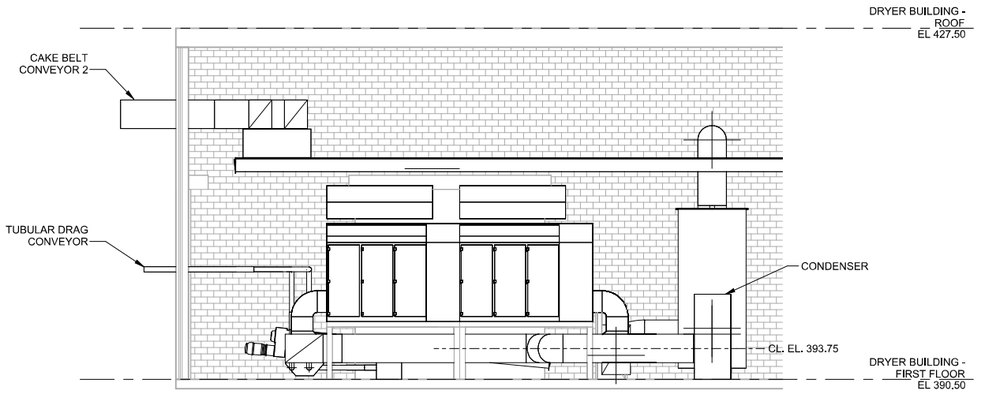
FILE NAME: Autodesk Docs://OCDWEP 203580/58-M-3D-101.rvt



1 SECTION (58M01)
SCALE: 1/8" = 1'-0"



2 SECTION (58M01)
SCALE: 1/8" = 1'-0"



3 SECTION (58M01)
SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
MECHANICAL
DRYER BUILDING - SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 58M02
SHEET NO. 137 OF 251

PLOT DATE: 6/24/2025 9:52:46 AM

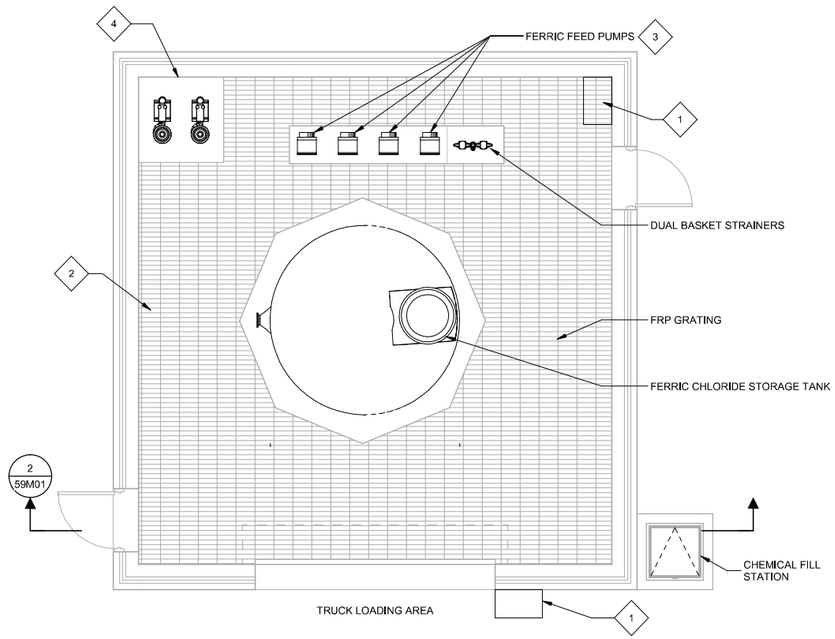
FILE NAME: Autodesk Docs://OCDWEP 203580/58-M-3D-101.rvt

GENERAL NOTES:

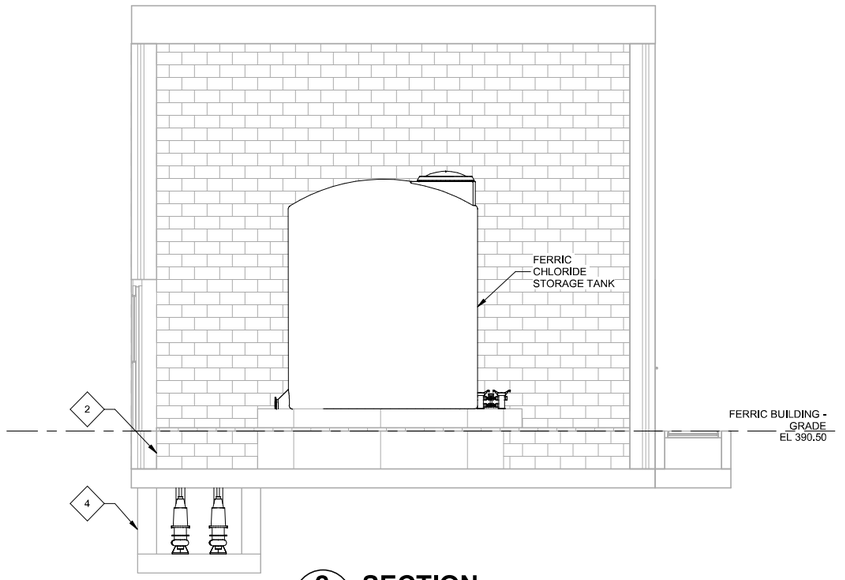
1. PROVIDE MINIMUM 10' OF CLEAR ACCESS AROUND DRYER SYSTEM UNLESS OTHERWISE REQUIRED BY THE DRYER MANUFACTURER.

KEY NOTES:

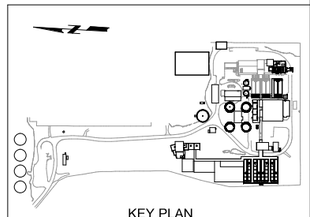
1. EMERGENCY SHOWER AND EYE WASH STATION TO BE PROVIDED IN THE FERRIC CHLORIDE BUILDING AND THE LOADING AREA OUTSIDE, SUPPLIED WITH TEMPERED POTABLE WATER.
2. CHEMICAL CONTAINMENT AT A DEPTH OF 2 FEET TO BE PROVIDED BELOW FLOOR GRATING.
3. FERRIC CHLORIDE PUMPS TO SUPPLY THE DIGESTERS, DEWATERING FEED, AND CENTRATE PIPING, WITH ONE STANDBY PUMP.
4. SUMP WITH DUPLEX THERMOPLASTIC SUMP PUMPS SUITABLE FOR FERRIC CHLORIDE SERVICE.



1 PLAN
SCALE: 1/4" = 1'-0"



2 (59M01) SECTION
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SPRICK
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPDRAGES AND BIOSOLIDS FACILITY
MECHANICAL
FERRIC CHLORIDE BUILDING - PLAN AT EL. 390.50' AND SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 59M01
SHEET NO. 138 OF 251

PLOT DATE: 6/24/2025 1:34:32 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/58-M-3D-101.rvt

ELECTRICAL PLAN SYMBOLS

IDENTIFICATION SYMBOLS

EQUIP # — EQUIPMENT AND INSTRUMENT IDENTIFICATION

EQUIPMENT/INSTRUMENT LOCATOR

LUMINAIRE IDENTIFICATION
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED FROM
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF FIXTURE
X = LUMINAIRE TYPE, REFER TO THE LUMINAIRE SCHEDULE

XXXX — CONDUIT IDENTIFICATION
XXXX = CONDUIT NUMBER, REFER TO CONDUIT SCHEDULE
UNLESS OTHERWISE NOTED, GROUPED CONDUITS ARE LABELED LEFT TO RIGHT OR TOP TO BOTTOM.

INDICATES KEYNOTE X
(PERTAINS ONLY TO SHEET WHERE NOTE IS FOUND)

DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

CAMERA

LUMINAIRES

LINEAR FIXTURE

2' X 2' LAY-IN TROFFER

2' X 4' LAY-IN TROFFER

LUMINAIRE POLE MOUNTED

LUMINAIRE, EMERGENCY BATTERY-POWERED

LUMINAIRE, EMERGENCY/EXIT BATTERY-POWERED

LUMINAIRE, EMERGENCY BATTERY-POWERED REMOTE

LUMINAIRE, SURFACE OR PENDANT MOUNTED

LUMINAIRE, WALL MOUNTED

LUMINAIRE, FLOOD/SPOT

LUMINAIRE, EXIT ONE OR TWO FACES AS INDICATED. ARROW POINTS IN DIRECTION OF EGRESS.

SWITCHES/RECEPTACLES

SINGLE POLE SWITCH
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATED
c = TYPE
2 = DOUBLE POLE SWITCH
3 = THREE-WAY SWITCH
3P = THREE POSITION SWITCH
4 = FOUR-WAY SWITCH
K = KEY OPERATED SWITCH
F = SWITCH AND FUSESTAT HOLDER
P = SWITCH AND PILOT LIGHT
T = THERMOSTAT
D = DIMMER SWITCH
L = LOW VOLTAGE LIGHT SWITCH
M = MANUAL MOTOR STARTER
N = NETWORKED SINGLE OR MULTIPLE SWITCH LOCATIONS
WP = WEATHER PROOF
REFER TO ABBREVIATIONS LEGEND FOR ALL OTHER DESIGNATIONS.

OCCUPANCY SENSOR
X = REFERENCE LIGHTING CONTROL COMPONENT SCHEDULE
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATION
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF SENSOR

PE — PHOTOCELL

SWITCH AND SINGLE RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

DUPLEX RECEPTACLE

QUADRUPLEX RECEPTACLE

IN FLOOR DUPLEX RECEPTACLE

IN FLOOR QUADRUPLEX RECEPTACLE

DUPLEX RECEPTACLE w/SPLIT WIRE

DEDICATED RECEPTACLE

SPECIAL PURPOSE RECEPTACLE

WELDING RECEPTACLE
a = CIRCUIT DESIGNATION
b = DISCONNECT TYPE

TWIST LOCK RECEPTACLE
a = AMP RATING

TELEPHONE OUTLET

DATA COMMUNICATIONS OUTLET
a = NETWORK SWITCH

FIRE ALARM

FACP — FIRE ALARM CONTROL PANEL

RACEWAY

EXPOSED CONDUIT

BREAK AND CONTINUATION IN CONDUIT RUN

EXPOSED CONDUIT HIDDEN BEHIND WALLS, FLOORS OR OTHER STRUCTURES

UNDERGROUND CONDUIT, DIRECT BURIED OR IN DUCT BANK

CONDUIT IN SLAB

CONDUIT VERTICAL CHANGE IN DIRECTION

CONDUIT CAP

J — JUNCTION BOX

CONDUIT SEAL

CONDUIT TEE

DUCT BANK
APPROXIMATE DIMENSIONS SHOWN ON DUCT BANK SECTIONS

CONDUIT SIZE AND CONDUCTORS

INDIVIDUAL CONDUCTORS

W"C-(3-X (Ø), 1-Y (N) & 1-Z (G))

W"C (WHERE INDICATED): W = CONDUIT TRADE SIZE

3-X (Ø):
3 = QUANTITY
X = SIZE OF CONDUCTORS
(Ø) = DESIGNATES PHASE CONDUCTORS

1-Y (N) (WHERE INDICATED):
1 = QUANTITY
Y = SIZE OF CONDUCTORS
(N) = DESIGNATES NEUTRAL CONDUCTORS

1-Z (G) (WHERE INDICATED):
1 = QUANTITY
Z = SIZE OF CONDUCTORS
(G) = DESIGNATES GROUND CONDUCTORS

U{3-X (Ø) & 1-X (G)}
U = NUMBER OF PARALLEL RUNS

VFD CONDUCTORS

U{[N/C-X (Ø) & INTEGRAL (G)]:VFD}
U = NUMBER OF PARALLEL RUNS
N/C = NUMBER OF PHASE CONDUCTORS IN CABLE
X = SIZE OF CONDUCTORS
VFD = VFD CABLE

MULTI CONDUCTOR CABLES

K/2/C#16S
K (WHERE INDICATED) = NUMBER OF PAIRS
2/C#16S = TWO CONDUCTOR, 16 GAUGE, TWISTED SHIELDED PAIR

K/3/C#16S
K (WHERE INDICATED) = NUMBER OF TRIPLETS
3/C#16S = THREE CONDUCTOR, 16 GAUGE, TWISTED SHIELDED TRIPLETS

U{[N/C-X (Ø) & INTEGRAL (G)]:MC}
U = NUMBER OF PARALLEL RUNS
MC = MULTICONDUCTOR CABLE
N/C = NUMBER OF PHASE CONDUCTORS IN THE CABLE
X = SIZE OF CONDUCTORS

FIBER OPTIC CABLES

FO/N
N = NUMBER OF INDIVIDUAL FIBERS

GROUNDING

UNDERGROUND GROUND CABLE
#4/0 SDBC UNLESS OTHERWISE NOTED

GROUND ROD

GROUND ROD AND GROUND WELL

ELECTRICAL ONE-LINE SYMBOLS

MEDIUM VOLTAGE

CIRCUIT BREAKER, MEDIUM VOLTAGE
a = CIRCUIT BREAKER NUMBER
b = FRAME SIZE

ANSI RELAY DEVICE
a = ANSI DEVICE FUNCTION
b = QUANTITY

MEDIUM VOLTAGE DISCONNECT SWITCH NON-FUSED CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE SINGLE FUSE CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE DOUBLE FUSE CUT OUT

MEDIUM VOLTAGE SINGLE FUSE

MEDIUM VOLTAGE DOUBLE FUSE

MEDIUM VOLTAGE LIVE FRONT TERMINATOR

MEDIUM VOLTAGE ELBOW

MEDIUM VOLTAGE TEE

MEDIUM VOLTAGE CONTACTOR

MEDIUM VOLTAGE STARTER

MOV-ELBOW ARRESTER

LOW VOLTAGE

LOW VOLTAGE CIRCUIT BREAKER
a = TYPE
MCP = MOTOR CIRCUIT PROTECTOR
TM = THERMAL MAGNETIC
SS = SOLID STATE
b = FRAME SIZE (MANUFACTURER TO DETERMINE FRAME SIZE UNLESS INDICATED)
c = NUMBER OF POLES
d = TRIP SETTING (AT = AMP TRIP) (AC = MCP CONTINUOUS RATING)
e = DESIGNATION
f = INTERRUPTING RATING

LOW VOLTAGE CIRCUIT BREAKER AUXILIARY OPERATOR
* = S = SHUNT TRIP
= G = GROUND FAULT INTERRUPTER
= V = SOLENOID KEY RELEASE

DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

FUSED DISCONNECT SWITCH
B = TYPE, REFER TO DISCONNECT SCHEDULE
b = FUSE RATING

FUSE

COMBINATION STARTER WITH CONTROL POWER TRANSFORMER
a = CIRCUIT BREAKER DISCONNECT, TYPE AS NOTED
b = STARTER TYPE
REFER TO THE SPECIFICATIONS FOR STARTER DEFINITIONS.
c = NEMA STARTER SIZE
d = OVERLOAD

MOTOR STARTER/DRIVES:
a = DEVICE TYPE
VFD-6 = 6-PULSE VFD
VFD-18 = 18-PULSE VFD
VFD-RH = REDUCED HARMONIC VFD (18-PULSE OR ACTIVE FRONT END AS DEFINED IN THE SPECIFICATIONS)
RVSS = REDUCED VOLTAGE SOLID STATE STARTER
RVAT = REDUCED VOLTAGE AUTO TRANSFORMER
a/B = DEVICE WITH BYPASS STARTER, REFER TO THE SPECIFICATIONS

b = INPUT OPTIONS
LL = LINE REACTOR
PHF = PASSIVE HARMONIC FILTER

c = OUTPUT OPTIONS
LR = LOAD REACTOR
DV/DT = Dv/dt FILTER
SWF = SINE WAVE FILTER

EQUIPMENT ENCLOSURE

MISCELLANEOUS

MOTOR
HP = HORSEPOWER RATING
FULL LOAD AMPS AS NOTED

PACKAGED EQUIPMENT
LOAD RATING AS INDICATED
a = RATED LOAD
b = UNIT(HP, KW, KVA) AS INDICATED

TRANSFORMER
a = DEVICE I.D.
b = KVA RATING
c = NUMBER OF PHASES
d = PRIMARY VOLTAGE
e = SECONDARY VOLTAGE
f,g = CONNECTION TYPE SYMBOL
h = IMPEDANCE

GROUNDED WYE CONNECTION

DELTA CONNECTION

ENGINE-GENERATOR RATINGS AS INDICATED ON THE DRAWINGS
a = KVA/KW
b = VOLTAGE/CONNECTION
c = PHASE
d = WIRE
e = PF

CURRENT TRANSFORMER WITH SHORTING TERMINAL BLOCK
a = QUANTITY
b = RATIO

POTENTIAL TRANSFORMER
a = QUANTITY
b = RATIO
c,d = CONNECTION TYPE SYMBOL

SSM — SOLID STATE MULTIFUNCTION METER

ATP — AMPERE TEST POINT

VTP — VOLTAGE TEST POINT

UTILITY METER

LIGHTNING ARRESTER

SPD — SURGE PROTECTIVE DEVICE

DRAWOUT CONNECTION

GROUND

CAPACITOR

BATTERY

KIRK KEY INTERLOCK

LOAD BANK

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED W. FLETCHER
DRAWN A. CHARDE
CHECKED J. BREHM
DATE JULY 2025

PDG POPLI DESIGN GROUP | carollo | Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ELECTRICAL
GENERAL LEGEND AND SYMBOLS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00GE01
SHEET NO. 139 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:

ABBREVIATIONS

A	AMP
ABS	ABSOLUTE
AC	ALTERNATING CURRENT
ACK	ACKNOWLEDGE
ACTR	ACTUATOR
AF	AMP FRAME
AFC	AUTOMATIC FREQUENCY CONTROL
AIC	AMP INTERRUPTING CAPACITY
AM	AMMETER
ANN	ANNUNCIATOR
ANT	ANTENNA
APU	AUXILIARY POWER UNIT
ARM	ARMORED CABLE
AS	AMMETER SWITCH
ASYM	ASYMMETRICAL
AT	AMP TRIP
ATO	AUTOMATIC THROW OVER
ATP	AMMETER TEST POINT
ATS	AUTOMATIC TRANSFER SWITCH
AUTO XFMR	AUTOMATIC TRANSFORMER
AUX	AUXILIARY
AWG	AMERICAN WIRE GAGE
B	BELL
BAT	BATTERY
BFG	BELOW FINISHED GRADE
BHP	BRAKE HORSEPOWER
BKR	BREAKER
BRF	BELOW RAISED FLOOR
C	CONDUIT / CONTINUOUS LOAD
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CCW	COUNTER CLOCKWISE
CKT	CIRCUIT
COAX	COAXIAL CABLE
COM	COMMON
COMM	COMMUNICATION
CPT	CONTROL POWER TRANSFORMER
CR	CONTROLLED RECEPTACLE
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
CV	CONTROL VALVE
CW	CLOCKWISE / COOL WHITE
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DCU - X	DISTRIBUTED CONTROL UNIT NO. X
DEMO	DEMOLITION
DISC	DISCONNECT SWITCH
DM	DEMAND METER
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DS	DOOR SWITCH
E/G	EMERGENCY GENERATOR
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSURE
ENG	ENGINE
ENT	ELECTRICAL NON-METALLIC TUBING
EP	EXPLOSION PROOF
ETM	ELAPSED TIME METER
F	SUB-FED
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FDR	FEEDER
FLA	FULL LOAD AMPS
FLX	FLEXIBLE CONDUIT
FO	FIBER OPTIC
FRC	FIBERGLASS RIGID CONDUIT
FREQ	FREQUENCY
FU	FUSE
FU SW	FUSED SWITCH
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
FWD	FORWARD

G	GROUND / EQUIPMENT GROUND / GROUND FAULT
GEN	GENERATOR
GRC	GALVANIZED STEEL RIGID CONDUIT
GFCI	GROUND FAULT CIRCUIT INTERRUPTER (RECEPTACLE)
GFI	GROUND FAULT INTERRUPTER (BREAKER)
GFR	GROUND FAULT RELAY
H	HOT-LEG
HF	HIGH FREQUENCY
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HSTAT	HUMIDISTAT
HV	HIGH VOLTAGE
HVAC	HEATING/VENTILATION/AIR CONDITIONING
HZ	HERTZ
I	INSTANTANEOUS / INTERMITTENT LOAD
IC	INTERRUPTING CAPACITY
IJB	INSTRUMENT JUNCTION BOX
IMC	INTERMEDIATE METAL CONDUIT
INST	INSTANTANEOUS
INT	INTERLOCK
INTERCOM	INTERCOMMUNICATION
J	JUNCTION BOX
K	KEY INTERLOCK
KA	KILOAMP
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAR	KILOVAR (REACTANCE)
KW	KILOWATT
KWD	KILOWATT DEMAND
KWH	KILOWATT HOUR
L	LONG-TIME
L-B	LINE-BUS
L-G	LINE-GROUND
LA	LIGHTNING ARRESTOR
LBL	LABEL
LC	LIGHTING CONTACTOR
LCP- X	LOCAL CONTROL PANEL NO. X
LL	LEAD-LAG LOAD REACTOR
LP	LIGHT POLE
LP - X	LIGHTING PANEL NO. X
LTG	LIGHTING
LV	LOW VOLTAGE
LVL	LEVEL
M-X	MOTOR CONTROLLER NO. X
MA	MILLIAMPERE
MCA	MOTOR CIRCUIT AMPS
MCC - X	MOTOR CONTROL CENTER NO. X
MCP	MOTOR CIRCUIT PROTECTOR
MH	MANHOLE / MOUNTING HEIGHT
MLO	MAIN LUGS ONLY
MOD	MOTOR OPERATED DAMPER
MOV	METAL OXIDE VARISTOR
MPR	MOTOR PROTECTION RELAY
MS-X	MOTOR STARTER NO. X
MSP	MOTOR STARTING PANEL
MTO	MANUAL THROW OVER
MTR-X	MOTOR NO. X
MTS	MANUAL TRANSFER SWITCH
MV	MEGAVOLT
MVA	MEGAVOLT-AMPERES
MVS	MEDIUM VOLTAGE SWITCH
MW	MEGAWATT
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NFC	NONMETALLIC FLEXIBLE CONDUIT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NP	NAMEPLATE

O	OPEN OR OPENED
OH	OVERHEAD
OL	OVERLOAD RELAY
P	POLE
PA	PUBLIC ADDRESS
PB	PUSHBUTTON / PULL BOX
PCS	PVC COATED GALVANIZED STEEL CONDUIT
PCM	PROCESS CONTROL MODULE
PE	PHOTOCELL
PF	POWER FACTOR
PFCC	POWER FACTOR CORRECTION CAPACITOR
PFR	PHASE FAILURE RELAY
PH	PHASE
PNL	PANEL
PPX	POWER PANEL NO. X
PRI	PRIMARY
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE RIGID PLASTIC CONDUIT
PWR	POWER
RAC	RIGID ALUMINUM CONDUIT
RECPT	RECEPTACLE
REV	REVERSE
RF	RADIO FREQUENCY
RMS	ROOT MEAN SQUARED
RVAT	REDUCED VOLTAGE AUTO TRANSFORMER
RVNR	REDUCED VOLTAGE NON-REVERSING
RVSS	REDUCED VOLTAGE SOLID STATE
S	SHIELD / SHORT-TIME
SA	SURGE ARRESTER
SC	SHORT CIRCUIT
SDBC	SOFT DRAWN BARE COPPER
SFL	SUB FEED LUGS
SLT	SEALTIGHT LIQUIDTIGHT FLEXIBLE CONDUIT
SM	SURFACE MOUNTED
SP	SINGLE POLE
SPD	SURGE PROTECTIVE DEVICE
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SPKR	SPEAKER
SS	SOLID STATE
STB	SHORTING TERMINAL BLOCK
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
TACH	TACHOMETER
TB - X	TERMINAL BLOCK - UNIT X
TC	THERMOCOUPLE / TIME CLOCK / TRAY CABLE
TD	TEMPERATURE DETECTOR RELAY
TE	TOTALLY ENCLOSED
TEFC	TOTALLY ENCLOSED FAN COOLED
TENV	TOTALLY ENCLOSED NON-VENTILATED
TERM	TERMINAL
TJB	TERMINAL JUNCTION BOX
TM	THERMAL MAGNETIC
TP	TWISTED PAIR
TS	TEMPERATURE SWITCH
TS1W	TWO SPEED CONSEQUENT POLE, ONE WINDING
TS2W	TWO SPEED SEPARATE WINDING
TSTAT	THERMOSTAT
UHF	ULTRA HIGH FREQUENCY
UNG	UNGROUNDED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UVR	UNDER VOLTAGE RELAY

V	VOLT
VA	VOLT AMPERE
VAR	VARMETER
VCP	VENDOR CONTROL PANEL
VFD	VARIABLE FREQUENCY DRIVE
VHF	VERY HIGH FREQUENCY
VM	VOLTMETER
VP	VAPORPROOF
VR	VOLTAGE REGULATOR
VS	VOLTAGE SWITCH
VT	VOLTAGE TRANSFORMER
VTP	VOLTAGE TEST POINT
W	WATT / WEST
WT	WATER TIGHT
WP	WEATHER PROOF
XFMR	TRANSFORMER

NOTES:

1. REFER TO SPECIFICATIONS AND OTHER DRAWINGS FOR ADDITIONAL ABBREVIATIONS.

POWER DEVICE FUNCTION NUMBERS

1	MASTER ELEMENT
2	TIME-DELAY STARTING OR CLOSING RELAY
3	CHECKING OR INTERLOCKING RELAY
4	MASTER CONTACTOR
5	STOPPING DEVICE
6	STARTING CIRCUIT BREAKER
7	ANODE CIRCUIT BREAKER
8	CONTROL POWER DISCONNECTING DEVICE
9	REVERSING DEVICE
10	UNIT SEQUENCE SWITCH
11	MULTIFUNCTION DEVICE
12	OVER-SPEED DEVICE
13	SYNCHRONOUS-SPEED DEVICE
14	UNDER-SPEED DEVICE
15	SPEED OR FREQUENCY MATCHING DEVICE
16	DATA COMMUNICATIONS DEVICE
17	SHUNTING OR DISCHARGE SWITCH
18	ACCELERATING OR DECELERATING DEVICE
19	STARTING-TO-RUNNING TRANSITION CONTACTOR
20	ELECTRICALLY OPERATED VALVE
21	DISTANCE RELAY
22	EQUALIZER CIRCUIT BREAKER
23	TEMPERATURE CONTROL DEVICE
24	VOLTS PER HERTZ RELAY
25	SYNCHRONIZING OR SYNCHRONISM-CHECK DEVICE
26	APPARATUS THERMAL DEVICE
27	UNDERVOLTAGE RELAY
27N	GROUND FAULT UNDERVOLTAGE RELAY
28	FLAME DETECTOR
29	ISOLATING CONTACTOR
30	ANNUNCIATOR RELAY
31	SEPARATE EXCITATION DEVICE
32	DIRECTIONAL POWER RELAY
33	POSITION SWITCH
34	MASTER SEQUENCE DEVICE
35	BRUSH-OPERATING OR SLIP-RING SHORT-CIRCUITING DEVICE
36	POLARITY DEVICE
37	UNDERCURRENT OR UNDERPOWER RELAY
38	BEARING PROTECTIVE DEVICE
39	MECHANICAL CONDITION MONITOR
40	FIELD RELAY
41	FIELD CIRCUIT BREAKER
42	RUNNING CIRCUIT BREAKER
43	MANUAL TRANSFER OR SELECTOR DEVICE
44	UNIT SEQUENCE STARTING RELAY
45	ABNORMAL ATMOSPHERIC CONDITION MONITOR
46	REVERSE-PHASE OR BALANCE CURRENT RELAY
47	PHASE-BALANCE OR PHASE-SEQUENCE VOLTAGE RELAY
48	INCOMPLETE SEQUENCE RELAY
49	MACHINE OR TRANSFORMER THERMAL RELAY
50	INSTANTANEOUS OVERCURRENT RELAY
51	AC TIME OVERCURRENT RELAY
52	AC CIRCUIT BREAKER
53	FIELD EXCITATION RELAY
54	TURNING GEAR ENGAGING DEVICE
55	POWER FACTOR RELAY
56	FIELD APPLICATION RELAY
57	SHORT-CIRCUITING OR GROUNDING DEVICE
58	RECTIFICATION FAILURE RELAY
59	OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT BALANCE RELAY
61	DENSITY SWITCH OR SENSOR
62	TIME-DELAY STOPPING OR OPENING RELAY
63	PRESSURE SWITCH
64	GROUND DETECTOR RELAY
65	GOVERNOR
66	NOTCHING OR JOGGING DEVICE
67	AC DIRECTIONAL OVERCURRENT RELAY
68	BLOCKING OR OUT OF STEP RELAY
69	PERMISSIVE CONTROL DEVICE
70	RHEOSTAT
71	LIQUID LEVEL SWITCH
72	DC CIRCUIT BREAKER
73	LOAD-RESISTOR CONTACTOR
74	ALARM RELAY
75	POSITION CHANGING MECHANISM
76	DC OVERCURRENT RELAY
77	TELEMETERING DEVICE
78	PHASE-ANGLE MEASURING RELAY
79	AC RECLOSING RELAY
80	FLOW SWITCH
81	FREQUENCY RELAY
82	DC LOAD MEASURING RECLOSING RELAY
83	AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY
84	OPERATING MECHANISM
85	PILOT COMMUNICATIONS, CARRIER OR PILOT-WIRE RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTIVE RELAY
88	AUXILIARY MOTOR OR MOTOR GENERATOR
89	LINE SWITCH
90	REGULATING DEVICE
91	VOLTAGE DIRECTIONAL RELAY
92	VOLTAGE AND POWER DIRECTIONAL RELAY
93	FIELD-CHANGING CONTACTOR
94	TRIPPING OR TRIP-FREE RELAY

COMMONLY USED SUFFIX LETTER APPLIED TO POWER DEVICE FUNCTION NUMBERS

A	ALARM ONLY
B	BUS PROTECTION
G	GROUND FAULT PROTECTION (RELAY CT IN A SYSTEM NEUTRAL CIRCUIT OR GENERATOR PROTECTION)
GS	GROUND FAULT PROTECTION (RELAY CT IN TOROIDAL OR GROUND SENSOR TYPE)
L	LINE PROTECTION
M	MOTOR PROTECTION
N	GROUND FAULT PROTECTION (RELAY COIL CONNECTED IN RESIDUAL CT CIRCUIT)
T	TRANSFORMER PROTECTION
V	VOLTAGE
P	PHASE PROTECTION

ABBREVIATIONS

AFD	ARC FLASH DETECTOR
CLK	CLOCK OR RIMING SOURCE
DDR	DYNAMIC DISTURBANCE RECORDER
DFR	DIGITAL FAULT RECORDER
ENV	ENVIRONMENTAL DATA
HIZ	HIGH IMPEDANCE FAULT DETECTOR
HMI	HUMAN MACHINE INTERFACE
HST	HISTORIAN
LGC	SCHEME LOGIC
MET	SUBSTATION METERING
PDC	PHASOR DATA CONCENTRATOR
PMU	PHASOR MEASUREMENT UNIT
PQM	POWER QUALITY MONITOR
RIO	REMOTE I/O DEVICE
RTU	REMOTE TELEMETRY UNIT/REMOTE TERMINAL UNIT
SER	SEQUENCE OF EVENTS RECORDER
TCM	TRIP CIRCUIT MONITOR

REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED W. FLETCHER
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DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

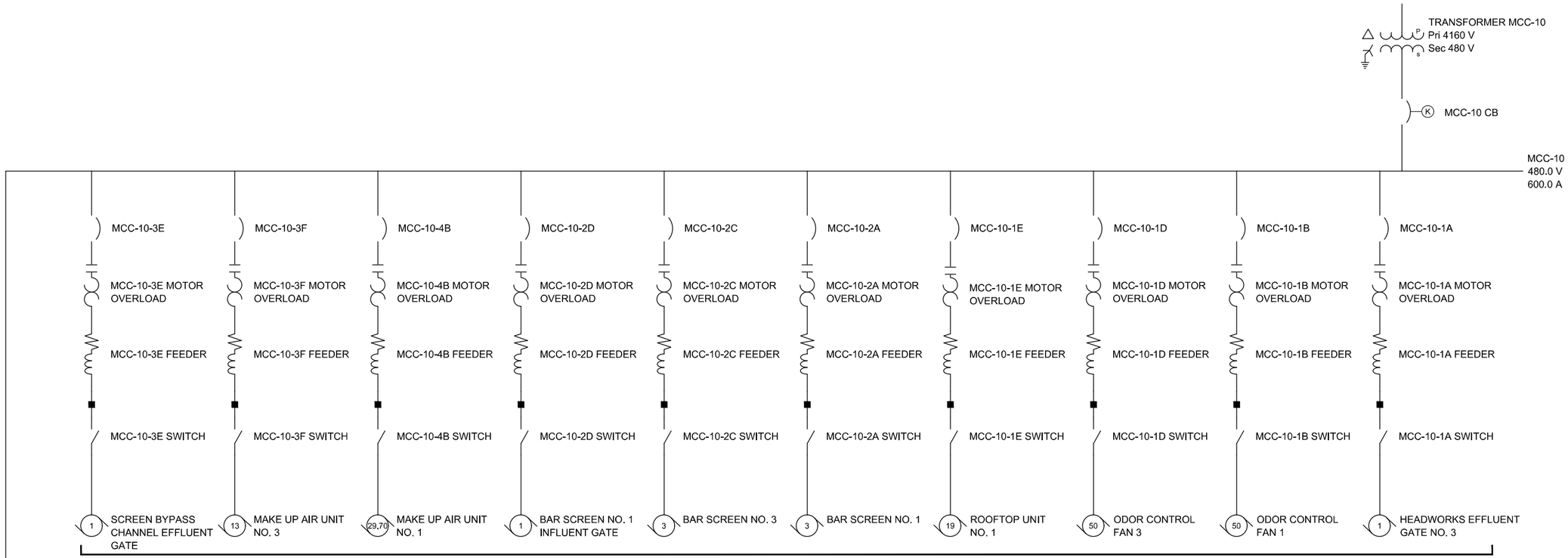
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ELECTRICAL
ABBREVIATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

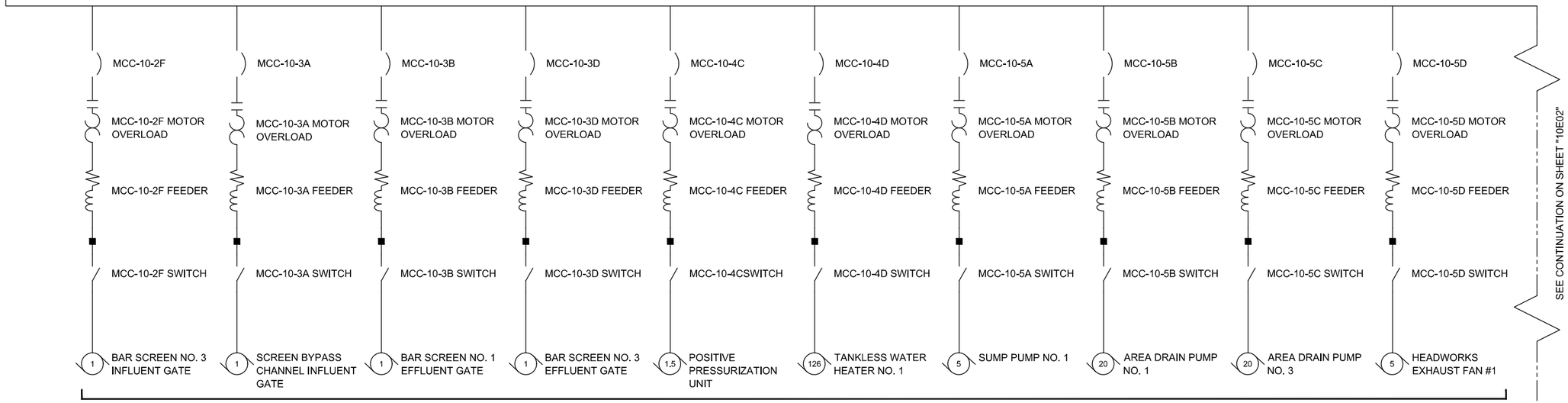
JOB NO. 203580-60000
DRAWING NO. 00GE02
SHEET NO. 140 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:

BLDG.10 - HEADWORKS BUILDING



PROCESS 10 - HEADWORKS



PROCESS 10 - HEADWORKS

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DESIGNED W. FLETCHER
DRAWN A. CHARDE
CHECKED J. BREHM
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ELECTRICAL
HEADWORKS - ONE - LINE DIAGRAM - 01

VERIFY SCALES
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0 1"
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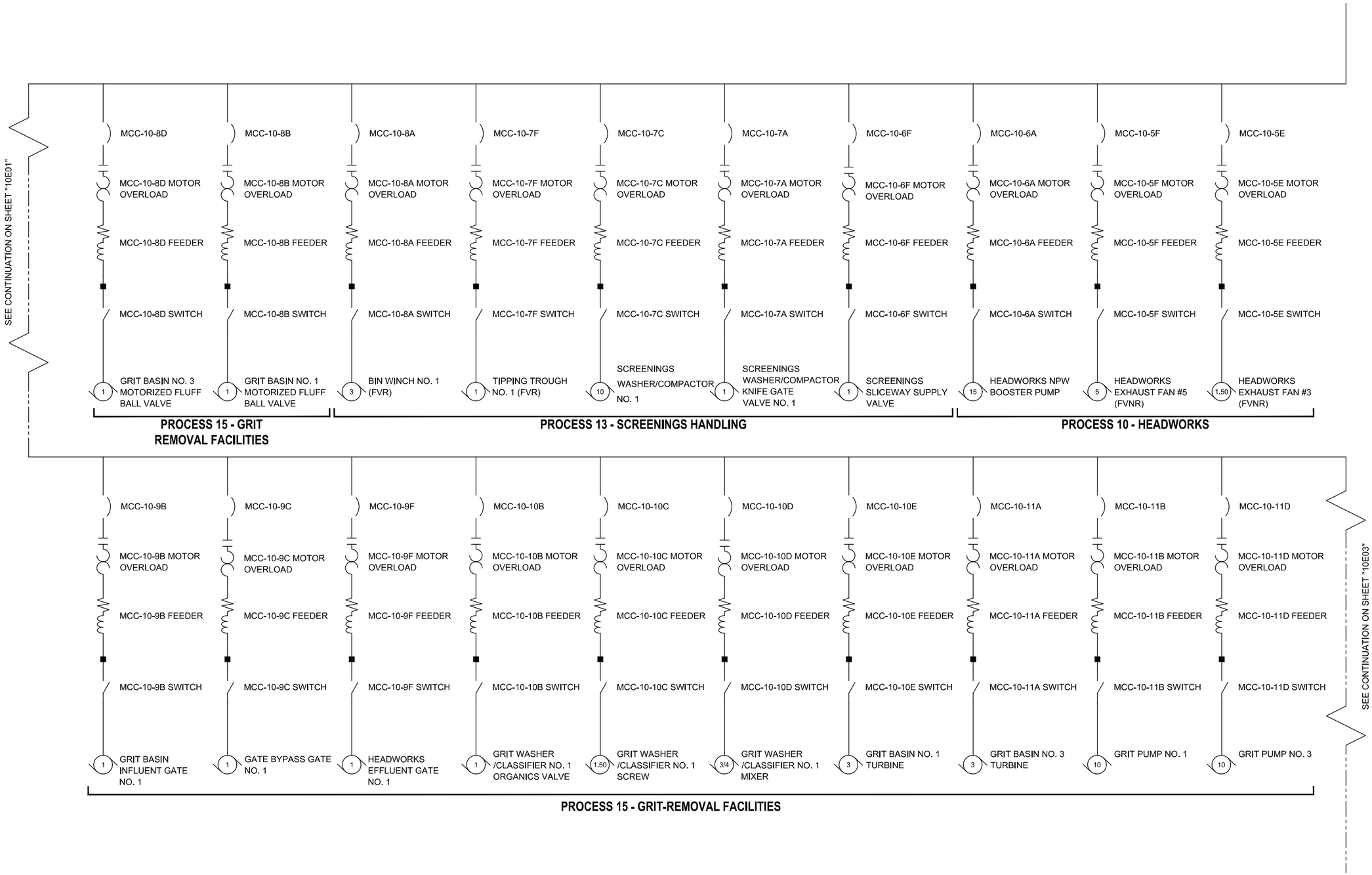
JOB NO. 203580-60000
DRAWING NO. 10E01
SHEET NO. 141 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:



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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

HEADWORKS - ONE - LINE DIAGRAM - 02

VERIFY SCALES
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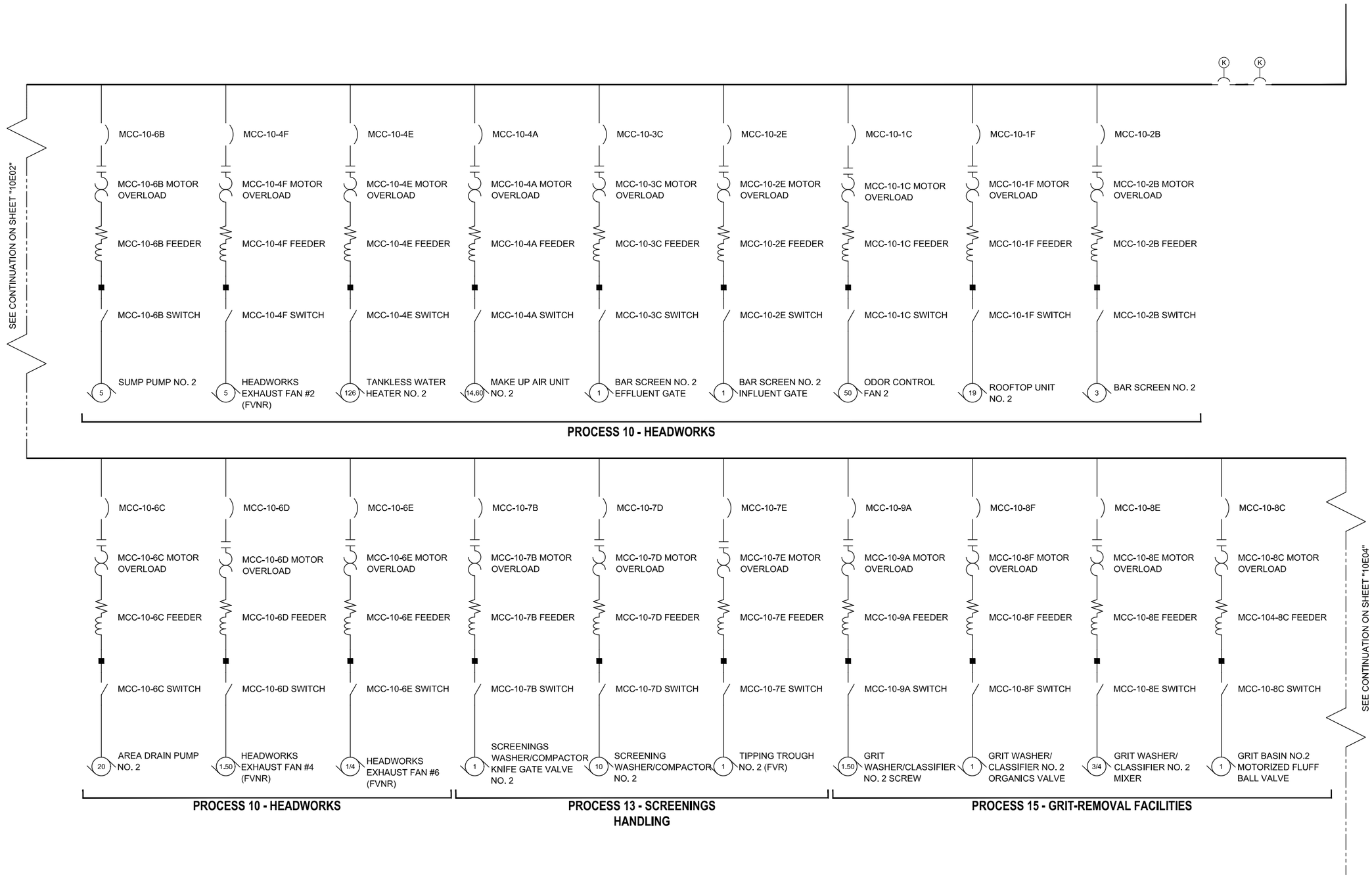
JOB NO. 203580-60000
DRAWING NO. 10E02
SHEET NO. 142 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

HEADWORKS - ONE - LINE DIAGRAM - 03

VERIFY SCALES
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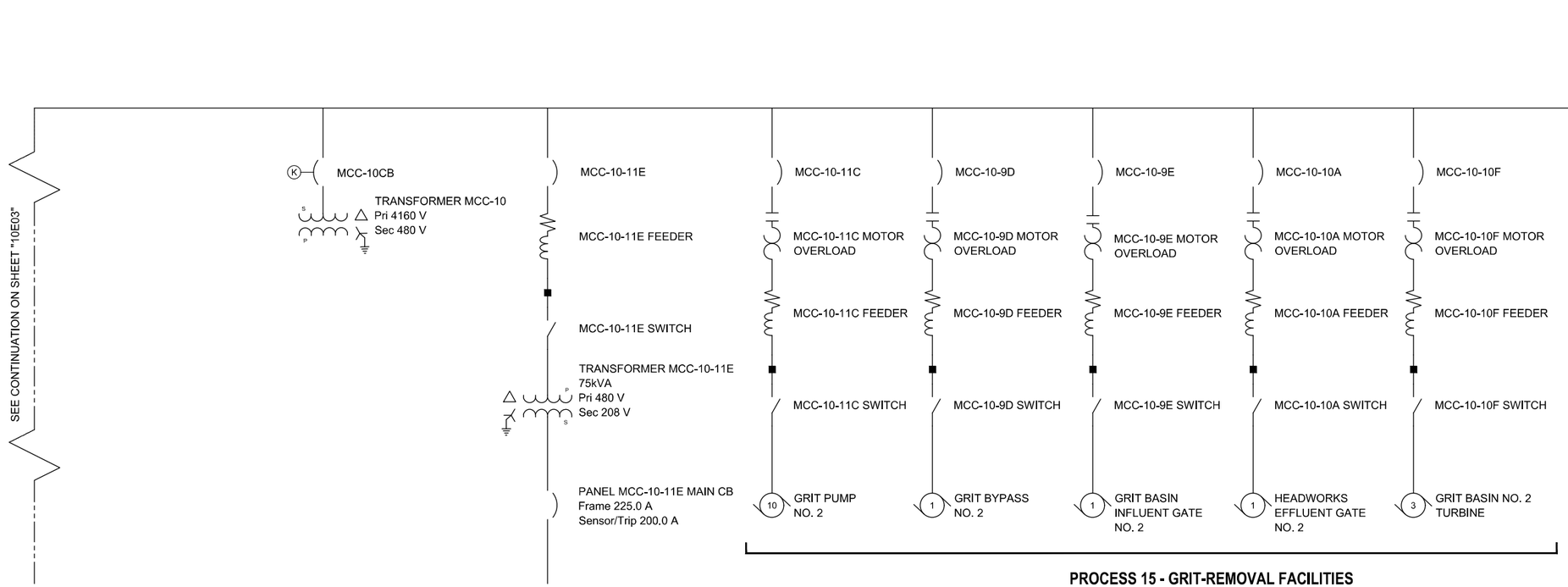
JOB NO. 203580-60000
DRAWING NO. 10E03
SHEET NO. 143 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



PROCESS 15 - GRIT-REMOVAL FACILITIES

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

HEADWORKS - ONE - LINE DIAGRAM - 04

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0 1"
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JOB NO. 203580-60000
DRAWING NO. 10E04
SHEET NO. 144 OF 251

PROJECT NO.

FILE NAME:

BLDG.20 - PRIMARY INFLUENT FLOW SPLITTER STRUCTURE

TRANSFORMER MCC-20
Pri 4160 V
Sec 480 V

MCC-20 CB

MCC-20
480.0 V
600.0 A

MCC-20-3F	MCC-20-3D	MCC-20-3C	MCC-20-3A	MCC-20-2E	MCC-20-2C	MCC-20-2A	MCC-20-1E	MCC-20-1C	MCC-20-1A
MCC-20-3F MOTOR OVERLOAD	MCC-20-3D MOTOR OVERLOAD	MCC-20-3C MOTOR OVERLOAD	MCC-20-3A MOTOR OVERLOAD	MCC-20-2E MOTOR OVERLOAD	MCC-20-2C MOTOR OVERLOAD	MCC-20-2A MOTOR OVERLOAD	MCC-20-1E MOTOR OVERLOAD	MCC-20-1C MOTOR OVERLOAD	MCC-20-1A MOTOR OVERLOAD
MCC-20-3F FEEDER	MCC-20-3D FEEDER	MCC-20-3C FEEDER	MCC-20-3A FEEDER	MCC-20-2E FEEDER	MCC-20-2C FEEDER	MCC-20-2A FEEDER	MCC-20-1E FEEDER	MCC-20-1C FEEDER	MCC-20-1A FEEDER
MCC-20-3F SWITCH	MCC-20-3D SWITCH	MCC-20-3C SWITCH	MCC-20-3A SWITCH	MCC-20-2E SWITCH	MCC-20-2C SWITCH	MCC-20-2A SWITCH	MCC-20-1E SWITCH	MCC-20-1C SWITCH	MCC-20-1A SWITCH
5 SLUICE GATE NO. 3	5 SLUICE GATE NO. 1 (EXISTING)	5 GATE VALVE NO. 3	5 GATE VALVE NO. 1 (EXISTING)	1/2 CROSS COLLECTOR NO. 5	1/2 CROSS COLLECTOR NO. 3 (EXISTING)	1/2 CROSS COLLECTOR NO. 1 (EXISTING)	3/4 MAIN COLLECTOR NO. 5	3/4 MAIN COLLECTOR NO. 3 (EXISTING)	3/4 MAIN COLLECTOR NO. 1 (EXISTING)

PROCESS 21 - PRIMARY CLARIFIERS

MCC-20-4B	MCC-20-4D	MCC-20-4F	MCC-20-5B	MCC-20-5C	MCC-20-5E	MCC-20-5F	MCC-20-6B	MCC-20-6D	MCC-20-6F
MCC-20-4B MOTOR OVERLOAD	MCC-20-4D MOTOR OVERLOAD	MCC-20-4F MOTOR OVERLOAD	MCC-20-5B MOTOR OVERLOAD	MCC-20-5C MOTOR OVERLOAD	MCC-20-5E MOTOR OVERLOAD	MCC-20-5F MOTOR OVERLOAD	MCC-20-6B MOTOR OVERLOAD	MCC-20-6D MOTOR OVERLOAD	MCC-20-6F MOTOR OVERLOAD
MCC-20-4B FEEDER	MCC-20-4D FEEDER	MCC-20-4F FEEDER	MCC-20-5B FEEDER	MCC-20-5C FEEDER	MCC-20-5E FEEDER	MCC-204-5F FEEDER	MCC-204-6B FEEDER	MCC-204-6D FEEDER	MCC-204-6F FEEDER
MCC-20-4B SWITCH	MCC-20-4D SWITCH	MCC-20-4F SWITCH	MCC-20-5B SWITCH	MCC-20-5CSWITCH	MCC-20-5E SWITCH	MCC-20-5F SWITCH	MCC-20-6B SWITCH	MCC-20-6D SWITCH	MCC-20-6F SWITCH
30 SOLIDS PUMP NO. 1 (EXISTING)	30 SOLIDS PUMP NO. 3 (EXISTING)	30 SOLIDS PUMP NO. 5	30 SOLIDS PUMP NO. 7	25 SCUM PUMP NO. 1 (EXISTING)	25 SCUM PUMP NO. 3	1 GRAVITY THICKENER MECHANISM 1	5 PRIMARY SLUDGE SCREEN 1	20 THICKENED PRIMARY SLUDGE PUMP 1	5 GRAVITY THICKENER SCUM PUMP 1

SEE CONTINUATION ON SHEET "20E02"

PROCESS 22 - PRIMARY SLUDGE PUMPING

PROCESS 23 - PRIMARY SCUM PUMPING

PROCESS 24 - PRIMARY SLUDGE HANDLING & THICKENING

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DESIGNED W. FLETCHER
DRAWN A. CHARDE
CHECKED J. BREHM
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

PRIMARY CLARIFIERS
ONE - LINE DIAGRAM - 01

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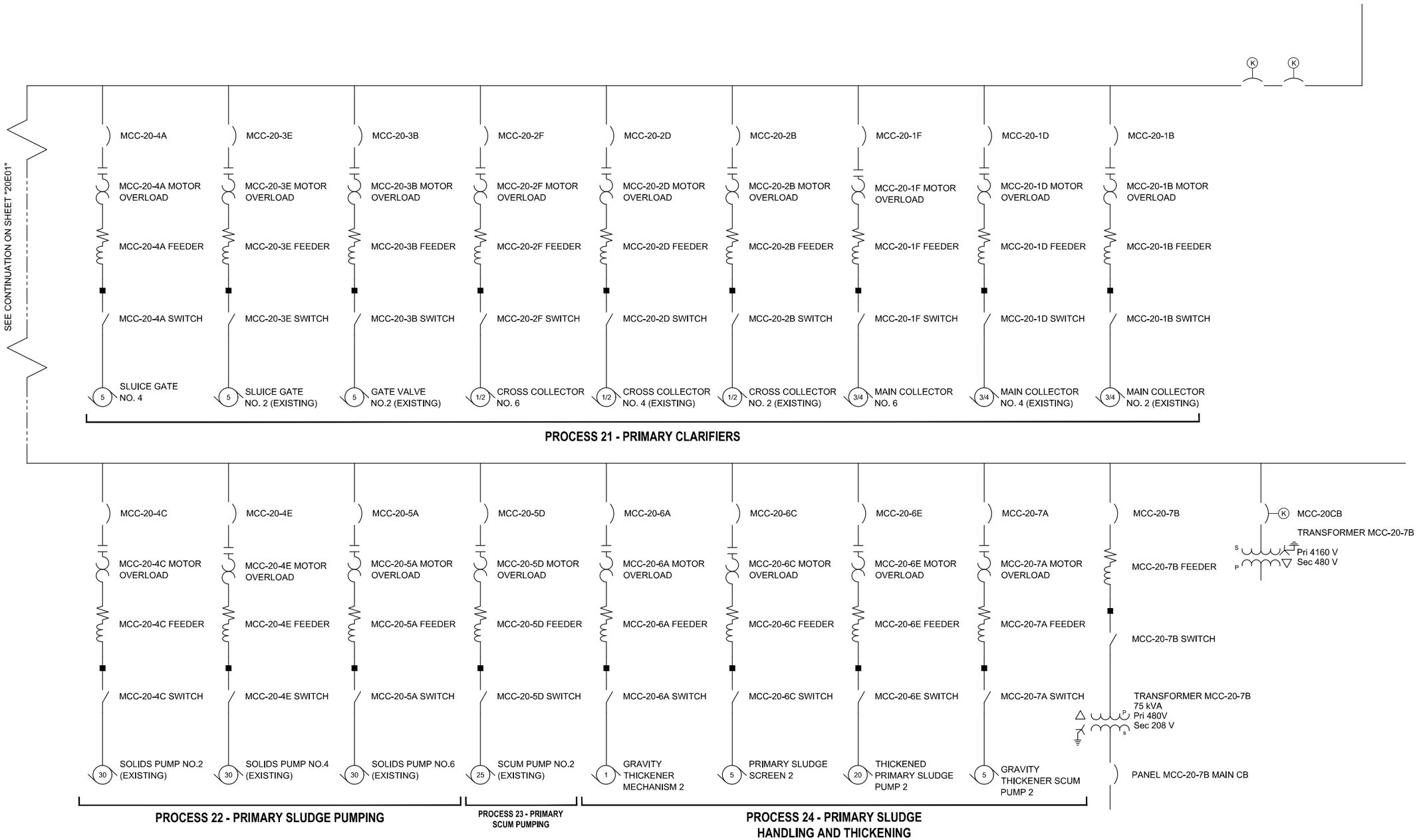
JOB NO. 203580-60000
DRAWING NO. 20E01
SHEET NO. 145 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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PRIMARY CLARIFIERS
ONE - LINE DIAGRAM - 02

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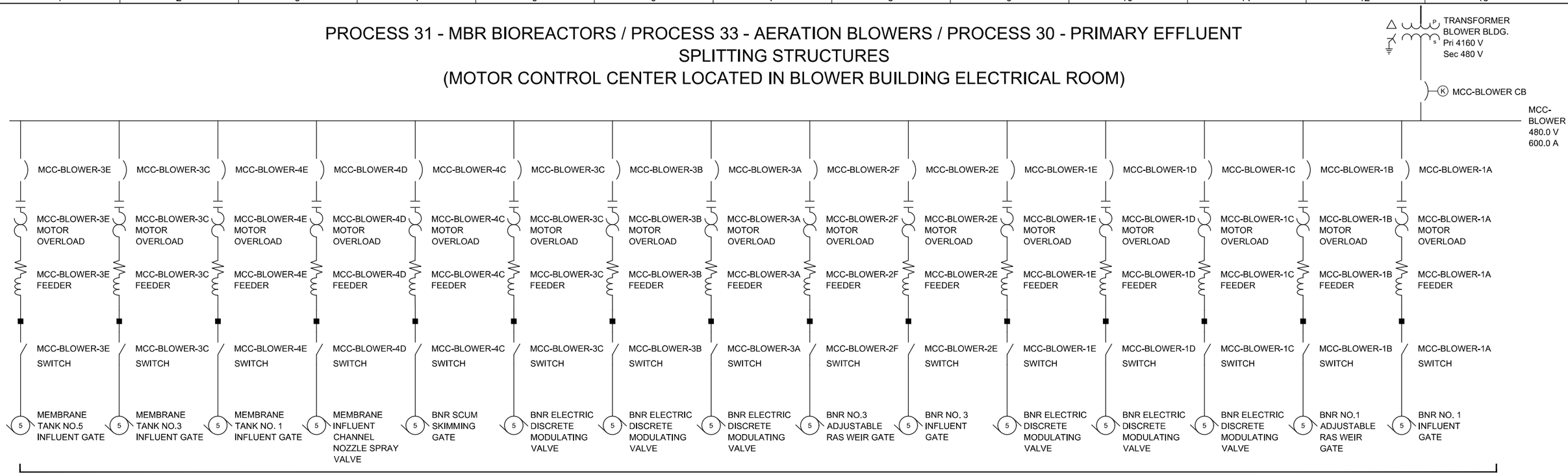
JOB NO. 203580-60000
DRAWING NO. 20E02
SHEET NO. 146 OF 251

LAST SAVED BY:

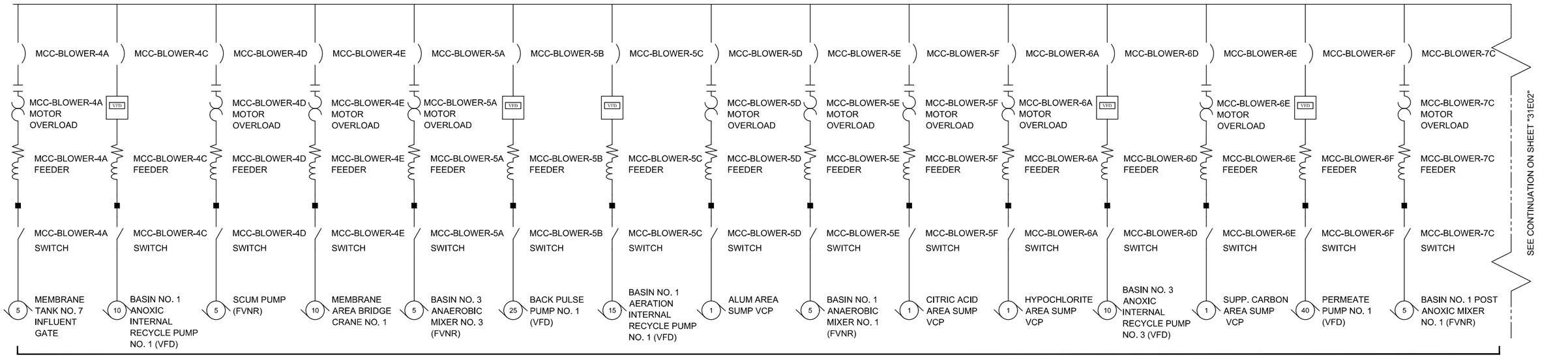
PROJECT NO.

FILE NAME:

PROCESS 31 - MBR BIOREACTORS / PROCESS 33 - AERATION BLOWERS / PROCESS 30 - PRIMARY EFFLUENT SPLITTING STRUCTURES
(MOTOR CONTROL CENTER LOCATED IN BLOWER BUILDING ELECTRICAL ROOM)



PROCESS 31 - MBR BIOREACTORS



PROCESS 31 - MBR BIOREACTORS

REV	DATE	BY	DESCRIPTION

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ELECTRICAL
MBR BIOREACTORS
ONE - LINE DIAGRAM - 01

VERIFY SCALES
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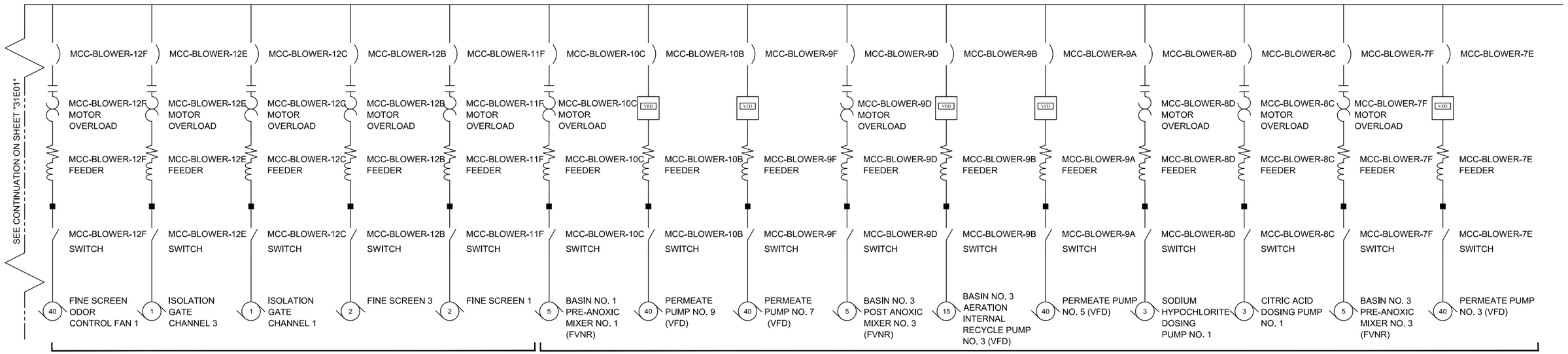
JOB NO. 203580-60000
DRAWING NO. 31E01
SHEET NO. 147 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ELECTRICAL
MBR BIOREACTORS
ONE - LINE DIAGRAM - 02

VERIFY SCALES
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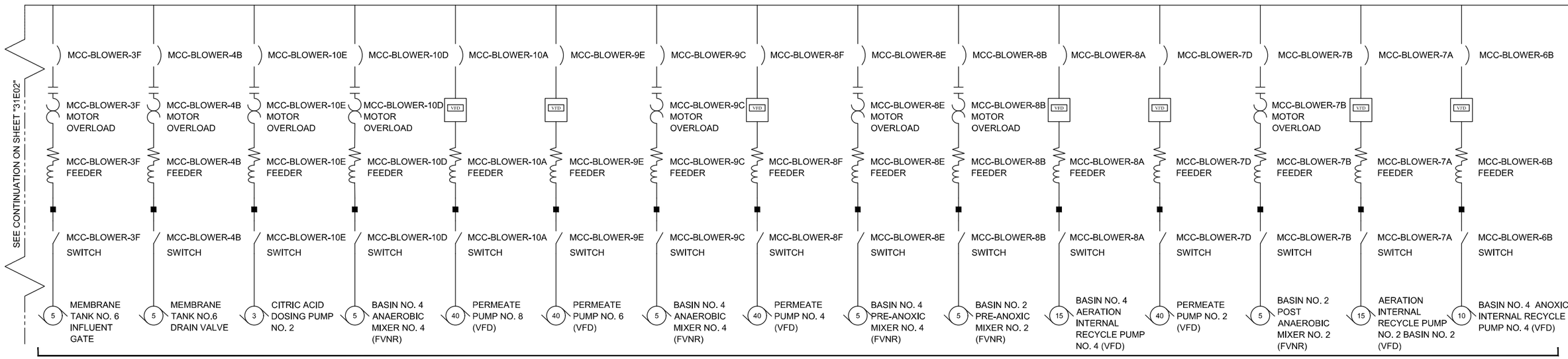
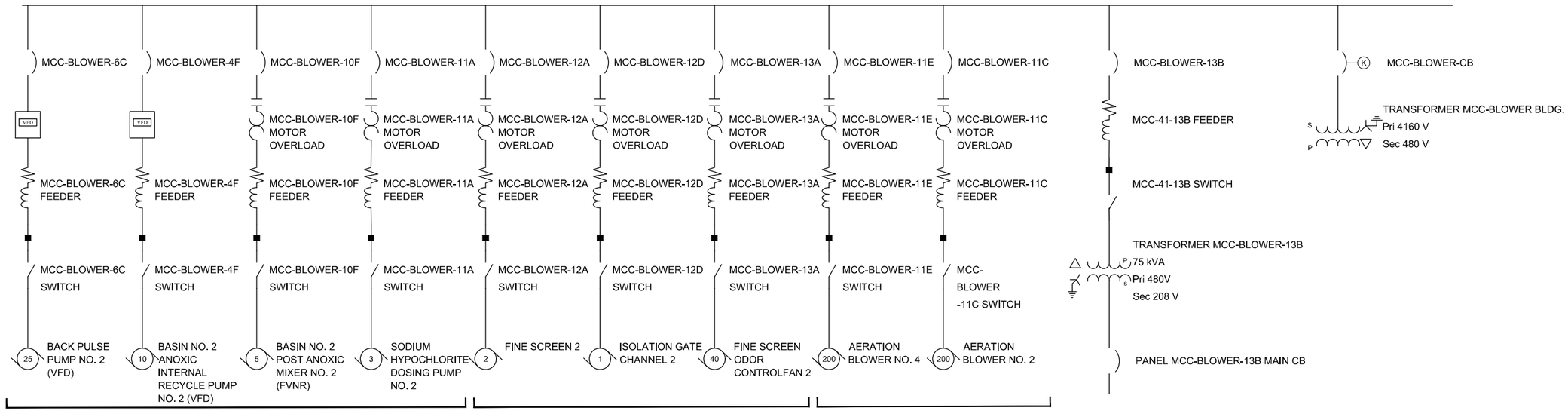
JOB NO. 203580-60000
DRAWING NO. 31E02
SHEET NO. 148 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:



PROCESS 31 - MBR BIOREACTORS



PROCESS 31 - MBR BIOREACTORS | **PROCESS 30 - PRIMARY EFFLUENT SPLITTING STRUCTURES** | **PROCESS 33 - AERATION BLOWERS**

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ELECTRICAL
MBR BIOREACTORS
ONE - LINE DIAGRAM - 03

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JOB NO. 203580-60000
DRAWING NO. 31E03
SHEET NO. 149 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:

TRANSFORMER
MCC-MEMB
Pri 4160V
Sec 480 V

MCC-MEMBCB

MCC-MEMB
480.0 V
600.0 A

MCC-MEMB-4D	MCC-MEMB-4F	MCC-MEMB-4C	MCC-MEMB-4B	MCC-MEMB-3E	MCC-MEMB-3D	MCC-MEMB-3C	MCC-MEMB-3B	MCC-MEMB-2F	MCC-MEMB-2E	MCC-MEMB-2C	MCC-MEMB-1F	MCC-MEMB-1E	MCC-MEMB-1C	MCC-MEMB-1A
MCC-MEMB-4D OVERLOAD	MCC-MEMB-4F OVERLOAD	MCC-MEMB-4C MOTOR OVERLOAD	MCC-MEMB-4B MOTOR OVERLOAD	MCC-MEMB-3E MOTOR OVERLOAD	MCC-MEMB-3D MOTOR OVERLOAD	MCC-MEMB-3C MOTOR OVERLOAD	MCC-MEMB-3B MOTOR OVERLOAD	VDF	VDF	VDF	VDF	VDF	VDF	VDF
MCC-MEMB-4D FEEDER	MCC-MEMB-4F FEEDER	MCC-MEMB-4C FEEDER	MCC-MEMB-4B FEEDER	MCC-MEMB-3E FEEDER	MCC-MEMB-3D FEEDER	MCC-MEMB-3C FEEDER	MCC-MEMB-3B FEEDER	MCC-MEMB-2F FEEDER	MCC-MEMB-2E FEEDER	MCC-MEMB-2C FEEDER	MCC-MEMB-1F FEEDER	MCC-MEMB-1E FEEDER	MCC-MEMB-1C FEEDER	MCC-MEMB-1A FEEDER
MCC-MEMB-4D SWITCH	MCC-MEMB-4F SWITCH	MCC-MEMB-4C SWITCH	MCC-MEMB-4B SWITCH	MCC-MEMB-3E SWITCH	MCC-MEMB-3D SWITCH	MCC-MEMB-3C SWITCH	MCC-MEMB-3B SWITCH	MCC-MEMB-2F SWITCH	MCC-MEMB-2E SWITCH	MCC-MEMB-2C SWITCH	MCC-MEMB-1F SWITCH	MCC-MEMB-1E SWITCH	MCC-MEMB-1C SWITCH	MCC-MEMB-1A SWITCH
2 UV REACTOR 1 HYDRAULIC SYSTEM CTR.	2 UV REACTOR 3 HYDRAULIC SYSTEM CTR.	1 UV REACTOR 3 OUTLET VALVE	1 UV REACTOR 3 INLET VALVE	1 UV REACTOR 1 OUTLET VALVE	1 UV REACTOR 1 INLET VALVE	2 UV OUTLET HEADER VALVE	2 UV INLET HEADER VALVE	3 WAS PUMP NO.3 (VFD)	100 RAS PUMP NO.1 (VFD)	100 RAS PUMP NO.3 (VFD)	100 RAS PUMP NO.5 (VFD)	3 WAS PUMP NO.1 (VFD)	150 AIR SCOUR BLOWER NO.3 (VFD)	150 AIR SCOUR BLOWER NO.1 (VFD)

PROCESS 43 - DISINFECTION | **PROCESS 35 - RAS & WAS PUMPING** | **PROCESS 33 - AERATION**

MCC-MEMB-5A	MCC-MEMB-5C	MCC-MEMB-1D	MCC-MEMB-1B	MCC-MEMB-3F	MCC-MEMB-4A	MCC-MEMB-4E	MCC-MEMB-5B	MCC-MEMB-3A	MCC-MEMB-2D	MCC-MEMB-2B	MCC-MEMB-2A	MCC-MEMB-5D
MCC-MEMB-5A OVERLOAD	MCC-MEMB-5C OVERLOAD	VDF	VDF	MCC-MEMB-3F MOTOR OVERLOAD	MCC-MEMB-4A MOTOR OVERLOAD	MCC-MEMB-4E OVERLOAD	MCC-MEMB-5B OVERLOAD	VDF	VDF	VDF	VDF	MCC-MEMB-5D FEEDER
MCC-MEMB-5A FEEDER	MCC-MEMB-5C FEEDER	MCC-MEMB-1D FEEDER	MCC-MEMB-1B FEEDER	MCC-MEMB-3F FEEDER	MCC-MEMB-4A FEEDER	MCC-MEMB-4E FEEDER	MCC-MEMB-5B FEEDER	MCC-MEMB-3A FEEDER	MCC-MEMB-2D FEEDER	MCC-MEMB-2B FEEDER	MCC-MEMB-2A FEEDER	MCC-MEMB-5D SWITCH
MCC-MEMB-5A SWITCH	MCC-MEMB-5C SWITCH	MCC-MEMB-1D SWITCH	MCC-MEMB-1B SWITCH	MCC-MEMB-3F SWITCH	MCC-MEMB-4A SWITCH	MCC-MEMB-4E SWITCH	MCC-MEMB-5B SWITCH	MCC-MEMB-3A SWITCH	MCC-MEMB-2D SWITCH	MCC-MEMB-2B SWITCH	MCC-MEMB-2A SWITCH	TRANSFORMER MCC-MEMB-5D 75 kVA Pri 480V Sec 208 V
42,6 UV REACTOR 1 POWER DIST. CENTER	42,6 UV REACTOR 3 POWER DIST. CENTER	150 AIR SCOUR BLOWER NO.4 (VFD)	150 AIR SCOUR BLOWER NO.2 (VFD)	1 UV REACTOR 2 INLET VALVE	1 UV REACTOR 2 OUTLET VALVE	2 UV REACTOR 2 HYDRAULIC SYSTEM CTR.	42,6 UV REACTOR 2 POWER DIST. CENTER	100 RAS PUMP NO.6 (VFD)	100 RAS PUMP NO.2 (VFD)	3 WAS PUMP NO.2 (VFD)	100 RAS PUMP NO.4 (VFD)	PANEL MCC-MEMB-5D MAIN CB Frame 225.0 A Sensor / Trip 200.0 A

MCC-MEMBCB

TRANSFORMER
MCC-MEMB-5D
Pri 480V
Sec 208 V

PROCESS 43 - DISINFECTION | **PROCESS 33 - AERATION** | **PROCESS 43 - DISINFECTION** | **PROCESS 35 - RAS & WAS PUMPING**

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION

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DESIGNED W. FLETCHER
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
ELECTRICAL
MEMBRANE BUILDING
ONE - LINE DIAGRAM

VERIFY SCALES
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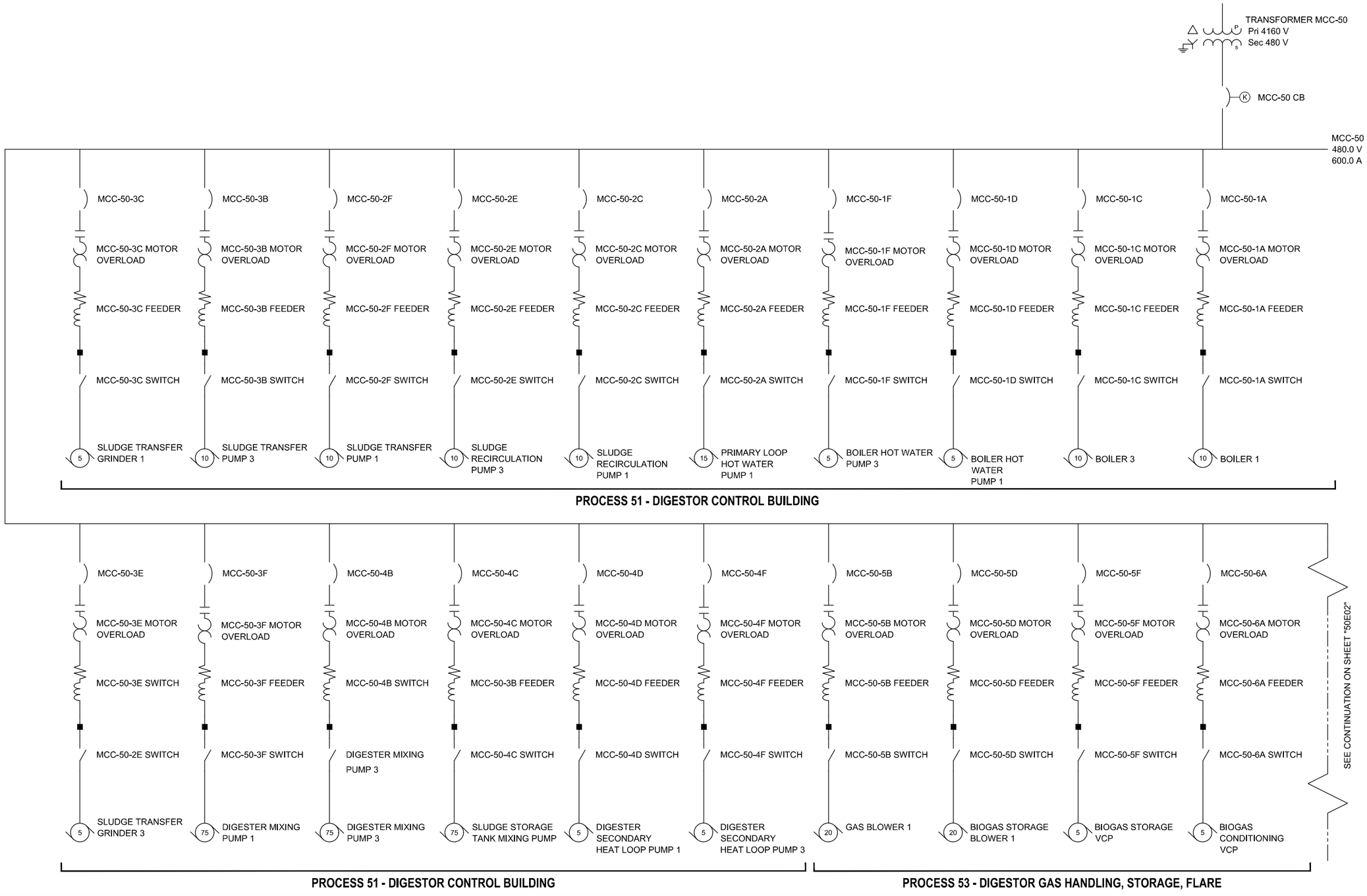
JOB NO. 203580-60000
DRAWING NO. 43E01
SHEET NO. 150 OF 251

PROJECT NO.
FILE NAME:

BLDG.50 - DIGESTION - DIGESTERS, SLUDGE STORAGE



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ELECTRICAL
BIOSOLIDS FACILITIES
ONE - LINE DIAGRAM - 01

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JOB NO. 203580-60000
DRAWING NO. 50E01
SHEET NO. 151 OF 251

LAST SAVED BY:
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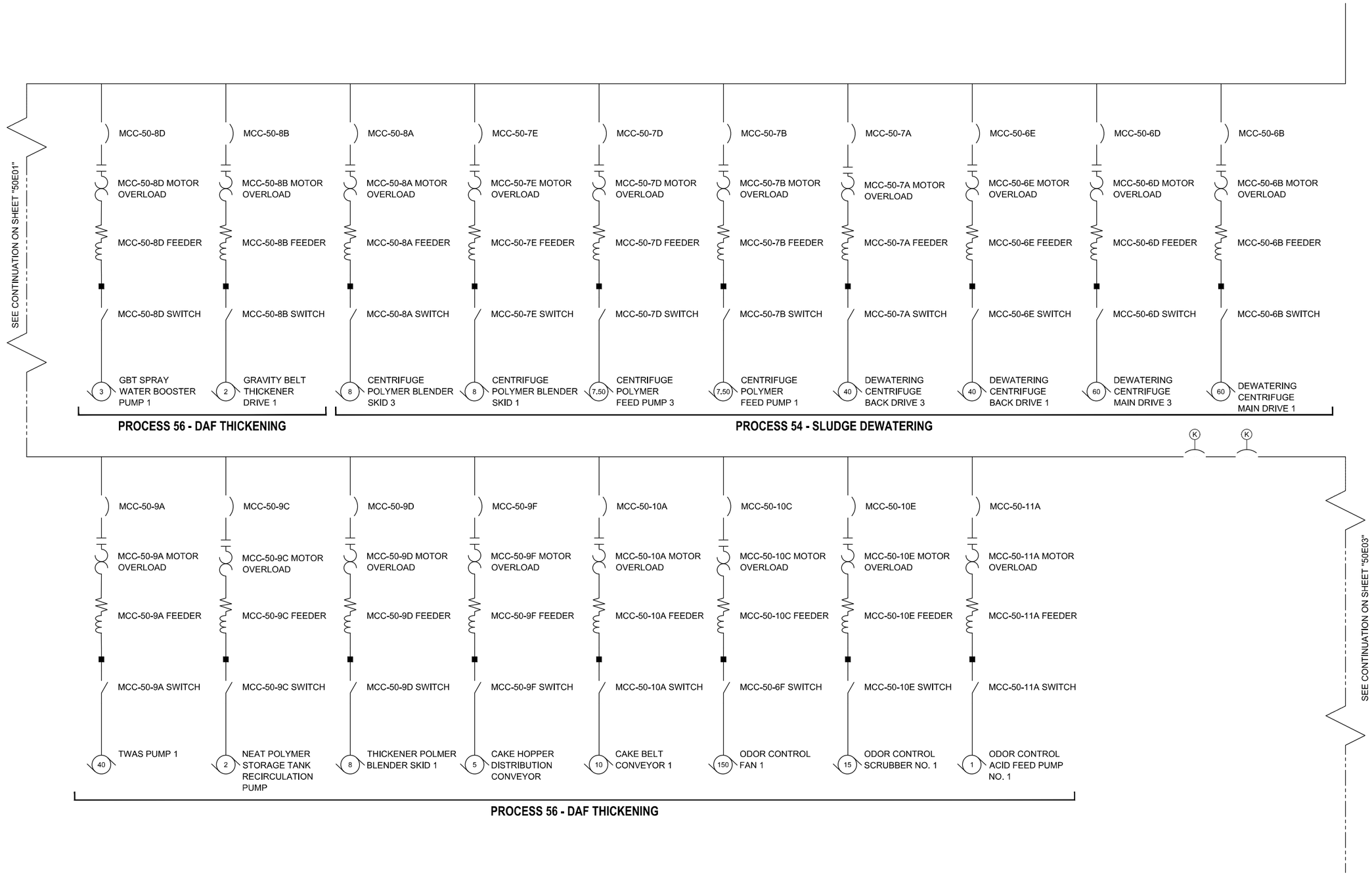

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

BIOSOLIDS FACILITIES ONE - LINE DIAGRAM - 02

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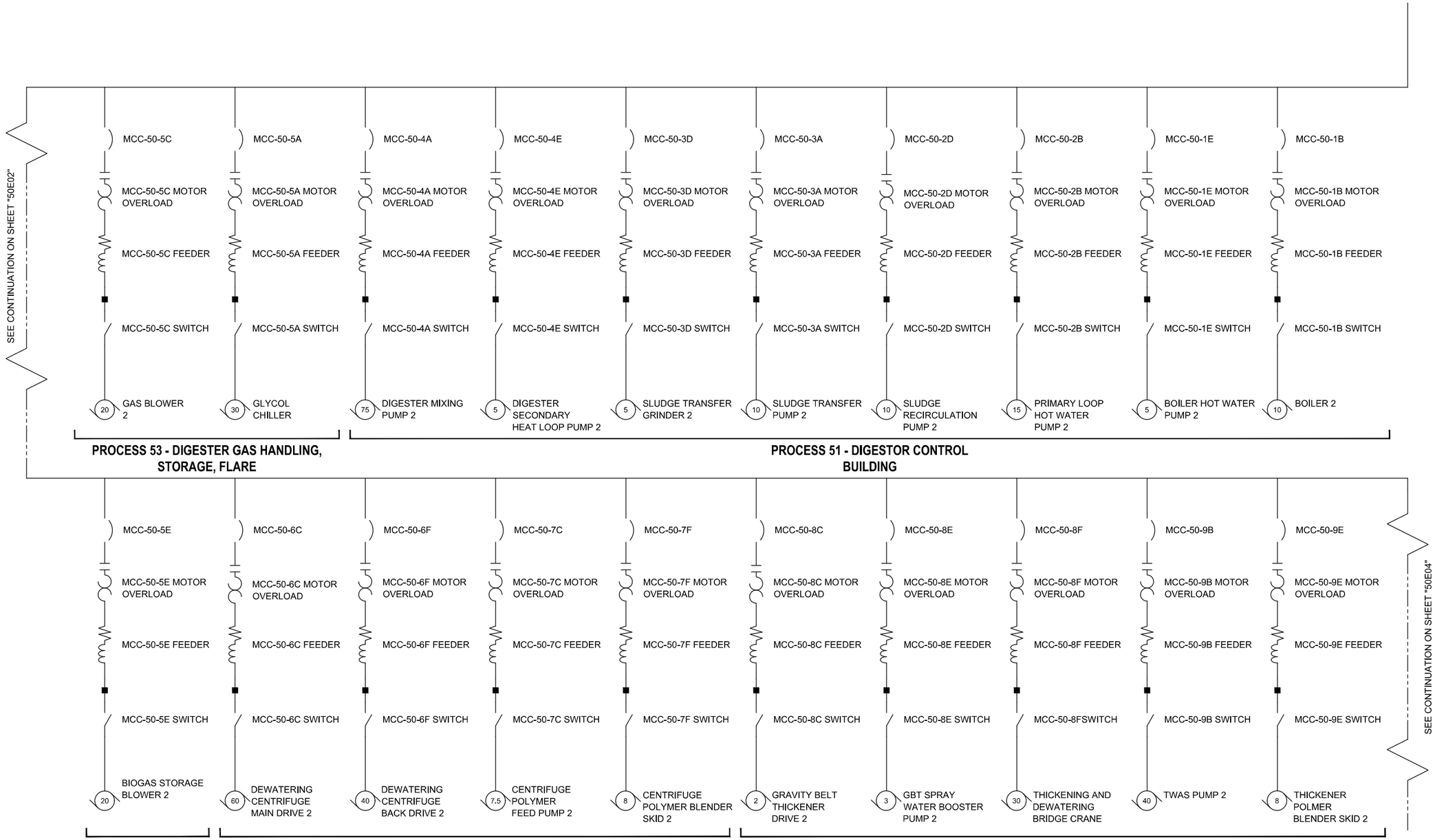
JOB NO. 203580-60000
DRAWING NO. 50E02
SHEET NO. 152 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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DRAWN A. CHARDE
CHECKED J. BREHM
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

BIOSOLIDS FACILITIES ONE - LINE DIAGRAM - 03

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 50E03
SHEET NO. 153 OF 251

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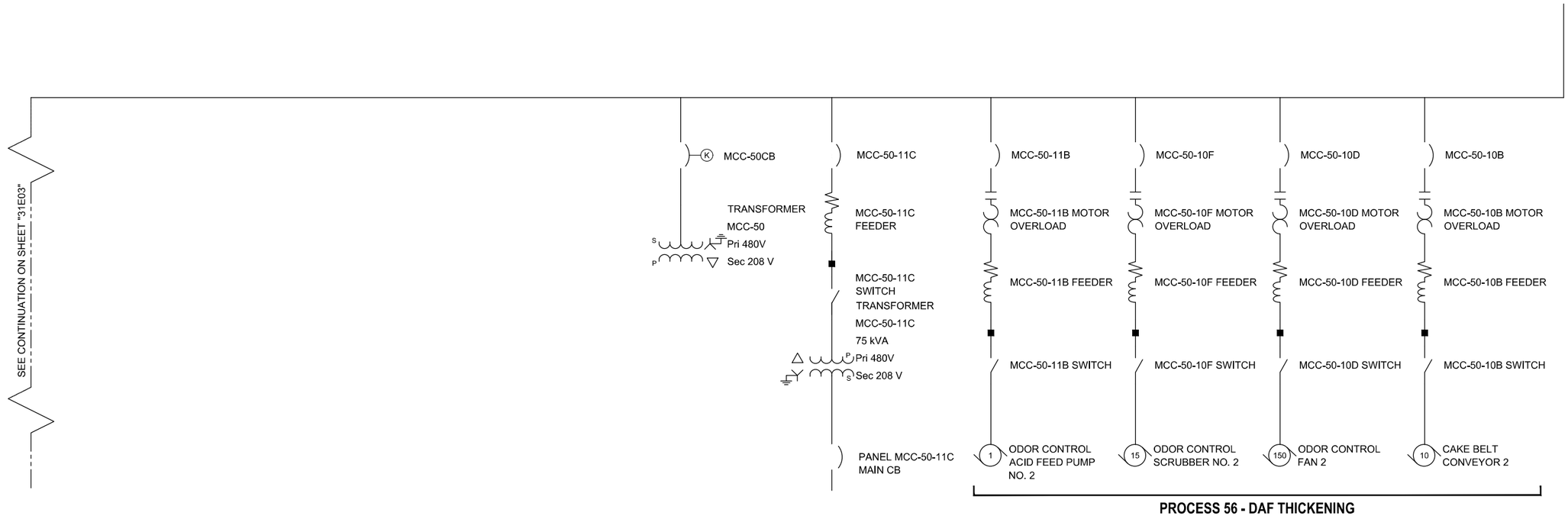
PROJECT NO.

FILE NAME:



PROCESS 56 - DAF THICKENING

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ELECTRICAL
BIOSOLIDS FACILITIES
ONE - LINE DIAGRAM - 04

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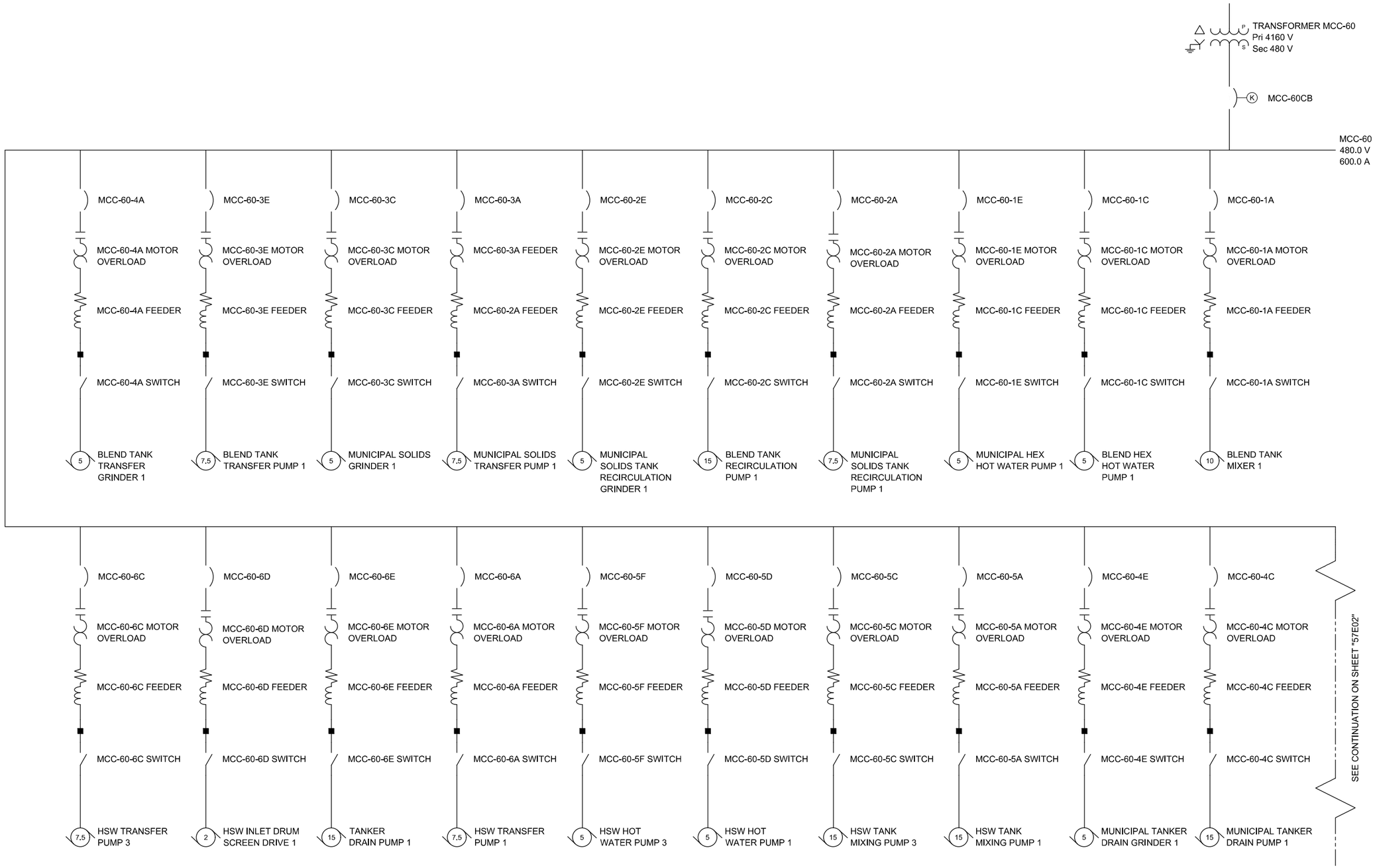
JOB NO. 203580-60000
DRAWING NO. 50E04
SHEET NO. 154 OF 251

PROJECT NO.
FILE NAME:

BLDG.57 - HSW AND SLUDGE RECEIVING STATIONS



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

HSW & MS RECEIVING STATIONS - ONE - LINE DIAGRAM - 01

VERIFY SCALES
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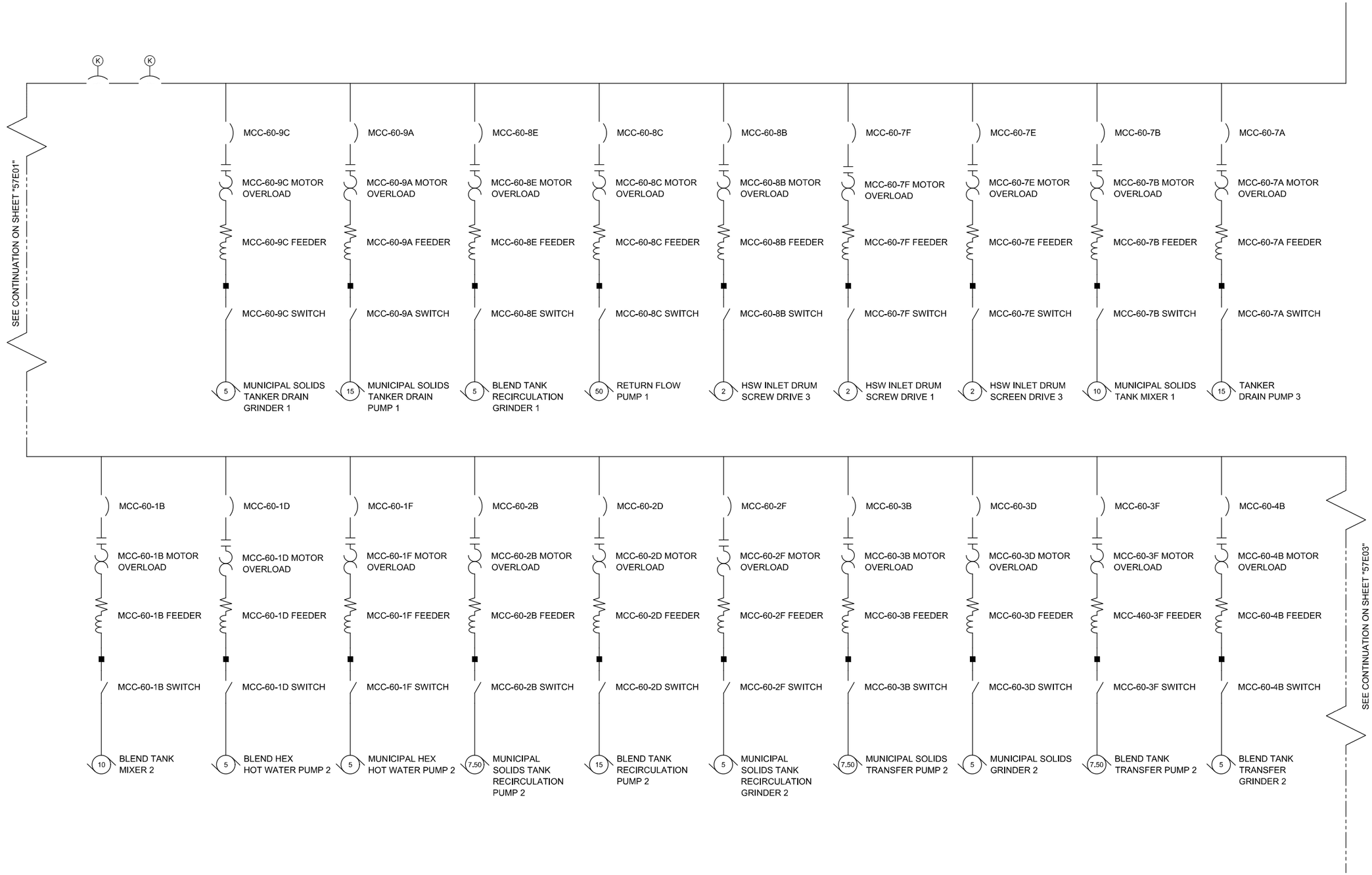
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57E01
SHEET NO. 155 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

HSW & MS RECEIVING STATIONS - ONE - LINE DIAGRAM - 02

VERIFY SCALES
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0 1"
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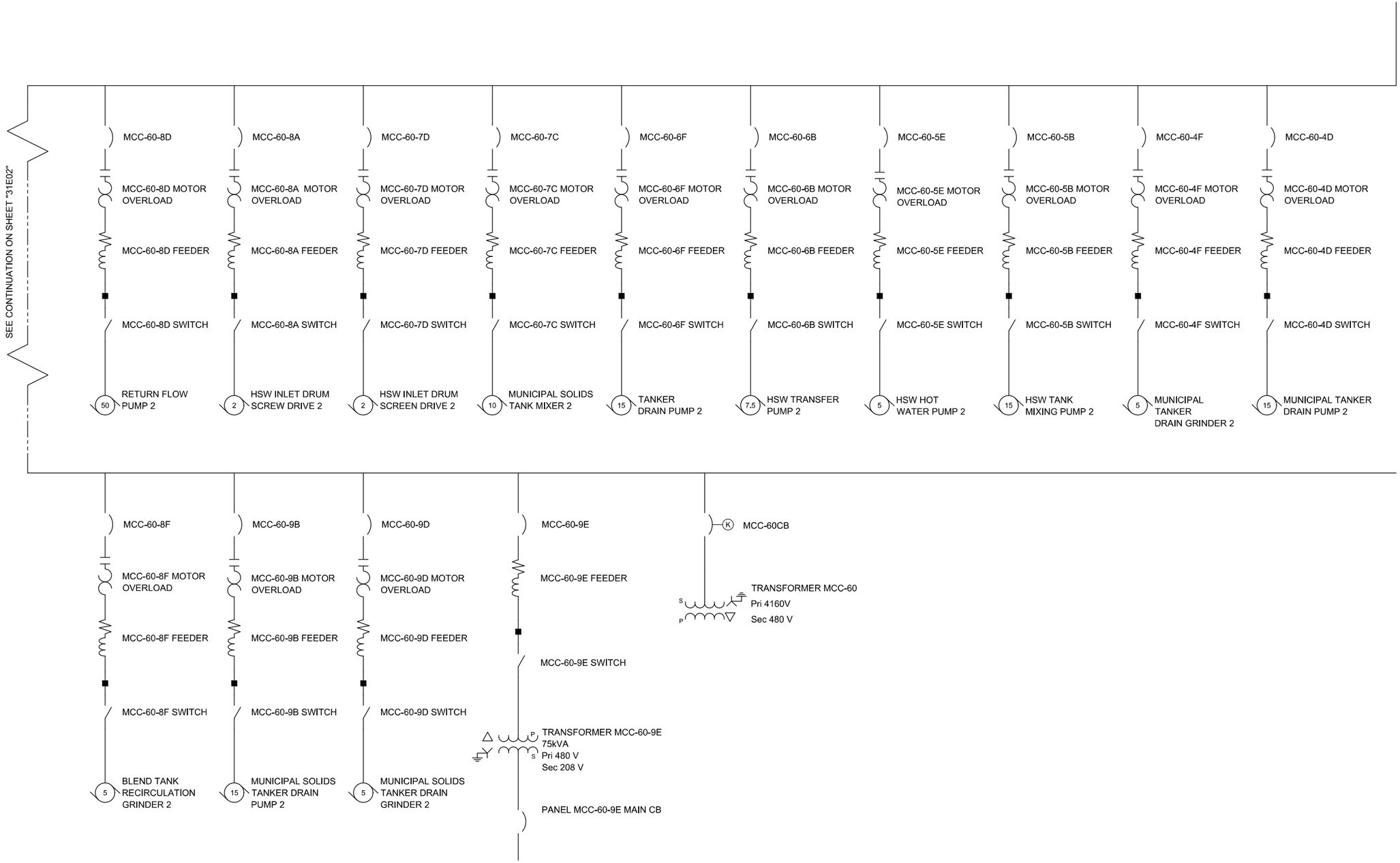
JOB NO. 203580-60000
DRAWING NO. 57E02
SHEET NO. 156 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

HSW & MS RECEIVING STATIONS - ONE - LINE DIAGRAM - 03

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 57E03
SHEET NO. 157 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

BLDG.58 - SLUDGE DRYING, SLUDGE BEDS, COMPOSTING



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ELECTRICAL

DRYER BUILDING
ONE - LINE DIAGRAM - 01

VERIFY SCALES
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0 1"
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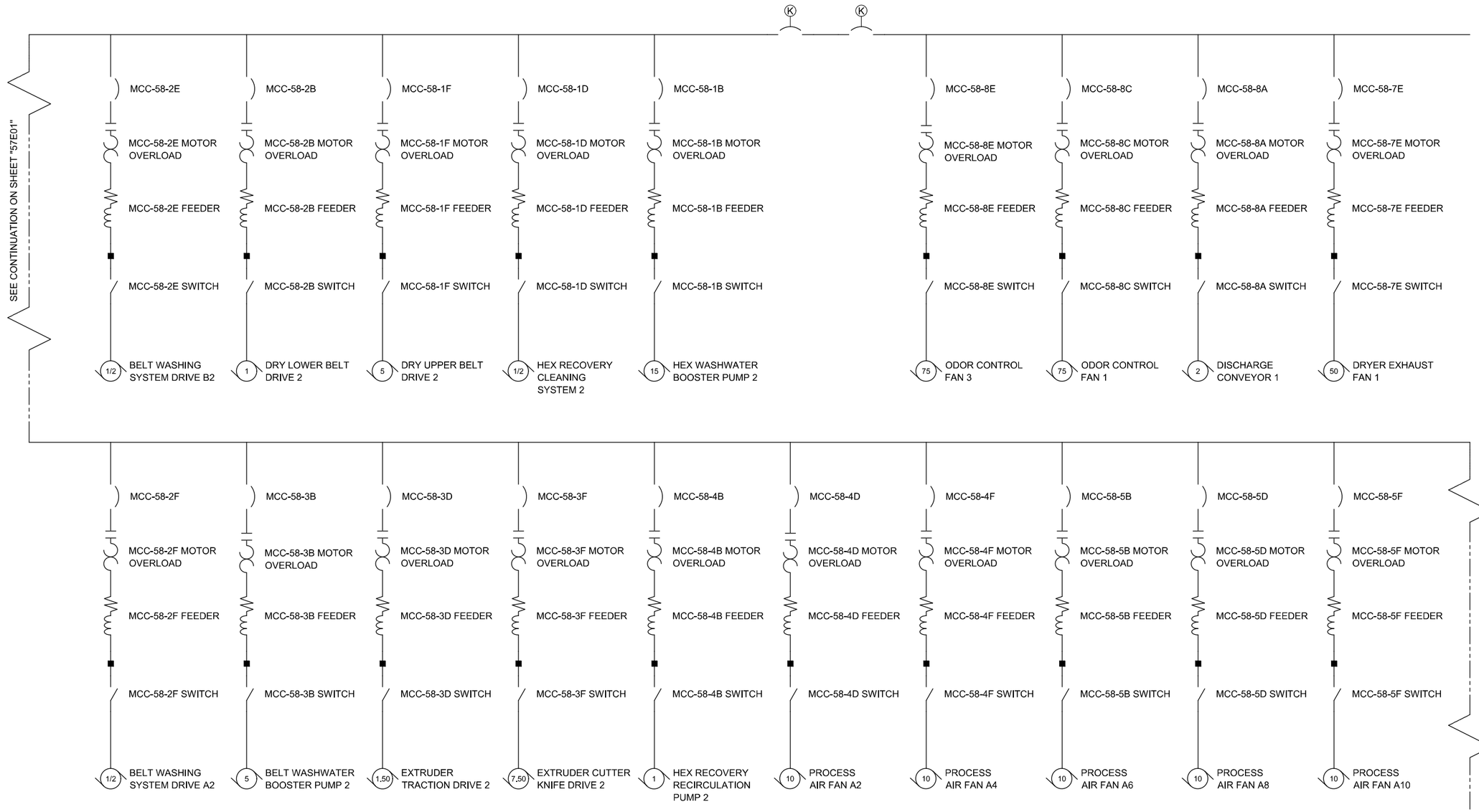
JOB NO. 203580-60000
DRAWING NO. 58E01
SHEET NO. 158 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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ELECTRICAL
DRYER BUILDING
ONE - LINE DIAGRAM - 02

VERIFY SCALES
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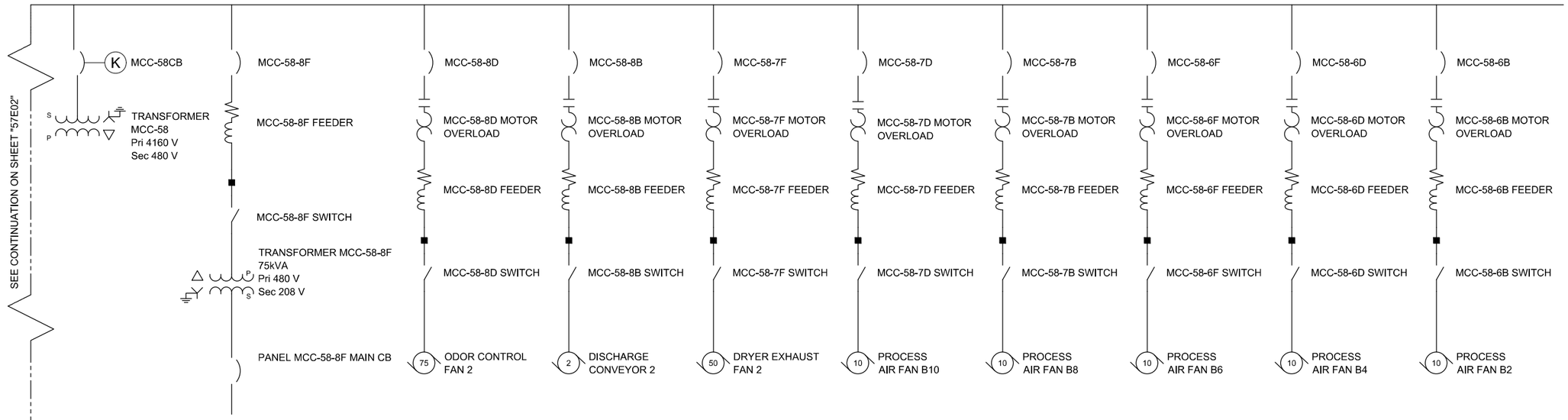
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 58E02
SHEET NO. 159 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

ELECTRICAL

DRYER BUILDING
ONE - LINE DIAGRAM - 03

VERIFY SCALES
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0 1"
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JOB NO. 203580-60000
DRAWING NO. 58E03
SHEET NO. 160 OF 251

LAST SAVED BY:

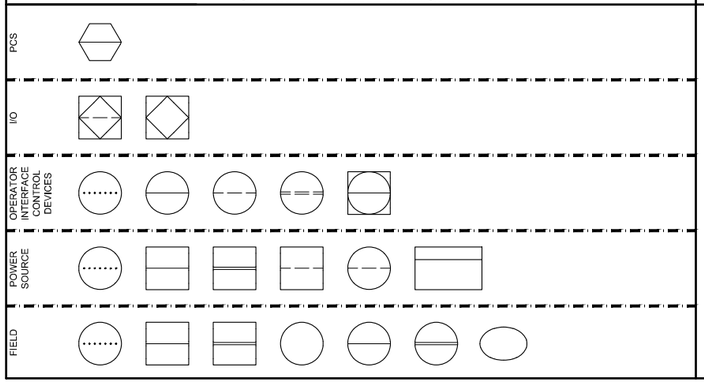
PROJECT NO.

FILE NAME:

SYMBOL	DRAWING VISIBLE FIELDS	FIELD - 1	FIELD - 2	FIELD - 3	FIELD - 4	FIELD - 5	FIELD - 6	FIELD - 7	FIELD - 8
HMI/SCADA SYSTEM OPERATOR INTERFACE TERMINAL	1 - TAG111 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - DESCRIPTION 6 - EXISTING/FUTURE	REFER ◇1 ◇2	REFER ◇3	ACTION ALARM SP - NUMERIC STATUS - SET POINT TREND	DESCRIPTION ◇2 ◇5	DESCRIPTION	E - EXISTING F - FUTURE		
HARDWIRED I/O POINT	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE 7 - IO TABLE	REFER ◇1 ◇2 ◇4	REFER ◇3	AI - ANALOG INPUT AO - ANALOG OUTPUT DI - DISCRETE INPUT DO - DISCRETE OUTPUT RTD - RTD INPUT	DESCRIPTION	PAC - PROGRAMMABLE AUTOMATION CONTROLLER NO. PLC - PROGRAMMABLE LOGIC CONTROLLER NO. RIO - REMOTE I/O VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
NETWORK / SOFT I/O	1 - TAG 2 - LOOP NUMBER 3 - PROTOCOL 4 - PANEL 5 - PLC 6 - EXISTING/FUTURE 7 - IO TABLE 8 - SWITCH/SEGMENT	REFER ◇1 ◇2	REFER ◇3	COMMUNICATION PROTOCOL CNET - CONTROLNET DNET - DEVICENET EIP - ETHERNET/IP FF - FOUNDATION FIELDBUS HART-IP - HART OVER ETHERNET MANF - MFR. PROPRIETARY MBRTU - MODBUS RTU MB+ - MODBUS PLUS MBTCP - MODBUS TCP DP - PROFIBUS DP PA - PROFIBUS PA PNET - PROFINET SNMP - SNMPv3 HTTP - WEB SERVER (TCP/IP)	DESCRIPTION	PAC - PROGRAMMABLE AUTOMATION CONTROLLER NO. PLC - PROGRAMMABLE LOGIC CONTROLLER NO. RIO - REMOTE I/O VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
LOCAL OPERATOR INTERFACE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE	REFER ◇1 ◇2	REFER ◇3	ACTION ALARM SP - NUMERIC STATUS - SET POINT TREND	DESCRIPTION	LOI - LOCAL OPERATOR INTERFACE NO. LCP - LOCAL CONTROL PANEL NO. PCM - PROCESS CONTROL MODULE NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
PILOT DEVICE OPERATOR INTERFACE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE	REFER ◇1 ◇2	REFER ◇3	AM - AUTO/MANUAL BYPASS - BY PASS ESD - EQUIPMENT SHUTDOWN HOA - HAND/OFF/AUTO LOR - LOCAL/OFF/REMOTE LOS - LOCK OUT STOP LS - LEAD/STANDBY LSR - LOCAL/STOP/REMOTE OC - OPEN/CLOSE OO - OFF/ON OSC - OPEN/STOP/CLOSE RST - RESET SEL - SELECT SPD - SPEED SS - START/STOP ST - STOP	DESCRIPTION ◇2 ◇5	LCP - LOCAL CONTROL PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. RVSS - REDUCED VOLTAGE SOLID STARTER NO. VCP - VENDOR CONTROL PANEL NO. VFD - VARIABLE FREQUENCY DRIVE NO.	E - EXISTING F - FUTURE		
POWER DEVICE PRIMARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - VOLTAGE-POLE 5 - LOCATION 6 - EXISTING/FUTURE	CB - CIRCUIT BREAKER DISC - DISCONNECT FU - FUSE	REFER ◇3	TM - THERMAL MAGNETIC CIRCUIT BREAKER	24VDC - 1P 24VDC - 2P 24VAC - 1P 48VDC - 2P 120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	DP - DISTRIBUTION PANEL NO. LCP - LOCAL CONTROL PANEL NO. LP - LIGHTING PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. PP - POWER PANEL NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
POWER DEVICE AUXILIARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - DESCRIPTION 4 - DESCRIPTION 5 - DESCRIPTION 6 - EXISTING/FUTURE	DISC - DISCONNECT	REFER ◇3	DESCRIPTION	DESCRIPTION	DESCRIPTION	E - EXISTING F - FUTURE		
POWER DEVICE PRIMARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - VOLTAGE-POLE 5 - LOCATION 6 - EXISTING/FUTURE	CB - CIRCUIT BREAKER FU - FUSE	REFER ◇3	MCP - MOTOR CIRCUIT PROTECTOR SS - SOLID STATE CIRCUIT BREAKER TM - THERMAL MAGNETIC CIRCUIT BREAKER	24VDC - 1P 24VDC - 2P 24VAC - 1P 48VDC - 2P 120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	DP - DISTRIBUTION PANEL NO. LCP - LOCAL CONTROL PANEL NO. LP - LIGHTING PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. PP - POWER PANEL NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT STARTER / DRIVE CUBICLE / CABINET	1 - TAG 2 - LOOP NUMBER 3 - TYPE 4 - VOLTAGE-POLE 5 - POWER SOURCE 6 - EXISTING/FUTURE	MS - MOTOR STARTER RVAT - REDUCED VOLTAGE AUTO TRANSFORMER STARTER RVSS - REDUCED VOLTAGE SOLID STATE STARTER VFD - VARIABLE FREQUENCY DRIVE	REFER ◇3	FVNR - FULL VOLTAGE NON-REVERSING STARTER FVR - FULL VOLTAGE REVERSING STARTER PWS - PART-WINDING STARTER RVAT - REDUCED VOLTAGE AUTO RVSS - REDUCED VOLTAGE SOLID STATE STARTER TS1W - TWO SPEED SINGLE WINDING TS2W - TWO SPEED TWO WINDINGS VFD - VARIABLE FREQUENCY DRIVE	120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	LCP - LOCAL CONTROL PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		

SYMBOL	DRAWING VISIBLE FIELDS	FIELD - 1	FIELD - 2	FIELD - 3	FIELD - 4	FIELD - 5	FIELD - 6	FIELD - 7	FIELD - 8
INSTRUMENT PRIMARY ELEMENT	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER ◇1	REFER ◇3	DESCRIPTION ◇5	DESCRIPTION ◇6 ◇7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT PRIMARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - DESCRIPTION 6 - EXISTING/FUTURE	REFER ◇1	REFER ◇3	DESCRIPTION ◇5	DESCRIPTION ◇6 ◇7	DESCRIPTION INT - INTEGRAL REM - REMOTE	E - EXISTING F - FUTURE		OUT - OUTDOOR
INSTRUMENT/ CONTROL ELEMENT AUXILIARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER ◇1	REFER ◇3	DESCRIPTION	DESCRIPTION ◇6 ◇7	DESCRIPTION	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT PRIMARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER ◇1 ◇3 XR - PROTECTION RELAY CR - CONTROL RELAY XR - INTERPOSING RELAY	REFER ◇3	DESCRIPTION	DESCRIPTION ◇6 ◇7	DESCRIPTION	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT AUXILIARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER ◇1 ◇3 XR - PROTECTION RELAY CR - CONTROL RELAY XR - INTERPOSING RELAY	REFER ◇3	DESCRIPTION	DESCRIPTION ◇6 ◇7	DESCRIPTION	E - EXISTING F - FUTURE		
FIELD EQUIPMENT NON-POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION/SIZE 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER ◇1	REFER ◇3	DESCRIPTION	DESCRIPTION ◇6 ◇7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT PRIMARY FUNCTION POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER ◇1	REFER ◇3	DESCRIPTION	DESCRIPTION ◇6 ◇7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT AUXILIARY FUNCTION POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	MWH - MOTOR WINDING HEATER TSH - TEMPERATURE SWITCH XSH - TORQUE SWITCH	REFER ◇3	DESCRIPTION	DESCRIPTION ◇6 ◇7	DESCRIPTION	E - EXISTING F - FUTURE		

INSTRUMENT BUBBLE LOCATIONS



NOTES

1. INSTRUMENT TAG IDENTIFICATION LETTERS TABLE
2. OPERATOR PILOT DEVICE LEGEND
3. EQUIPMENT TAGGING TABLE
4. I/O TYPE DESIGNATIONS
5. INSTRUMENT TYPE DESIGNATIONS TABLE
6. FURNISHED BY:
   - FBO FURNISHED BY OWNER
   - FBV FURNISHED BY VENDOR
7. PROVIDED BY:
   - PBO PROVIDED BY OWNER
   - PBV PROVIDED BY VENDOR

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DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

SYMBOLS AND ABBREVIATIONS 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00GN01
SHEET NO. 161 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

INSTRUMENT TAG IDENTIFICATION LETTERS

MEASURED VARIABLE / INSTRUMENTATION FUNCTION		ELEMENT	TRANSMITTER	INDICATING TRANSMITTER	CONVERTER TRANSDUCER, RELAY SPECIAL DEVICES	INDICATOR	RECORDER	CONTROL/COMMAND	INDICATING CONTROLLER	RECORDING CONTROLLER	SWITCH	SWITCH LOW LOW	SWITCH LOW	SWITCH HIGH	SWITCH HIGH HIGH	SWITCH COMBINATION HIGH LOW	ACTION	ALARM LOW LOW	ALARM LOW	ALARM HIGH	ALARM HIGH HIGH	TOTALIZE INDICATOR TRANSMITTER	VALVE	GAUGE	LIGHT	SPEED SETTING
A	ANALYSIS	AE	AT	AIT	AY	AI	AR	AC	AIC	ARC	AS	ASLL	ASL	ASH	ASHH	ASHL		AALL	AAL	AAH	AAHH				AL	
C	CONDUCTIVITY	CE	CT	CIT	CY	CI	CR	CC	CIC	CRC	CS	CSLL	CSL	CSH	CSHH	CSHL		CALL	CAL	CAH	CAHH				CL	
D	DENSITY	DE	DT	DIT	DY	DI	DR	DC	DIC	DRC	DS	DSLL	DSL	DSH	DSHH	DSHL		DALL	DAL	DAH	DAHH				DL	
E	VOLTAGE												ESL													
F	FLOW	FE	FT	FIT	FY	FI	FR	FC	FIC	FRC	FS	FSLL	FSL	FSH	FSHH	FSHL		FALL	FAL	FAH	FAHH	FQI	FCV	FG	FL	
H	HAND (MANUAL)*							HC			HS*						HA*						HV		HL	HSS
I	CURRENT		IT	IIT	IY	II	IR	IC	IIC	IRC	IS	ISLL	ISL	ISH	ISHH			IALL	IAL	IAH	IAHH				IL	
J	POWER					JS																				
K	TIME				KY	KI	KR	KC	KIC	KRC	KS	KSLL	KSL	KSH	KSHH			KALL	KAL	KAH	KAHH		KV		KL	
L	LEVEL	LE	LT	LIT	LY	LI	LR	LC	LIC	LRC	LS	LSLL	LSL	LSH	LSHH	LSHL		LALL	LAL	LAH	LAHH		LCV	LG	LL	
M	MOISTURE OR HUMIDITY	ME	MT	MIT	MY	MI	MR	MC	MIC	MRC	MS	MSLL	MSL	MSH	MSHH			MALL	MAL	MAH	MAHH				ML	
N	USER'S CHOICE																									
P	PRESSURE OR VACUUM	PE	PT	PIT	PY	PI	PR	PC	PIC	PRC	PS	PSLL	PSL	PSH	PSHH	PSHL		PALL	PAL	PAH	PAHH		PCV		PL	
PD	DIFFERENTIAL PRESSURE		PDT	PDIT	PDY	PDI	PDR	PDC	PDIC	PDRC	PDS	PDSLL	PDSL	PDSH	PDSHH			PDALL	PDAL	PDAH	PDAHH		PDCV		PDL	
Q	QUANTITY	QE	QT	QIT	QY	QI	QR				QS	QSLL	QSL	QSH	QSHH			QALL	QAL	QAH	QAHH					
R	RADIATION																									
S	SPEED	SE	ST	SIT	SY	SI	SR	SC	SIC	SRC	SS	SSLL	SSL	SSH	SSHH			SALL	SAL	SAH	SAHH					
T	TEMPERATURE	TE	TT	TIT	TY	TI	TR	TC	TIC	TRC	TS	TSLL	TSL	TSH	TSHH	TSHL		TALL	TAL	TAH	TAHH		TCV		TL	
TD	DIFFERENTIAL TEMPERATURE		TDT	TDIT	TDY	TDI	TDR	TDC	TDIC	TDRC	TDS	TDSLL	TDSL	TDSH	TDSHH			TDALL	TDAL	TDAH	TDAHH		TDCV		TDL	
U	MULTIVARIABLE					UI	UR	UC	UIC	URC	US														UL	
V	VISCOSITY	VE	VT	VIT	VY	VI	VR	VC	VIC	VRC	VS	VSLL	VSL	VSH	VSHH			VALL	VAL	VAH	VAHH				VL	
W	WEIGHT	WE	WT	WIT	WY	WI	WR				WS	WSLL	WSL	WSH	WSHH			WALL	WAL	WAH	WAHH					
X	UNCLASSIFIED	XE	XT	XIT	XY	XI	XR	XC	XIC	XRC	XS	XSLL	XSL	XSH	XSHH			XALL	XAL	XAH	XAHH		XCV	XG	XL	
XV	VIBRATION	XVE	XVT		XVY	XVI	XVR				XVS			XVSH	XVSHH					XVAH	XVAHH				XVL	
Y	STATUS					YI																			YL	
Z	POSITION	ZE	ZT	ZIT	ZY	ZI		ZC**			ZS**												ZV		ZL**	

OPERATOR PILOT DEVICE LEGEND

DEVICE TYPE / PILOT DEVICE FUNCTION	LOCAL-OFF-REMOTE (LOR) OR LOCAL-STOP-REMOTE (LSR)	STOP(SP)	START (ST)	HAND-OFF-AUTO (HOA) HAND-OFF-REMOTE (HOR)	OFF-ON (OO)	SELECT (SEL)	OPEN-STOP-CLOSE (OSC)	JOG OPEN-HOLD-CLOSE (JOHC)	SEMIAUTO-AUTO-MANUAL (SAAM)	LEAD-LAG-STANDBY (LLGS)	AUTO-MANUAL (AM)	OPEN-CLOSE (OC)	LOW-HIGH (LH)	RESET (RST)	SPEED (SPD)	START-STOP (STSP)	EQUIPMENT SHUTDOWN (ESD)	BYPASS (BYP)			SILENCE	POSITION (POS)
PILOT DEVICE TAG (HAND SWITCHES)	HSA	HSB	HSC	HSD	HSE	HSF	HSG	HSH	HIS	HSJ	HSM	HSO	HSQ	HSR	HSS	HST	HSU	HSV	HSW	HSX	HSY	HSZ

I/O TYPE DESIGNATIONS

RNG	RUNNING	SPDC	SPEED COMMAND
FAIL	FAILED/FAULT	SPDF	SPEED FEEDBACK
FWD	RUNNING FORWARD	REM	LOR IN REMOTE
FAST	RUNNING HIGH	LOC	LOR IN LOCAL
SLOW	RUNNING LOW	AUTO	HOA IN AUTO
REV	RUNNING REVERSE	HAND	HOA IN HAND
SVC	SOLENOID VALVE CLOSE	RST	RESET
SVO	SOLENOID VALVE OPEN		
RUN	RUN		
SLWC	MOTOR START LOW		
REVC	MOTOR START REVERSE		

INSTRUMENT TYPE DESIGNATIONS

CGD	COMBUSTIBLE GAS DETECTOR	PTOF	PULSE TIME OF FLIGHT
COND	CONDUCTIVITY	RTD	RESISTANCE TEMP DETECTOR
DO	DISSOLVED OXYGEN	SB	SLUDGE BLANKET
FMCW	FREQ. MODULATED CONT. WAVE	SC	STREAMING CURRENT
ISB	INTRINSIC SAFETY BARRIER	SD	SLUDGE DEPTH
LEL	LOWER EXPLOSIVE LIMIT	TDR	TIME DOMAIN REFLECTOMETRY
MLSS	MIXED LIQUOR SUSPENDED SOLIDS	TOC	TOTAL ORGANIC CARBON
ORG	UV 504	TSS	TOTAL SUSPENDED SOLIDS
ORP	OXIDATION REDUCTION POTENTIAL	TURB	TURBIDITY
PSUB	PRESSURE SUBMERSIBLE	UVI	UV INTENSITY
PC	PARTICLE COUNTER	UVT	UV TRANSMITTANCE

SPECIFIC ABBREVIATIONS

HTR	HEATER
HTU	HEAT TRACE UNIT
MWH	MOTOR WINDING HEATER
SV	SOLENOID VALVE
SPD	SURGE PROTECTIVE DEVICE
UPS	UNINTERRUPTIBLE POWER SUPPLY
YLA	STATUS AUTO PILOT LIGHT
YLR	STATUS REMOTE PILOT LIGHT
YL1	STATUS RUNNING PILOT LIGHT
YL2	ALARM FAILED/FAULT PILOT LIGHT

P&ID LINE SYMBOLS

INSTRUMENT OR CONNECTION TO PROCESS

PNEUMATIC SIGNAL

ELECTRIC SIGNAL

HYDRAULIC SIGNAL

CAPILLARY TUBE

INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)

PROCESS LINE SYMBOLS

PRIMARY PROCESS FLOW IN PIPE

SECONDARY PROCESS FLOW IN PIPE

PRIMARY PROCESS FLOW IN CHANNEL

SECONDARY PROCESS FLOW IN CHANNEL

HEAT TRACE

DESIGNATIONS

EQUIPMENT ENCLOSURE

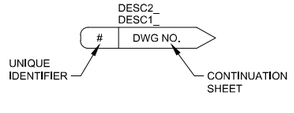
EXISTING

FUTURE

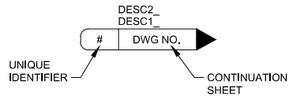


MISCELLANEOUS P&ID SYMBOLS

PROCESS CONTINUATION



SIGNAL CONTINUATION



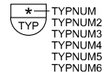
PIPE CALLOUT



SCHEMATIC DETAIL



TYPICAL DETAIL



REV	DATE	BY	DESCRIPTION

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DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
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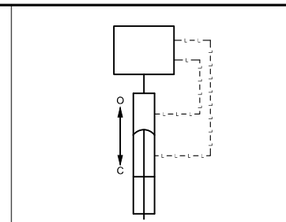
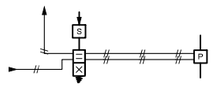
ACTUATORS

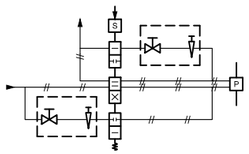
- DIAPHRAGM
- ELECTRIC HYDRAULIC
- ELECTRIC
- HAND
- HYDRAULIC
- MOTOR
- PNEUMATIC
- SOLENOID



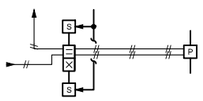
HYDRAULIC MODULATING



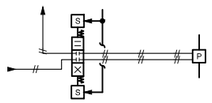
PNEUMATIC SINGLE SOLENOID OPEN/CLOSE



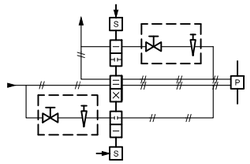
PNEUMATIC SINGLE SOLENOID w/ SPEED CONTROL



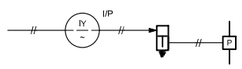
PNEUMATIC DUAL SOLENOID OPEN/CLOSE



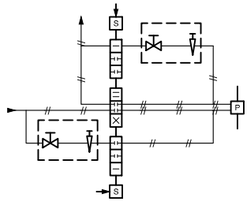
PNEUMATIC DUAL SOLENOID OPEN/HOLD/CLOSE



PNEUMATIC DUAL SOLENOID OPEN/CLOSE w/ SPEED CONTROL



PNEUMATIC MODULATING



PNEUMATIC MODULATING OPEN/CLOSE w/ SPEED CONTROL

PIPING

- AIR GAP
- BLIND FLANGE
- CAPPED OR PLUGGED
- CONCENTRIC INCREASER
- CONCENTRIC REDUCER
- DRAIN
- ECCENTRIC INCREASER
- FLANGED CONNECTION
- TEE
- UNION
- ECCENTRIC REDUCER
- EXPANSION COUPLING
- EXPANSION JOINT VIBRATION CENTER
- FLEXIBLE CONNECTION
- QUICK DISCONNECT

PUMPS

- AIR DRIVEN
- CENTRIFUGAL
- CHEMICAL FEED DIAPHRAGM
- DIAPHRAGM
- GEAR
- LOBE
- PERISTALTIC OR HOSE
- PISTON
- PROGRESSIVE CAVITY

OR SUBMERSIBLE

- VERTICAL TURBINE
- VERTICAL CHOPPER
- WATER CHAMP

BLOWERS/ COMPRESSORS/FANS

- CENTRIFUGAL SINGLE STAGE BLOWER/FAN
- CENTRIFUGAL MULTI STAGE BLOWER
- RECIPROCATING COMPRESSOR
- SCREW COMPRESSOR
- FAN
- LIQUID RING COMPRESSOR
- ROTARY LOBE BLOWER

CHECK VALVES

- BACK FLOW PREVENTER
- BALL
- DIAPHRAGM CHECK
- DOUBLE FLAP
- FLAPPER
- SLANTING CHECK VALVE
- SPRING LOADED GENERAL
- SPRING LOADED SWING
- SWING

PRESSURE VALVES

- BACKPRESSURE REGULATING SELF CONTAINED
- BACKPRESSURE REGULATING EXTERNAL TAP
- PRESSURE REDUCING SELF CONTAINED
- PRESSURE REDUCING EXTERNAL PRESSURE TAP
- REGULATING
- PRESSURE RELIEF
- VACUUM RELIEF

VALVES

- 3-WAY
- 3-WAY PLUG
- 4-WAY
- AIR-RELIEF
- ANGLE
- BALL
- BALL V-NOTCH
- BUTTERFLY
- BUTTERFLY-BURIED VALVE BOX
- CONE
- DIAPHRAGM
- FLOAT
- GATE
- GATE-BURIED VALVE BOX
- GLOBE
- HOSE
- MISCELLANEOUS
- MUD
- NEEDLE
- PINCH
- PLUG ECCENTRIC
- PLUG ECCENTRIC w-VALVE BOX
- PLUG ECCENTRIC LUBRICATED
- PLUG ECCENTRIC LUBRICATED BURIED VALVE BOX
- PLUG CONCENTRIC
- PLUG CONCENTRIC -BURIED VALVE BOX
- PLUG CONCENTRIC LUBRICATED
- PLUG CONCENTRIC LUBRICATED BURIED VALVE BOX
- PUMP DISCHARGE
- TELESCOPING

VALVE DESIGNATIONS	
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
FO	FAIL OPEN
FC	FAIL CLOSE
FLP	FAIL LAST POSITION

MISC

- AIR / CHEMICAL DIFFUSER
- BASKET STRAINER
- BLOW-OFF SILENCER
- CALIBRATION COLUMN
- COALESCER
- DESICCANT DRYER
- EDUCTOR/EJECTOR
- EQUIPMENT/ INSTRUMENT LOCATOR
- EYEWASH
- FILTER
- FILTER SEPARATOR
- FINE FILTER
- FIRE ALARM/SENSOR
- FLAME ARRESTER
- FLAME ARRESTER w/THERMALLY OPERATED VALVE
- FLOW CONDITIONER
- GAS CANNON
- GRINDER
- HEAT EXCHANGER
- HOIST
- HORIZONTAL MIXER
- HOSE CONNECTION
- INLET STRAINER
- INLINE STATIC MIXER
- INLINE DUCT BALANCING DAMPER
- LOUVER OR BACKDRAFT DAMPER
- MATERIAL CHANGE
- MIXER
- NOZZLE
- ORIFICE RESTRICTION
- PERISTALTIC COMPOSITE SAMPLER

OR PULSATION DAMPENER

- REFRIGERATED DRYER
- RUPTURE DISK
- SAMPLE PORT
- SIGHT TUBE
- SMOKE DETECTOR
- STRAINER - MECHANICALLY CLEANED
- STRAINER WITH BLOW OFF
- STRAINER WYE TYPE
- VAPOR HEATER
- VAPORIZER
- VENT
- VENT TO ATMOSPHERE

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DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

carollo

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FLOW

- CORIOLIS
- MAGNETIC
- ORIFICE
- PADDLE WHEEL
- PISTON
- ANNUBAR
- PITOT TUBE
- POSITIVE-DISPLACEMENT
- PROPELLER-TURBINE
- ROTAMETER
- SHUTTLE
- THERMAL
- ULTRASONIC
- ULTRASONIC BIOGAS
- V-CONE
- VENTURI TUBE OR FLOW NOZZLE
- VORTEX

FLUMES

- LEOPOLD-LAGCO
- PALMER-BOWLUS
- PARSHALL
- REGULAR CUTTHROAT
- TRAPEZOIDAL

GATES

SIDE VIEW	PLAN VIEW
	FLAP
	KNIFE
SLIDE	SLIDE
SLUICE	SLUICE
STOP	STOP
	WEIR
	BUTTERFLY

LEVELS

- BUBBLER
- CAPACITANCE
- DIFFERENTIAL PRESSURE (TANK)
- DISPLACEMENT
- ELECTRODE
- BALL FLOAT
- INVERTED COLUMN
- PROBE
- RADAR PTOF
- RADAR (FREQUENCY MODULATED CONTINUOUS WAVE)
- RADAR TDR
- SUSPENDED/ SUBMERSIBLE
- TUNING FORK
- ULTRASONIC

NETWORKS

CABLE CALLOUTS AND ABBREVIATIONS

- 24/FO-SM — FIBER LINE REPRESENTS ONE 24-STRAND FIBER OPTIC CABLE
- (2) 24/FO-SM — FIBER LINE REPRESENTS TWO 24-STRAND FIBER OPTIC CABLES
- (1) 24/FO-SM EA. — EACH FIBER LINE REPRESENTS ONE 24-STRAND FIBER OPTIC CABLE
- (4) — COPPER LINE REPRESENTS FOUR COPPER ETHERNET CABLES
- (2) EA. — EACH COPPER LINE REPRESENTS TWO COPPER ETHERNET CABLES

FIBER ABBREVIATIONS

###/FO-XX
- ## = STRAND COUNT
- FO = FIBER OPTIC

XX = MODE
- SM = SINGLE MODE
- MM = MULTIMODE

NETWORK ABBREVIATIONS

BMS	= BUILDING MANAGEMENT SYSTEM
BSN	= BUSINESS NETWORK
FCN	= FIELD CONTROL NETWORK
MIN	= MAINTENANCE INFORMATION NETWORK
PCN	= PROCESS CONTROL NETWORK
PLCN	= PLC NETWORK
SCN	= SECURITY CONTROL NETWORK
PCN-W	= WIRELESS PROCESS CONTROL NETWORK
NR	= NETWORK RACK
NP	= NETWORK PANEL
ES	= ETHERNET SWITCH
FPP	= FIBER PATCH PANEL

VLAN SYMBOLS

- = BUSINESS NETWORK
- = SECURITY CONTROL NETWORK
- = BUILDING MANAGEMENT SYSTEM
- = PROCESS CONTROL NETWORK
- = WIRELESS PROCESS CONTROL NETWORK
- = MAINTENANCE INFORMATION NETWORK
- = PLC NETWORK
- = FIELD CONTROL NETWORK

PRESSURE/VACUUM

PRESSURE

- PI — GAUGE
- PSH / PE — PRESSURE SWITCH
- PIT / PE — PRESSURE TRANSMITTER
- MANOMETER

DIFFERENTIAL PRESSURE

- PDI — GAUGE DIFFERENTIAL INDICATOR
- PDSL / PDE — DIFFERENTIAL PRESSURE SWITCH
- PDIT / PDE — DIFFERENTIAL PRESSURE TRANSMITTER

PRESSURE SEALS

- SEAL ANNULAR
- SEAL DIAPHRAGM
- SEAL SANITARY

EXAMPLE

PSH / PE — PRESSURE SWITCH

TEMPERATURE

- TEMPERATURE w/THERMOWELL
- TEMPERATURE GAUGE
- T — THERMOMETER

WEIGHT

- PLATFORM SCALE

WEIRS

SIDE VIEW	PLAN VIEW
RECTANGULAR w/o END CONTRACTIONS	RECTANGULAR w/o END CONTRACTIONS
RECTANGULAR w/ END CONTRACTIONS	RECTANGULAR w/ END CONTRACTIONS
V-NOTCH (TRIANGULAR)	V-NOTCH (TRIANGULAR)
TRAPEZOIDAL (CIPOLLETTI)	TRAPEZOIDAL (CIPOLLETTI)

NETWORK LINE SYMBOLS

COPPER ETHERNET	— C — C — C — C — C — C —
DUPLEX FIBER PATCH	— FP — FP — FP — FP — FP — FP —
FIBER OPTIC ETHERNET	— F — F — F — F — F — F —
WIRELESS	— W — W — W — W — W — W —
PROFIBUS DP	— PBD — PBD — PBD — PBD — PBD — PBD —
PROFIBUS PA	— PBA — PBA — PBA — PBA — PBA — PBA —
SERIAL DATA	—o—o—o—o—o—o—o—o—o—o—o—o—o—o—

MISCELLANEOUS NETWORK SYMBOLS

NETWORK CABLE CONTINUATIONS

TOP OF PAGE STYLE CONTINUATION

DESC 3
DESC 2
DESC 1 — CONTINUATION SHEET
DWG NO. — UNIQUE IDENTIFIER
(#)

BOTTOM/LEFT OF PAGE STYLE CONTINUATION

(#) — UNIQUE IDENTIFIER, CONTINUATION SHEET
DWG NO.
DESC 1
DESC 2
DESC 3

FIELD NETWORK DEVICE

PLC TAG / PANEL TAG — PROTOCOL / SEGMENT #
DEVICE SPECIFIC SYMBOL
TAG
DESC 1
DESC 2
DESC 3
P&ID DRAWING REFERENCE

NETWORK EQUIPMENT CALLOUT

TAG
DESC 1

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

carollo

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
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PROCESS SWITCHES

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION

- LEVEL SWITCH CLOSE ON RISING LEVEL
- LEVEL SWITCH OPEN ON RISING LEVEL
- PRESSURE SWITCH CLOSE ON RISING PRESSURE
- PRESSURE SWITCH OPEN ON RISING PRESSURE
- TEMPERATURE SWITCH CLOSE ON RISING TEMPERATURE
- TEMPERATURE SWITCH OPEN ON RISING TEMPERATURE
- FLOW SWITCH CLOSE ON INCREASE IN FLOW
- FLOW SWITCH OPEN ON INCREASE IN FLOW
- VIBRATION SWITCH OPEN ON RISING VIBRATION
- VIBRATION SWITCH CLOSE ON RISING VIBRATION
- TORQUE SWITCH OPEN ON HIGH TORQUE
- TORQUE SWITCH CLOSE ON HIGH TORQUE
- NORMALLY CLOSED LIMIT SWITCH
- NORMALLY CLOSED HELD OPEN LIMIT SWITCH
- NORMALLY OPEN LIMIT SWITCH
- NORMALLY OPEN HELD CLOSED LIMIT SWITCH

HAND SWITCHES

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a/b/c = POSITION
x = DENOTES POSITION CONTACTS CLOSED IN

- NORMALLY OPEN MOMENTARY PUSHBUTTON
- NORMALLY CLOSED MOMENTARY PUSHBUTTON
- MUSHROOM HEAD PUSHBUTTON NORMALLY OPEN
- MUSHROOM HEAD PUSHBUTTON NORMALLY CLOSED
- PUSH-PULL PUSHBUTTON MAINTAINED CONTACT
- PUSH-PULL PUSHBUTTON NORMALLY CLOSED
- PADLOCK SWITCH
- PULL CORD SWITCH
- STOP-LOCKOUT PUSHBUTTON
- THREE POSITION SELECTOR SWITCH
- TWO POSITION SELECTOR SWITCH NORMALLY OPEN
- TWO POSITION SELECTOR SWITCH NORMALLY CLOSED
- SPRING-RETURN

RELAYS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = TYPE
CR- CONTROL RELAY
TD- TIME DELAY RELAY
M - MOTOR STARTER COIL
L - MOTOR STARTER COIL - LOW SPEED
H - MOTOR STARTER COIL - HIGH SPEED
F - MOTOR STARTER COIL - FORWARD
R - MOTOR STARTER COIL - REVERSE

b = TIME DELAY STATE
TDON - TIME DELAY ON ENERGIZATION
TDOFF - TIME DELAY ON DEENERGIZATION

c = TIMING RANGE/SETTING

- RELAY COIL
- NORMALLY OPEN CONTROL CONTACT
- NORMALLY CLOSED CONTROL CONTACT
- TIME DELAY CONTACT NORMALLY OPEN TIMED CLOSING (NCTC)
- TIME DELAY CONTACT NORMALLY CLOSED TIMED OPENING (NCTO)
- TIME DELAY CONTACT NORMALLY OPEN TIMED OPENING (NOTO)
- TIME DELAY CONTACT NORMALLY CLOSED TIMED CLOSING (NOTC)

I/O

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = INPUT/OUTPUT
b = I/O VOLTAGE

- PLC DISCRETE
- PLC ANALOG
- DIGITAL BUS

MISC

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION

- SOLENOID
- CIRCUIT BREAKER
- DISCONNECT
- FUSE
- TRANSIENT SURGE PROTECTION
- MOTOR WINDING HEATER

MOTORS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = HORSEPOWER

- MOTOR - 1 PHASE
- MOTOR - 3 PHASE

INDICATORS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = LENS COLOR
R - RED
G - GREEN
W - WHITE
A - AMBER
B - BLUE
Y - YELLOW
C - CLEAR

- PILOT LIGHT
- PUSH-TO-TEST LIGHT
- BEACON
- HORN

MISC

- VARISTOR
- CAPACITOR
- RESISTOR
- BATTERY
- DIODE
- MOTOR OVERLOAD HEATERS
- OVERLOAD CONTACT
- DRAWOUT CONNECTION
- GROUND
- LIGHTNING ARRESTOR
- CONTROL POWER TRANSFORMER (H1 H3 H2 H4 / X1 X2)

- ELAPSED TIME METER (ETM)
- RTD
- MISC PORT (a)
- ETHERNET PORT
- SURGE PROTECTION DEVICE (SPD)
- TRANSFORMER LINE/LOAD REACTOR
- SPEED SWITCH
- SPEED POTENTIOMETER
- SHIELDED WIRE
- LOOP

MOTORS

SCHEMATIC NUMBER — SCHEMATIC DESCRIPTION

DESCRIPTION

 # CONTROL SCHEMATIC

TAG → LOOP
* = XXX → XXX-
TAG NUMBER — PRIMARY EQUIPMENT LOOP

REFERENCE DWG.
DWG1 DWG2
ADDITIONAL REFERENCES
P&ID REFERENCE

LOCATION LEGEND
XXX IN/AT XXX
ABBREVIATION — LOCATION DESCRIPTION

REV	DATE	BY	DESCRIPTION

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NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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FILE NAME:

EQUIPMENT DESCRIPTOR			
XXX		**XXX**	
AB	AERATION BASIN	GRI	GRINDER
AER	AERATOR	GRD	GRIT DEWATERING UNIT (CYCLONE)
AHU	AIR HANDLING UNIT	GRW	GRIT WASHER
ARC	AIR COMPRESSOR	GTW	GATEWAY
ARF	AIR FILTER	HPU	HYDRAULIC POWER UNIT
ARR	ARRESTOR	IC	ISOLATION CONTACTOR
ATS	AUTOMATIC TRANSFER SWITCH	INJ	INJECTOR
AUG	AUGER	LAG	LAGOON
AVR	AIR VACUUM RELIEF	INM	INDUCTION MIXER
BAR	BAR SCREEN	MAU	MAKE-UP AIR UNIT
BAS	BASIN	MIX	MIXER
BC	BYPASS CONTACTOR	MS	MOTOR STARTER
BFP	BELT FILTER PRESS	MPR	MOTOR PROTECTION RELAY
BIT	BIO TOWER	MTR	MOTOR
BLO	BLOWER	NP	NETWORK PANEL
BOI	BOILER	NR	NETWORK RACK
BUR	BURNER	OZG	OZONE GENERATOR
CAL	CALIBRATION COLUMN	PBU	POLYMER BLENDING UNIT
CB	CIRCUIT BREAKER	PCM	PROCESS CONTROL MODULE
CC	COMMUNICATIONS CABINET	PDC	POWER DISTRIBUTION CENTER
CEN	CENTRIFUGE	PLO	PLOW
CHI	CHILLER	PMP	PUMP
CHL	CHLORINATOR	PPR	PUMP PROTECTION RELAY
CLA	CLASSIFIER	PQM	POWER QUALITY METER
CLR	CLARIFIER	PRE	PRESS
CLU	CLUTCH	PUD	PULSATION DAMPENER
COA	COALESCER	REC	RECEIVER
COL	COLLECTOR	RVSS	REDUCED VOLTAGE STARTER
CON	CONVEYOR	RIO	REMOTE IO PANEL
COO	COOLER	RES	RESERVOIR
COS	COMPOSITE SAMPLER	RUD	ROLL UP DOOR
CPT	CONTROL POWER TRANSFORMER	SCB	SCRUBBER
CF	CARTRIDGE FILTER	SCR	SCREEN
CR	CONTROL RELAY	SCW	SCREW
CRN	BRIDGE CRANE/HOIST/MONORAIL	SEL	SEAL
CYC	CYCLONE CLASSIFER	SF	SUPPLY FAN
DAM	DAMPER	SHA	SHAKER
DCD	DC DRIVE	SLA	SLAKER
DEC	DECARBONATOR	SLC	SLUDGE COLLECTOR
DGC	DIGESTER GAS CONDITIONING	SPD	SURGE PROTECTION DEVICE
DIF	DIFFUSER	SRR	STIRRER
DIG	ANAEROBIC DIGESTER	STR	STRAINER
DIS	DISTRIBUTOR	SV	SOLENOID VALVE
DISC	DISCONNECT	SWC	SCREENING WASHER COMPACTOR
DRY	DRYER	THI	THICKENER
DSC	DUST COLLECTOR	TIP	TIPPING TROUGH
EDU	EDUCTOR	TNK	TANK
EF	EXHAUST FAN	TRA	TRAP
ES_	ETHERNET SWITCH	UPS	UNINTERRUPTIBLE POWER SUPPLY
ERD	ENERGY RECOVERY DEVICE	UVB	UV BANK
EUH	ELECTRIC UNIT HEATER	UVR	ULTRAVIOLET REACTOR
EVP	EVAPORATOR	VAL	VALVE
EXC	EXCHANGER	LCP	LOCAL CONTROL PANEL
FACP	FIRE ALARM CONTROL PANEL	VCP	VENDOR CONTROL PANEL
FAN	FAN	VFD	VARIABLE FREQUENCY DRIVE
FDR	FEEDER	WEL	WELL
FLA	FLARE	*CV	* CONTROL VALVE
FLC	FLOCCULATOR	*V	* VALVE
FLT	FILTER	*CG	* CONTROL GATE
FU	FUSE	*G	* GATE
GAT	GATE		* = A (ANALYTICAL), F (FLOW), L (LEVEL)
GEN	ENGINE GENERATOR		P (PRESSURE), T (TEMPERATURE)
GRC	GRIT CHAMBER		

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

EQUIPMENT TAGGING

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00GN06
SHEET NO. 166 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

AI

AI

VALVE1 MB VALVE

VALVE1 MB VALVE

VALVE1 MB VALVE

VALVE1 MB VALVE

CB

CB

CB

CB

LIT

LIT

LE

LE

ZSOC

HSA

LSR

HSG

OSC

EDR

DISC

E/D

GAT

SCREEN CHANNEL NO.1

SCREEN CHANNEL NO.2

BYPASS CHANNEL

SCREEN CHANNEL NO.3

BAR SCREEN NO. 1

BAR SCREEN NO. 2

BYPASS CHANNEL

BAR SCREEN NO. 3

Davis Road Forcemain

Plant Drain Return Flows

Horseshoe Island Forcemain

INFLUENT COLLECTION BOX

BAR SCREEN NO. 3 INFLUENT GATE

BAR SCREEN NO. 2 INFLUENT GATE

SCREEN BYPASS CHANNEL INFLUENT GATE

BAR SCREEN NO. 1 INFLUENT GATE

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
HEADWORKS INFLUENT CHANNEL

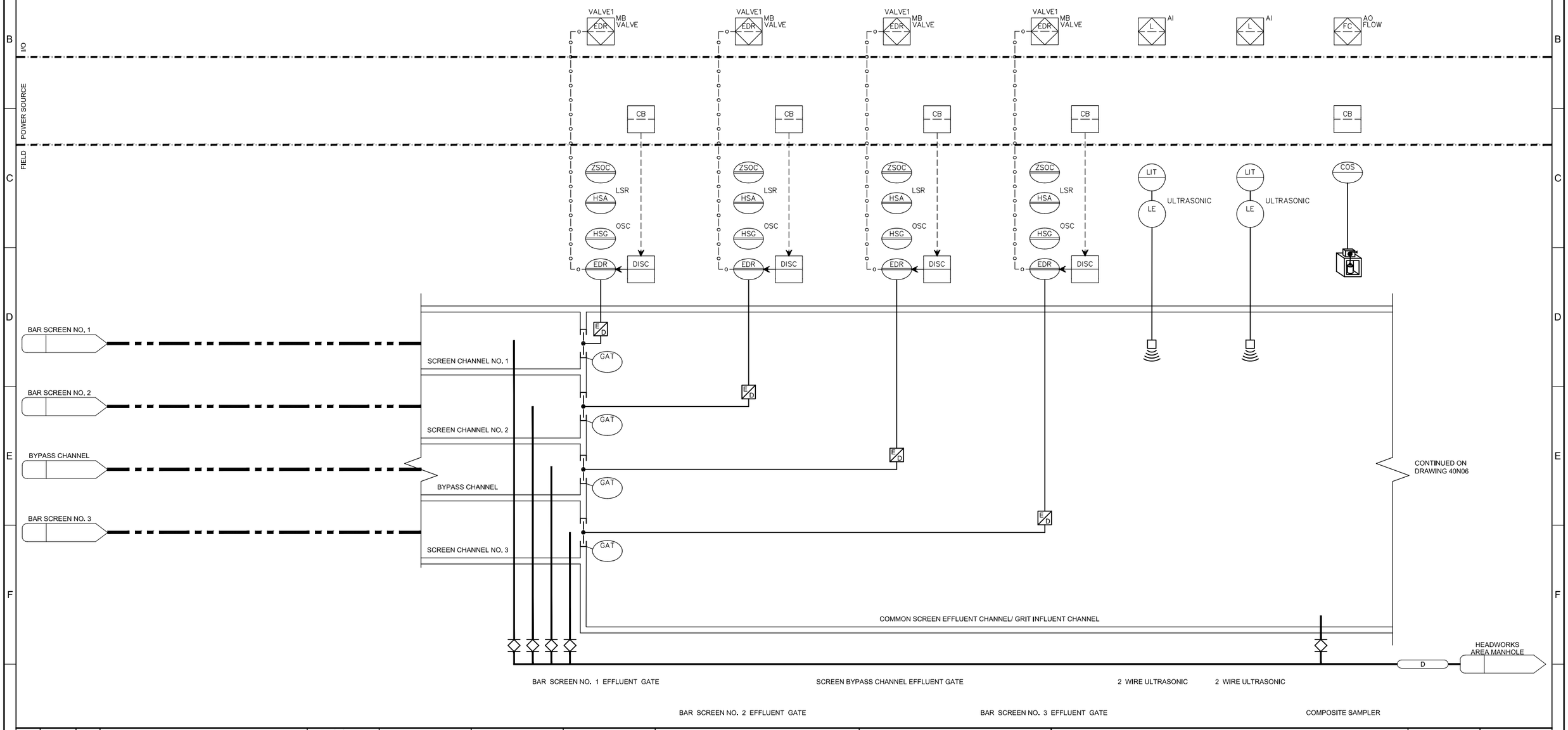
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 10N01
SHEET NO. 167 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

HEADWORKS COMMON SCREEN EFFLUENT CHANNEL

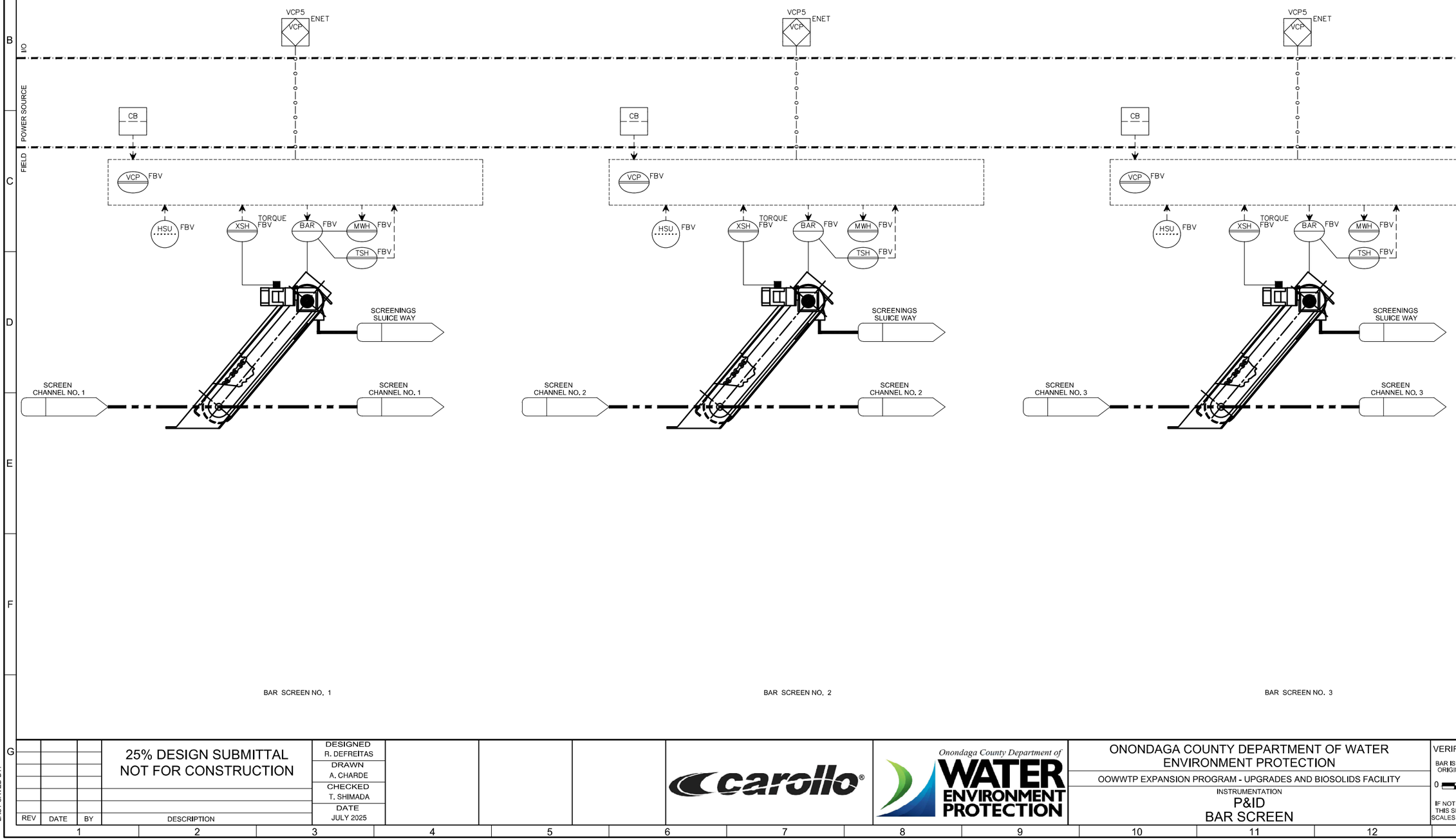
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 10N02
SHEET NO. 168 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



BAR SCREEN NO. 1

BAR SCREEN NO. 2

BAR SCREEN NO. 3

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
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CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
BAR SCREEN

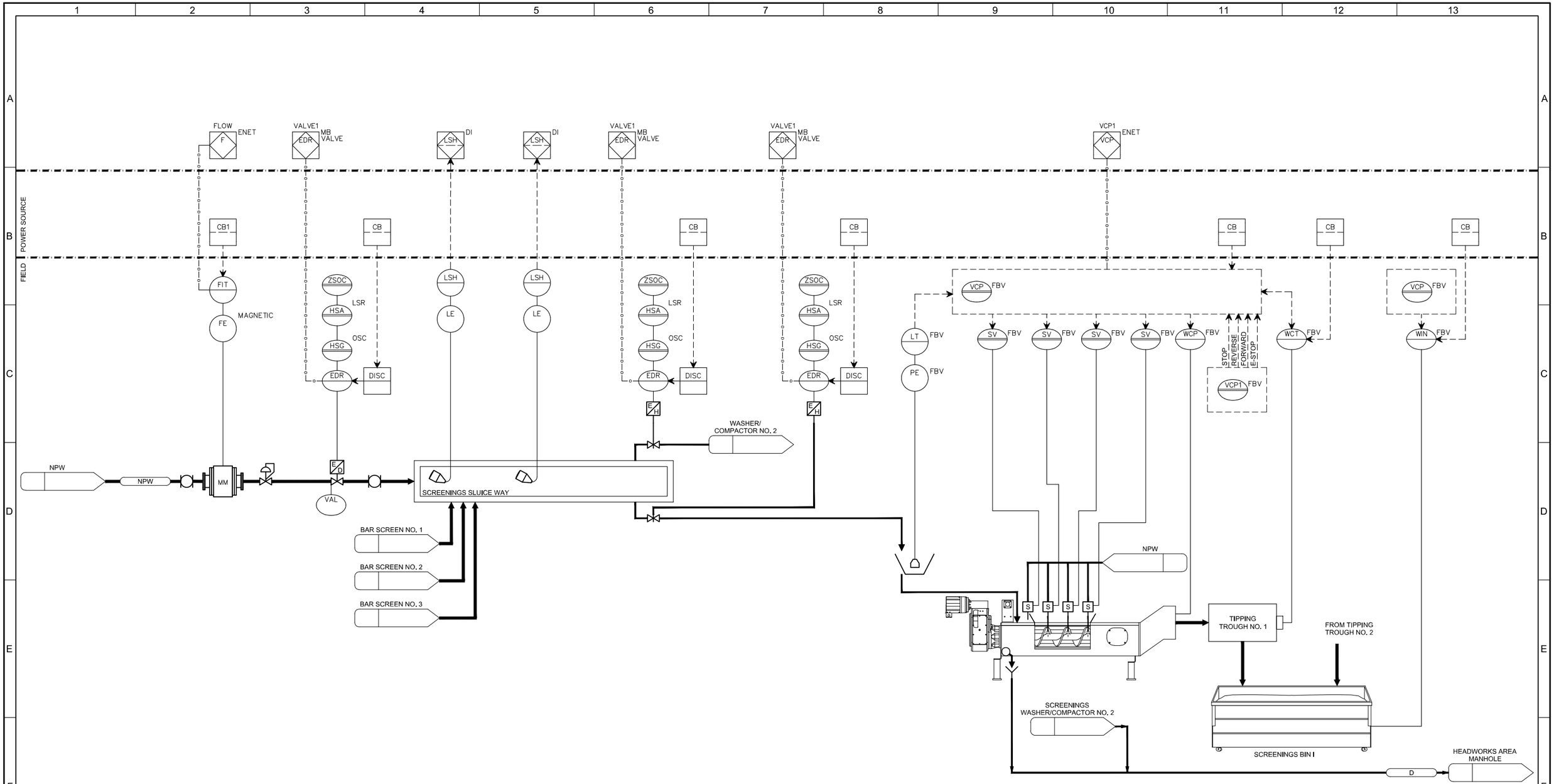
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 10N03
SHEET NO. 169 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
WASHER COMPACTOR NO. 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 10N04
SHEET NO. 170 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

VALVE1 EDR MB VALVE

CB

ZSOC LSR HSA OSC HSG EDR DISC

L AL LIT LE ULTRASONIC

FLOW F ENET

CB1 FIT FE MAGNETIC

E/D GAT

GRIT BASIN NO. 1 INFLUENT CHANNEL

GRIT BASIN NO. 1 EFFLUENT CHANNEL

GRIT BASIN NO. 2 EFFLUENT CHANNEL

GRIT BASIN NO. 2 INFLUENT CHANNEL

COMMON GRIT INFLUENT CHANNEL/ GRIT INFLUENT CHANNEL

CONNECTION TO GRIT BASIN NO. 3 (FUTURE)

CONTINUED ON DRAWING 40N05

GRIT BASIN NO. 1

PRIMARY SPLITTER STRUCTURE

GRIT BASIN NO. 2

MM

PI

GRIT BASIN INFLUENT GATE NO. 2

GRIT BYPASS GATE NO. 1

2 WIRE ULTRASONIC

GRIT BYPASS GATE NO. 2

GRIT BASIN INFLUENT GATE NO. 1

HEADWORKS EFFLUENT GATE NO. 2

HEADWORKS EFFLUENT GATE NO. 1

ELECTRIC DISCRETE VALVE RUN OPEN/CLOSE

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

GRIT REMOVAL - 1

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

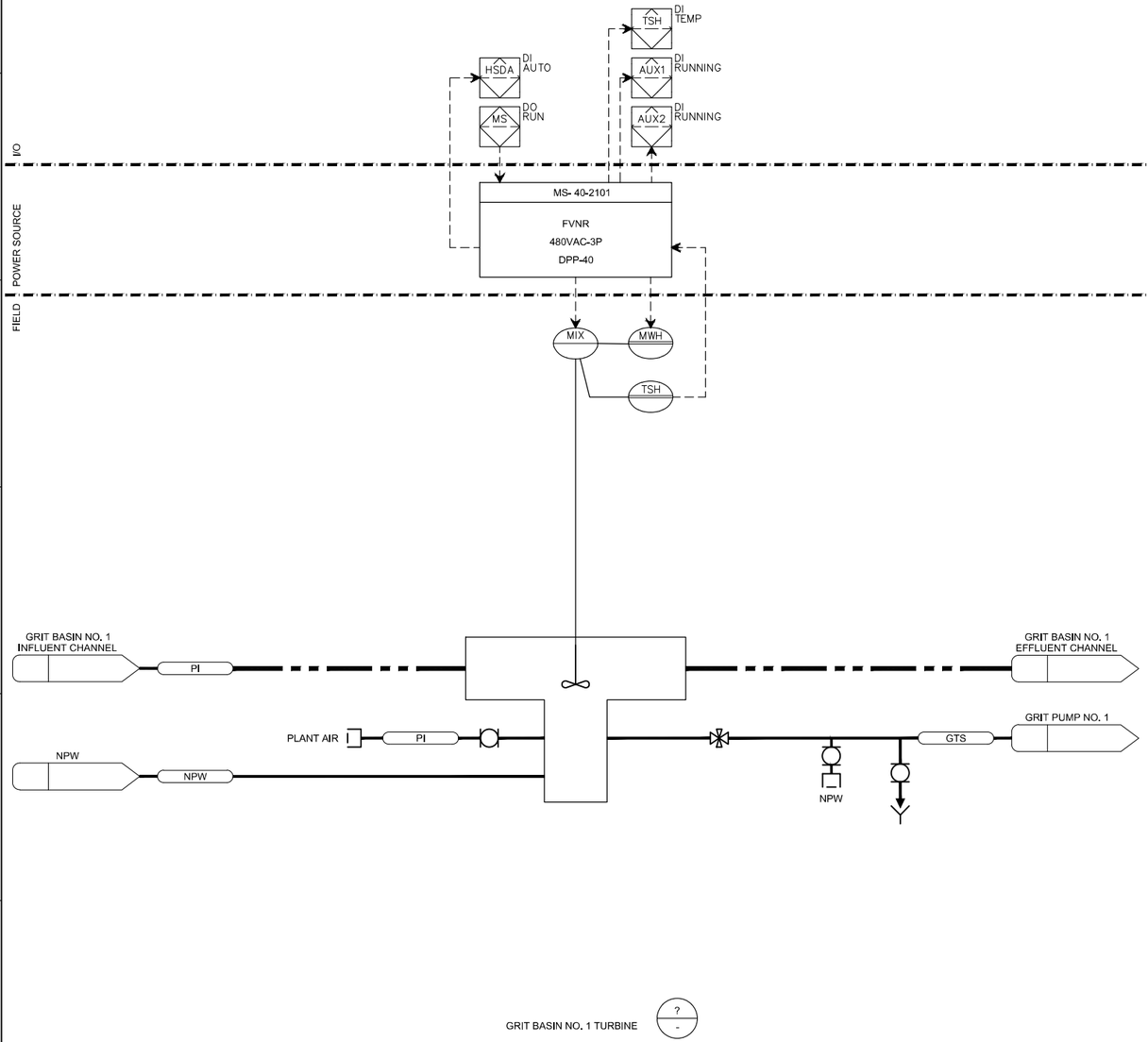
DRAWING NO. 10N05

SHEET NO. 171 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



RESERVED FOR GRIT BASIN NO. 2

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
GRIT REMOVAL - 2

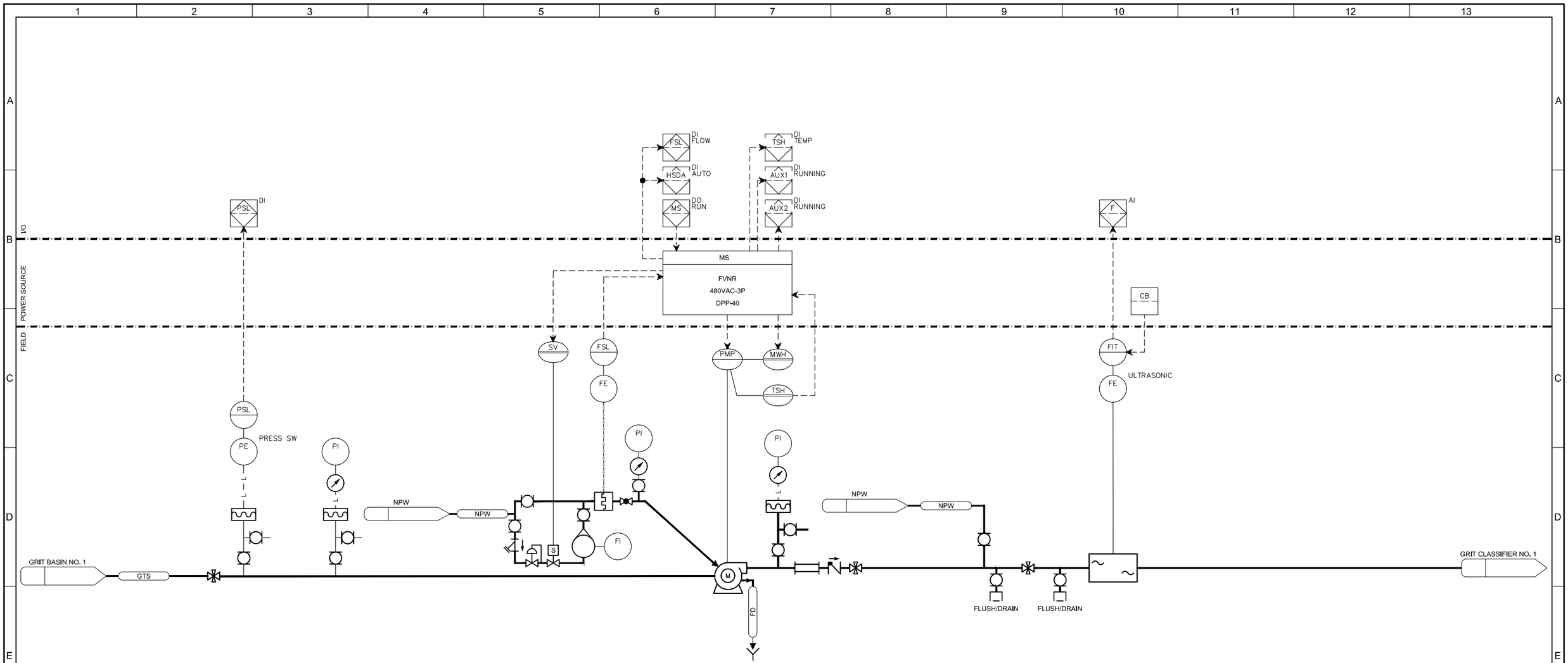
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 10N06
SHEET NO. 172 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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INSTRUMENTATION

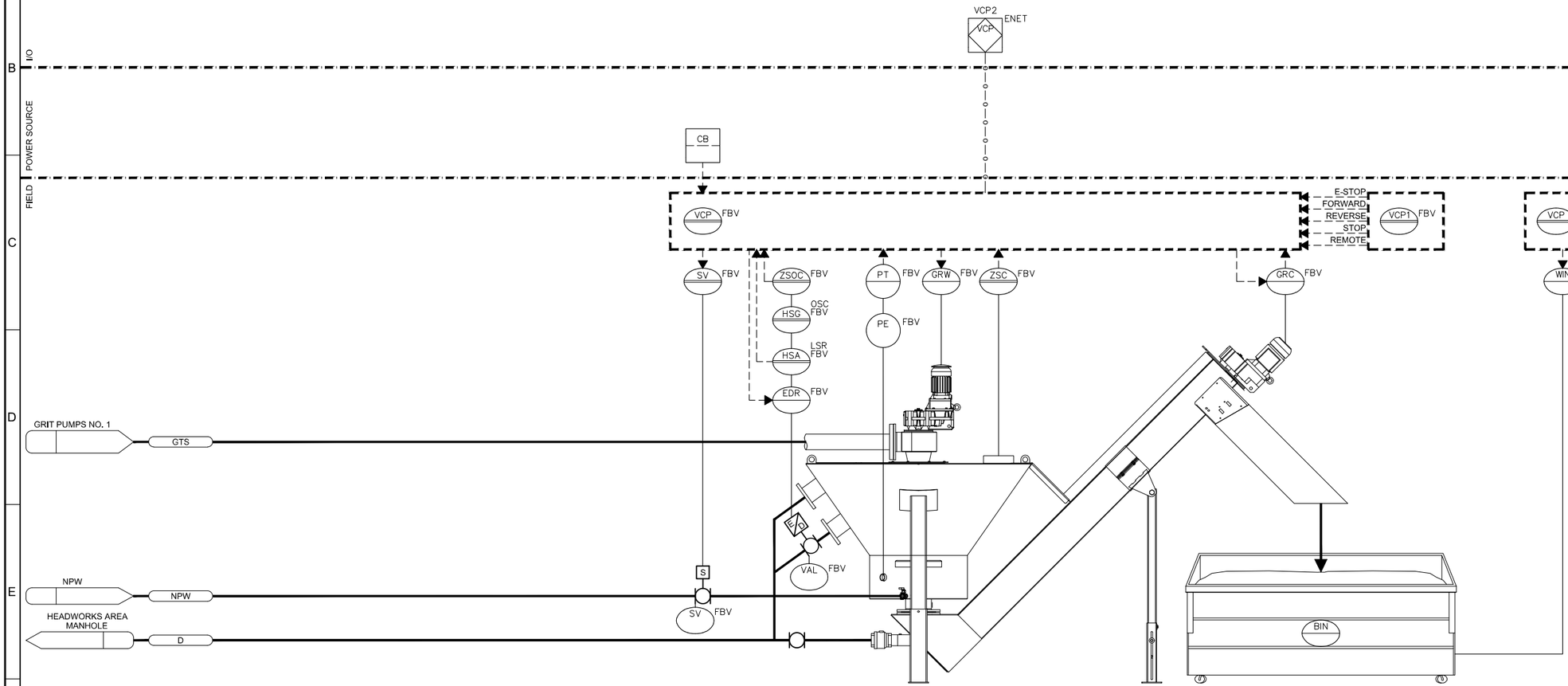
P&ID
GRIT PUMP NO. 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 10N07
SHEET NO. 173 OF 251

PROJECT NO.
FILE NAME:

Xref ..\d0224788\ProjNum34x22Border.dwg



GRIT WASHER/CLASSIFIER NO.1 MIXER

GRIT WASHER/CLASSIFIER NO.1 SCREW

GRIT BIN WINCH

GRIT WASHER/CLASSIFIER NO. 1 ORGANICS VALVE

GRIT BIN

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

GRIT CLASSIFIER NO. 1

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

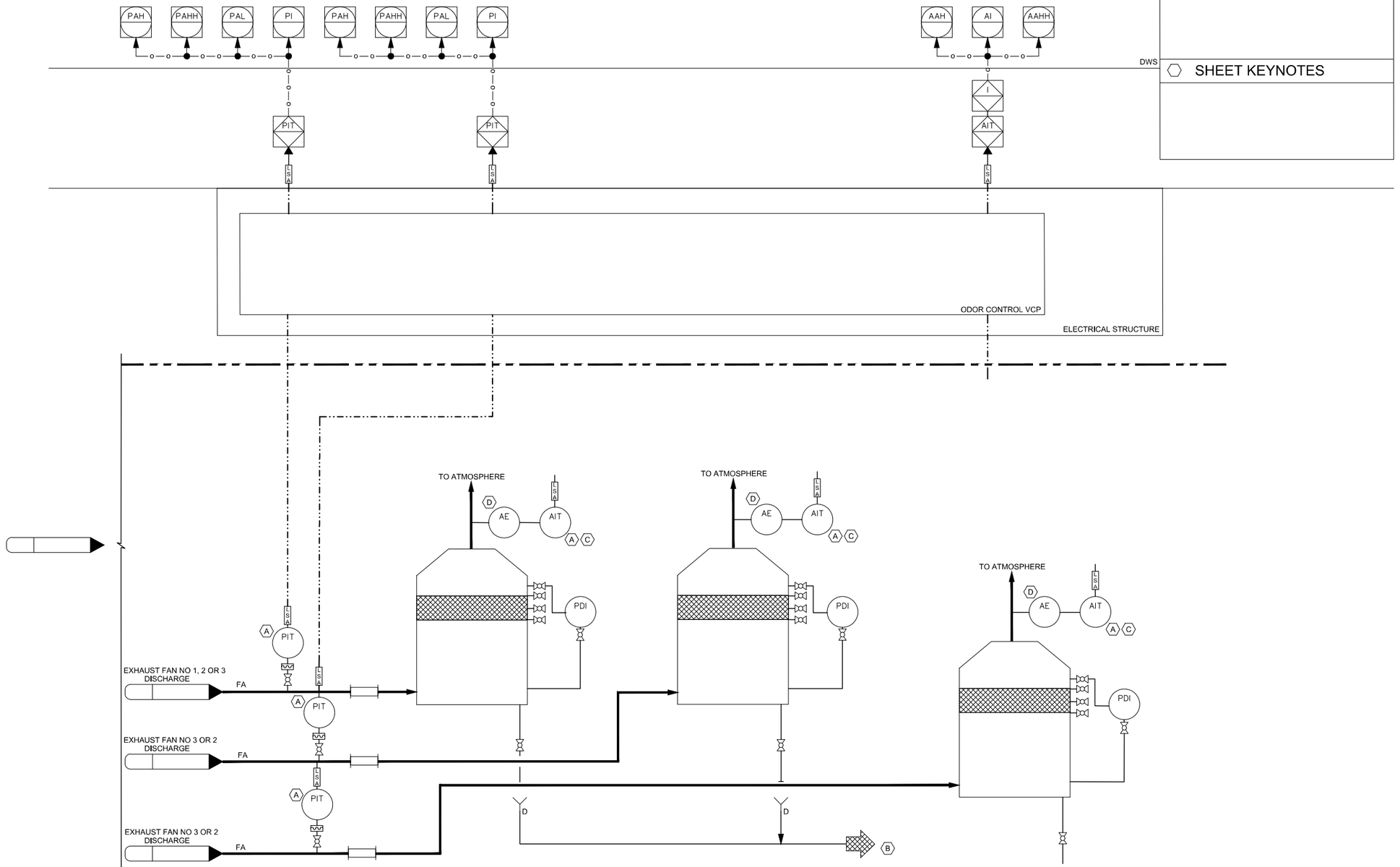
DRAWING NO. 10N08

SHEET NO. 174 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



GENERAL SHEET NOTES

SHEET KEYNOTES

REV	DATE	BY	DESCRIPTION

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DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

HEADWORKS ODOR CONTROL

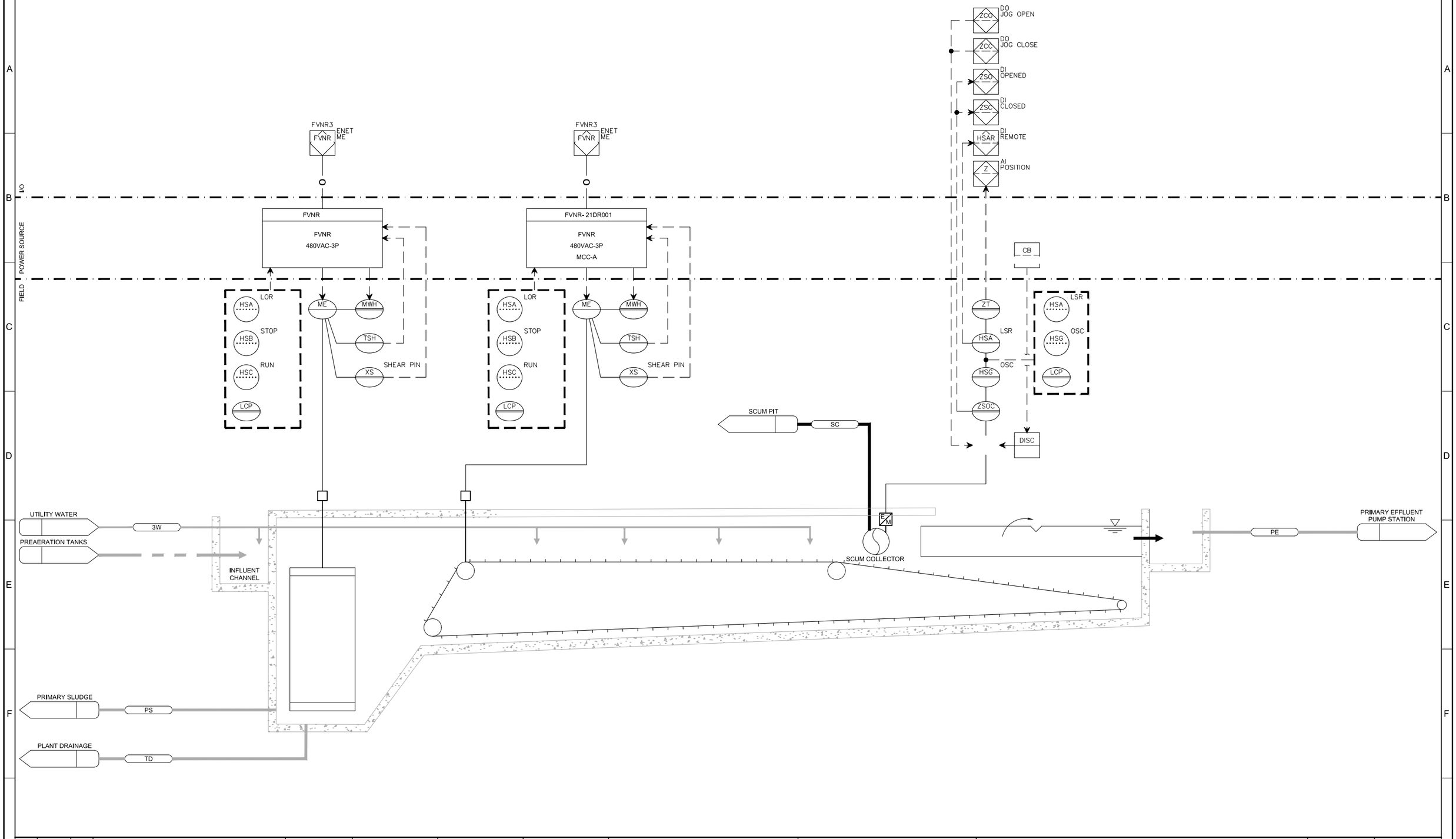
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 10N09
SHEET NO. 175 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
TYPICAL PRIMARY CLARIFIER

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 21N01
SHEET NO. 176 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

GENERAL SHEET NOTES

1. VENDOR SKID EQUIPMENT AND CONTROL PANELS SHALL BE FURNISHED BY ODOR CONTROL SYSTEM VENDOR. FIELD INSTALLATION BY CONTRACTOR.
2. OFF-SKID PIPELINES, VALVES AND INSTRUMENTS FURNISHED AND INSTALLED BY CONTRACTOR UNLESS SPECIFICALLY NOTED OTHERWISE.
3. FIELD WIRING BY THE CONTRACTOR

SHEET KEYNOTES

A. FURNISH AND INSTALL SUNSHIELD.

B. REFERENCE DRAWINGS I-0010 FOR I/O DETAILS.

EXHAUST FAN 1

EXHAUST FAN 2

EXHAUST FAN 3

DWS

FROM ODOR CONTROL SYSTEM LOGIC

MIST/GREASE TRAP 1

MIST/GREASE TRAP 2

MIST/GREASE TRAP 3

TO CARBON ADSORBER VESSEL 3

CONTINUED TO CARBON ADSORBER VESSELS

ODOR CONTROL SYSTEM VENDOR PACKAGE

FA

REV	DATE	BY	DESCRIPTION

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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

BIOSOLIDS ODOR CONTROL 1

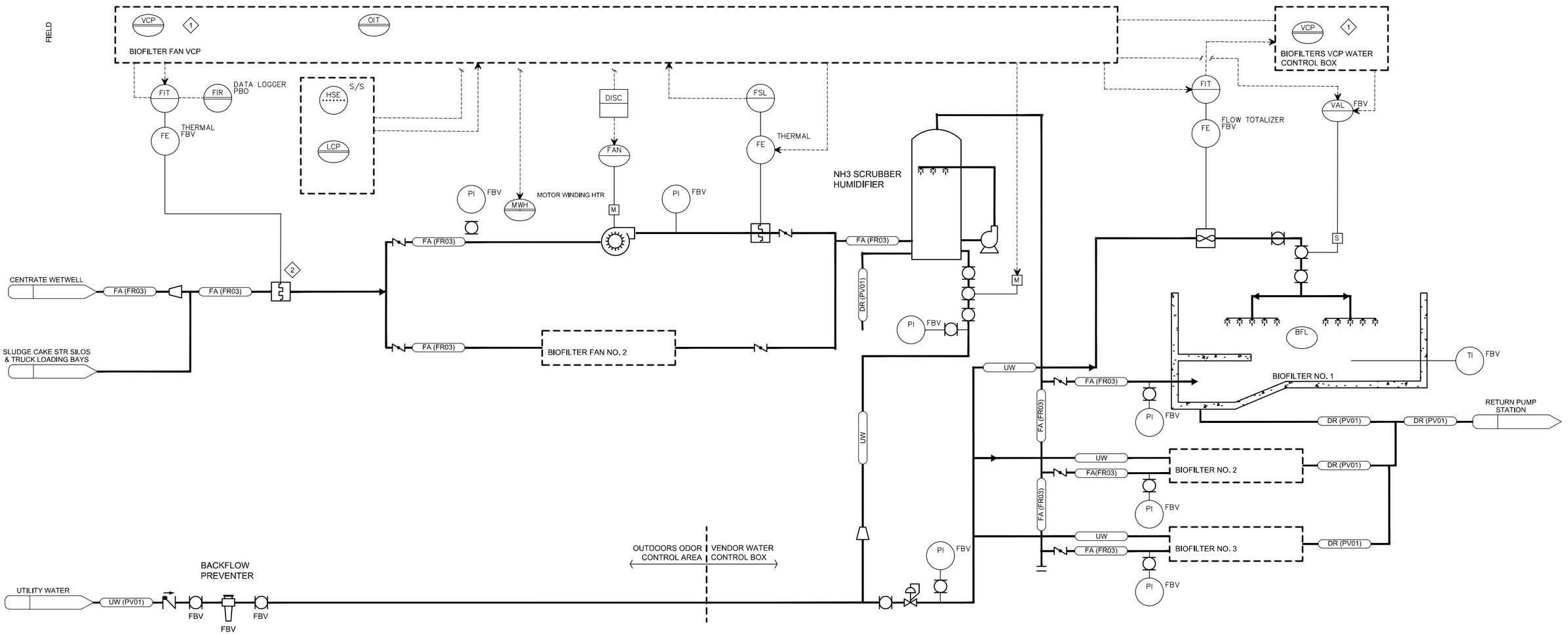
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 28N01
SHEET NO. 177 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
BIOSOLIDS ODOR CONTROL 2

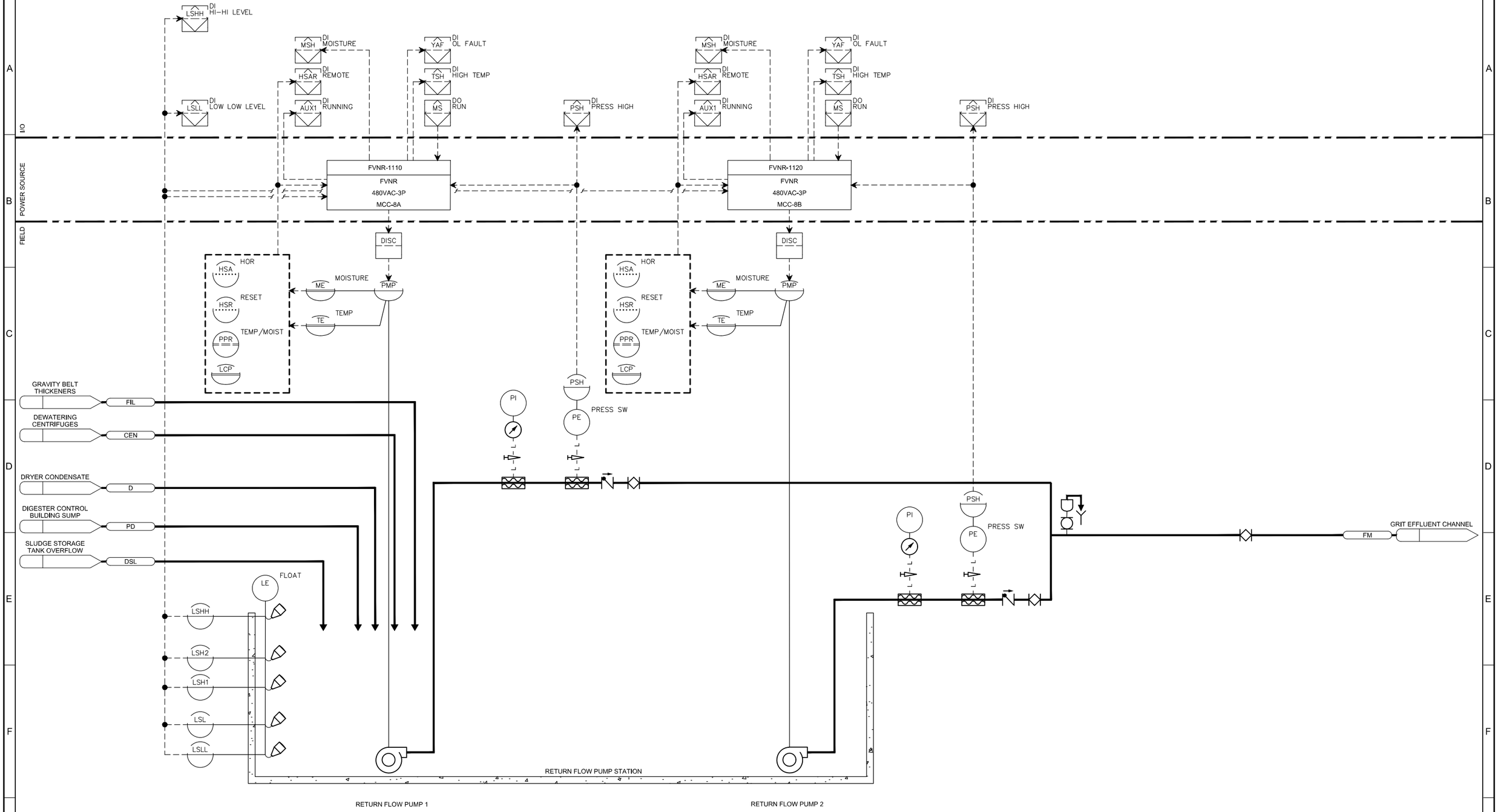
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 28N02
SHEET NO. 178 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
RETURN FLOW PUMP STATION

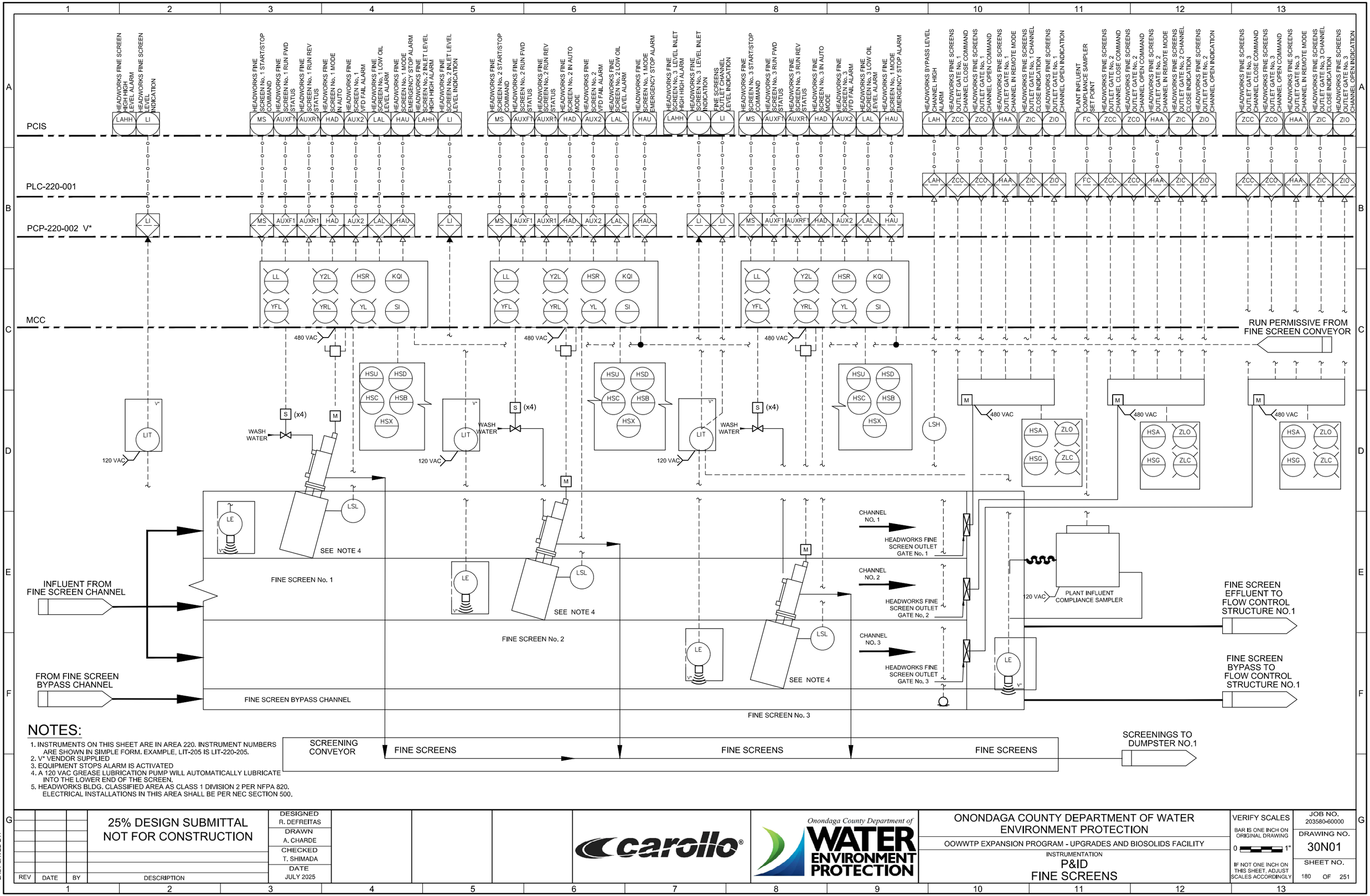
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 29N01
SHEET NO. 179 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



NOTES:

1. INSTRUMENTS ON THIS SHEET ARE IN AREA 220. INSTRUMENT NUMBERS ARE SHOWN IN SIMPLE FORM. EXAMPLE, LIT-205 IS LIT-220-205.
2. V* VENDOR SUPPLIED
3. EQUIPMENT STOPS ALARM IS ACTIVATED
4. A 120 VAC GREASE LUBRICATION PUMP WILL AUTOMATICALLY LUBRICATE INTO THE LOWER END OF THE SCREEN.
5. HEADWORKS BLDG. CLASSIFIED AREA AS CLASS 1 DIVISION 2 PER NFPA 820. ELECTRICAL INSTALLATIONS IN THIS AREA SHALL BE PER NEC SECTION 500.

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED	R. DEFREITAS
DRAWN	A. CHARDE
CHECKED	T. SHIMADA
DATE	JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

FINE SCREENS

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

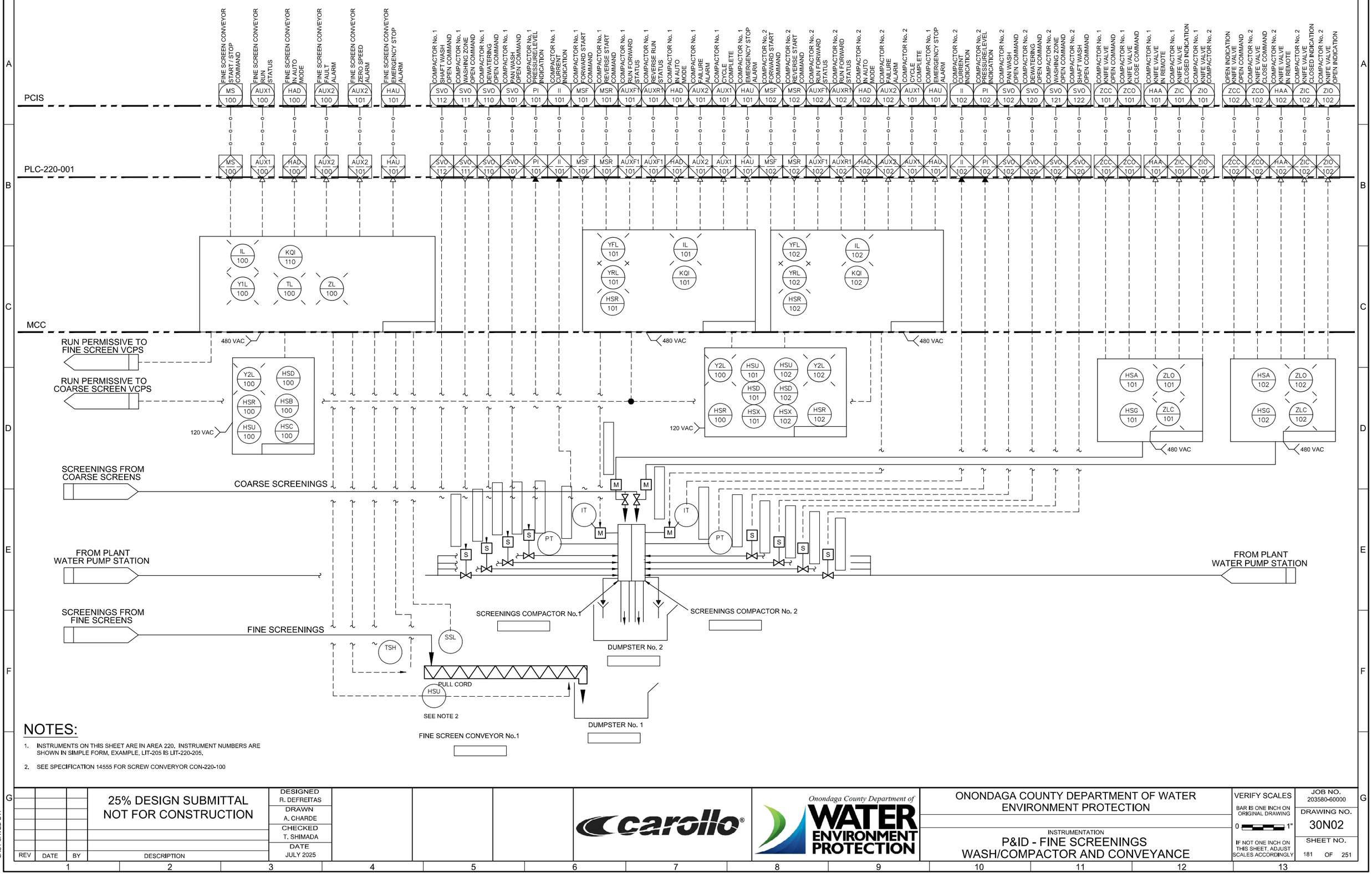
DRAWING NO. 30N01

SHEET NO. 180 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



NOTES:

1. INSTRUMENTS ON THIS SHEET ARE IN AREA 220. INSTRUMENT NUMBERS ARE SHOWN IN SIMPLE FORM. EXAMPLE, LIT-205 IS LIT-220-205.
2. SEE SPECIFICATION 14555 FOR SCREW CONVERYOR CON-220-100

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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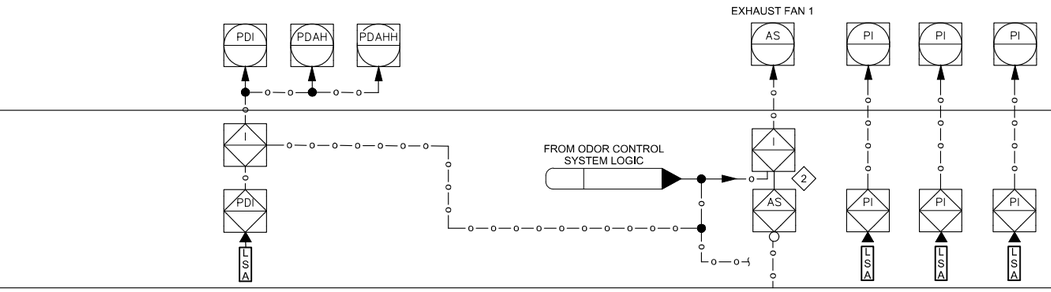
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

INSTRUMENTATION
P&ID - FINE SCREENINGS WASH/COMPACTOR AND CONVEYANCE

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 30N02
SHEET NO. 181 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:

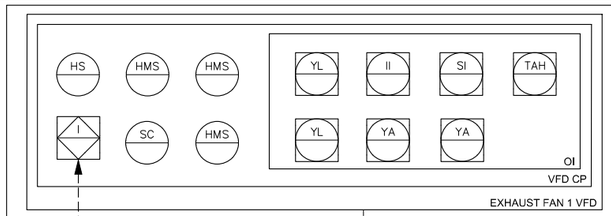


ODOR CONTROL VCP

ODOR CONTROL VCP

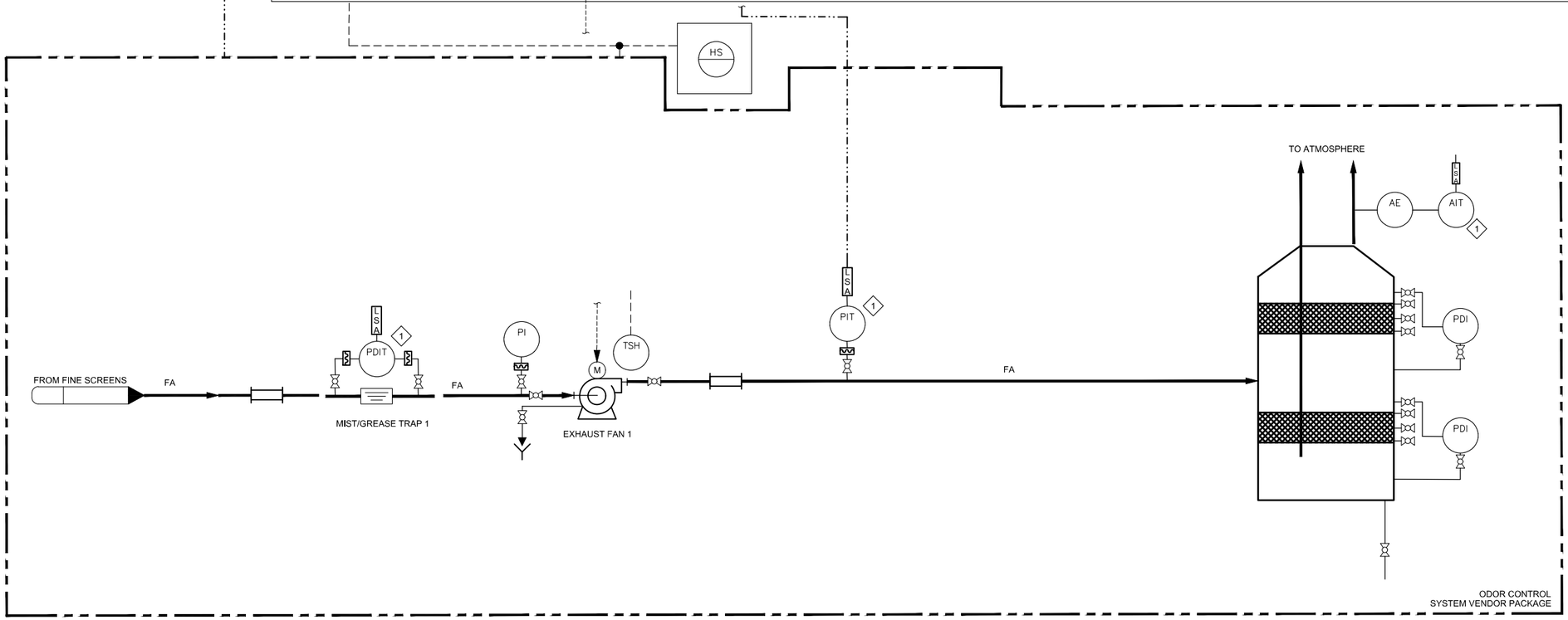
FIELD

FIELD



ODOR CONTROL VCP

ODOR CONTROL/SOLIDS ELECTRICAL STRUCTURE



GENERAL NOTES:

1. VENDOR SKID EQUIPMENT AND CONTROL PANELS SHALL BE FURNISHED BY ODOR CONTROL SYSTEM VENDOR. FIELD INSTALLATION BY CONTRACTOR.
2. OFF-SKID PIPELINES, VALVES AND INSTRUMENTS FURNISHED AND INSTALLED BY CONTRACTOR UNLESS SPECIFICALLY NOTED OTHERWISE.
3. FIELD WIRING BY THE CONTRACTOR

KEY NOTES:

1. FURNISH AND INSTALL SUNSHEILD.
2. REFERENCE DRAWINGS

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

FINE SCREENS ODOR CONTROL

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 30N03
SHEET NO. 182 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

Xref ..\d0224788\ProjNum34x22Border.dwg

I/O

POWER SOURCE

FIELD

CB

ZT

HSA

LSR

HSG

OSC

ZSOC

EAM

DISC

TIT

AIT

ORP

AE

CB 20.1109

NITRATE

VFD-

VFD-
480VAC-3P

PMP

ME

MOISTURE

TE

TEMP

PPR

TEMP/MOIST FBV

LOR

HSB

STOP

HSC

START

HSR2

PPR RESET

HSU

E-STOP

Y1

RUNNING

Y2

FAIL

LCP

SWING ZONE 2

SUPPLEMENTAL CARBON FEED

24" PE FROM FINE SCREENS

MIXER AIR COMPRESSORS

VAL

E/M

16" ARCY

ANAEROBIC ZONE 1

ANAEROBIC ZONE 2

PRE-ANOXIC ZONE 1

PRE-ANOXIC ZONE 2

SWING ZONE 1

CONTINUED ON

BASIN NO.2 ANOXIC INTERNAL RECYCLE PUMP NO.2

BASIN NO.1 ANOXIC INTERNAL RECYCLE PUMP NO.1

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
BNR BASIN TYPICAL 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N01
SHEET NO. 183 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

KEY NOTES:

1. REFERENCE SPECIFICATION 17506, THIS ANALYZER IS MOUNTED WITH AN AIR COMPRESSOR CLEANING SYSTEM THAT REQUIRES A SEPARATE POWER CIRCUIT FROM THE ANALYZER TRANSMITTER.

I/O

POWER SOURCE

FIELD

CB

FIT

FE

THERMAL

ZT

HSA

LSR

OSC

HSG

ZSOC

EAM

DISC

TIT

AIT

ORP

AE

DO

1

NRCY

BNR BASIN 2

VAL

E/M

LPA

CONTINUED ON DWG

SWING ZONE 1.
CONT.

AEROBIC ZONE

DISTRIBUTION BOX

AERATION BLOWERS

RAS

RAS PUMP STATION

THERMAL FLOW METER

DISSOLVED OXYGEN

BNR ELECTRIC DISCRETE MODULATING VALVE

ORP

BNR ELECTRIC DISCRETE MODULAT

REV	DATE	BY	DESCRIPTION
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CHECKED T. SHIMADA
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
BNR BASIN TYPICAL 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N02
SHEET NO. 184 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

VFD-
VFD-
480VAC-3P

VFD-
VFD-
480VAC-3P

CB

PMP
ME
MOISTURE
TE
TEMP
PPR
TEMP /MOIST
FBV
HSA
LOR
HSB
STOP
HSC
START
HSR2
RESET
HSU
E–STOP
Y1
RUNNING
Y2
FAIL
LCP

ZT
HSA
LSR
HSG
OSC
ZSOC
EAM
DISC

TIT
AIT
AE
ORP

NITRATE

SUPPLEMENTAL
CARBON FEED

VAL
E/M

CONTINUED ON
DWG 20N02

AEROBIC ZONE

SWING
ZONE 2.

POST-ANOXIC
ZONE 1.

POST-ANOXIC
ZONE 2.

COMMON
EFFLUENT
CHANNEL

SECONDARY EFFLUENT TO MBR
INFLUENT CHANNEL

BNR ELECTRIC DISCRETE MODULATING VALVE

BASIN NO. 1 INTRIFIED INTERNAL RECYCLE PUMP NO.1

BASIN NO. 1 INTRIFIED INTERNAL RECYCLE PUMP NO.2

BNR ELECTRIC DISCRETE MODULATING VALVE

ORP

NITRATE

BNR ELECTRIC DISCRETE MODULATING VALVE

BNR ELECTRIC DISCRETE MODULATING VALVE

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
BNR BASIN TYPICAL 3

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N03
SHEET NO. 185 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

VFD-

VFD-

480VAC-3P

VFD-

VFD-

480VAC-3P

VCP FBBSS

MEMBRANE AIR SCOUR
BLOWER MASTER CONTROL PANEL

CONTINUED ON DWG 22N02

TE3 RTD PH A

TE4 RTD PH B

TE5 RTD PH C

BLO FBBSS

PIT PE FBBSS

TIT TE FBBSS

PI FBBSS

PDSH FBBSS

PE FBBSS

ZSOC

EAM FBBSS

VIB FBBSS

XIT

XEA FBBSS

XEB FBBSS

TI FBBSS

TIT

PDIT

TE FBBSS

PE FBBSS

E M

AIR INTAKE

PACKAGED SKID FURNISHED BY BLOWER SYSTEM SUPPLIER

MEMBRANE AIR SCOUR BLOWERS 3 & 4

MEMBRANE AIR SCOUR BLOWER MASTER CONTROL PANEL

MEMBRANE AIR SCOUR BLOWER NO.1

MEMBRANE AIR SCOUR BLOWER NO.2

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION

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NOT FOR CONSTRUCTION

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

MEMBRANE AIR SCOUR BLOWERS TYPICAL

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 31N04

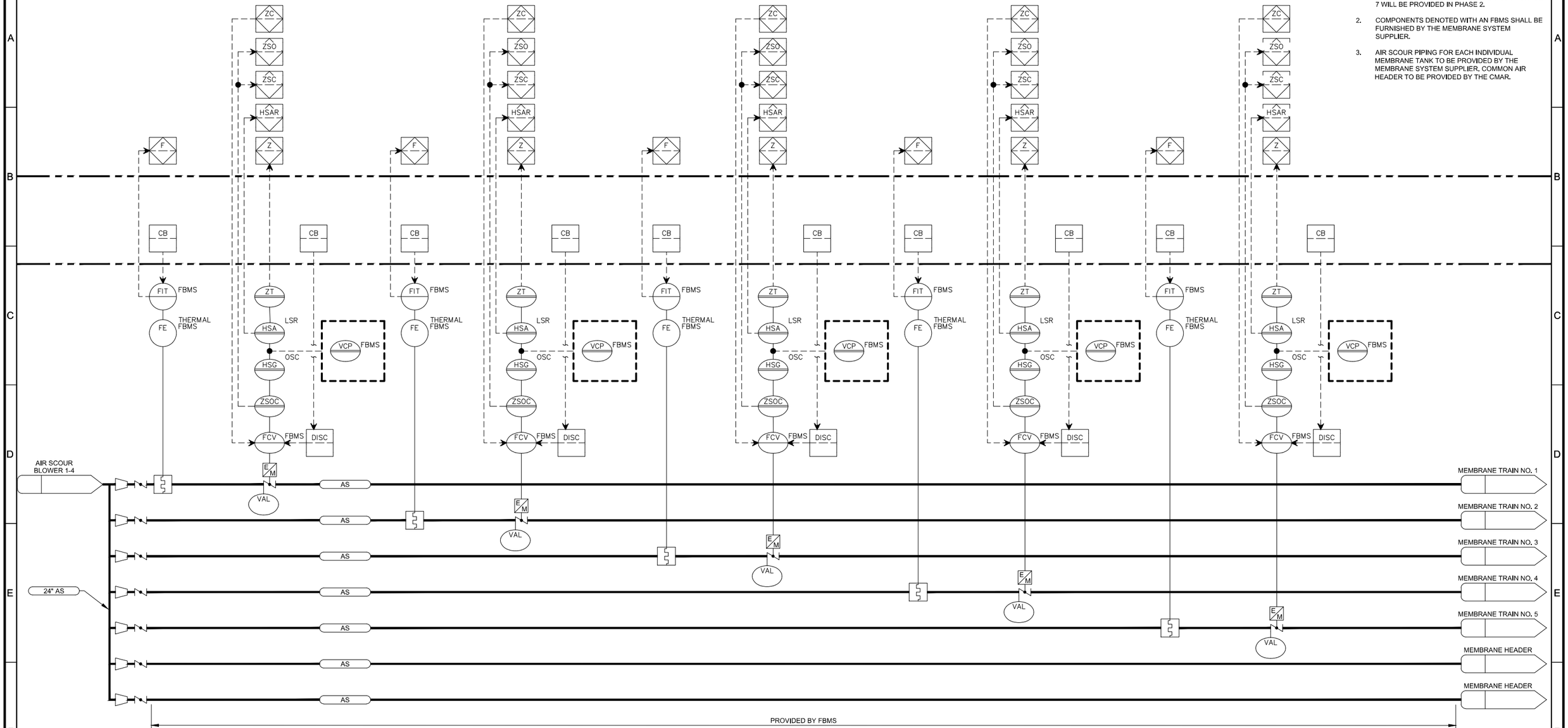
SHEET NO. 186 OF 251

PROJECT NO.

FILE NAME:

GENERAL NOTES:

1. MEMBRANE SKID PACKAGES 1 THROUGH 6 ARE PROVIDED IN PHASE 1. MEMBRANE SKID PACKAGE 7 WILL BE PROVIDED IN PHASE 2.
2. COMPONENTS DENOTED WITH AN FBMS SHALL BE FURNISHED BY THE MEMBRANE SYSTEM SUPPLIER.
3. AIR SCOUR PIPING FOR EACH INDIVIDUAL MEMBRANE TANK TO BE PROVIDED BY THE MEMBRANE SYSTEM SUPPLIER. COMMON AIR HEADER TO BE PROVIDED BY THE CMAR.



REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED	R. DEFREITAS
DRAWN	A. CHARDE
CHECKED	T. SHIMADA
DATE	JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
MEMBRANE AIR HEADER 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N05
SHEET NO. 187 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

GENERAL NOTES:

1. MEMBRANE SKID PACKAGES 1 THROUGH 6 ARE PROVIDED IN PHASE 1. MEMBRANE SKID PACKAGE 7 THROUGH 10 WILL BE PROVIDED IN PHASE 2.
2. COMPONENTS DENOTED WITH AN FBMS SHALL BE FURNISHED BY THE MEMBRANE SYSTEM SUPPLIER.
3. AIR SCOUR PIPING FOR EACH INDIVIDUAL MEMBRANE TANK TO BE PROVIDED BY THE MEMBRANE SYSTEM SUPPLIER. COMMON AIR HEADER TO BE PROVIDED BY THE CMAR.

I/O

POWER SOURCE

FIELD

AO POSITION
DI OPENED
DI CLOSED
DI REMOTE
AI POSITION
AI
CB
FIT
FBMS
FE
THERMAL FBMS
ZT
HSA
LSR
OSC
VCP
HSG
ZSOC
FCV
DISC

MEMBRANE HEADER
AS
VAL
MEMBRANE TRAIN NO. 6
MEMBRANE TRAIN NO. 7
MEMBRANE TRAIN NO. 8
MEMBRANE TRAIN NO. 9
MEMBRANE TRAIN NO. 10

PROVIDED BY FBMS

FLOW CONTROL VALVE DESCRIPTION

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION

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NOT FOR CONSTRUCTION

DESIGNED	R. DEFREITAS
DRAWN	A. CHARDE
CHECKED	T. SHIMADA
DATE	JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
MEMBRANE AIR HEADER 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N06
SHEET NO. 188 OF 251

PROJECT NO.
FILE NAME:

GENERAL NOTES:

1. ALL TAGS ON THIS DRAWING ARE PRECEDED WITH "???".

I/O

POWER SOURCE

FIELD

AUX2 DI FAILED

AUX1 DI RUNNING

HSAR DI REMOTE

ZCO DO OPEN

CB

VCP FBMS
AIR COMPRESSOR CONTROL CABINET

LOR

HSA

HSO OC

LCP

ARC FBMS

SV FBMS

DRY FBMS

PSL PRESS SW FBMS

PSH PRESS SW FBMS

FE FBMS

PI FBMS

PE PRESS SW FBMS

TNK FBMS

2500 GALLON RECEIVER TANK

SKID LIMITS REFER TO SPEC

MEMBRANE RACK MEMBRANE INTEGRITY TEST PORT

TRAIN NO.1 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.2 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.3 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.4 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.5 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.6 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.7 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.8 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.9 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.10 LOCALLY MOUNTED SOLENOIDS

TRAIN NO.1 EJECTOR

TRAIN NO.2 EJECTOR

TRAIN NO.3 EJECTOR

TRAIN NO.4 EJECTOR

TRAIN NO.5 EJECTOR

TRAIN NO.6 EJECTOR

TRAIN NO.7 EJECTOR

TRAIN NO.8 EJECTOR

TRAIN NO.9 EJECTOR

TRAIN NO.10 EJECTOR

AIR COMPRESSOR NO.1

AIR COMPRESSOR NO.2

AIR DRYER NO.1

AIR DRYER NO.2

PRESSURE SWITCH LOW

PRESSURE INDICATOR

SOLENOID VALVE

PRESSURE SWITCH LOW

PRESSURE SWITCH LOW

REV	DATE	BY	DESCRIPTION
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DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

MEMBRANE SYSTEM AIR COMPRESSORS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

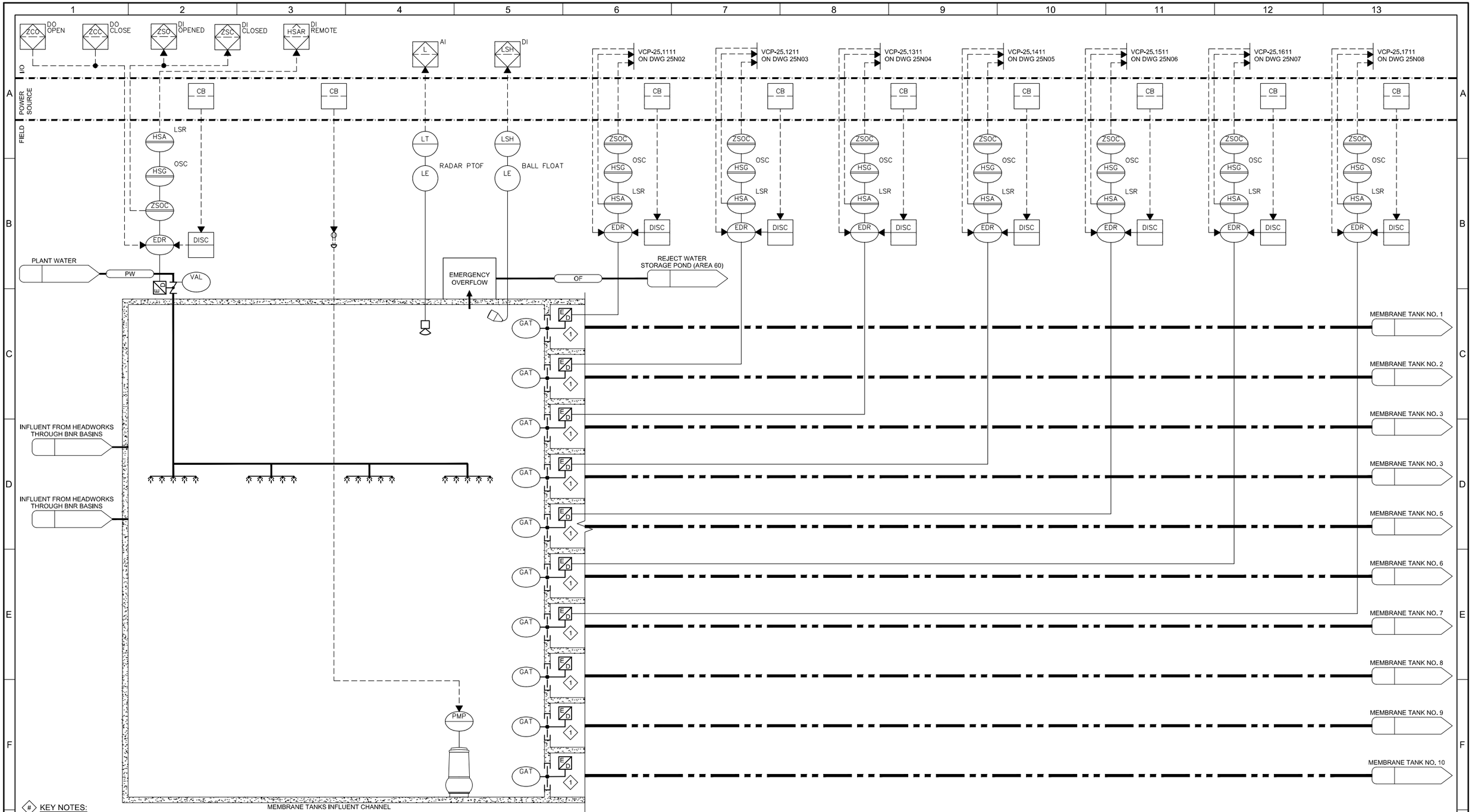
DRAWING NO. 31N07

SHEET NO. 189 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

MEMBRANE TANKS COMMON INFLUENT CHANNEL

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N08
SHEET NO. 190 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

GENERAL NOTES:

1. COMPONENTS DENOTED WITH AN FBMS SHALL BE FURNISHED BY THE MEMBRANE SYSTEM SUPPLIER AND INSTALLED BY THE CONTRACTOR.
2. COMPONENTS NOT DENOTED WITH A FBMS SHALL BE PROVIDED BY THE CONTRACTOR AND INSTALLED BY THE CONTRACTOR.

(#) KEY NOTES:

1. AIR SCOUR PIPING FOR EACH INDIVIDUAL MEMBRANE TANK TO BE PROVIDED BY THE MEMBRANE SYSTEM SUPPLIER. COMMON AIR HEADER TO BE PROVIDED BY THE CMAR.
2. EJECTOR TAP MUST BE LOCATED ON THE TOP OF THE PIPE AT THE HIGHEST POINT OF THE PIPE. PROVIDE AN AIR GAP NEAR THE EJECTOR, DIRECT DISCHARGE TO DRAIN.
3. REFERENCE SPECIFICATION 17506, THIS ANALYZER IS MOUNTED WITH AN AIR COMPRESSOR CLEANING SYSTEM THAT REQUIRES A SEPARATE POWER CIRCUIT FROM THE ANALYZER TRANSMITTER.

I/O

POWER SOURCE

FIELD

P AI

MEMB VCP ENET

A AI TSS

A AI DO

CB

CB1

FU

CB2

CB

CB

FIT-25.2005 DWG. 25N28

PIT-25.2007 DWG. 25N28

FIT-25.3017 DWG. 25N10

FIT-25.3019 DWG. 25N10

FCV-25.4092 DWG. 25N24

SV-25.3016 DWG. 25N10

SV-25.3018 DWG. 25N10

FCV-25.4091 DWG. 25N24

VCP MEMBRANE VENDOR MASTER CONTROL CABINET VCP-25M-A

CONTINUED ON DWG 25N04

VCP MEMBRANE TRAIN NO. 1 VENDOR RIO CABINET

PIT FBMS

PE PRESSURE FBMS

ZSOC FBMS

HSG OSC

HSA LSR

DISC

EDR FBMS

EDR-25.1010 DWG. 25N01

OPENED
CLOSED
REMOTE
OPEN
CLOSE

SV FBMS

ZCOC FBMS

FCV FBMS

LSH

LE FBMS

OPENED
CLOSED
REMOTE
OPEN
CLOSE

FCV-25.3013 DWG. 25N09

OPENED
CLOSED
REMOTE
OPEN
CLOSE

FCV-25.3011 DWG. 25N09

LSLL LE1 FBMS

LSL LE2 FBMS

LT LE3 P-SUB FBMS

LIT LE RADAR P-TOF

AIT AE TSS

AIT 3 AE DO

OPENED
CLOSED
REMOTE
OPEN
CLOSE

FCV-25.3018 DWG. 25N10

OPENED
CLOSED
REMOTE
OPEN
CLOSE

FCV-25.3019 DWG. 25N10

COMPRESSED AIR FROM COMPRESSOR

S

VAL

2

P

VAL

AIR COMPRESSORS TO MEMBRANE INTEGRITY TEST PORT

1

1 FBMS

MEMBRANE TANK NO. 1 PERMEATE PUMP

PERMEATE PUMP 1 CIP RECIRCULATION LINE

CIP

DESICCANT

MEMBRANE TANKS INFLUENT CHANNEL

WAS PUMPS

RAS CHANNEL

MEMBRANE TANK NO. 1

F D VAL

DR

PLANT DRAIN PIPING REFER TO CIVIL DRAWINGS

MEMBRANE AIR HEADER

1 FBMS 28 RACKS TOTAL

PRESSURE TRANSMITTER

MEMBRANE TANK NO.1 DRAIN VALVE

SOLENOID VALVE

AUTOMATED BALL VALVE

LEVEL SWITCH LOW

TOTAL SUSPENDED SOLIDS

RADAR PTOF

DISSOLVED OXYGEN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID MEMBRANE TRAIN NO.1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 31N09

SHEET NO. 191 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

Xref ..\d0224788\ProjNum34x22Border.dwg

KEY NOTES:

1. COORDINATE PEER-TO-PEER COMMUNICATION BETWEEN PLC-80A AND VCP-25M-A OVER THE ETHERNET NETWORK

I/O

POWER SOURCE

FIELD

VCP-25.1111
ON DWG 25N02

FU FUSE

ZSOC

FCV FBMS

VCP-25.1111
ON DWG 25N02

FU FUSE

ZSOC

FCV FBMS

CB

PERM
1 PMP ENET

VFD

VFD
480VAC-3P

VCP FBMS

PMP FBMS

MWH

TSH

FSL FBMS

FE THERMAL FBMS

COMPRESSED AIR FROM COMPRESSOR

COMPRESSED AIR FROM COMPRESSOR

PERMEATE TO/FROM MEMBRANES

PM

PM

VAL

BACKPULSE/CIP PUMPS

CIP

VAL

PI FBMS

M

PM

PUMP 1 DISCHARGE HEADER

PNEUMATIC DISCRETE OPEN/CLOSE VALVE

PNEUMATIC DISCRETE OPEN/CLOSE VALVE

PERMEATE PUMP NO.1

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

MEMBRANE TRAIN PERMEATE PUMP 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N10
SHEET NO. 192 OF 251

PROJECT NO.

FILE NAME:

KEY NOTES:

1. REFERENCE MECHANICAL DRAWING FOR PHYSICAL LOCATION. INSTALL A REMOTE MOUNTED TRANSMITTER HEAD.
2. TURBIDITY SAMPLE POINT AND PRESSURE TRANSMITTER PIPE TAP MUST BE ON THE SIDE OF THE PIPE TO AVOID AIR ENTRAINMENT.

I/O

POWER SOURCE

FIELD

VCP-25.1111 ON DWG 25N02

FU FUSE

SV

FIT

FE MAGNETIC FBMS

ZSOC

FCV FBMS

S

P

AI TURB

CB

AIT FBMS

AE TURBIDITY FBMS

AI TEMB

TIT FBMS

TE FBMS

MEMBRANE PERMEATE PUMP NO.2

MEMBRANE PERMEATE PUMP NO.3

MEMBRANE PERMEATE PUMP NO.4

MEMBRANE PERMEATE PUMP NO.5

MEMBRANE PERMEATE PUMP NO.6

MEMBRANE PERMEATE PUMP NO.7

COMPRESSED AIR FROM COMPRESSOR

SA

PM

CIP/BACKPULSE PUMPS

CIP

PERMEATE TO DISINFECTION

AQUEOUS AMMONIA

MEMBRANE BASIN 1

MEMBRANE TRAIN PERMEATE PUMP 1

1

2

MM

VAL

CIP

SA

SOLENOID VALVE

PNEUMATIC DISCRETE OPEN/CLOSE VALVE

MEMBRANE TRAIN NO.1 TURBIDITY

TEMPERATURE TRANSMITTER

MAGNETIC FLOW METER

PNEUMATIC DISCRETE OPEN/CLOSE VALVE

COMPLIANCE TURBIDITY

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

LAST SAVED BY:

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INSTRUMENTATION
P&ID
MEMBRANE TRAIN PERMEATE PUMP 2

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N11
SHEET NO. 193 OF 251

PROJECT NO.

FILE NAME:

GENERAL NOTES:

1. ALL PIPING, VALVES AND EQUIPMENT ON THIS SHEET WITH THE EXCEPTION OF THE VFD'S TO BE FURNISHED BY MEMBRANE SUPPLIER.

◇# KEY NOTES:

1. REFERENCE MECHANICAL DRAWING FOR PHYSICAL LOCATION. INSTALL A REMOTE MOUNTED TRANSMITTER HEAD.

I/O

POWER SOURCE

FIELD

VFD-
VFD-
480VAC-3P

VFD-
VFD-
480VAC-3P

ZSOC
FCV FBMS

VCP FBMS
PMP FBMS
MWH
TSH
FSL FBMS
FE THERMAL FBMS

VCP FBMS
PMP FBMS
MWH
TSH
FSL FBMS
FE THERMAL FBMS

PI FBMS
PIT FBMS ◇1
PE PRESSURE FBMS

FIT FBMS ◇1
FE MAGNETIC FBMS

MEMBRANE TRAIN PERMEATE PUMPS
VAL
CIP
FBMS
CIP
M
FBMS
FBMS
CIP
CIP
FBMS
M
FBMS
FBMS
CIP
CIP
MM
CIP/BACK PULSE PUMPS DISTRIBUTION

PNEUMATIC DISCRETE OPEN/CLOSE VALVE
BACK PULSE PUMP NO.1
THERMAL FLOW SWITCH
BACK PULSE PUMP NO.2
THERMAL FLOW SWITCH
PRESSURE TRANSMITTER
PRESSURE INDICATOR
MAGNETIC FLOW METER

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
INSTRUMENTATION
P&ID
CIP/BACK PULSE PUMPS TYPICAL

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N12
SHEET NO. 194 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

VCP-25M-A
ON DWG 25N02

FU
FUSE

ZSOC
FCV
FBMS

COMPRESSED AIR
FROM COMPRESSOR

S
P

VAL

CB

VCP
FBV

CIP/BACK PULSE
PUMPS 1 & 2

HYP
SODIUM HYPOCHLORITE
CHEMICAL DOSING

CTA
CITRIC ACID
CHEMICAL DOSING

CIP

MEMBRANE TRAIN NO. 10
MEMBRANE TRAIN NO. 9
MEMBRANE TRAIN NO. 8
MEMBRANE TRAIN NO. 7
MEMBRANE TRAIN NO. 6
MEMBRANE TRAIN NO. 5
MEMBRANE TRAIN NO. 4
MEMBRANE TRAIN NO. 3
MEMBRANE TRAIN NO. 2
MEMBRANE TRAIN NO. 1

PNEUMATIC OPEN/CLOSE VALVE

PNEUMATIC OPEN/CLOSE VALVE

PNEUMATIC OPEN/CLOSE VALVE

MEMBRANE AREA BRIDGE CRANE NO.1

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION

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NOT FOR CONSTRUCTION

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INSTRUMENTATION
P&ID
CIP/BACK PULSE PUMPS DISTRIBUTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N13
SHEET NO. 195 OF 251

PROJECT NO.

FILE NAME:

KEY NOTES:

1. LEVEL DEVICE POWERED FROM FILL STATION PANEL.

I/O

POWER SOURCE

FIELD

LSLL AUX2 AUX1 LSH FSH LI LSH LI FSH LI LSH FSH CB CB CB CB CB

VCP LCP TANK FILL STATION PANEL XH1 HORN XB1 STROBE HSY1 SILENCE LI1 LSH LI1 LEVEL LSH OVER FILL VCP EYEWASH HORN & STROBE PACKAGE

LSH FBV LE1 FBV LSLL FBV LE2 FBV ME FBV TE FBV PMP FBV FSH FBV FE LIT LE LSH LE2 FSH FBV FE LIT LE RADAR PTOF LSH LE2 CAPACITANCE FSH W3 FBV FE EMERGENCY EYEWASHES

HOSE QUICK DISCONNECT SUMP VENT FILL STATION CTA OVF TNK LI CITRIC ACID STORAGE TANK 800 GAL OVERFLOW VAL CTA VENT FILL STATION CTA OVF TNK LI CITRIC ACID STORAGE TANK 800 GAL OVERFLOW VAL CTA CITRIC ACID METERING PUMPS

SUMP LEVEL — LEVEL SWITCH HIGH

NORTH WALL EMERGENCY SHOWER/EYEWASH — CITRIC ACID AREA SUMP PUMP

RADAR PTOF — LEVEL SWITCH HIGH

WEST WALL EMERGENCY SHOWER/EYEWASH

RADAR PTOF — LEVEL SWITCH HIGH

EYE WASH STROBE AND HORN — CITRIC ACID AREA EYEWASH FLOW SWITCH

REV	DATE	BY	DESCRIPTION
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CHECKED T. SHIMADA
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OOWWTP EXPANSION PROGRAM - REUSE FACILITY

INSTRUMENTATION

P&ID
CITRIC ACID STORAGE TANKS

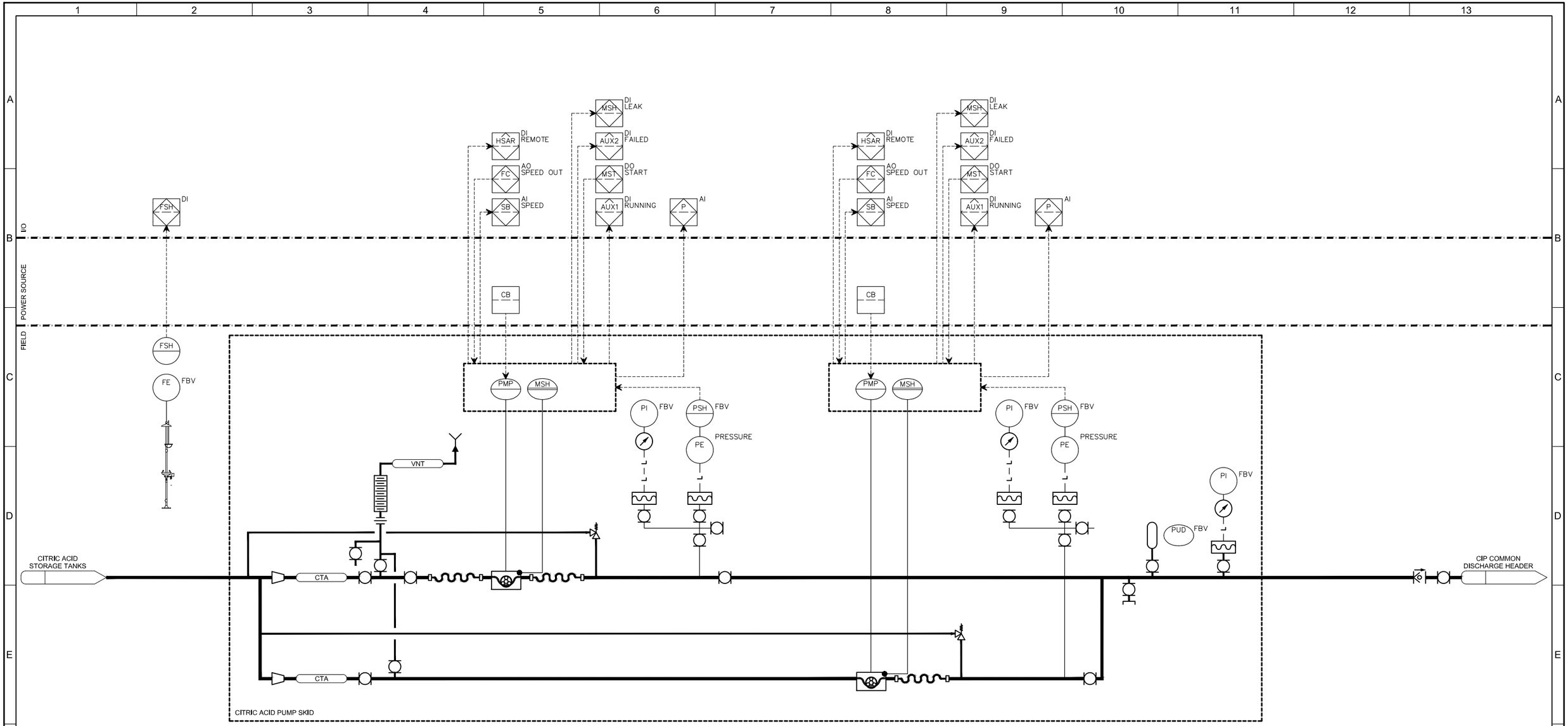
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N14
SHEET NO. 196 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
CITRIC ACID FEED PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N15
SHEET NO. 197 OF 251

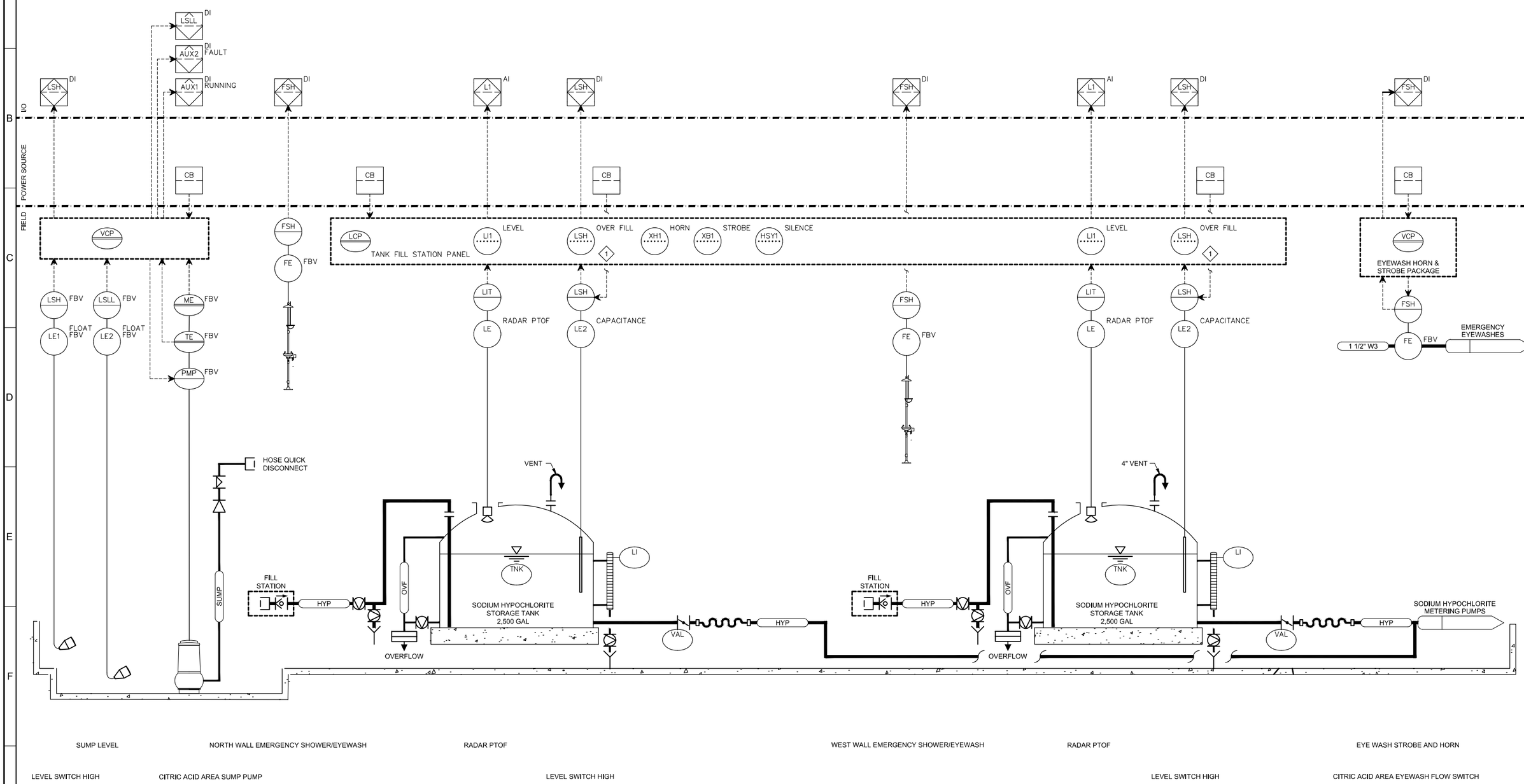
LAST SAVED BY:

PROJECT NO.

FILE NAME:

KEY NOTES:

1. LEVEL DEVICE POWERED FROM FILL STATION PANEL.



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

SODIUM HYPOCHLORITE TANK

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

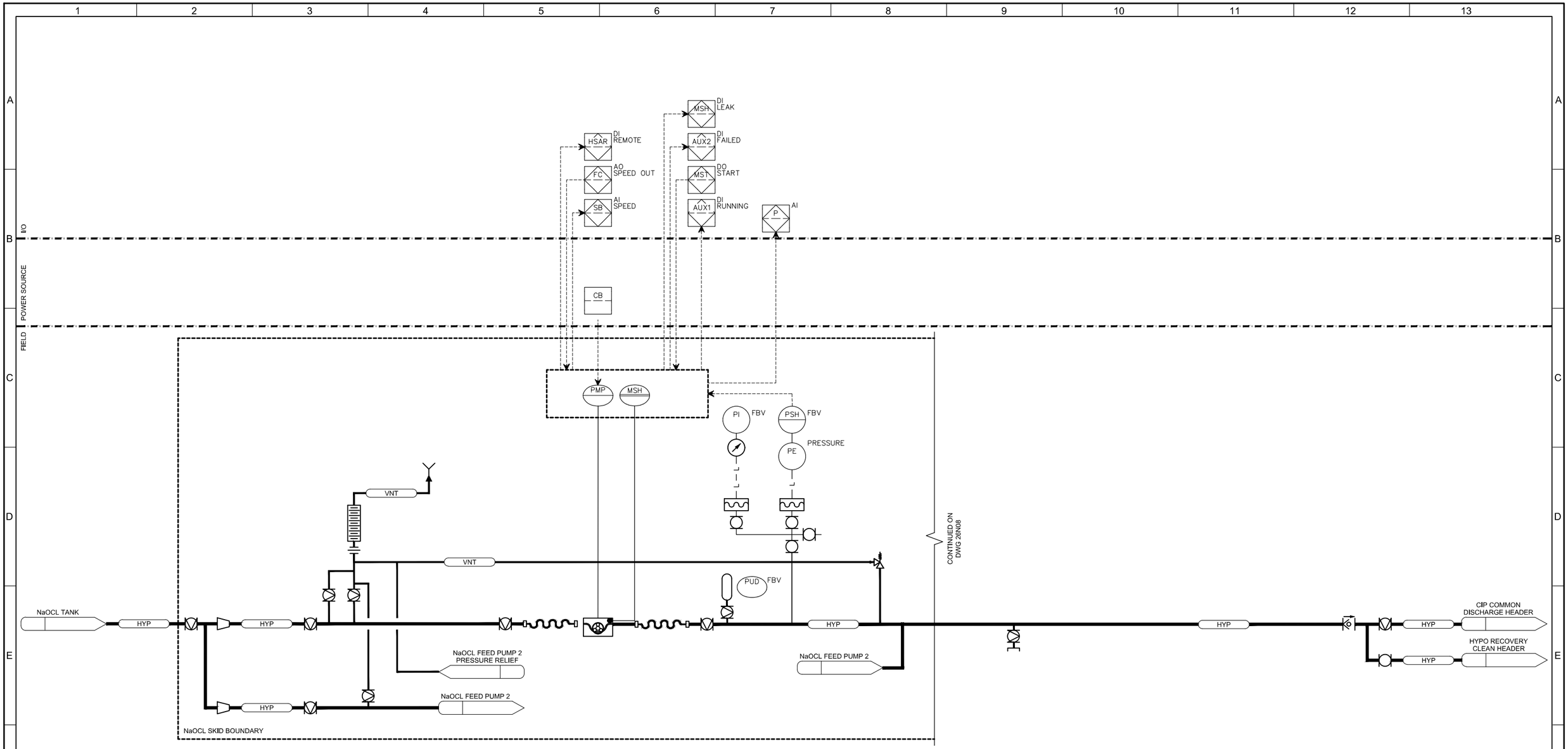
DRAWING NO. 31N16

SHEET NO. 198 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



PRESSURE SWITCH HIGH

CITRIC ACID DOSING PUMP NO. 1

PRESSURE INDICATOR

LAST SAVED BY:

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INSTRUMENTATION

P&ID
SODIUM HYPOCHLORITE PUMP

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 31N17
SHEET NO. 199 OF 251

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

VFD-

VFD-

480VAC-3P

VFD-

VFD-

480VAC-3P

CONTINUED ON DWG 22N02

VCP FBBSS

AERATION BLOWER MASTER CONTROL PANEL

TE3 RTD PH A

TE4 RTD PH B

TE5 RTD PH C

BLO FBBSS

PIT PE FBBSS

TIT TE FBBSS

PI FBBSS

PDSH FBBSS

PE FBBSS

ZSOC EAM FBBSS

VIB XIT FBBSS

TI FBBSS

TIT TE FBBSS

PDIT PE FBBSS

XEA FBBSS

XEB FBBSS

E M

AIR INTAKE

PACKAGED SKID FURNISHED BY BLOWER SYSTEM SUPPLIER

AERATION BLOWERS 3 & 4

REV	DATE	BY	DESCRIPTION
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DESIGNED R. DEFREITAS

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CHECKED T. SHIMADA

DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

AERATION BLOWERS TYPICAL

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 33N01

SHEET NO. 200 OF 251

LAST SAVED BY:

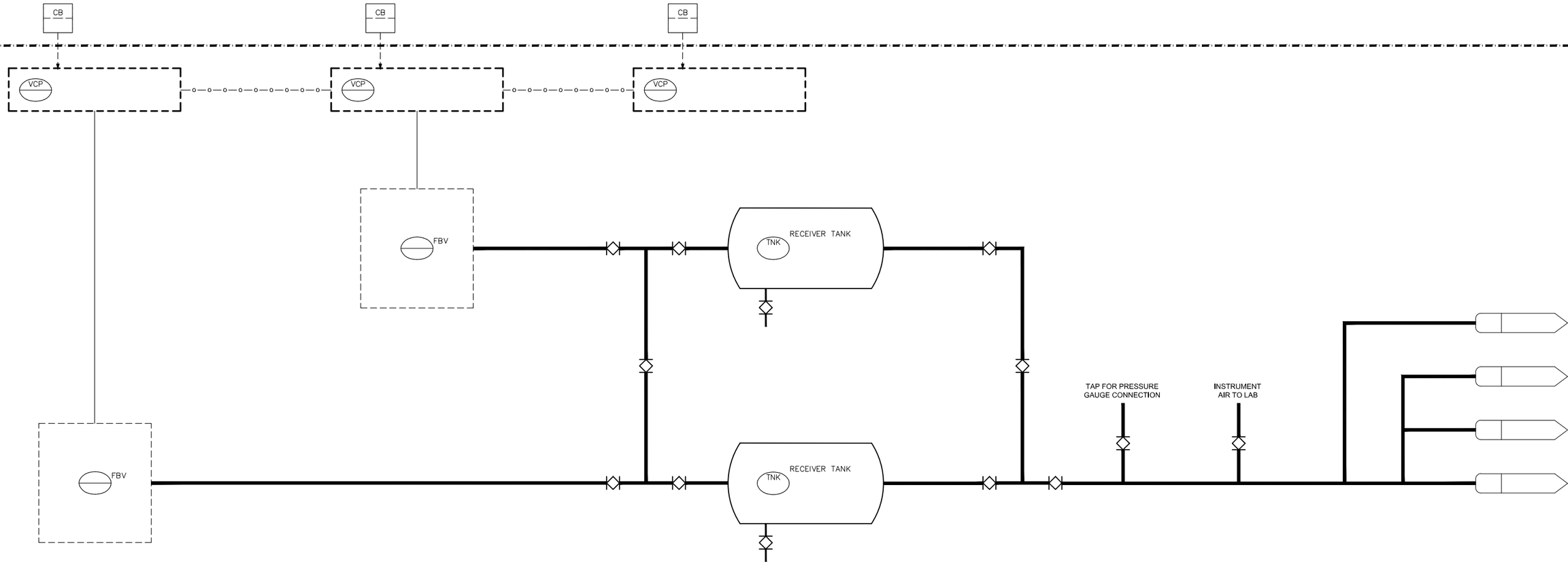
PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD



VENDOR CONTROL PANEL

LARGE BUBBLE MIXER AIR COMPRESSOR NO. 1

VENDOR CONTROL PANEL

LARGE BUBBLE MIXER AIR COMPRESSOR NO. 2

VENDOR CONTROL PANEL

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
LARGE BUBBLE MIXING SYSTEM TYPICAL

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 33N02
SHEET NO. 201 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA

PLC-9 (1)
910LCP9601 (E)

UVT
AI
AI

120VAC (D)
AIT FBUVSS
(2)
AE UVT

MBR PERMEATE PUMP STATION

MBR
EFFLUENT UVT

OPENED OP
CLOSED CL
REMOTE RE
OPEN OPW
CLOSE CLW

OP CL RE OPW CLW

ZSC ZSO
HS HS
LOR
OSC

(D) 480VAC
(M) E/D

UV REACTOR NO. 1

UV REACTOR NO. 2

(FUTURE)
UV REACTOR NO. 3

KEY NOTES:

(1) PANEL, PANEL MODIFICATIONS, AND PROGRAMMING BY OWNER. CONTRACTOR TO DEVELOP LOOP DRAWINGS FROM THE TYPICAL DRAWINGS SHOWN IN THE DESIGN DOCUMENTS AND SUBMIT TO OWNER FOR PLC I/O ADDRESS ASSIGNMENTS. USE ASSIGNMENTS TO TERMINATE SIGNALS FROM FIELD DEVICES.

(2) UVT INSTRUMENT FURNISHED BY UV SYSTEM SUPPLIER. MOUNTING APPURTENANCES AND INSTALLATION BY CONTRACTOR.

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

UV REACTORS INLET HEADER

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 43N01
SHEET NO. 202 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA

UV MASTER CONTROL PANEL

FLOW
FI

OPENED OP
CLOSED CL
REMOTE RE
OPEN OPW
CLOSE CLW

UV
YX

E/IP

KEY NOTES

1. UV LAMP CABLE FURNISHED BY UV MANUFACTURER. INSTALLATION BY CONTRACTOR IN COORDINATION WITH UV MANUFACTURER.

HYDRAULIC SYSTEM CENTER (HSC)

480VAC

POWER DISTRIBUTION CENTER (PDC)

480VAC

ZSC
ZSO
HS LOR
HS OSC

480VAC

M

FV
UV REACTOR NO. 1 OUTLET VALVE

UV DISCHARGE HEADER

WPR FBUVSS
LSL FBUVSS
TSH FBUVSS
AIT FBUVSS

CHEMICAL CLEANING SOLUTION

120VAC

FIT
FE

ZSC
ZSO
HS LOR
HS OSC

480VAC

M E/D

UV INLET HEADER

M

UV REACTOR NO. 1 FLOW METER

UV REACTOR NO. 1 INLET VALVE

UV REACTOR NO. 1

CHEMICAL CLEANING DRAIN

REV	DATE	BY	DESCRIPTION
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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

UV REACTOR 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 43N02
SHEET NO. 203 OF 251

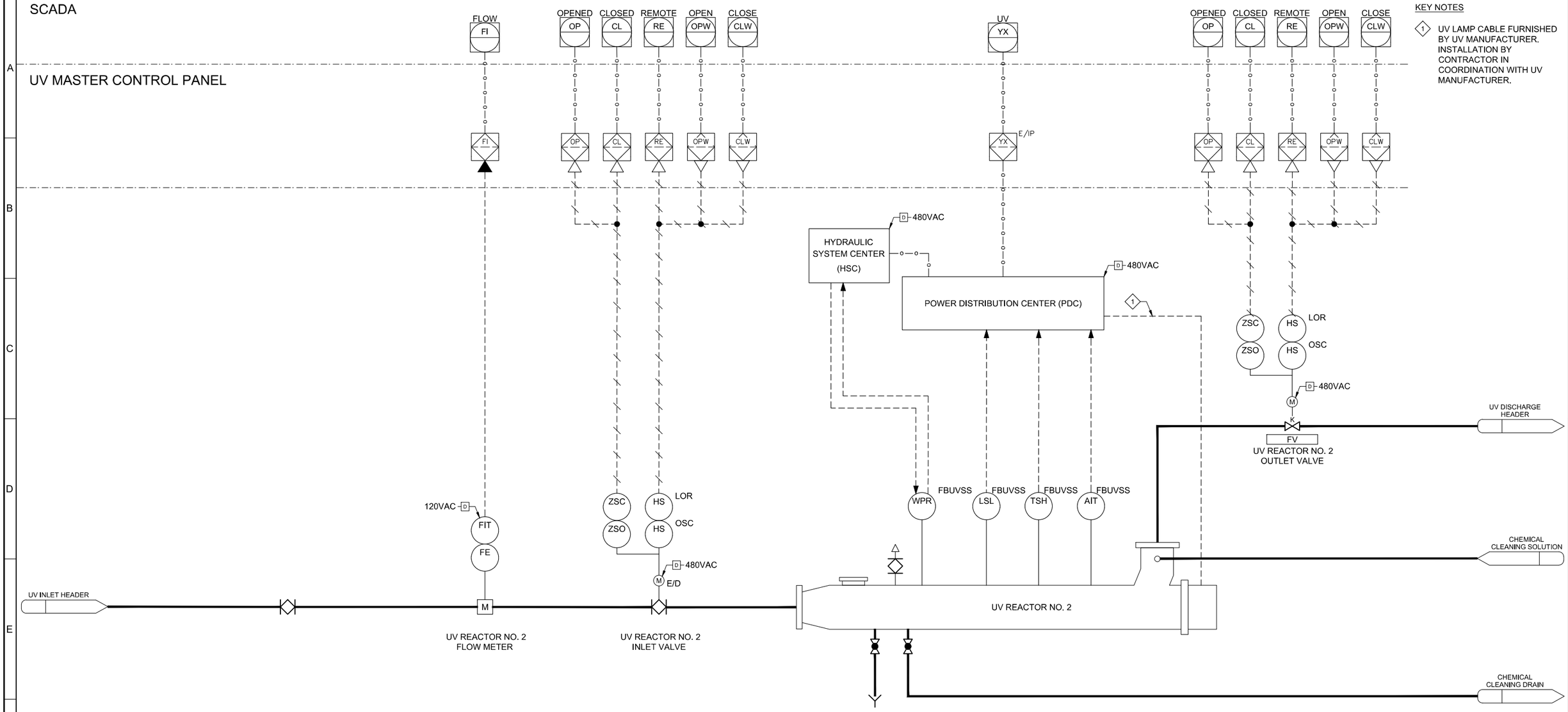
LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA

UV MASTER CONTROL PANEL



KEY NOTES

1. UV LAMP CABLE FURNISHED BY UV MANUFACTURER. INSTALLATION BY CONTRACTOR IN COORDINATION WITH UV MANUFACTURER.

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DRAWN A. CHARDE
CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

UV REACTOR 2

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

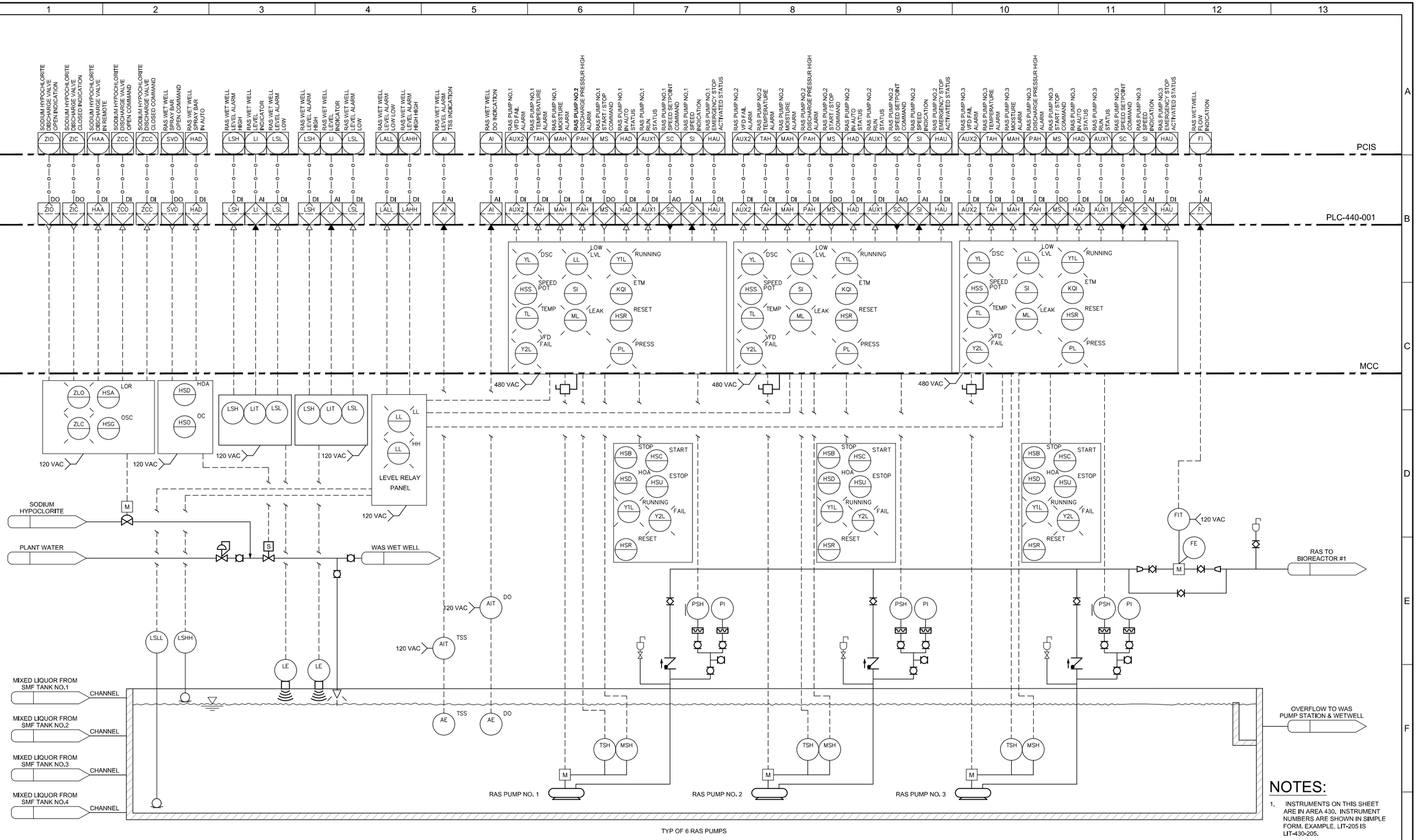
JOB NO. 203580-60000

DRAWING NO. 43N03

SHEET NO. 204 OF 251

PROJECT NO.

FILE NAME:



NOTES:

1. INSTRUMENTS ON THIS SHEET ARE IN AREA 430. INSTRUMENT NUMBERS ARE SHOWN IN SIMPLE FORM. EXAMPLE, LIT-205 IS LIT-430-205.

REV	DATE	BY	DESCRIPTION

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NOT FOR CONSTRUCTION

DESIGNED	R. DEFREITAS
DRAWN	A. CHARDE
CHECKED	T. SHIMADA
DATE	JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

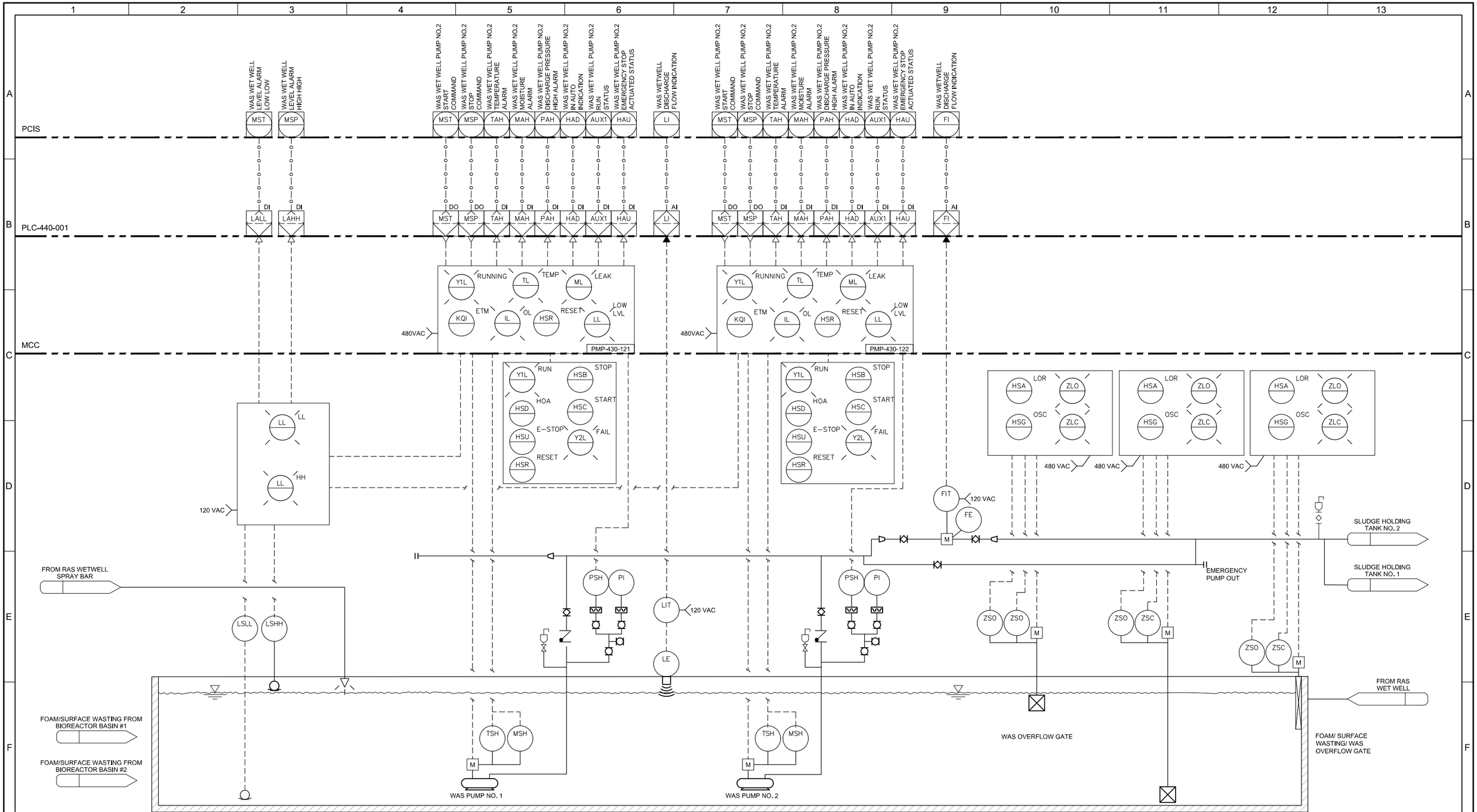
INSTRUMENTATION

P&ID
RAS WET WELL AND PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 43N04
SHEET NO. 205 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:



NOTES:

1. INSTRUMENTS ON THIS SHEET ARE IN AREA 430. INSTRUMENTS NUMBERS ARE SHOWN IN SIMPLE FORM. EXAMPLE, LIT-205 IS LIT-430-205.

WAS PUMP STATION AND WETWELL
TYP OF 3 WAS PUMPS

REV	DATE	BY	DESCRIPTION
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DESIGNED	R. DEFREITAS
DRAWN	A. CHARDE
CHECKED	T. SHIMADA
DATE	JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

WAS/FOAM WET WELL AND PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

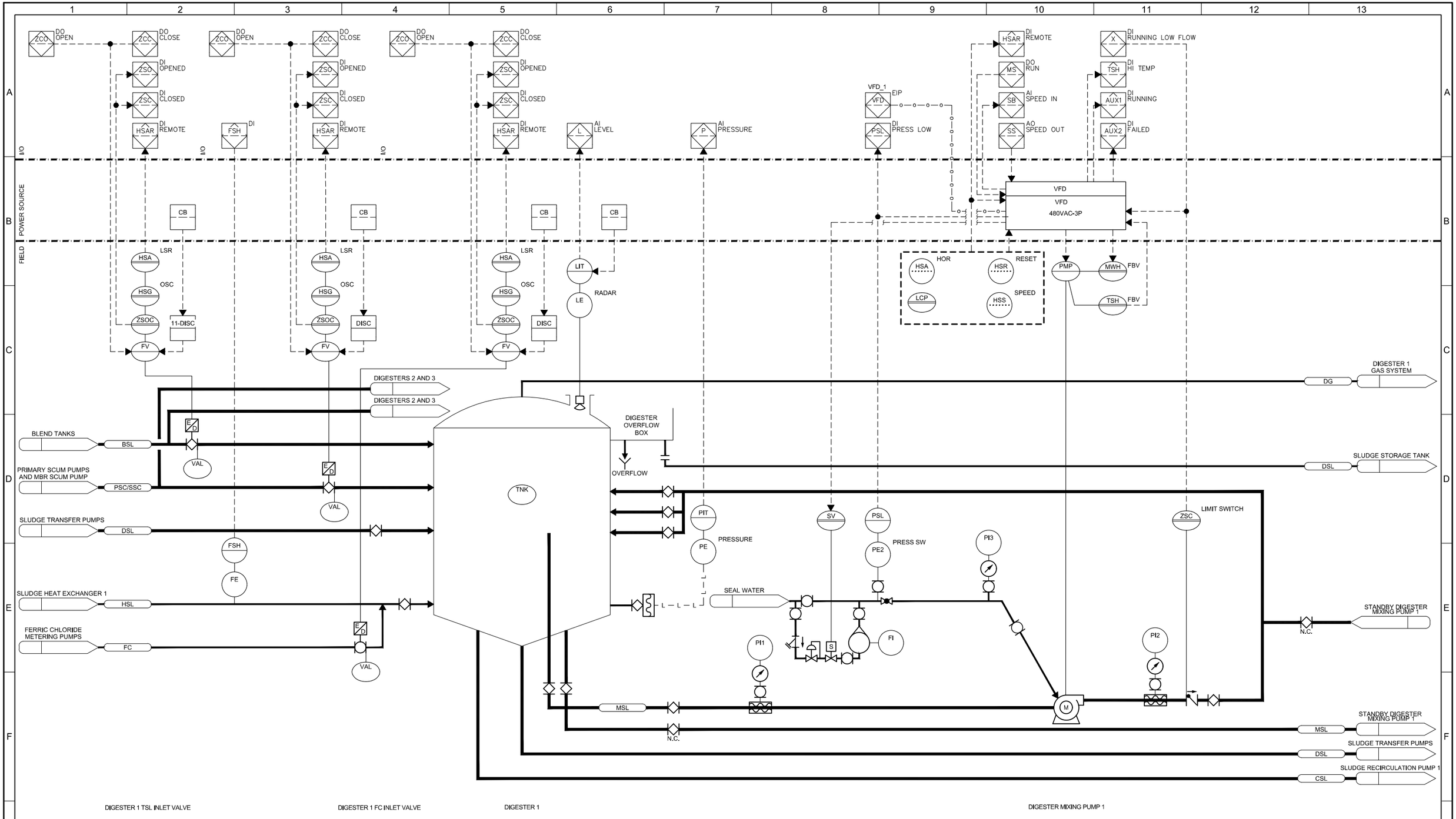
DRAWING NO. 43N05

SHEET NO. 206 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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CHECKED T. SHIMADA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
DIGESTER 1 TANK AND MIXING

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 51N01
SHEET NO. 207 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:

I/O

POWER SOURCE

FIELD

YAF DI OL FAULT

X DI RUNNING LOW FLOW

HSAR DI REMOTE

TSH DI HI TEMP

PSL DI PRESS LOW

AUX1 DI RUNNING

MS DO RUN

FVNR

FVNR

480VAC-3P

DISC

HOR

RESET

HSA

HSR

LCP

PMP

MWH FBV

TSH FBV

PSL

PRESS SW

PE

PI

SEAL WATER

SV

S

FI

PI

ZSC LIMIT SWITCH

PI

DIGESTER 1

CSL

M

SLUDGE RECIRCULATION PUMP 1

N.C.

STANDBY SLUDGE RECIRCULATION PUMP

T AI TEMP

T AI TEMP

T AI TEMP

T AI TEMP

TIT

TE RTD

TIT

TE RTD

TIT

TE RTD

TIT

TE RTD

PI

PI

EXC

SLUDGE HEAT EXCHANGER 1

PI

N.C.

STANDBY SLUDGE RECIRCULATION PUMP

PRIMARY HEAT LOOP

HWR

PI

DIGESTER SECONDARY HEAT LOOP PUMP 1

HWS

PI

DIGESTER 1

HSL

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION
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DRAWN A. CHARDE

CHECKED R. GUPTA

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INSTRUMENTATION

P&ID
SLUDGE HEATING

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

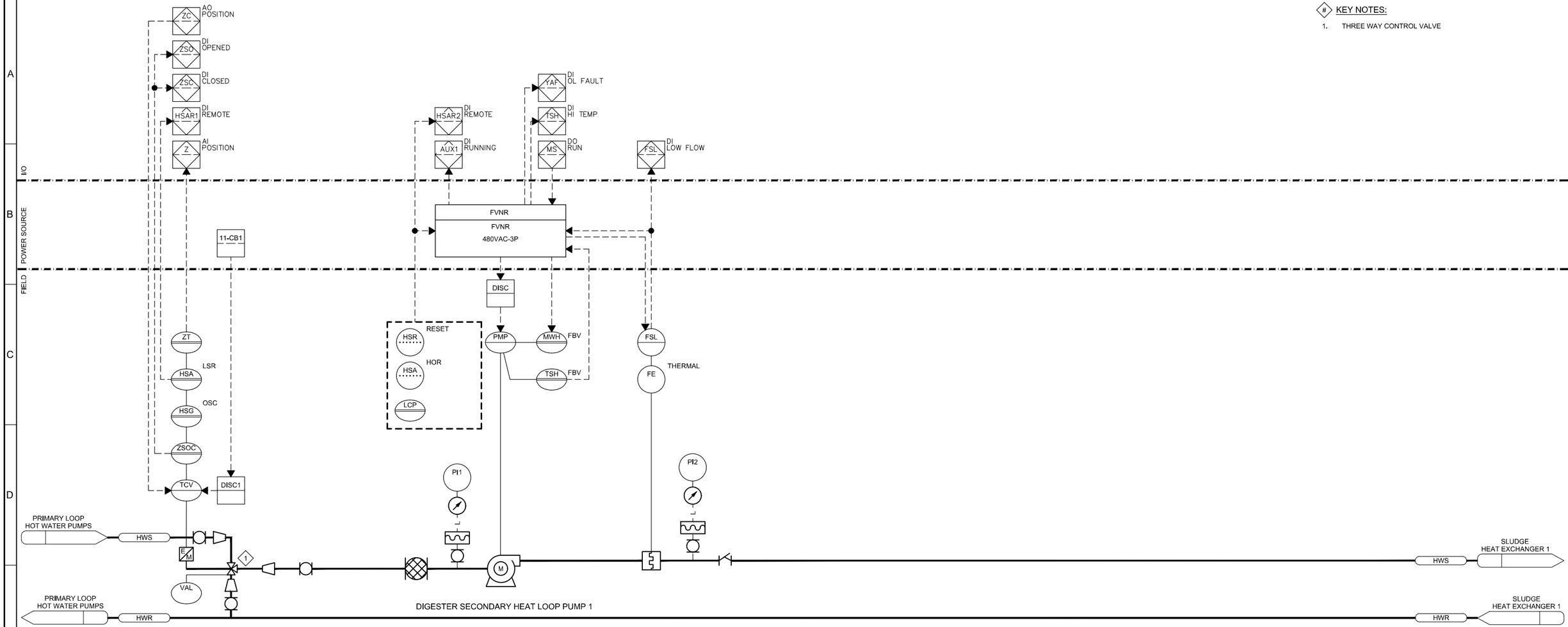
JOB NO. 203580-60000

DRAWING NO. 51N02

SHEET NO. 208 OF 251

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
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DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
DIGESTERS HOT WATER LOOPS

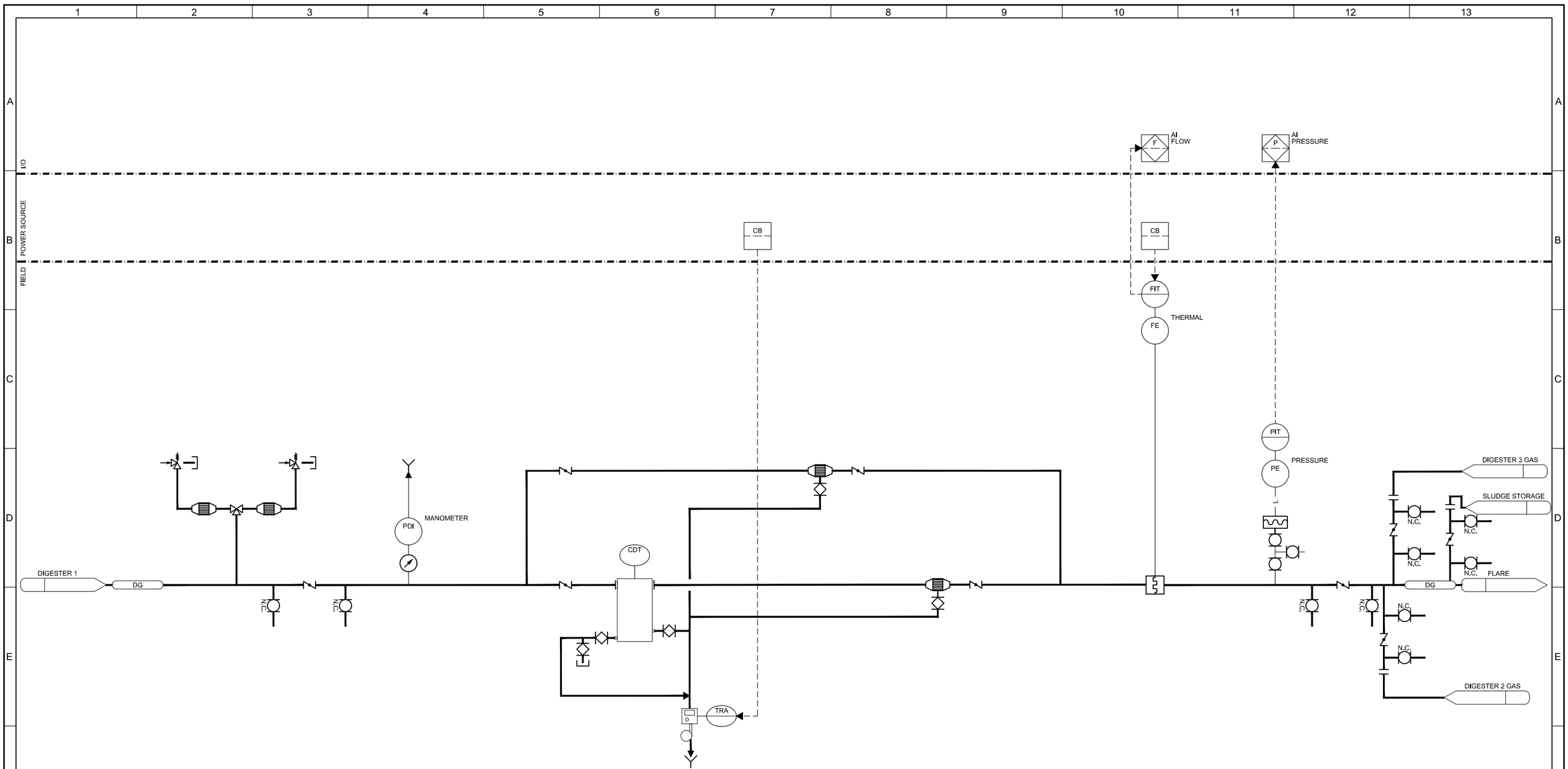
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 51N03
SHEET NO. 209 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



CONDENSATE AND SEDIMENT TRAP

DIGESTER 1 AUTOMATIC DRIP TRAP

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
DIGESTER 1 GAS SYSTEM

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 51N04
SHEET NO. 210 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

VFD_1
EIP
VFD
HST DO RUN
HSAR DI REMOTE
Y2 DI FAILED
AUX1 DI RUNNING
CB
VCP
GRI
MWH FBV
TSH FBV
PSL DI PRESS LOW
TSH2 DI HI TEMP
HSAR DI REMOTE
SS AO SPEED OUT
SB AI SPEED IN
X DI RUNNING LOW FLOW
AUX2 DI FAILED
MS DO RUN
AUX1 DI RUNNING
TSH1 DI MOTOR HI TEMP
VFD
VFD
480VAC-3P
2
HOR
HSA
RESET
HSR
TSH FBV
1
LCP
PMP
MWH FBV
TSH FBV
F AI FLOW
CB
11-FIT
11-FE MAGNETIC

DIGESTER 1
DSL
SLUDGE STORAGE TANK
DSL
SLUDGE TRANSFER GRINDER 2
PSL
PE
PRESS SW
PI
SEAL WATER
SV
S
FI
PI
TE FBV
ZSC LIMIT SWITCH
PI
SLUDGE TRANSFER PUMP 2
SLUDGE TRANSFER PUMP 3
MM
DSL
DEWATERING CENTRIFUGES
DIGESTER 1
DIGESTER 2
DIGESTER 3
SLUDGE STORAGE TANK
SLUDGE TRANSFER GRINDER 1
SLUDGE TRANSFER PUMP 1

KEY NOTES:

1. INCLUDES TEMPERATURE CONVERSION MODULE FURNISHED BY PUMP VENDOR, INSTALLED IN LCP BY CONTRACTOR.
2. POWER AND SIGNAL WIRING, 120VAC POWER FOR TEMPERATURE CONVERSION MODULE.

REV	DATE	BY	DESCRIPTION
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DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
SLUDGE TRANSFER PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
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JOB NO. 203580-60000
DRAWING NO. 51N05
SHEET NO. 211 OF 251

LAST SAVED BY:

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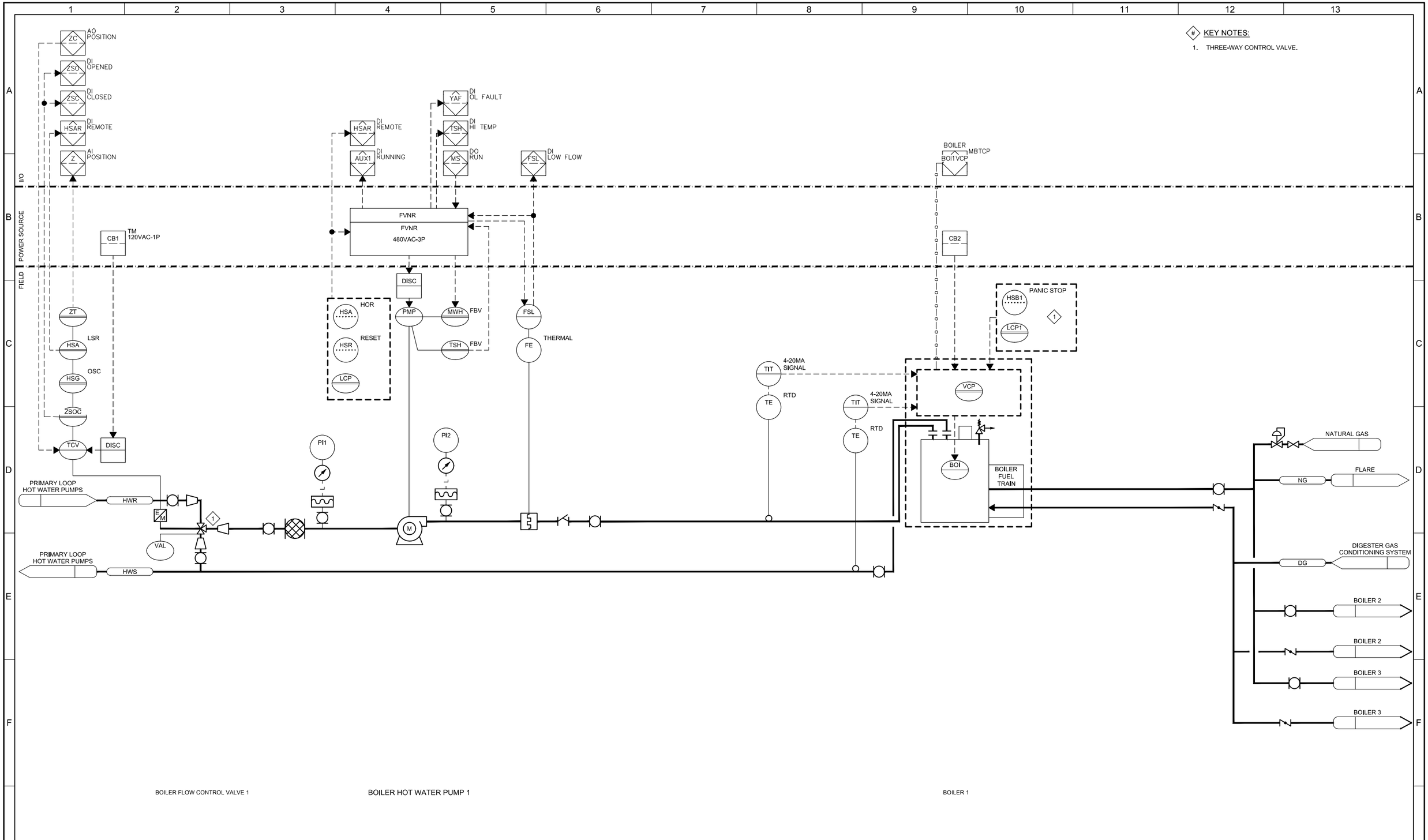
FILE NAME:



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INSTRUMENTATION
P&ID
DIGESTER BOILERS

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JOB NO. 203580-60000
DRAWING NO. 51N06
SHEET NO. 212 OF 251

LAST SAVED BY:

PROJECT NO.
FILE NAME:

I/O

POWER SOURCE

FIELD

DI OL FAULT
DI HI TEMP
DI REMOTE
DI RUNNING
DO RUN
DI LOW FLOW
AI TEMP
AI TEMP
FVNR
FVNR
480VAC-3P
DISC
HOR
HSA
RESET
HSR
LCP
PMP
MWH FBV
TSH FBV
FSL
THERMAL
FE
TIT
RTD
TE
TIT
RTD
TE
PI2
TNK
EXPANSION TANK
PI1
PI1
PI2
M
PRIMARY LOOP HOT WATER PUMP 1
PRIMARY LOOP HOT WATER PUMP 2
WATER
N.C.
TNK
AIR SEPARATOR
PRIMARY LOOP HOT WATER PUMP 2
TNK
N.C.
CHEMICAL FEED TANK
HSW TANK HEX 3
HWR
HSW HOT WATER PUMP 3
HWS
HSW TANK HEX 2
HWR
HSW HOT WATER PUMP 2
HWS
HSW TANK HEX 1
HWR
HSW HOT WATER PUMP 1
HWS
MUNICIPAL SOLIDS TANK HEX 2
HWR
MUNICIPAL HEX HOT WATER PUMP 1
HWS
MUNICIPAL SOLIDS TANK HEX 1
HWR
MUNICIPAL HEX HOT WATER PUMP 1
HWS
BLEND TANK HEX 2
HWR
BLEND HEX HOT WATER PUMP 2
HWS
BLEND TANK HEX 1
HWR
BLEND HEX HOT WATER PUMP 1
HWS
DIGESTER SECONDARY HEAT LOOP PUMP 1
HWS
SLUDGE HEAT EXCHANGER 1
HWR
DIGESTER SECONDARY HEAT LOOP PUMP 2
HWS
SLUDGE HEAT EXCHANGER 2
HWR
DIGESTER SECONDARY HEAT LOOP PUMP 3
HWS
SLUDGE HEAT EXCHANGER 3
HWR
BOILER HOT WATER PUMP 1
HWR
BOILER 1
HWR
BOILER HOT WATER PUMP 2
HWR
BOILER 2
HWS
BOILER HOT WATER PUMP 3
HWR
BOILER 3
HWS

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INSTRUMENTATION

P&ID

DIGESTER PRIMARY HEAT LOOPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 51N07
SHEET NO. 213 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

CB

VCP

LSHH DI HI HI LEVEL

AUX2 DI FAULT

AUX1 DI RUNNING

AUX2 DI FAULT

AUX1 DI RUNNING

ME FBV PMP FBV

TE FBV

ME FBV PMP FBV

TE FBV

DRAINS FROM DIGESTER CONTROL BUILDING

PD

LE FLOAT FBV

LSHH FBV

LSH2 FBV

LSH1 FBV

LSL FBV

PD

PLANT DRAIN

DIGESTER CONTROL BUILDING SUMP

DIGESTER CONTROL BUILDING SUMP PUMP 1

DIGESTER CONTROL BUILDING SUMP PUMP 2

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CHECKED R. GUPTA
DATE JULY 2025

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PROJECT NO.

FILE NAME:

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

DIGESTER CONTROL BUILDING SUMP

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

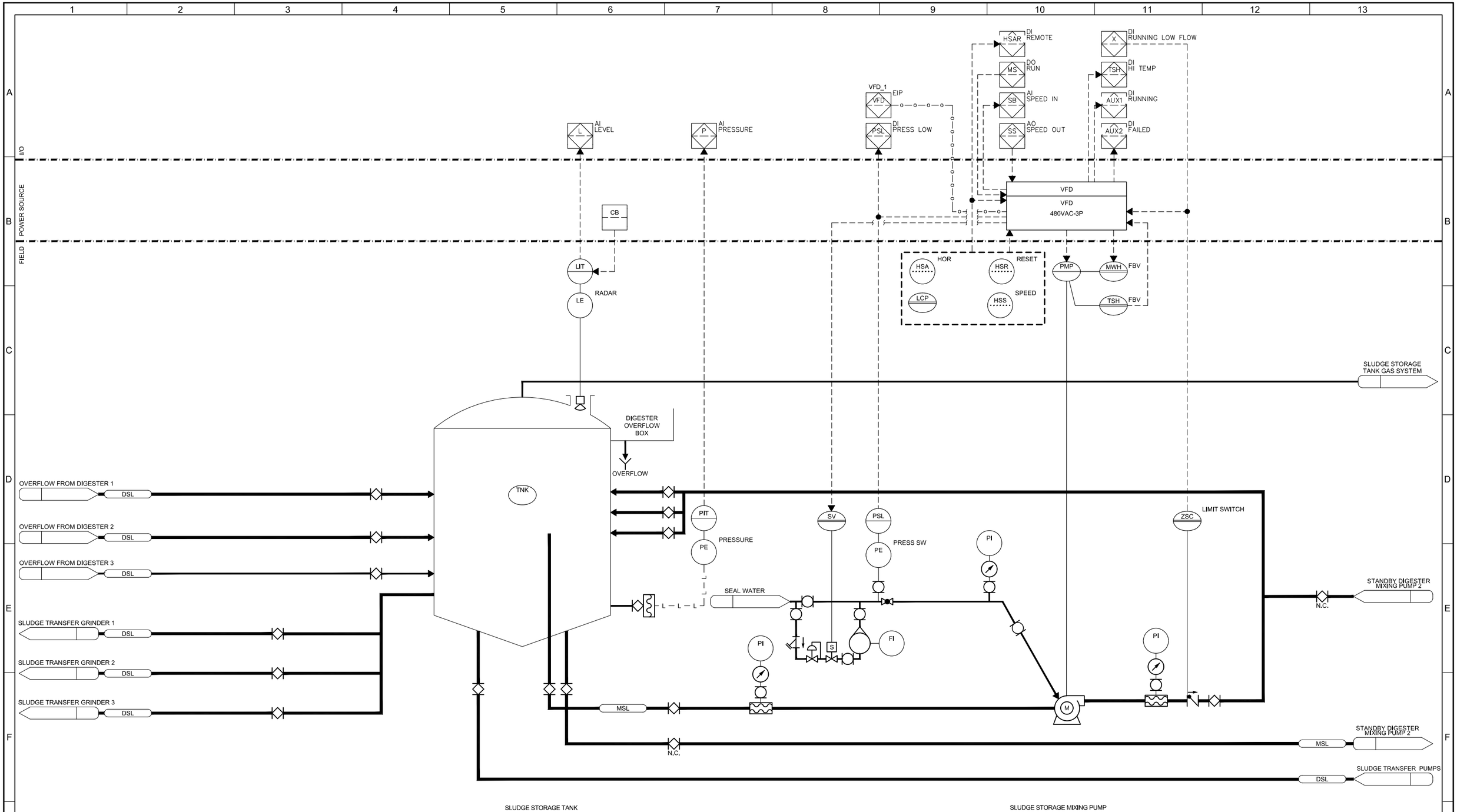
0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 51N08

SHEET NO. 214 OF 251



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
SLUDGE STORAGE TANK

VERIFY SCALES
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0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 51N09
SHEET NO. 215 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

KEY NOTES:

1. THERMOCOUPLE WIRE

I/O

FIELD

POWER SOURCE

YAF DI SYSTEM ALARM

CB1

CB2

CB

FLR FBV

BURNER

PILOT

1

FLARE STACK

NATURAL GAS

VCP FBV

PI

PSH FBV

PE PRESS SW FBV

SV PBV

S

DIGESTER GAS SYSTEMS

DG

TRA1

N.C.

N.C.

TRA2

BIOGAS STORAGE SYSTEM

DG

AUTOMATIC DRIP TRAP

SOLENOID VALVE

WASTE GAS FLARE

FLAME ARRESTOR AUTOMATIC DRIP TRAP

REV	DATE	BY	DESCRIPTION
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INSTRUMENTATION

P&ID

WASTE GAS FLARE

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 53N01

SHEET NO. 216 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

GENERAL NOTES:

1. REFER TO VENDOR INFORMATION FOR COMPLETE DEPICTION OF INSTRUMENTATION, VALVES, AND OTHER REQUIRED APPURTENANCES FOR A FULLY FUNCTIONING BIOGAS STORAGE SYSTEM. THIS P&ID DEPICTION DOES NOT CAPTURE THE COMPLETE SYSTEM DESIGN.

I/O

POWER SOURCE

FIELD

VCP

EIP

CB

CB

VCP

VENT

INTAKE AIR

J-BOX

S

E

SLAB-MOUNTED DOUBLE MEMBRANE BIOGAS HOLDER

BIOGAS STORAGE BLOWER 1

BIOGAS STORAGE BLOWER 2

BIOGAS STORAGE SYSTEM FBV

DIGESTER GAS SYSTEMS

DG

NC

NC

TRA

DG

BIOGAS CONDITIONING SYSTEM

CONDENSATE DRAIN CHAMBER AUTOMATIC DRIP TRAP

BIOGAS STORAGE SYSTEM

REV	DATE	BY	DESCRIPTION
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INSTRUMENTATION
P&ID
BIOGAS STORAGE SYSTEM

VERIFY SCALES
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 53N02
SHEET NO. 217 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

GENERAL NOTES:

1. REFER TO VENDOR INFORMATION FOR COMPLETE DEPICTION OF INSTRUMENTATION, VALVES, AND OTHER REQUIRED APPURTENANCES FOR A FULLY FUNCTIONING BIOGAS CONDITIONING SYSTEM. THIS P&ID DEPICTION DOES NOT CAPTURE THE COMPLETE SYSTEM DESIGN.

KEY NOTES:

1. ELECTRICALLY ACTUATED AUTOMATIC DRIP TRAP.
2. NOT SHOWN BUT REQUIRED ARE FLEXIBLE CONNECTORS ON BOTH SIDES OF BLOWERS.
3. SILENCER.
4. POWER AND SIGNAL WIRING.
5. CONDENSATE ACCUMULATION TANK WITH HIGH AND LOW LEVEL SWITCHES TO CONTROL AUTOMATED DRAIN.

I/O
POWER SOURCE
FIELD

DGCS VCP EIP
CB
VCP
J-BOX
J-BOX
DGC FBV
E
FIL PBV
MOISTURE/ PARTICULATE FILTER 1
BLO PBV
GAS BLOWER 1
N.C.
E 1
N.C.
FIL PBV
MOISTURE/ PARTICULATE FILTER 2
E 1
N.C.
BLO PBV
GAS BLOWER 2
N.C.
BLOWER AND MOISTURE REMOVAL SKID FBV
DG (COND)
DG (COND)
HEAT EXCHANGER
EXC PBV
GRS
GRR
S
5
N.C.
PIT2 FBV
PE2 PRESSURE FBV
TIT2 FBV
TE2 RTD FBV
FIT1 FBV
FE1 THERMAL FBV
DG
BOILERS
N.C.
N.C.
PIT1 FBV
PE1 PRESSURE FBV
TIT1 FBV
TE1 RTD FBV
BIOGAS STORAGE SYSTEM
DG
N.C.
N.C.
TNK FBV
HYDROGEN SULFIDE TANK 1
TNK FBV
HYDROGEN SULFIDE TANK 2
HYDROGEN SULFIDE ADSORPTION SYSTEM FBV
DG (COND)
DG (COND)
4
CHI FBV
GLYCOL CHILLER FBV

HYDROGEN SULFIDE TANK 1
HYDROGEN SULFIDE TANK 2
BIOGAS CONDITIONING SKID

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INSTRUMENTATION
P&ID
BIOGAS CONDITIONING SYSTEM

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 53N03
SHEET NO. 218 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:

PLANT SCADA

0–100% SIC HS SCADA–MAN/SCADA AUTO
SS HS
RESET HS

GBT KQI YL AUTO MODE
YL HAND MODE
YL RUN
YL OFF

LAH YA FAILED
E–STOP YA YA BELT DRIVE FAIL
CORD STOP YA ZAH BELT OFF–TRACK
HYD SYS FAIL YA ZAL BELT BROKEN

HYD SYSTEM PAL TAH HYD SYS OIL

ETHERNET SWITCH

GBT KQI YL WW RUN
OL YA TAH WW MTR
WW DISCH PAL PAH WW DISCH
WW SUCT PAL

480V

GBT NO.1
CONTROL PANEL

VCP

FIELD

GRAVITY BELT THICKENER 2
WAS

ODOR CONTROL
FA

SLUDGE/POLYMER
MIXING VALVE

GBT

PI
HSX
PULL CORD
FBV

WAS PUMPS
WAS

TWAS PUMP 1
TWAS

THICKENER POLYMER
BLENDER SKID 1
POS

PI
PI
PSL
TSH
PSH
PSL
PI
M
M

UTILITY WATER
W4

GRAVITY BELT THICKENER 2
W4

GBT SPRAY WATER
BOOSTER PUMP 1

RETURN FLOW PUMP
STATION
FIL

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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

GRAVITY BELT THICKENER 1

VERIFY SCALES
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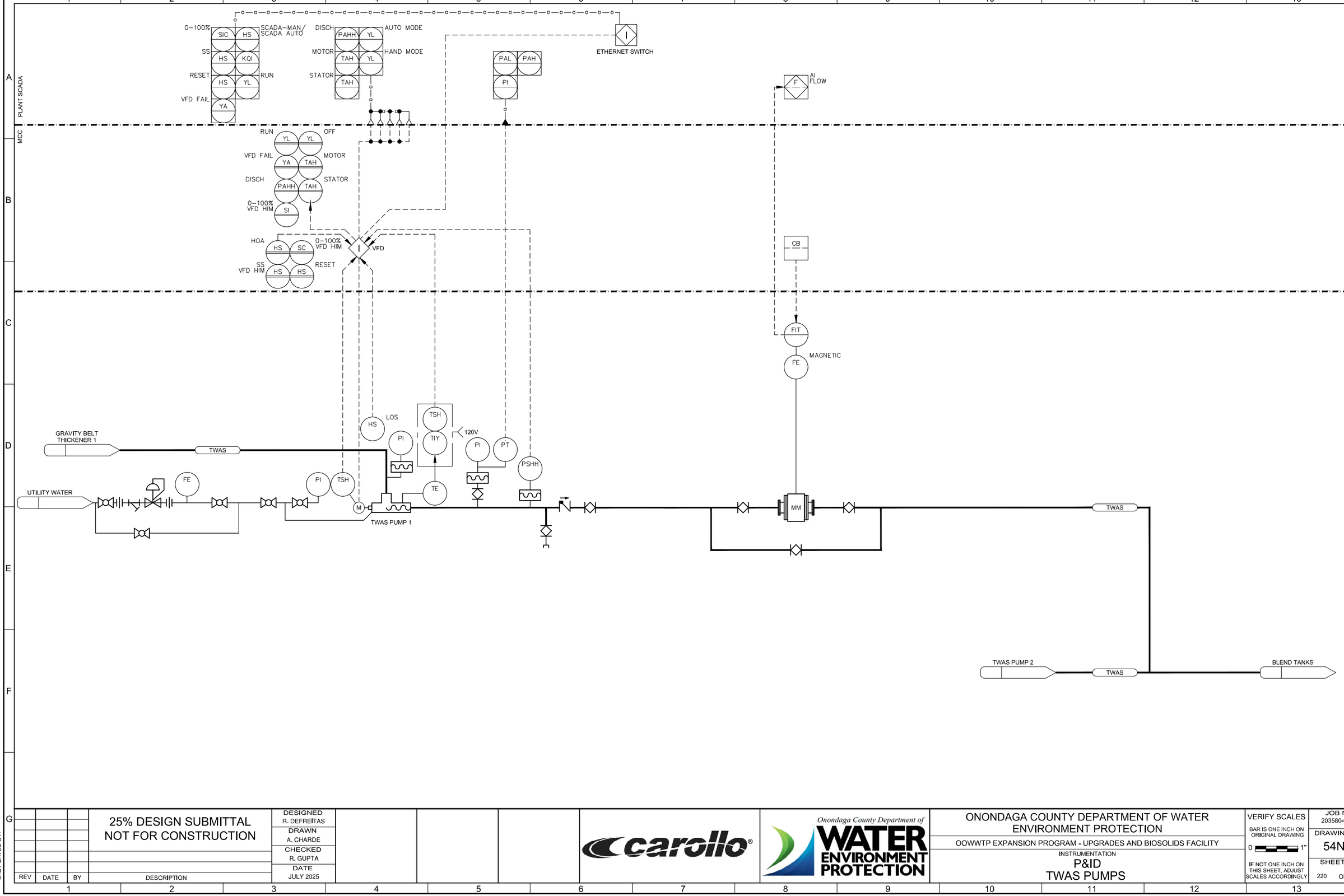
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 54N01
SHEET NO. 219 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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INSTRUMENTATION

P&ID
TWAS PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

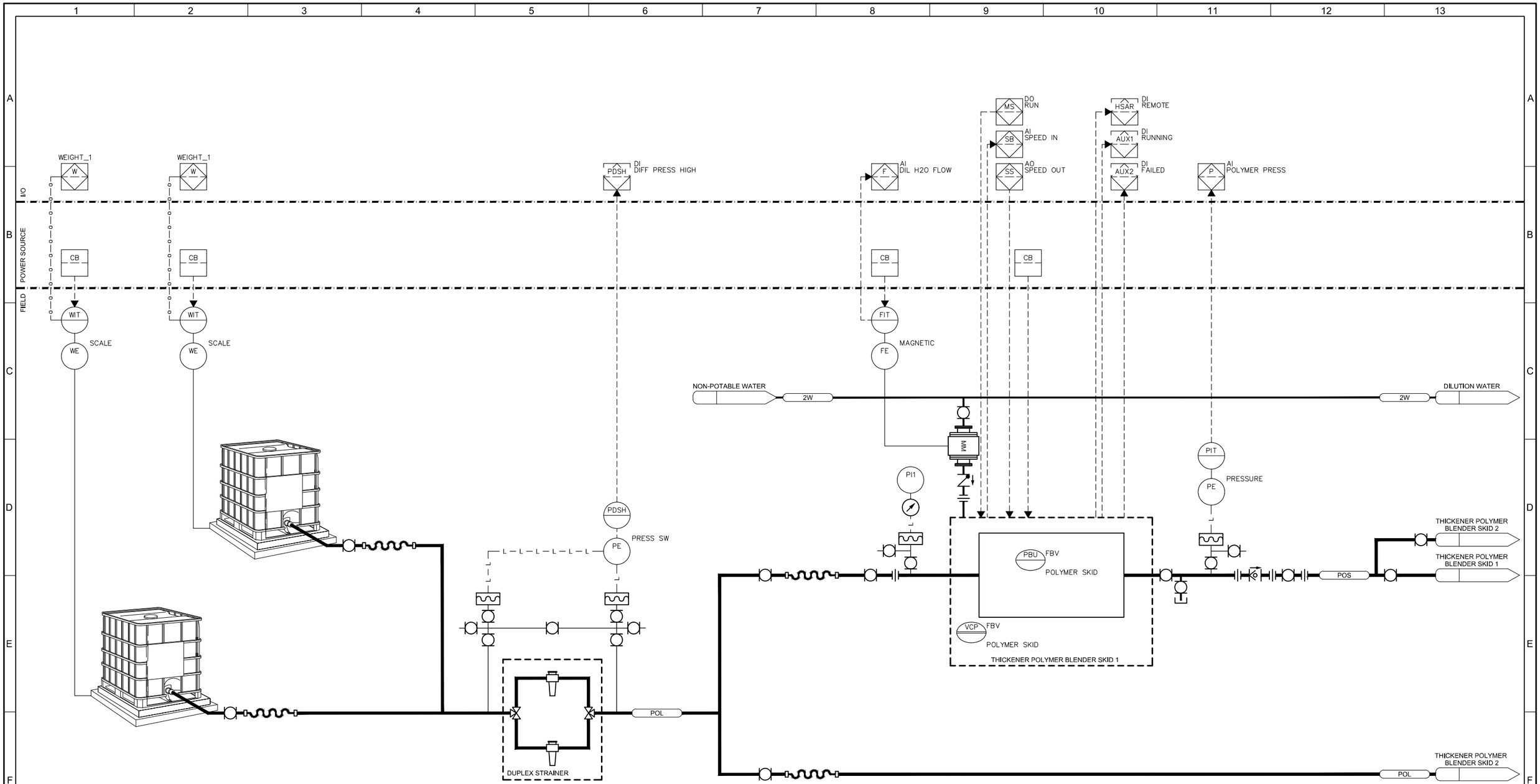
JOB NO. 203580-60000

DRAWING NO. 54N02

SHEET NO. 220 OF 251

PROJECT NO.

FILE NAME:



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INSTRUMENTATION

P&ID
THICKENER POLYMER BLENDERS

VERIFY SCALES
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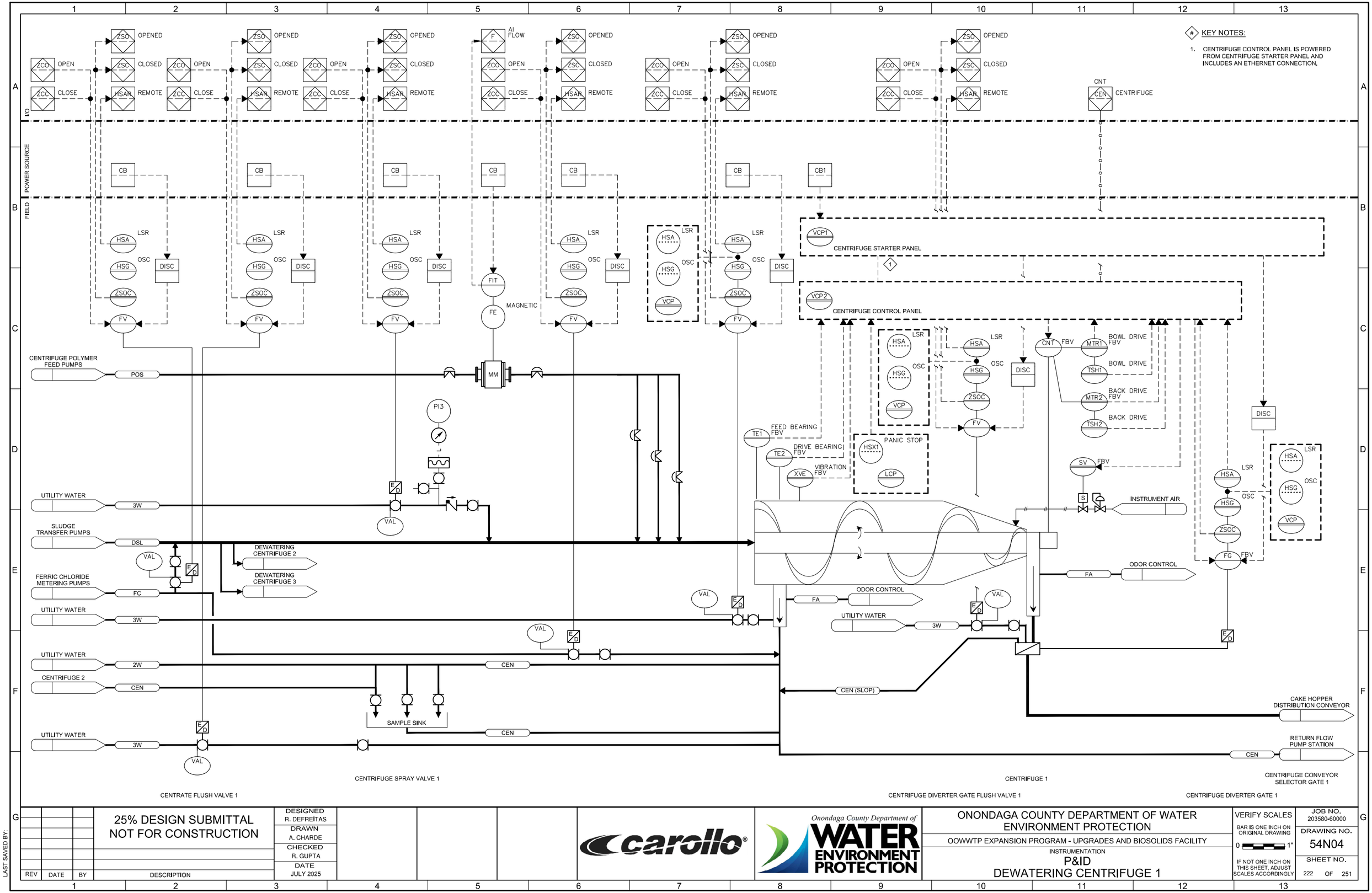
JOB NO. 203580-60000
DRAWING NO. 54N03
SHEET NO. 221 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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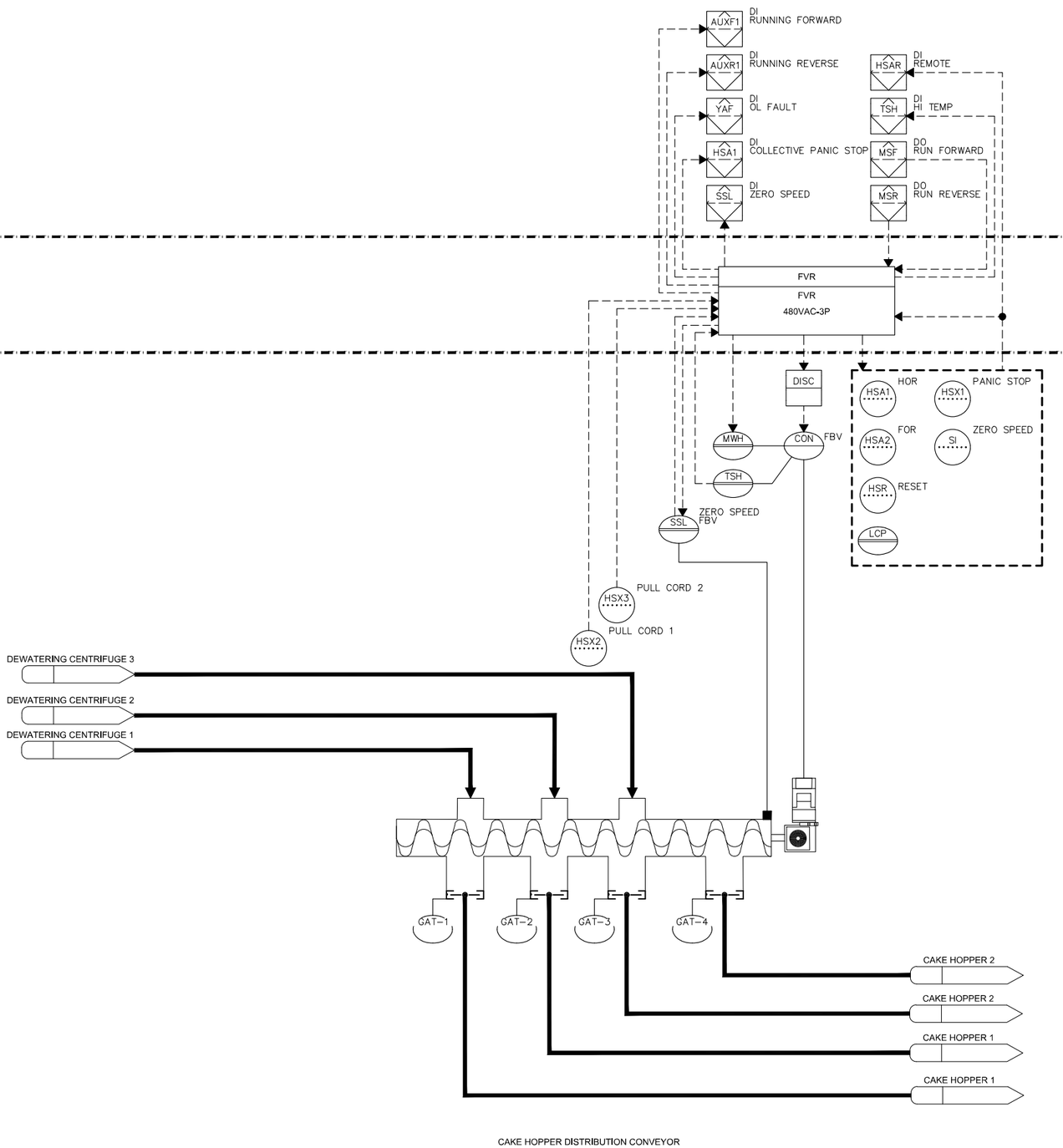
INSTRUMENTATION
P&ID
DEWATERING CENTRIFUGE 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 54N04
SHEET NO. 222 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:



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INSTRUMENTATION

P&ID

CAKE HOPPER DISTRIBUTION CONVEYOR

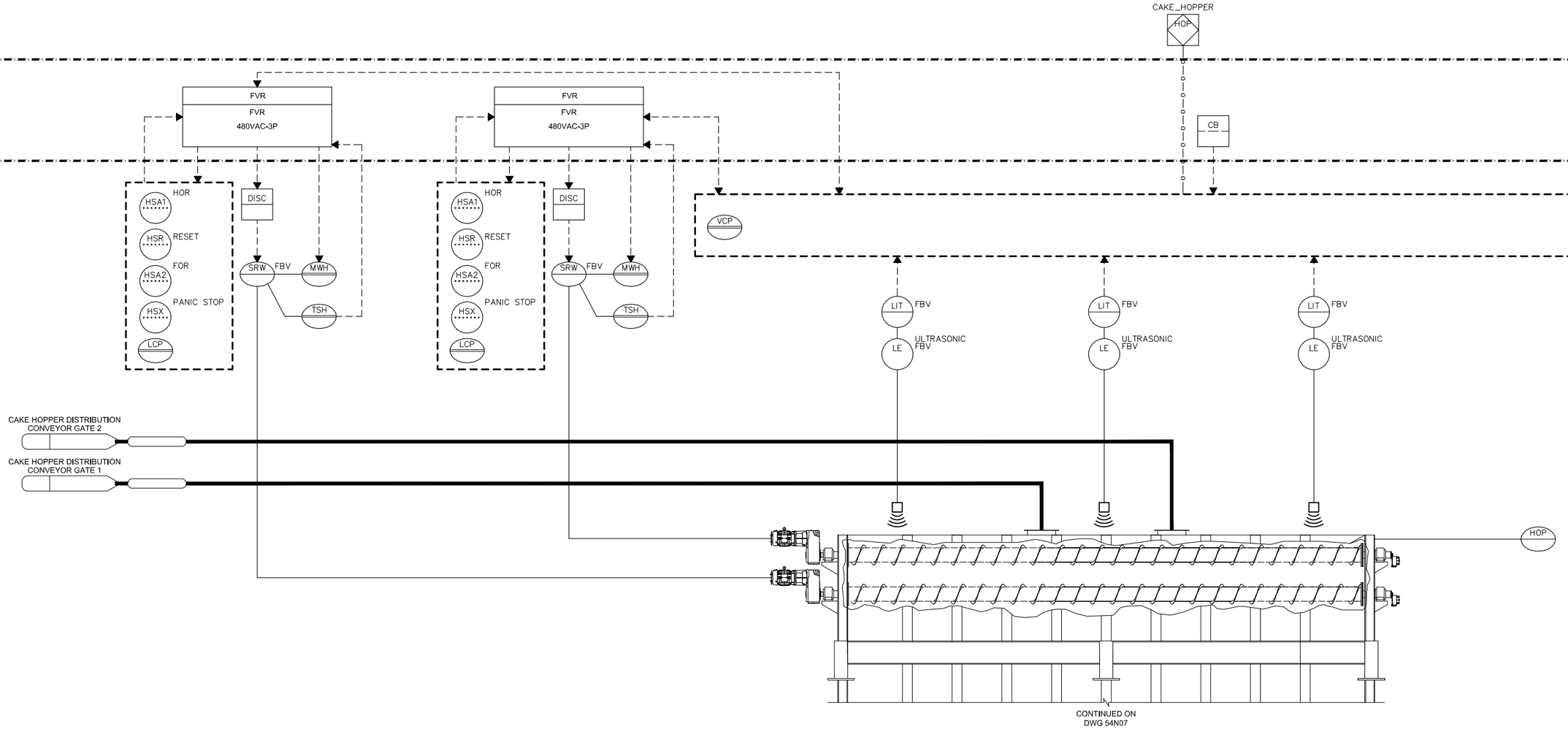
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 54N05
SHEET NO. 223 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



LAST SAVED BY:

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED	R. DEFREITAS
DRAWN	A. CHARDE
CHECKED	R. GUPTA
DATE	JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
CAKE HOPPER 1-1

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.	203580-60000
DRAWING NO.	54N06
SHEET NO.	224 OF 251

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

FVR
FVR
480VAC-3P

FVR
FVR
480VAC-3P

20 DISCRETE WIRES

20 DISCRETE WIRES

CB

CONTINUED ON DWG 54N06

DISC

AUG FBV MWH

TSH FBV

DISC

AUG FBV MWH

TSH

FG FBV

HPU

FG FBV

O C

O C

CONTINUED ON DWG 54N06

GAT

GAT

TRUCK

CAKE BELT CONVEYOR 1

CAKE HOPPER DISCH AUGER 1

CAKE HOPPER DISCH GATE 1

CAKE HOPPER DISCH GATE 2

CAKE HOPPER DISCH AUGER 2

GATE HOPPER DISCH GATE HPU

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INSTRUMENTATION

P&ID

CAKE HOPPER 1-2

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 54N07

SHEET NO. 225 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

AUXF1 DI RUNNING FORWARD
AUXR1 DI RUNNING REVERSE
YAF DI OL FAULT
HSA1 DI COLLECTIVE PANIC STOP
SSL DI ZERO SPEED
HSAR DI REMOTE
TSH DI HI TEMP
MSF DO RUN FORWARD
MSR DO RUN REVERSE

FVR
FVR
480VAC-3P

DISC
MWH
CON FBV
TSH
SSL ZERO SPEED FBV

HSA1 HOR
HSX1 PANIC STOP
HSA2 FOR
SI ZERO SPEED
HSR RESET
LCP

HSX3 PULL CORD 2
HSX2 PULL CORD 1

CAKE HOPPER 1

CAKE BELT CONVEYOR 2

CAKE RECEIVING HOPPER

FUTURE DRYER FEED CONVEYOR 2

CAKE BELT CONVEYOR 1

DRYER FEED CONVEYOR 1

BIOSOLIDS DRYER 1

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID - CAKE BELT CONVEYOR 1, HOPPER, AND DRYER FEED CONVEYOR 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 54N08
SHEET NO. 226 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA

FP

LEVEL
LI

LO LEVEL
LSL

HIHI LEVEL
LSHH

POLYMER RECIRC
XY

LI

LSL
TAG

LSHH

E/IP
YX

E

FP

120VAC D

LIT

LSH

LE

LSL

TANK FILL

120VAC D

LE

LSHH

TUNING FORK

OF

LPO

NEAT POLYMER STORAGE TANK

LPO

LPO

CENTRIFUGE POLYMER BLENDERS

D 480VAC

LCS

START HS

STOP HS

LORR HS

POT HC

RUNNING YL

PRESS YL

FAULT YL

FVNR

PSH

PE

M

NEAT POLYMER STORAGE TANK RECIRCULATION PUMP

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

NEAT POLYMER STORAGE

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 54N09
SHEET NO. 227 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

WEIGHT_1 W

WEIGHT_1 W

CB

CB

WIT

WE SCALE

WIT

WE SCALE

PDSH DI DIFF PRESS HIGH

PDSH

PE PRESS SW

F AI DIL H2O FLOW

CB

FIT

FE MAGNETIC

MS DO RUN

SB AI SPEED IN

SS AO SPEED OUT

CB

HSAR DI REMOTE

AUX1 DI RUNNING

AUX2 DI FAILED

P AI POLYMER PRESS

NON-POTABLE WATER 2W

2W DILUTION WATER

MM

PI1

PBU FBV POLYMER SKID

VCP FBV POLYMER SKID

CENTRIFUGE POLYMER BLENDER SKID 1

PIT

PE PRESSURE

LPO

POLYMER AGING TANK 1

LPO

LPO

DUPLEX STRAINER

CENTRIFUGE POLYMER BLENDER SKID 2

CENTRIFUGE POLYMER BLENDER SKID 2

NEAT POLYMER STORAGE TANK

LPO

CENTRIFUGE POLYMER BLENDER SKID 3

CENTRIFUGE POLYMER BLENDER SKID 3

POLYMER AGING TANK 2

REV	DATE	BY	DESCRIPTION
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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

CENTRIFUGE POLYMER BLENDER SKIDS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

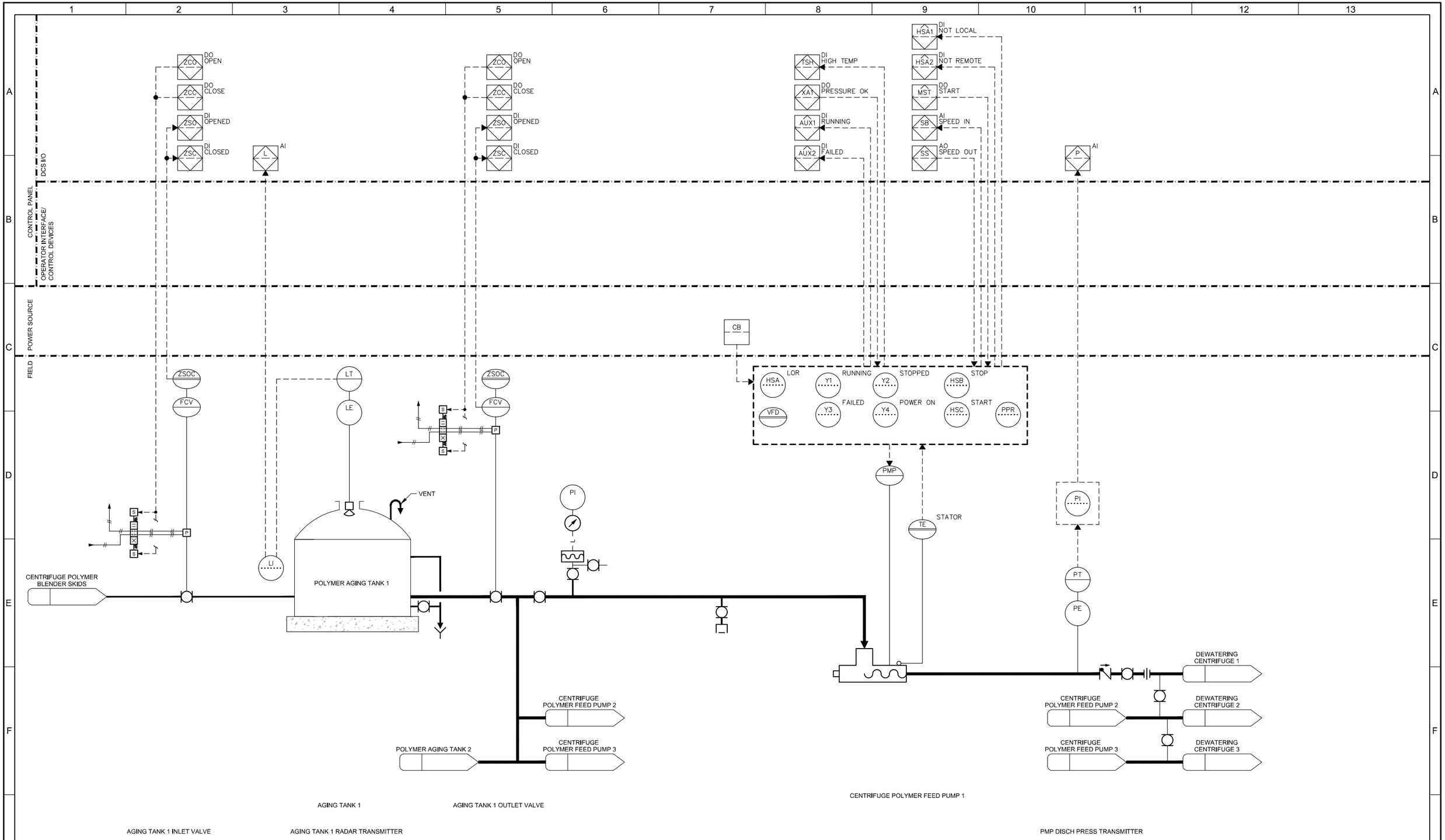
DRAWING NO. 54N10

SHEET NO. 228 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

POLYMER AGING TANKS AND CENTRIFUGE POLYMER FEED PUMPS P&ID

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 54N11
SHEET NO. 229 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

ZCO DO OPEN
ZCC DO CLOSE
YA DI FAILED
MK DI REMOTE
ZSC DI OPENED
ZSC DI CLOSE
FIT AI
VCP ETHERNET/IP SCREEN
ZCO DO FLUSH
MK DI REMOTE
CB
CB
CB
CB
FIT
FE MAG
LOR
LOR HSO LCP OC
VLV
DISC
DISC
VCP1 MAIN FBV
VCP2 PNEUMATIC FBV
LOR
LOR HSO LCP OC
SCR FBV
PIT1 FBV
PIT2 FBV
MSH FBV
ZSO FBV
INSTRUMENT AIR
F/D
PS
M
PS
SV
S
FLUSHWATER
PW
FA
ODOR CONTROL
SCREENINGS ROLL OFF BIN
SOLIDS PUMP
PS
PRIMARY SLUDGE SCREEN 2
GRAVITY THICKENER 1
PRIMARY SLUDGE SCREEN 2
PS
GRAVITY THICKENER 2

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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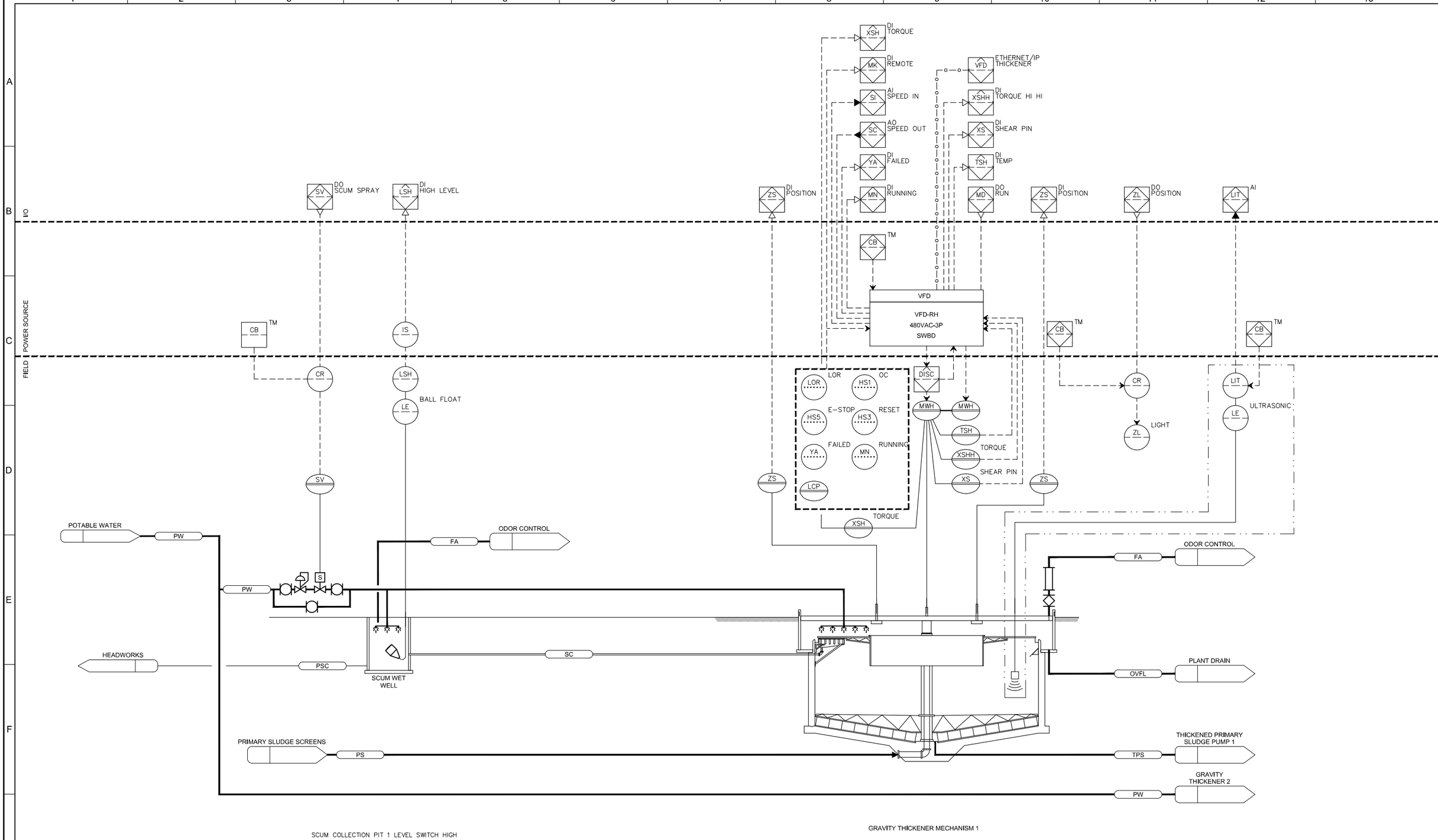
OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY
INSTRUMENTATION
P&ID
PRIMARY SLUDGE SCREEN 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 56N01
SHEET NO. 230 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

GRAVITY THICKENER 1

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 56N02

SHEET NO. 231 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

FIELD

TPS PUMP

NS DI E-STOP

MK DI REMOTE

MD DO RUN

SI AI SPEED IN

SC AO SPEED OUT

VFD ETHERNET/IP PUMP

TSH2 DI STATOR

TSH1 DI MOTOR

MN DI RUNNING

YA DI FAILED

AIT AI pH

PSH DI

AIT AI TSS

FIT AI

CB

VFD

VFD-RH

480VAC-3P

SWBD

120VAC

DISC

MWH

PMP

TSH1

START

LOR

HS1

LOR

SPEED

STOP

HS4

HS2

RUNNING

RESET

MN

HS3

FAILED

E-STOP

YA

HS5

LCP

PPR

PSH

PRESS SW

PE

STATOR

TSH2

AIT pH

AE pH

PI

GRAVITY THICKENER 1

TPS

THICKENED PRIMARY SLUDGE PUMP 1

RW FLUSH WATER

RW

TPS

SAMPLE SINK

AIT TSS

AE TSS

FIT MAG

FE MAG

GRAVITY THICKENER 2

TPS

THICKENED PRIMARY SLUDGE PUMP 2

THICKENED PRIMARY SLUDGE PUMP 2

TPS

MM

BLEND TANKS

TPS

TPS PUMP 1 SUCTION PH

TPS PUMP 1 PRESSURE INDICATOR

TPS PUMP 1 PRESSURE SWITCH HIGH

TPS PUMPS DISCHARGE TSS

TPS PUMPS DISCHARGE FLOW

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION

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INSTRUMENTATION

P&ID

THICKENED PRIMARY SLUDGE PUMPS

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

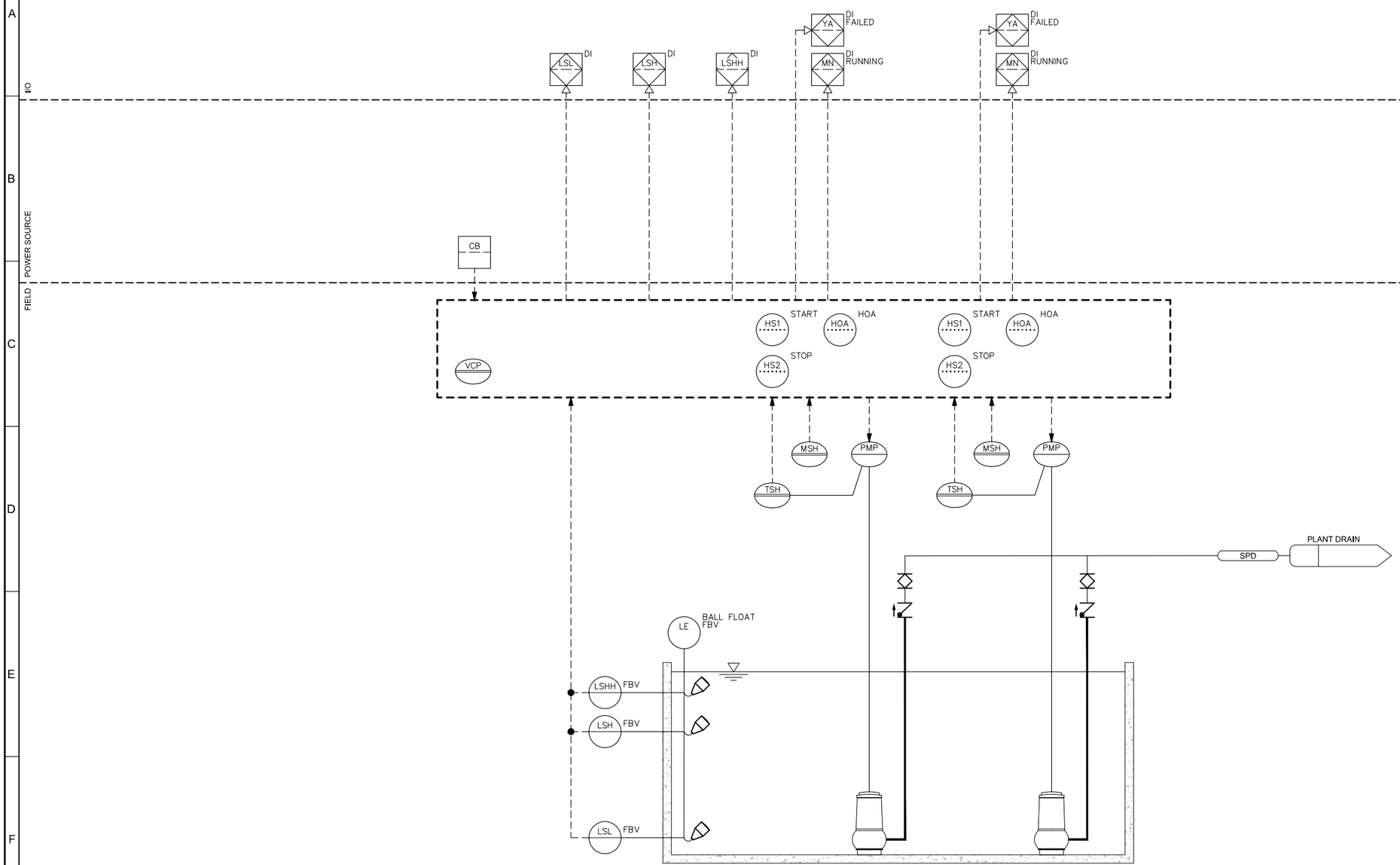
JOB NO. 203580-60000

DRAWING NO. 56N03

SHEET NO. 232 OF 251

PROJECT NO.

FILE NAME:



BUILDING SUMP PUMP 1 BUILDING SUMP PUMP 2

REV	DATE	BY	DESCRIPTION

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INSTRUMENTATION

THICKENER CONTROL BUILDING SUMP PUMPS

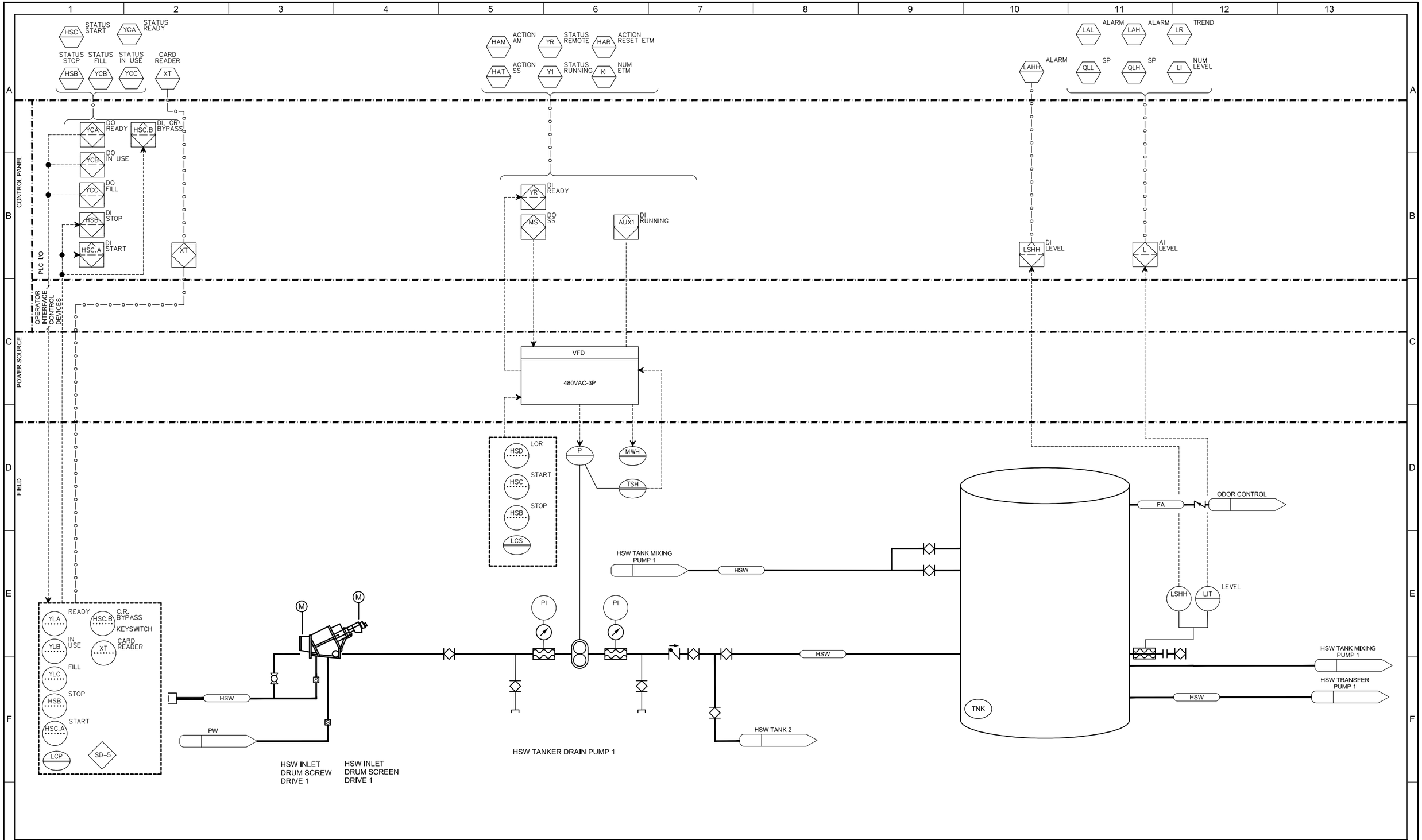
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 56N04
SHEET NO. 233 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

HSW TANK 1

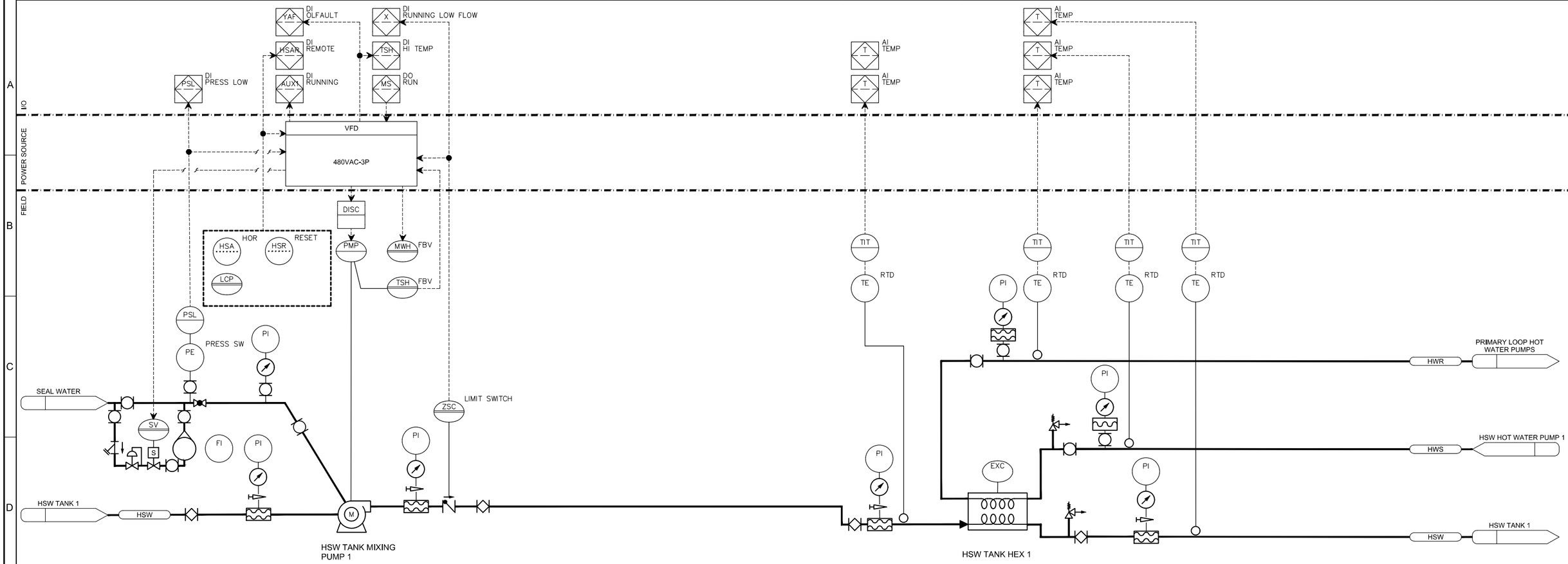
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N01
SHEET NO. 234 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DRAWN A. CHARDE
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INSTRUMENTATION

P&ID
HSW HEATING

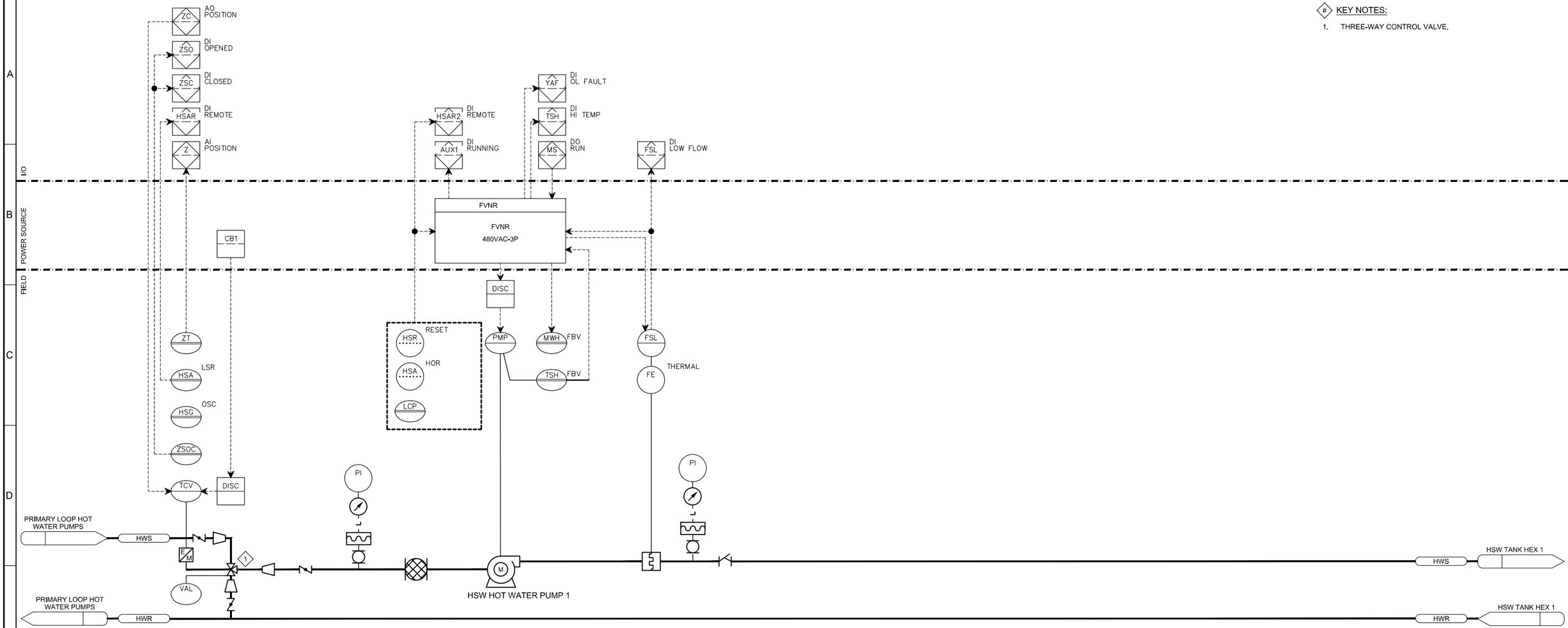
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N02
SHEET NO. 235 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DRAWN A. CHARDE
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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
HSW HOT WATER PUMP

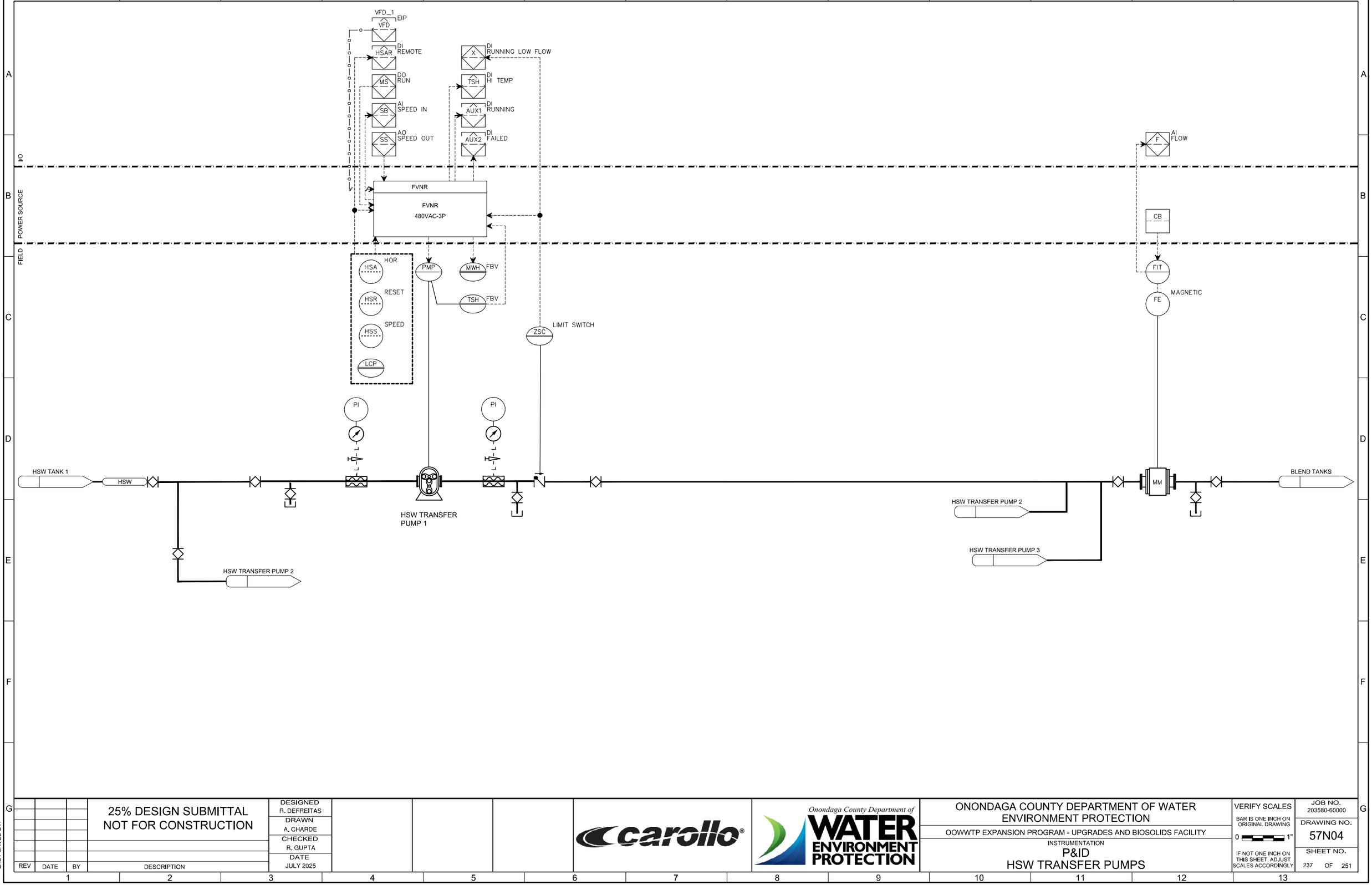
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N03
SHEET NO. 236 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
HSW TRANSFER PUMPS

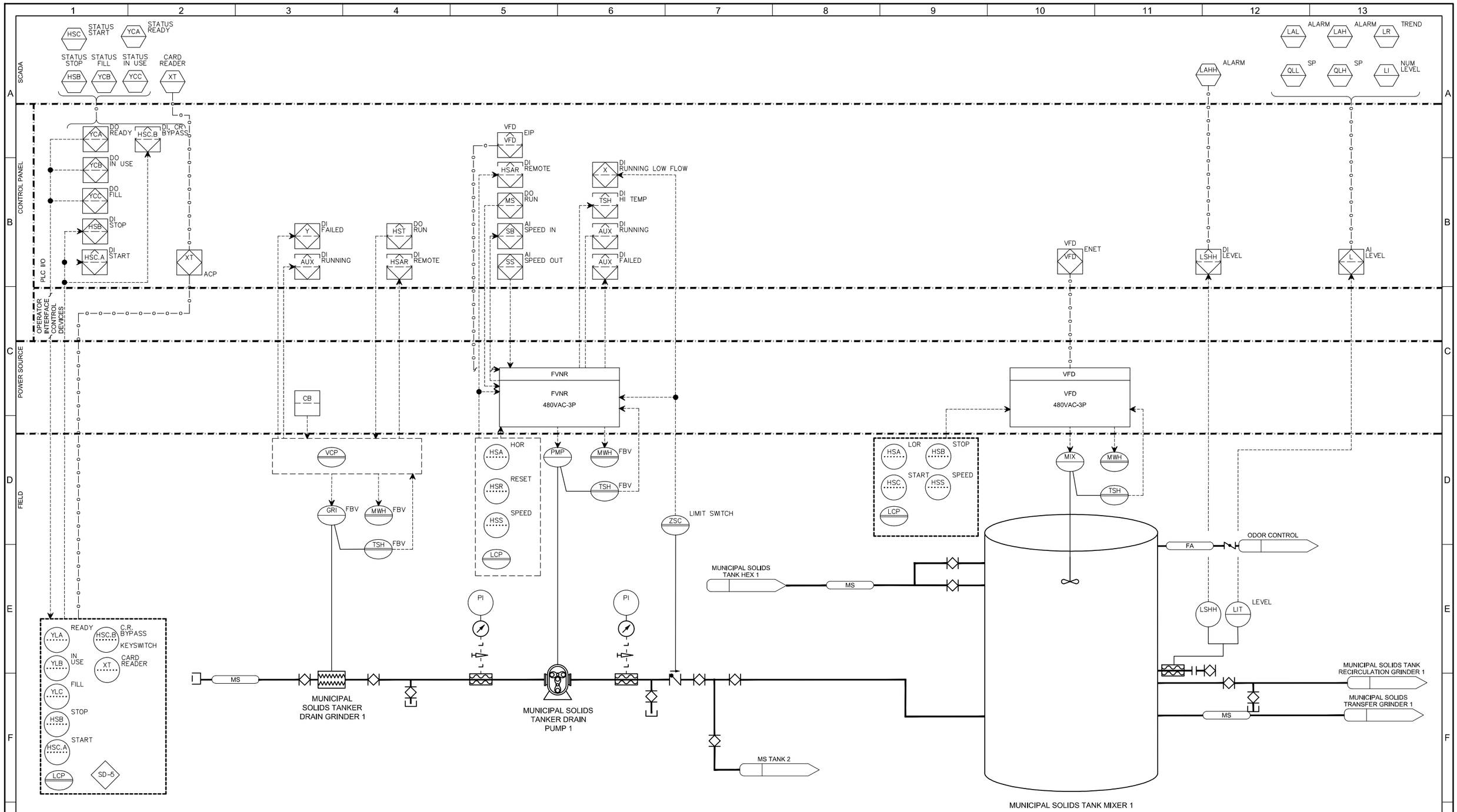
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N04
SHEET NO. 237 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED	R. DEFREITAS
DRAWN	A. CHARDE
CHECKED	R. GUPTA
DATE	JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
MS TANK 1

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

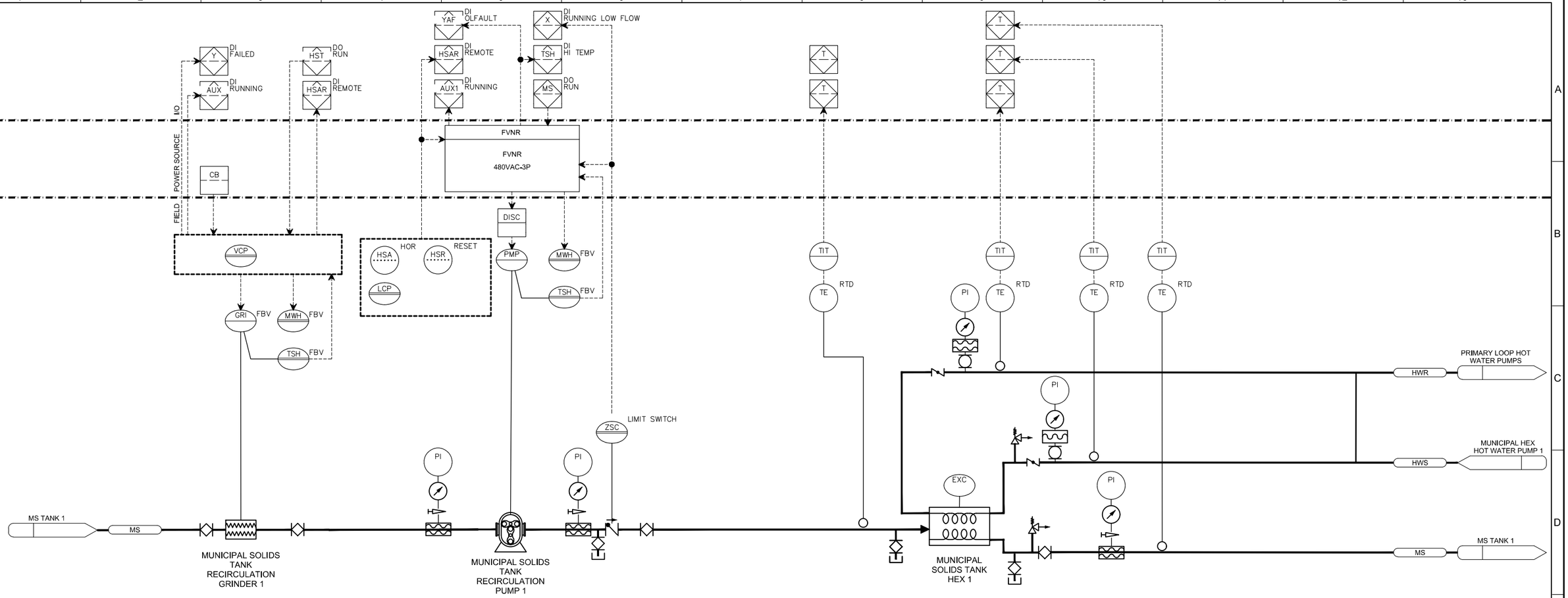
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.	203580-60000
DRAWING NO.	57N05
SHEET NO.	238 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
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DRAWN A. CHARDE
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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
MS HEATING

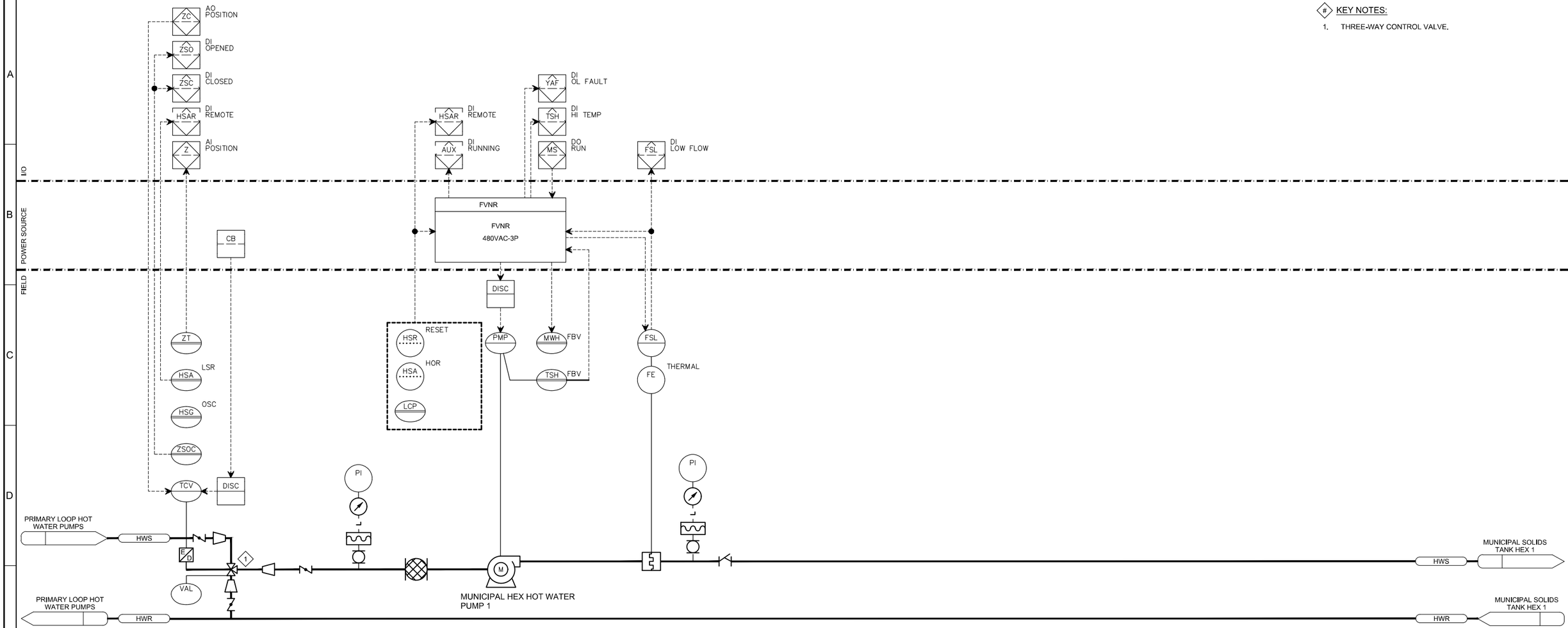
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N06
SHEET NO. 239 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
MUNICIPAL HEX HOT WATER PUMPS

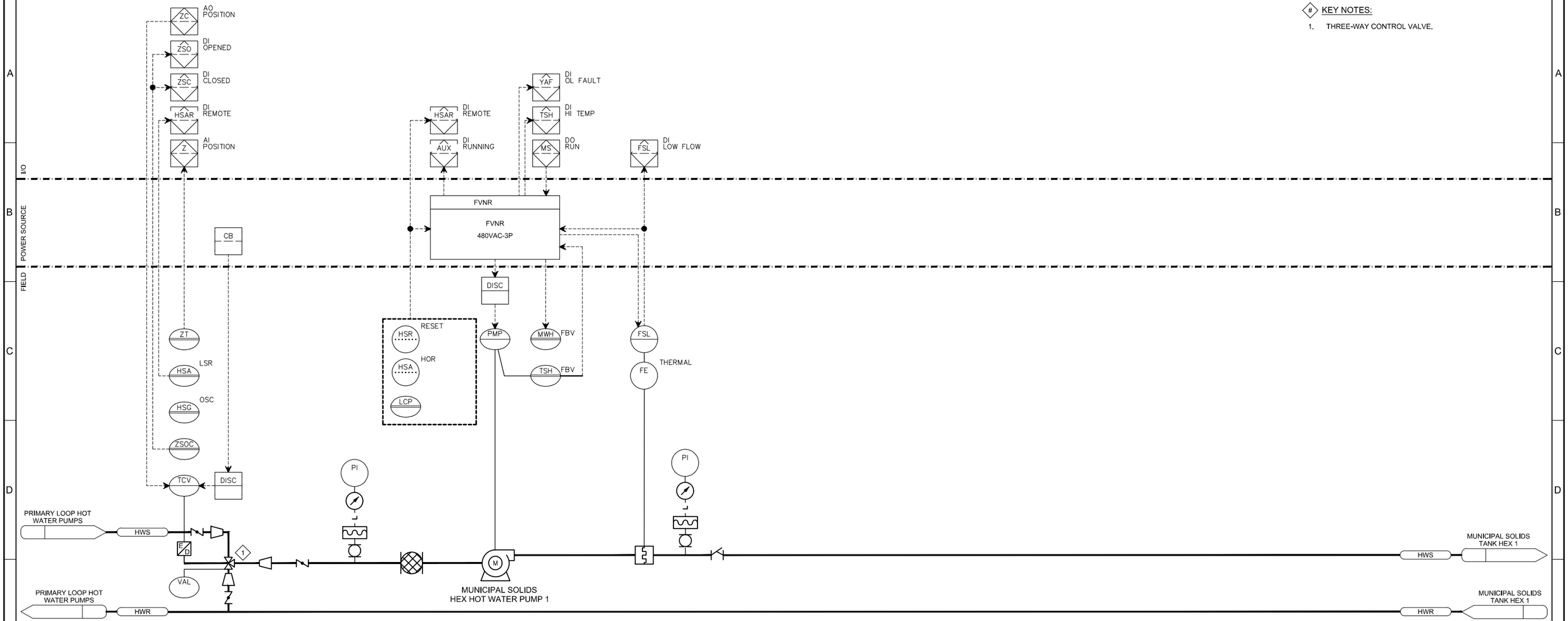
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N07
SHEET NO. 240 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
MUNICIPAL SOLIDS HEX HOT WATER PUMPS

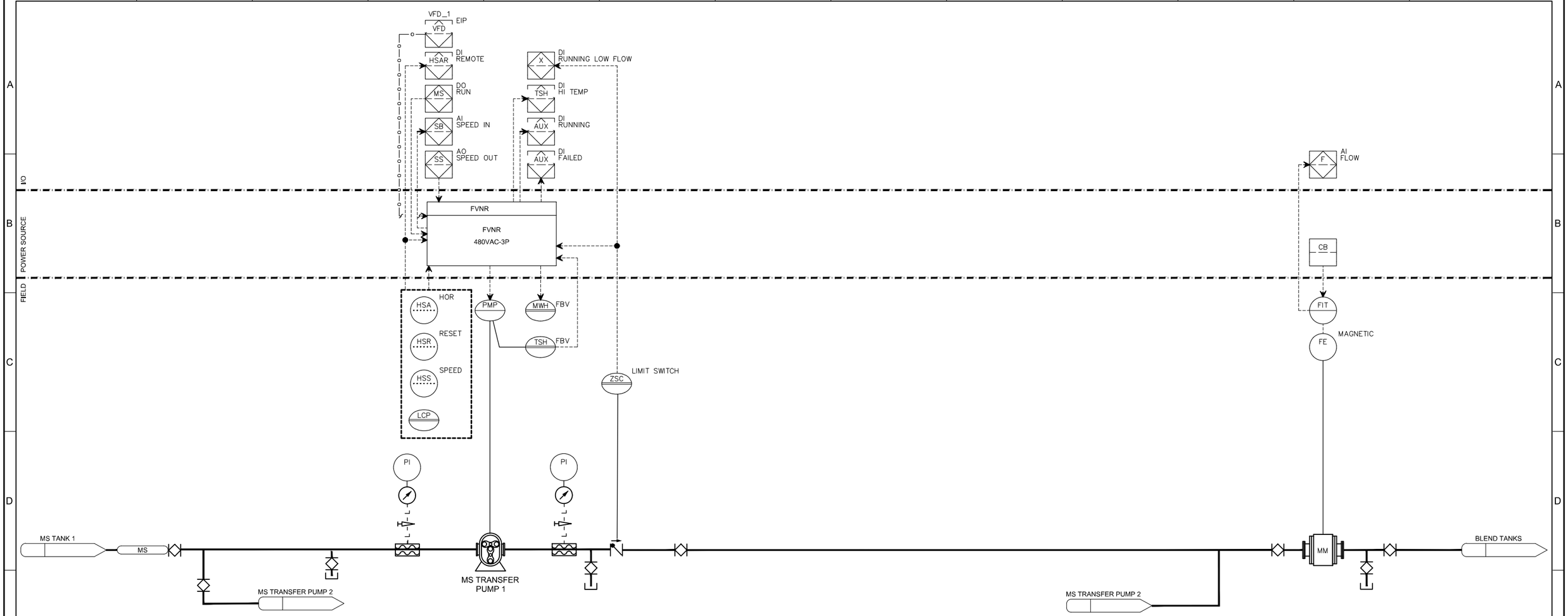
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N07
SHEET NO. 241 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
MUNICIPAL SOLIDS TRANSFER PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N08
SHEET NO. 242 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA

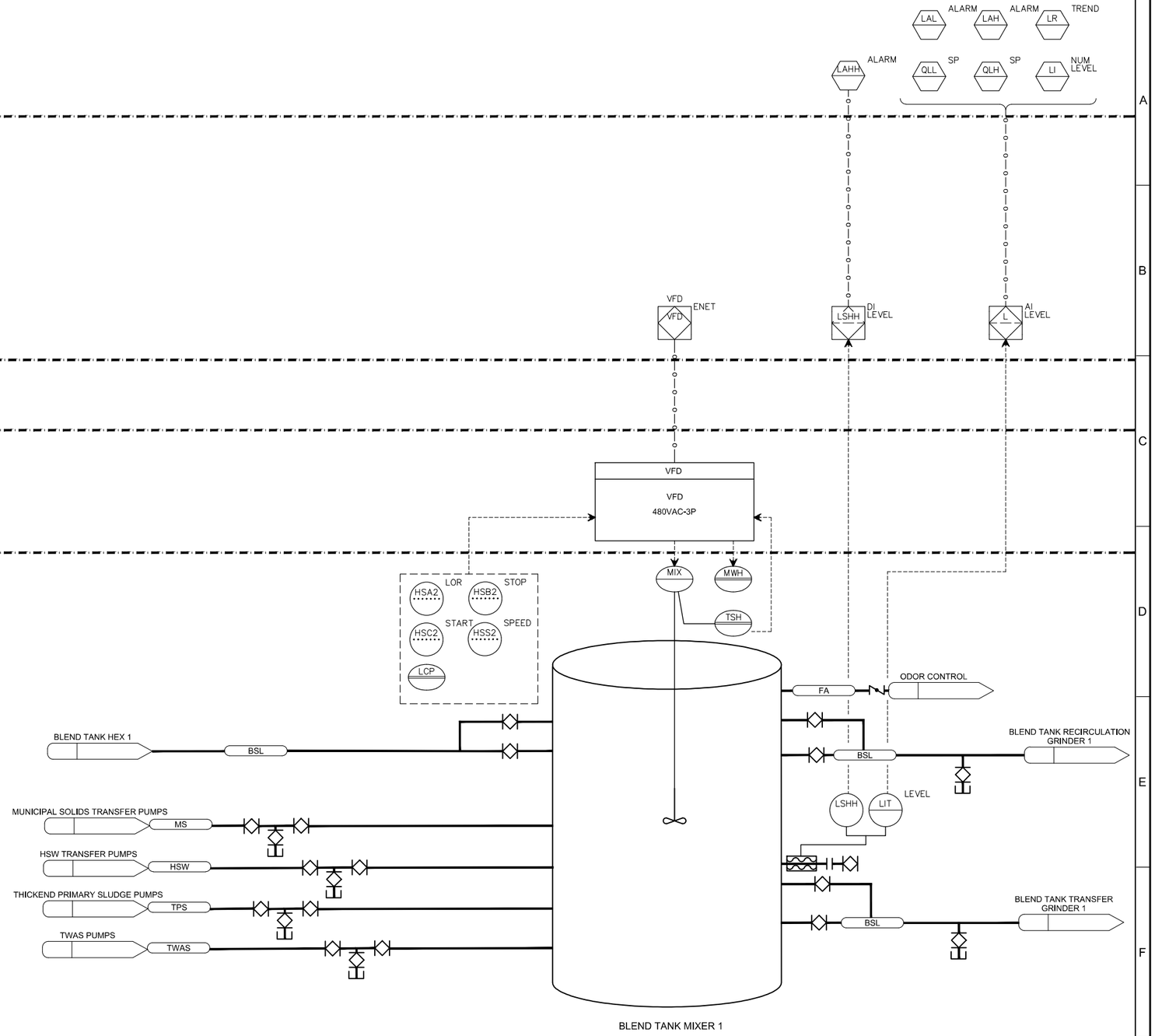
CONTROL PANEL

PLC I/O

OPERATOR INTERFACE CONTROL DEVICES

POWER SOURCE

FIELD



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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

PROCESS AND INSTRUMENTATION

P&ID
BLEND TANK 1

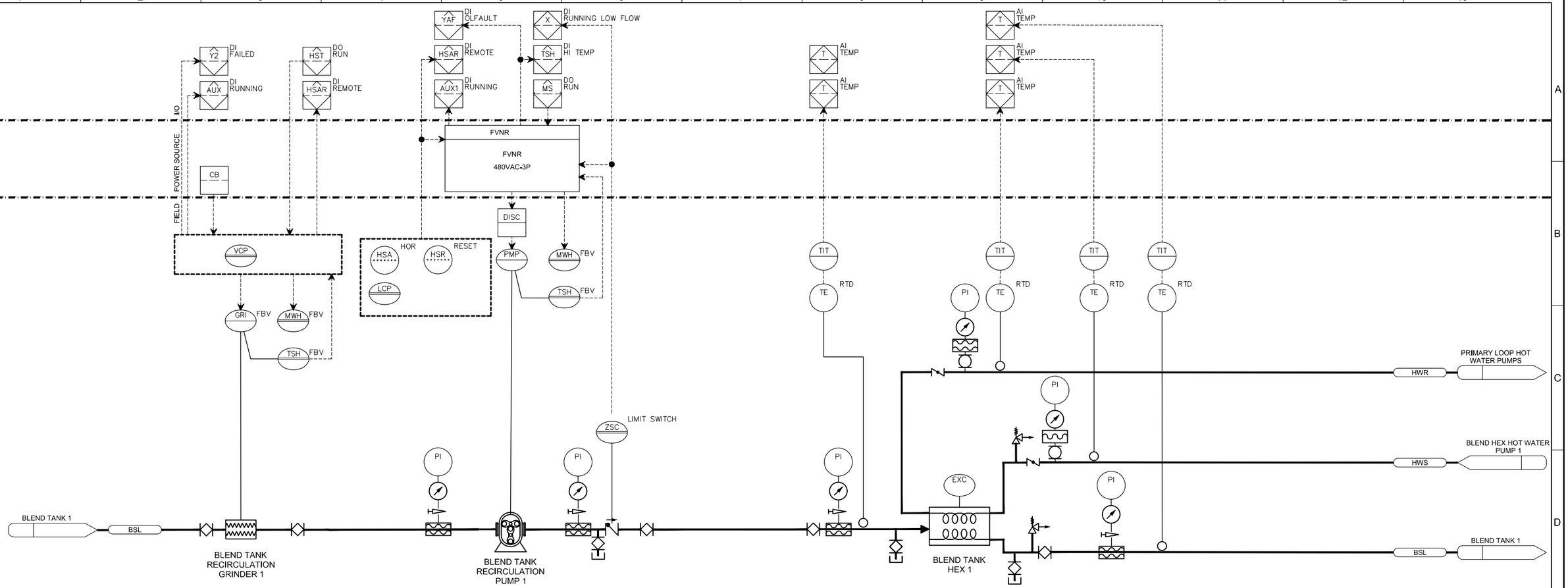
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N09
SHEET NO. 243 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
BSL HEATING

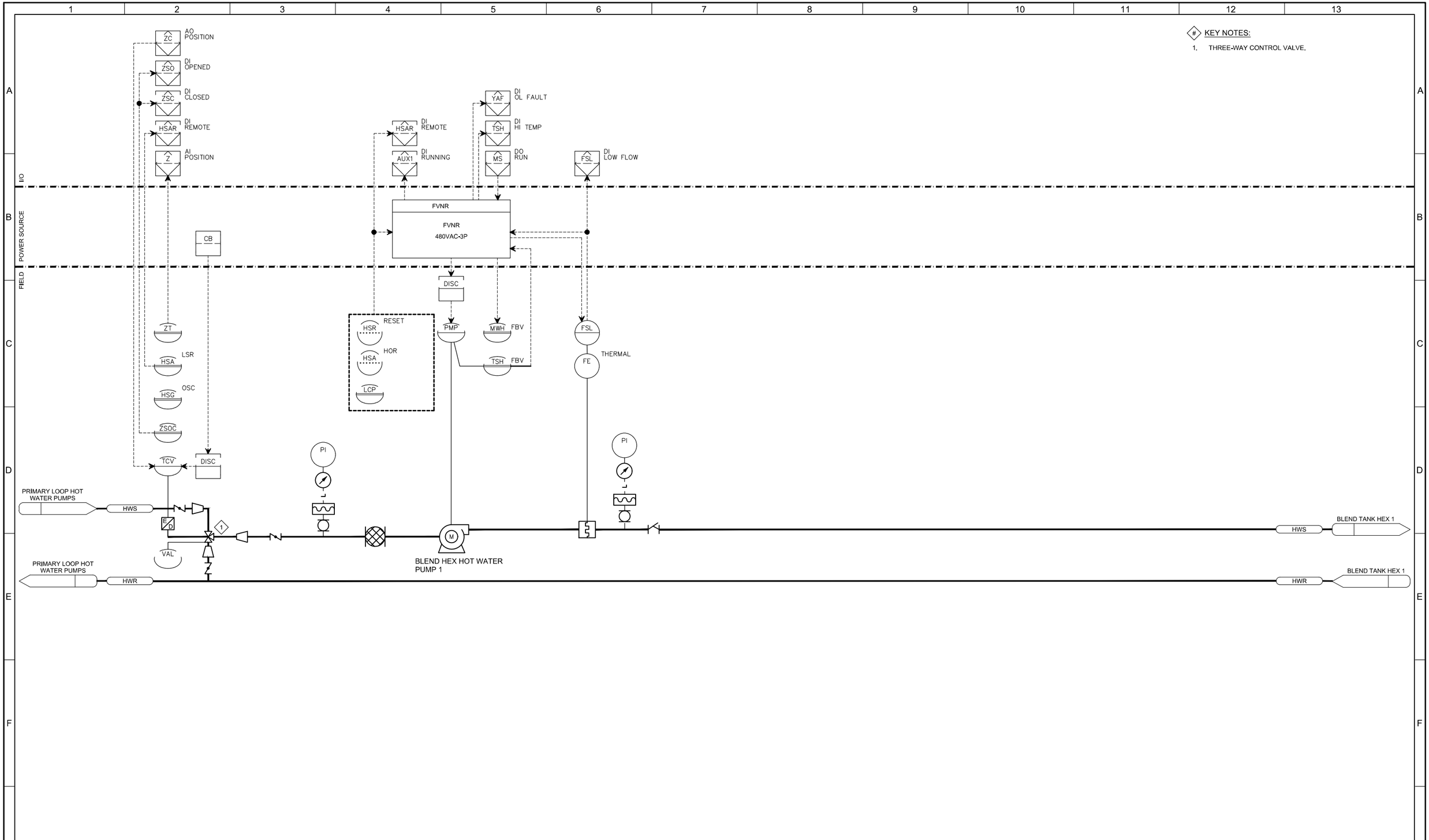
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N10
SHEET NO. 244 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

BLEND HEX HOT WATER PUMPS

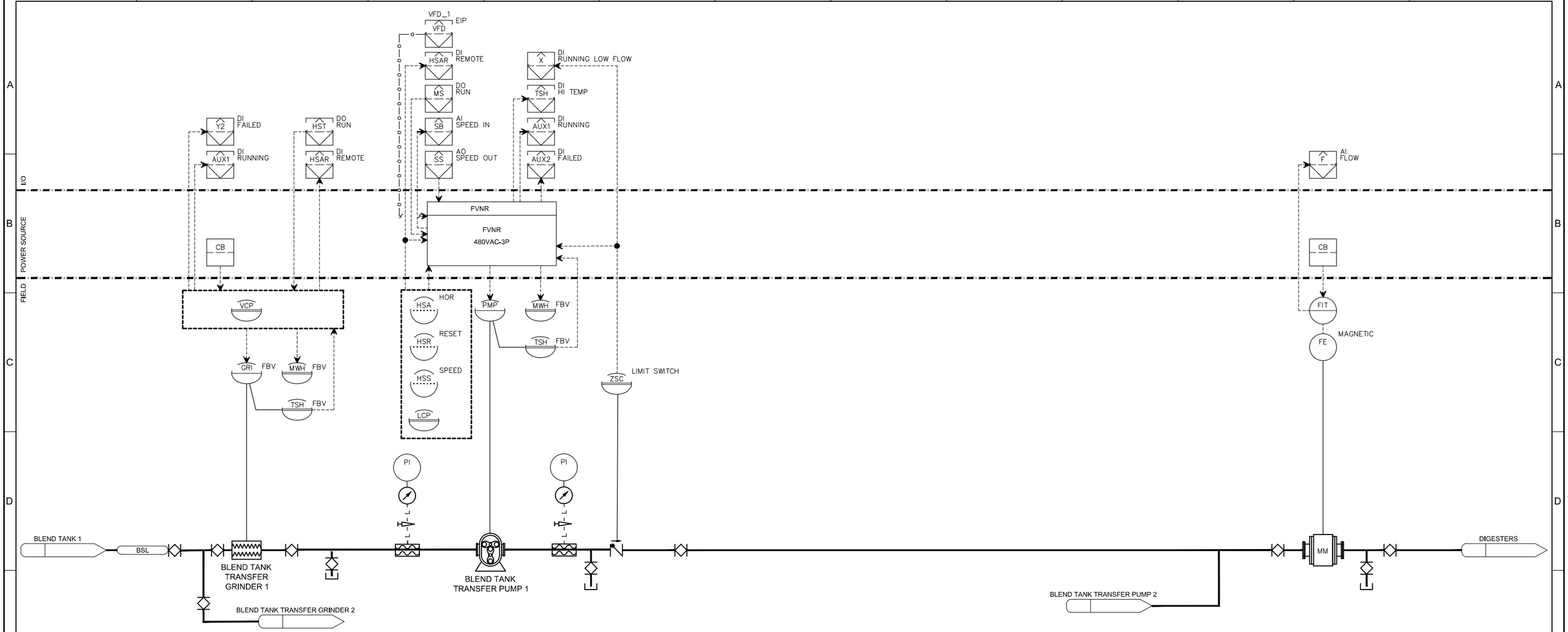
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N11
SHEET NO. 245 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:



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DESIGNED R. DEFREITAS
DRAWN A. CHARDE
CHECKED R. GUPTA
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
BLEND TANK TRANSFER PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 57N12
SHEET NO. 246 OF 251

LAST SAVED BY:
PROJECT NO.
FILE NAME:

KEY NOTES:

1. INTERNAL NETWORK CONNECTIVITY PROVIDED BY MCC VENDOR.

SCADA

CONTROL PANEL

PLC I/O

OPERATOR INTERFACE/ CONTROL DEVICES

POWER SOURCE

FIELD

FVNR1 VCP13A FVNR7 VCP13B FVNR7 VCP13B FVNR7 VCP13B VFD6 VCP13C VFD6 VCP13C

ENET

VFD VFD MS MS MS MS

VFD 480VAC-3P

FVNR 480VAC-3P

CB TM

VCP FBV

HSU E-STOP FBV

VCP1 FBV

CONTINUED ON DRAWING 58N02

PMP MWH TSH

XSH PMP MWH TSH

PSL PE SV PI FI S

UTILITY WATER

NATURAL GAS

AIR

UTILITY WATER TO CONDENSER

DRYER FEED CONVEYOR 1

A

HOP FBV AUG FBV AUG FBV AUG FBV PMP FBV PMP FBV

FOR P&ID DETAILS AND CONTRACTOR RESPONSIBILITIES REFER TO DRYER MFR DRAWING PACKAGE

CONTINUED ON DRAWING 58N02

EXTRUDER TRACTION DRIVE 1

EXTRUDER CUTTER KNIFE DRIVE 1

BELT WASHING SYSTEM DRIVE A1

BELT WASHING SYSTEM DRIVE A2

BELT WASHWATER BOOSTER PUMP 1

HEX WASHWATER BOOSTER PUMP 1

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

BIOSOLIDS DRYER P&ID - 01

VERIFY SCALES

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JOB NO. 203580-60000

DRAWING NO. 58N01

SHEET NO. 247 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

KEY NOTES:

1. INTERNAL NETWORK CONNECTIVITY PROVIDED BY MCC VENDOR.

SCADA

CONTROL PANEL

PLC I/O

OPERATOR INTERFACE/ CONTROL DEVICES

POWER SOURCE

FIELD

VFD8	VCP13E	FVNR7	VCP13B	FVNR7	VCP13B	VFD8	VCP13E	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A
ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET
VFD8	VCP13E	FVNR7	VCP13B	FVNR7	VCP13B	VFD8	VCP13E	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
VFD	VFD	MS	MS	MS	MS	MS	MS								
VFD 480VAC-3P	VFD 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P								

CONTINUED ON DRAWING 58N01

CONTINUED ON DRAWING 58N03

XSH	XSH	XSH	XSH	PMP	PMP	PMP	PMP	PMP	PMP	PMP	PMP	PMP
PMP	PMP	PMP	PMP	MWH	MWH	MWH	MWH	MWH	MWH	MWH	MWH	MWH
MWH	MWH	MWH	MWH	TSH	TSH	TSH	TSH	TSH	TSH	TSH	TSH	TSH
TSH	TSH	TSH	TSH									

BLT	SCP	CON	CON	FAN	FAN	FAN	FAN					
FBV	FBV	FBV	FBV	FBV	FBV	FBV	FBV					

CONTINUED ON DRAWING 58N01

CONTINUED ON DRAWING 58N03

DRYER UPPER BELT DRIVE 1

DRYER LOWER BELT DRIVE 1

HEX RECOVERY CLEANING SYSTEM 1

HEX RECOVERY RECIRCULATION PUMP 1

PROCESS AIR FAN A1

PROCESS AIR FAN A2

PROCESS AIR FAN A3

PROCESS AIR FAN A4

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DATE	JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID

BIOSOLIDS DRYER 1 - 02

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JOB NO. 203580-60000

DRAWING NO. 58N02

SHEET NO. 248 OF 251

PROJECT NO.

FILE NAME:

KEY NOTES:

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SCADA

CONTROL PANEL PLC I/O

OPERATOR INTERFACE/ CONTROL DEVICES

POWER SOURCE

FIELD

FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR7	VCP13B	FVNR1	VCP13A
ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET	ENET
FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR1	VCP13A	FVNR7	VCP13B	FVNR1	VCP13A
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P	FVNR 480VAC-3P

CONTINUED ON DRAWING 58N02

PMP	PMP	PMP	PMP	PMP	PMP	PMP	PMP	PMP	PMP	XSH	PMP	PMP
MWH	MWH	MWH	MWH	MWH	MWH	MWH	MWH	MWH	MWH	MWH	MWH	MWH
TSH	TSH	TSH	TSH	TSH	TSH	TSH	TSH	TSH	TSH	TSH	TSH	TSH

CONTINUED ON DRAWING 58N02

FAN	FAN	FAN	FAN	FAN	FAN	FAN	FAN	FAN	FAN	CON	CON	
FBV	FBV	FBV	FBV	FBV	FBV	FBV	FBV	FBV	FBV	FBV	FBV	

DRIED MATERIAL STORAGE

ODOR CONTROL

RETURN FLOW PUMP STATION

PROCESS AIR FAN A5	PROCESS AIR FAN A6	PROCESS AIR FAN A7	PROCESS AIR FAN A8	PROCESS AIR FAN A9	PROCESS AIR FAN A10	DISCHARGE CONVEYOR 1	DRYER EXHAUST FAN 1

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CHECKED R. GUPTA
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

P&ID
BIOSOLIDS DRYER 1 - 03

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JOB NO. 203580-60000
DRAWING NO. 58N03
SHEET NO. 249 OF 251

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA

CONTROL PANEL
PLC I/O
OPERATOR INTERFACE/
CONTROL DEVICES

POWER SOURCE

FIELD

L
AI

CHEMICAL METERING PUMP
PROFI-DP
PMP

MAGNETIC FLOW METER
ENET-IP
F

CBA

CBB

VCP
PMP
FBV

FIT

MAGNETIC
FE

LIT
PE

TANK FILL

OF

1

FC

FC

PI
FBV

DEWATERING CENTRIFUGE 1
(FEED AND CENTRATE), AND
DIGESTER 1

MM

FERRIC CHLORIDE
METERING PUMP 2

FERRIC CHLORIDE
METERING PUMP 2

FERRIC CHLORIDE
METERING PUMP 3

FERRIC CHLORIDE
METERING PUMP 4

FERRIC CHLORIDE
STORAGE TANK

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INSTRUMENTATION
P&ID
FERRIC CHLORIDE STORAGE AND PUMPING

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 59N01
SHEET NO. 250 OF 251

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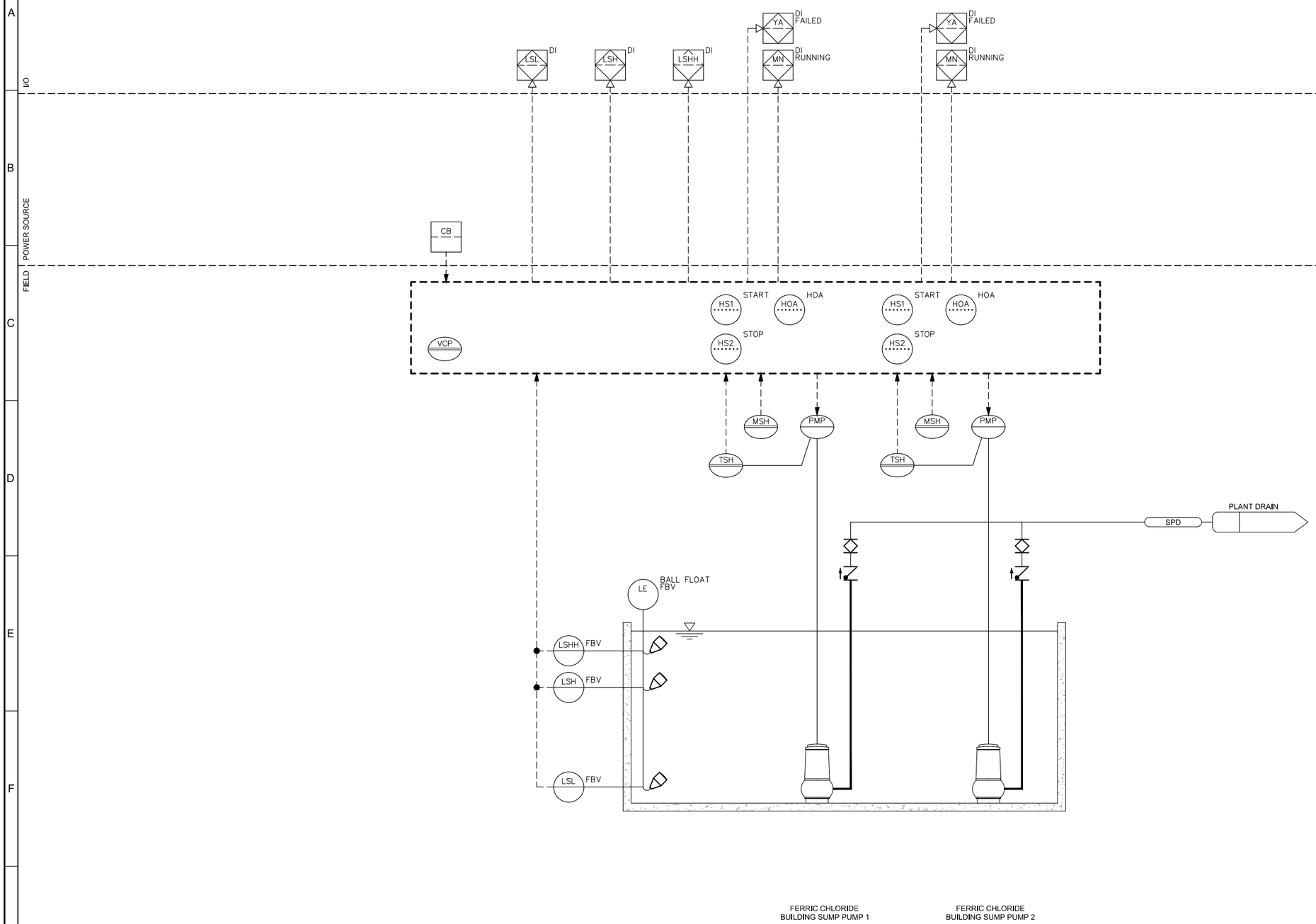

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OOWWTP EXPANSION PROGRAM - UPGRADES AND BIOSOLIDS FACILITY

INSTRUMENTATION

FERRIC CHLORIDE BUILDING SUMP PUMPS

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 59N02
SHEET NO. 251 OF 251

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PROJECT NO.

FILE NAME:

APPENDIX J

REUSE FACILITY DRAFT 25 PERCENT DESIGN DRAWINGS

Onondaga County Department of WATER ENVIRONMENT PROTECTION

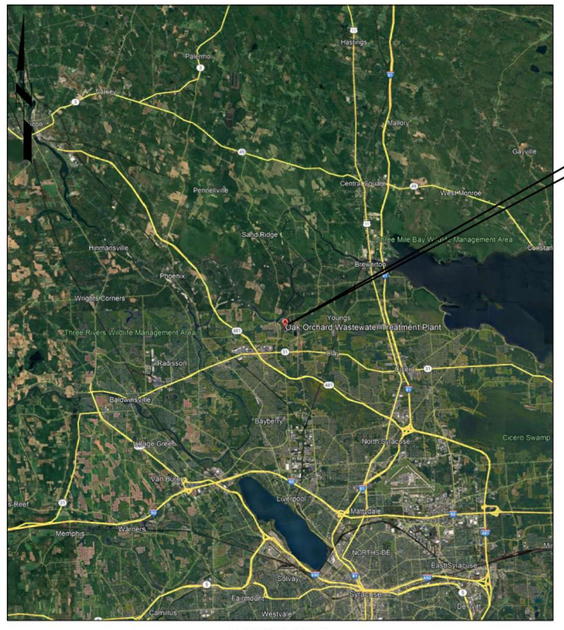
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - REUSE FACILITY

25% DESIGN SUBMITTAL

MAY 2025

VOLUME 1 OF 4



VICINITY MAP



LOCATION MAP

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DRAWN A. CHARDE
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DATE JUNE 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
COVER SHEET

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 00G01
SHEET NO. 1 OF 30

LAST SAVED BY:
PROJECT NO.
FILE NAME:

DRAWING NO.	DRAWING TITLE
GENERAL	
00G01	COVER SHEET
00G02	DRAWING INDEX
00G03	NOTES, LEGEND, AND SYMBOLS
00G04	ABBREVIATIONS
00G05	SITE PLAN DEMO
00G06	SITE PLAN
00G07	REUSE FACILITY - HYDRAULIC PROFILE
00G08	PROCESS FLOW DIAGRAM
ARCHITECTURAL	
41A01	REUSE FACILITY - PLAN AT EL. 393.50'
41A02	REUSE FACILITY - NORTH AND EAST ELEVATIONS
41A03	REUSE FACILITY - SOUTH AND WEST ELEVATIONS
STRUCTURAL	
41S01	REUSE FACILITY - PLAN AT EL. 393.50'
41S02	REUSE FACILITY - SECTIONS
PROCESS MECHANICAL	
00GM01	GENERAL LEGEND AND SYMBOLS
41M01	REUSE FACILITY - PLAN AT EL. 393.50'
ELECTRICAL	
00GE01	GENERAL LEGEND AND SYMBOLS
00GE02	ABBREVIATIONS
41E01	REUSE FACILITY - ONE-LINE DIAGRAM
INSTRUMENTATION	
00GN01	SYMBOLS AND ABBREVIATIONS 1
00GN02	SYMBOLS AND ABBREVIATIONS 2
00GN03	SYMBOLS AND ABBREVIATIONS 3
00GN04	SYMBOLS AND ABBREVIATIONS 4
00GN05	SCHEMATIC SYMBOLS
00GN06	EQUIPMENT TAGGING
41N01	P&ID - RO TRANSFER PUMPS
41N02	P&ID - RO PRETREATMENT
41N03	P&ID - RO CARTRIDGE FILTERS
41N04	P&ID - RO SYSTEM
41N05	P&ID - CIP SYSTEM
41N06	P&ID - RO FLUSH SYSTEM

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
DRAWING INDEX

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JOB NO. 203580-60000
DRAWING NO. 00G02
SHEET NO. 2 OF 30

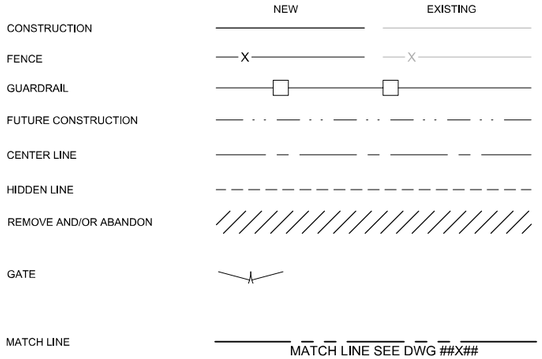
LAST SAVED BY:
PROJECT NO.
FILE NAME:

GENERAL NOTES

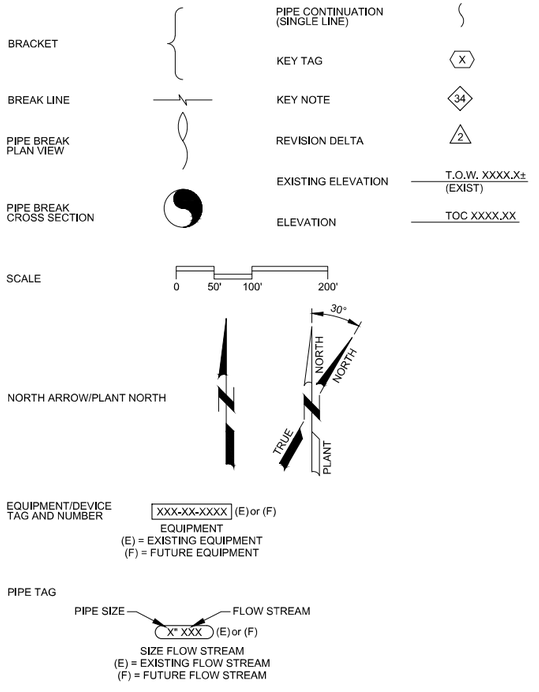
1. FOLLOWING NOTES ARE GENERAL AND APPLY TO ALL SHEETS OF THESE CONTRACT DOCUMENTS AS IF THEY WERE WRITTEN IN THEIR ENTIRETY ON EACH SHEET.
2. THIS SUBMITTAL IS INTENDED AS A REPRESENTATIVE DESIGN ONLY. VERIFICATION OF DESIGN IS THE REPONSIBILITY OF THE FINAL DESIGN CONSULTANT.
3. CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK AND SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING ALL EXISTING CONDITIONS INCLUDING LOCATION AND DIMENSIONS OF ALL EXISTING CONSTRUCTION AND UTILITIES. CONTRACTOR SHALL NOTIFY ENGINEER IF THERE IS A CONFLICT BETWEEN THE CONTRACT DOCUMENTS AND EXISTING CONSTRUCTION BEFORE PROCEEDING WITH WORK.
4. UNLESS DETAILED, SPECIFIED, OR OTHERWISE INDICATED ON THE DRAWINGS, CONSTRUCTION SHALL BE AS INDICATED IN THE APPLICABLE TYPICAL DETAILS AND GENERAL NOTES. TYPICAL DETAILS SHALL APPLY EVEN THOUGH NOT REFERENCED AT SPECIFIC LOCATIONS ON DRAWINGS.
5. WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF WORK. DETAILS SHALL BE IN THE SAME AS FOR OTHER SIMILAR WORK.
6. CONTRACTOR SHALL COMPLY WITH LOCAL CONSTRUCTION STORM WATER DISCHARGE REGULATIONS AND REQUIREMENTS.
7. PRIOR TO EXCAVATION FOR NEW STRUCTURES, ELECTRICAL CONDUIT, FABRICATION OF NEW PIPING AND/OR OTHER PROPOSED UTILITIES, CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING PIPING AND UTILITIES IN THE CONSTRUCTION AREA. THE CONTRACTOR SHALL TEMPORARILY RELOCATE CONFLICTING EXISTING UTILITIES AT TIE-IN/CONNECTION LOCATIONS AND REINSTALL THEM AS REQUIRED TO ELIMINATE THE CONFLICT AT NO ADDITIONAL COST TO THE OWNER.
8. ALL PIPELINES 12" AND LARGER SHALL HAVE A MINIMUM COVER OF 36" UNLESS THE COVER DEPTH IS SPECIFICALLY INDICATED ON THE DRAWINGS. PIPE SMALLER THAN 12" SHALL HAVE A MINIMUM COVER OF 30" UNLESS NOTED OTHERWISE. PIPES SHALL BE ROUTED AS SHOWN UNLESS MINOR REVISIONS ARE NECESSARY TO MISS EXISTING PIPES, STRUCTURES, ETC. CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING ALL FITTINGS AND ADAPTERS REQUIRED TO MAKE THE ROUTING CHANGES AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR SHALL INCLUDE COST FOR THIS IN THE BID.
9. EXISTING FACILITY AND UTILITY INFORMATION SHOWN ON THE DRAWINGS WAS OBTAINED FROM AVAILABLE RECORDS OR ELECTRONIC FILES. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR FACILITIES AND UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS, SIZES, MATERIAL TYPES, AND ELEVATIONS SHOWN AROUND OR NEAR AREAS OF NEW CONSTRUCTION PRIOR TO START OF CONSTRUCTION.
10. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT FROM DAMAGE EXISTING FACILITIES AND UTILITIES SHOWN OR NOT SHOWN THAT ARE TO REMAIN IN PLACE. ALL FACILITIES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED TO THE ORIGINAL OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE WITHOUT ADDITIONAL COMPENSATION.
11. CONTRACTOR SHALL MAKE CONNECTIONS TO EXISTING PIPE, EQUIPMENT, ETC. AS REQUIRED AND SHALL PROVIDE ALL FITTINGS, ADAPTERS, AND APPURTENANCES REQUIRED TO MAKE THE CONNECTIONS. PROVIDE ALL SUPPORTS REQUIRED FOR A RIGIDLY SUPPORTED COMPLETE AND WORKING SYSTEM.
12. ADJUST ALL VALVE BOXES, VAULTS, PULL BOXES, AND MANHOLES TO FINISHED GRADE UNLESS OTHERWISE SHOWN OR DIRECTED. MANHOLES IN OPEN FIELDS SHALL BE SET TWELVE INCHES ABOVE FINISHED GRADE AND VAULTS SHALL BE SIX INCHES ABOVE FINISHED GRADE.
13. THE CONTRACTOR SHALL CONTACT THE PROPER UTILITY REPRESENTATIVE AS FOLLOWS FOR QUESTIONS OR COORDINATION OF CONSTRUCTION RELATED TO EXISTING UTILITIES.

    STATE/REGION/MUNICIPALITY SPECIFIC: 1-800-XXX-XXXX
14. CONTRACTOR SHALL VERIFY THAT PIPING SHOWN TO BE ABANDONED OR AS ABANDONED PREVIOUSLY IS NO LONGER IN SERVICE. LINES IN SERVICE SHALL BE MAINTAINED UNTIL NO LONGER REQUIRED BY THE PLANT.
15. ALL EXISTING PIPES THAT ARE TO BE ABANDONED IN PLACE OR REMOVED MAY NOT BE SHOWN. WHERE PIPING IS TO BE ABANDONED AND MUST REMAIN IN SERVICE UNTIL COMPLETION OF OTHER PHASES OF WORK, AND IT CONFLICTS WITH NEW PIPING, TEMPORARILY RELOCATE PIPING AS REQUIRED TO MAINTAIN SERVICE BY THE PLANT.
16. CONTRACTOR SHALL REROUTE THE EXISTING PIPING IF REQUIRED TO MISS THE PROPOSED STRUCTURES. THE EXISTING PIPE SHALL REMAIN IN SERVICE UNTIL NEW PIPING IS READY TO BE PLACED INTO SERVICE. DOWNTIME SHALL BE A MAXIMUM OF 2 HOURS, UNLESS SPECIFIED OR SHOWN OTHERWISE.
17. ALL SIDEWALKS TO BE 3'-0" WIDE UNLESS SHOWN OTHERWISE.
18. THE CONTRACTOR SHALL TAKE SPECIAL PRECAUTIONS IN THE VICINITY OF ANY OVERHEAD ELECTRIC LINES. CONTRACTOR SHALL ABIDE BY THE NATIONAL ELECTRIC CODE AND ANY REQUIREMENT BY THE OWNER OF THE ELECTRIC LINES.
19. PROVIDE ALL SHEETING/SHORING REQUIRED TO PROTECT EXISTING STRUCTURES, PIPES AND FACILITIES.
20. CONTRACTOR SHALL VERIFY LOCATION OF ALL ARCHITECTURAL, MECHANICAL, AND ELECTRICAL ITEMS BEFORE PLACING ANY STRUCTURAL STEEL OR CONCRETE. ALSO, STRUCTURAL DIMENSIONS AND OPENINGS CONTROLLED BY ARCHITECTURAL, MECHANICAL, OR ELECTRICAL EQUIPMENT SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
21. MECHANICAL AND ELECTRICAL EQUIPMENT SUPPORTS, ANCHORAGES, OPENINGS, RECESSES, AND REVEALS NOT SHOWN ON THE STRUCTURAL DRAWINGS, THAT ARE REQUIRED BY OTHER CONTRACT DRAWINGS, SHALL BE PROVIDED PRIOR TO CASTING CONCRETE.

LINE WORK



SYMBOLS



New York 811, Inc.
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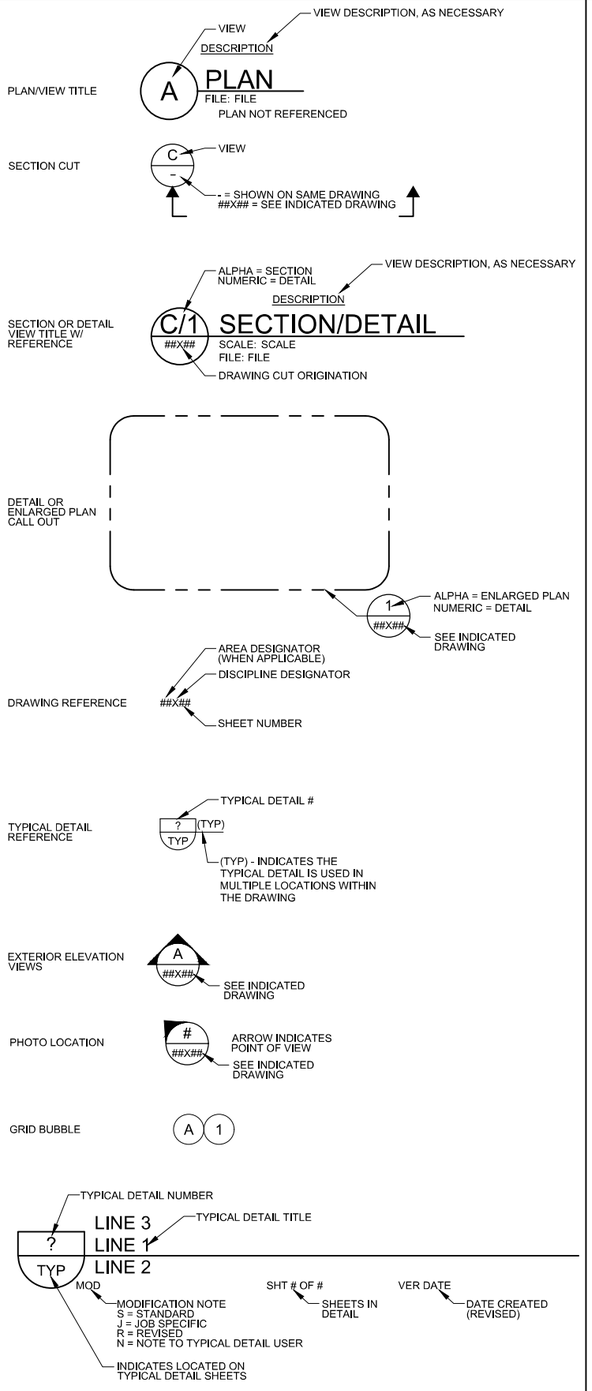
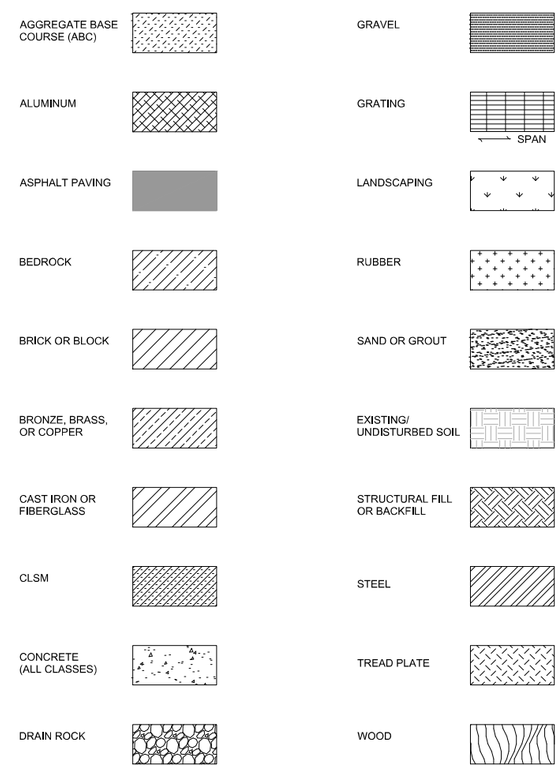
DETAIL REFERENCES



HATCH PATTERNS



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NOT FOR CONSTRUCTION

DESIGNED	N. FONTAINE
DRAWN	A. CHARDE
CHECKED	E. STEINLE-DARLING
DATE	JUNE 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
NOTES, LEGEND, AND SYMBOLS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00G03
SHEET NO. 3 OF 30

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PROJECT NO.
FILE NAME:

	@	AT (MEASUREMENT)
	△	DEFLECTION ANGLE, CENTRAL ANGLE
	#	NUMBER (REBAR Ø)
A		
	AB	ANCHOR BOLT
	ABC	AGGREGATE BASE COURSE
	ABS	ACRYLONITRILE BUTADIENE STYRENE
	AC	ASPHALTIC CONCRETE
	ACB	AIR CIRCUIT BREAKER
	ACI	AMERICAN CONCRETE INSTITUTE
	ACP	ASBESTOS CEMENT PIPE
	ACU	AIR CONDITIONING UNIT
	AD	AREA DRAIN
	ADDL	ADDITIONAL
	ADJ	ADJACENT, ADJUST, ADJUSTABLE
	ADMIN	ADMINISTRATION
	ADR	ACCESS DOOR
	AED	AREA EQUIPMENT DRAIN
	AER	AERAT(ION)(OR)
	AFC	AFTERCOOLER
	AFF	ABOVE FINISHED FLOOR
	AFM	AIR FLOW MONITOR
	AHU	AIR HANDLING UNIT
	AIC	AIR COMPRESSOR
	AIL	AIR INTAKE LOUVER
	ALT	ALTERNATE
	AL	ALUMINUM
	ANCH	ANCHOR
	ANV	ANGLE VALVE
	APPROX	APPROXIMATE, APPROXIMATELY
	ARCH	ARCHITECTURAL
	ARV	AIR RELEASE VALVE
	ASSY	ASSEMBLY
	ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
	AV	ACID VENT
	AVG	AVERAGE
	AVV	AIR AND VACUUM VALVE
	AW	ACID WASTE
B		
	BC	BEGIN CURVE, BRASS CAP, BACK OF CURB, BOLT CIRCLE
	BCKR	BACKER BOARD
	BCM	BATCHMETER
	BD	BOARD
	BDD	BACKDRAFT DAMPER
	BDR	BASIN DRAIN LINE
	BF	BLIND FLANGE
	BFG	BELOW FINISHED GRADE
	BFP	BELT FILTER PRESS
	BFV	BUTTERFLY VALVE
	BG	BREAK GLASS HAND SWITCH
	BKW	BACKWASH
	BLDG	BUILDING
	BLK	BLOCK
	BLKHD	BULKHEAD
	BLR	PROCESS BLOWER
	BM	BEAM, BENCH MARK
	BO	BOTTOM OF
	BOTT	BOTTOM
	BOTTS	BOTTOM SLUDGE
	BPV	BACK PRESSURE VALVE
	BRG	BEARING
	BSP	BLACK STEEL PIPE
	BTU	BRITISH THERMAL UNITS
	BTWN	BETWEEN
	BV	BALL VALVE
	BWCCP	BAR-WRAPPED CONCRETE CYLINDER PIPE
C		
	C	CLOSE, CONDUIT CHANNEL (STRUCTURAL)
	CA	CONCRETE ANCHOR
	CAUSTIC	CAUSTIC SOLUTION (CONCENTRATED OR DILUTE)
	CB	CATCH BASIN
	CC	CENTER OF CURVATURE, CENTER TO CENTER
	CCB	CHLORINE CONTACT BASIN
	CD	CEILING DIFFUSER, CONDENSATE DRAIN
	CDL	CHEMICAL DRAIN LINE
	CDT	CONDUIT
	CEF	CEILING EXHAUST FAN
	CF	CUBIC FEET
	CFM	CUBIC FEET PER MINUTE
	CFS	CUBIC FEET PER SECOND
	CHEMD	CHEMICAL DRAIN
	CHF	CHEMICAL FEEDER
	CHKD PL	CHECKERED PLATE
	CI	CAST IRON
	CIP	CAST IRON PIPE
	CIRC	CIRCUMFERENTIAL/CIRCUMFERENCE
	CJ	CONSTRUCTION JOINT
	CKA	CHECK VALVE, ANGLE
	CKB	CHECK VALVE, BALL
	CKF	CHECK VALVE, FLAP
	CKS	CHECK VALVE, SWING
	CL	CENTER LINE
	CLK	CHAIN LINK
	CLD	CHLORINE LEAK DETECTOR
	CLL	CHLORINE LIQUID
	CLP	CHLORINE GAS (PRESSURE)
	CLR	CLEAR
	CLS	CHLORINE SOLUTION
	CLSM	CONTROLLED LOW STRENGTH MATERIAL
	CLV	CHLORINE GAS (VACUUM)
	CML	CEMENT MORTAR LINED
	CMLC	CEMENT MORTAR LINED AND COATED
	CMP	CORRUGATED METAL PIPE
	CMU	CONCRETE MASONRY UNIT
	CNV	CONVEYOR
	CO	CLEANOUT
	COL(S)	COLUMN(S)
	CONC	CONCRETE
	CONN	CONNECT, CONNECTION
	CONST	CONSTRUCTION
	CONT	CONTINUOUS OR CONTINUATION OR (D) (OUS)
	CORR	CORRUGATE(D), CORROSION
	CP	CONTROL POINT
	CPLG	COUPLING
	CPT	CARPET
	CPVC	CHLORINATED POLYVINYL CHLORIDE
	CS	CARBON STEEL, CIRCULATING SLUDGE
	CSP	CHEMICAL SUMP PUMP, CORRUGATED STEEL PIPE
	CT	CURRENT TRANSFORMER, CERAMIC TILE
	CTJ	CONTROL JOINT
	CTL	CONTROL
	CTR	CENTER, CENTERED
	CTSK	COUNTERSUNK
	CU	CUBIC
	CUP	COPPER PIPE
	CV	CHECK VALVE
	CW	COLD WATER
	CWV	COMBINATION WASTE AND VENT
	CY	CUBIC YARD
D		
	D	DEPTH, DIGITAL OR DISCRETE, DRAIN
	D/W	DRIVEWAY
	DBL	DOUBLE
	DDR	DESICCANT DRYER
	DEG or °	DEGREE
	DEMO	DEMOLISH, DEMOLITION
	DET	DETAIL
	DFL	DECANT/FILTRATE
	DG	DOOR GRILLE
	DIA or Ø	DIAMETER
	DIAG	DIAGONAL
	DIF	DIFFUSER
	DIG	DIGESTER
	DIM	DIMENSION
	DIP	DUCTILE IRON PIPE
	DISCH	DISCHARGE
	DIW	DEIONIZED WATER
	DL	DEAD LOAD, DRAIN LINE
	DLV	DOOR LOUVER
	DMP	DAMPER
	DMS	DIAPHRAGM SEAL
	DN	DOWN
	do	DITTO
	DO	DOOR OPENING
	DP	DEEP (OR DEPTH)
	DPV	DIAPHRAGM VALVE
	DR	DOOR, DRAIN
	DRT	DRIP TRAP
	DRV	DRAIN VALVE
	DS	DIGESTED SLUDGE, DOWN SPOUT
	DSW	DISTILLED WATER, DOOR SWITCH
	DUC	DUST COLLECTOR
	DUH	DUCT HEATER UNIT
	DW	DISTILLED WATER
	DWD	DEWATERING DRAIN
	DWG(S)	DRAWING(S)
	DWL(S)	DOWEL(S)
E		
	E	EAST
	EA	EACH
	EC	END OF CURVE
	ECC RED	ECCENTRIC REDUCER
	ECU	EVAPORATOR COOLING UNIT
	ED	EQUIPMENT DRAIN
	EF	EXHAUST FAN, EACH FACE
	EFF	EFFLUENT
	EG	EXHAUST GRILLE
	EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
	EJ	EXPANSION JOINT
	EJR	INJECTOR/EDUCTOR
	EL	ELEVATION
	ELEC	ELECTRICAL
	ELL	ELBOW
	EMBED	EMBEDMENT
	EMH	ELECTRICAL MANHOLE
	EP	EDGE OF PAVEMENT
	EPS	EXPANDED POLYSTYRENE
	EPV	ECCENTRIC PLUG VALVE
	EQ	EQUAL
	EQUIP	EQUIPMENT
	ER	EXHAUST REGISTER
	ES	EACH SIDE
	ESEW	EMERGENCY SHOWER AND EYE WASH
	ESMT	EASEMENT
	ESS	EMERGENCY HAND SWITCH
	ET	ELECTRICALLY HEAT TRACED
	EUH	ELECTRIC UNIT HEATER
	EVR	EVAPORATOR
	EW	EACH WAY
	EWC	ELECTRIC WATER COOLER
	EWEF	EACH WAY EACH FACE
	EWH	ELECTRIC WATER HEATER, EXHAUST
	EX	EXISTING
	EXIST	EXISTING
	EXP	EXPANSION, EXPANSION TANK
	EXPO	EXPOSED
	EXT	EXTERIOR
F		
	FACT	FACTORY
	FAD	FOUL AIR DUCT
	FB	FLAT BAR
	FBW	FILTER BACKWASH
	FC	FACE OF CURB, FLEXIBLE COUPLING
	FCA	FLANGE COUPLING ADAPTER
	FCO	FLOOR CLEANOUT
	FCU	FAN COIL UNIT
	FD	FIRE DAMPER, FLOOR DRAIN, FOUND
	FDC	FIRE DEPARTMENT CONNECTION
	FDL	FLOOR DRAIN LINE
	FDR	FEEDER
	FEFF	FINAL EFFLUENT
	FG	FLAP GATE
	FH	FIRE HYDRANT
	FILT	FILTRATE
	FIN	FINISH
	FIN FL	FINISHED FLOOR
	FIN GR	FINISHED GRADE
	FL	FLOOR, FLOW LINE
	FLA	FOUL AIR
	FLD	FILTER DRAIN
	FLE	FILTER EFFLUENT
	FLEX	FLEXIBLE
	FLG	FLANGE, OR FLANGED
	FLR	FILTER
	FM	FORCE MAIN
	FND	FOUNDATION
	FO	FUEL OIL
	FOB	FLAT ON BOTTOM
	FOT	FLAT ON TOP
	FPM	FEET PER MINUTE
	FPP	FLEXIBLE PLASTIC PIPE
	FRP	FIBERGLASS REINFORCED PLASTIC
	FRPP	FIBERGLASS REINFORCED PLASTIC PIPE
	FRS	FROTH SPRAY
	FS	FAR SIDE
	FSTN	FASTEN(ED)
	FT or '	FOOT, FEET
	FTG	FOOTING
	FUP	FUEL DISPENSER
	FV	FLAP VALVE
	FW	FLUSHING WATER, FINISHED WATER
	FX	FIRE EXTINGUISHER
	FXC	FIRE EXTINGUISHER CABINET
	FXE	FIRE EXTINGUISHER - ELECTRICAL
G		
	G	GAS, GROUND, GUTTER
	GA	GAUGE or GAGE
	GAL	GALLONS
	GALV	GALVANIZE(D)
	GAV	GRAVITY VENTILATOR
	GB	GRADE BREAK
	GBT	GRAVITY BELT THICKENER
	GC	GROOVED COUPLING
	GEL	GRAVITY EXHAUST LOUVER
	GEN	GENERAL, GENERATOR
	GL	GLASS
	GLV	GLOBE VALVE
	GM	GAS METER
	GND	GROUND
	GPD	GALLONS PER DAY
	GPM	GALLONS PER MINUTE
	GR	GRADE
	GRTG	GRATING
	GRV	GRAVITY VENTILATOR
	GSP	GALVANIZED STEEL PIPE
	GV	GATE VALVE
	GYP	GYPSUM
H		
	H	EXPLOSION-PROOF, HIGH, HORIZONTAL
	H1E	HOOK ONE END
	H2E	HOOK TWO ENDS
	HAS	HEADED ANCHOR STUD
	HB	HOSE BIBB
	HDPE	HIGH DENSITY POLYETHYLENE
	HDW	HARDWARE
	HDWL	HEADWALL
	HEF	HOOD EXHAUST FAN
	HGT	HEIGHT
	HORIZ	HORIZONTAL
	HP	HEAT PUMP, HORSEPOWER, HIGH PRESSURE
	HPA	HIGH PRESSURE AIR
	HPT	HIGH POINT
	HPU	HEAT PUMP UNIT AIR
	HR	HANDRAIL, HOSE REEL, HOUR
	HSF	HOOD SUPPLY FAN
	HSS	HOLLOW STRUCTURAL SECTION (STEEL)
	HTX	HEAT EXCHANGER
	HV	HOSE VALVE
	HW	HOT WATER
	HWL	HIGH WATER LEVEL
	HWR	HOT WATER RETURN
	HWS	HOT WATER SUPPLY
	HxW	HEIGHT BY WIDTH
	HYD	HYDRANT
I		
	IA	INSTRUMENT AIR
	ID	INSIDE DIAMETER, INSIDE DIMENSION, IDENTIFICATION
	I.F.	INSIDE FACE
	IN or "	INCHES
	INCL	INCLUDE, INCLUDING
	INF	INFLUENT
	INJ	INJECTOR
	INSTR	INSTRUMENTATION
	INSUL	INSULATE(ED)(ING)(ION)
	INT	INTERIOR
	INV	INVERT
	IP	IRON PIPE
	ISR	INTRINSICALLY SAFE RELAY
J		
	JST	JOIST
	JT	JOINT
K		
	KGV	KNIFE GATE VALVE
L		
	L	ANGLE (STRUCTURAL), LENGTH, LOUVER
	LAB	LABORATORY
	LAV	LAVATORY
	LB(S)	POUND(S)
	LDF	LIQUID DIESEL FUEL
	LDFR	LIQUID DIESEL FUEL RETURN
	LF	LINEAL FEET
	LG	LONG
	LH	LEFT HAND
	LHR	LEFT HAND REVERSE
	LHRA	LEFT HAND REVERSE ACTIVE
	LHRB	LEFT HAND REVERSE BEVEL
	LL	LIVE LOAD
	LLH	LONG LEG HORIZONTAL
	LLV	LONG LEG VERTICAL
	LP	LOW PRESSURE
	LPA	LOW PRESSURE AIR
	LPG	LIQUIFIED PROPANE GAS
	LPT	LOW POINT
	LR	LONG RADIUS
	LS	LAB SINK
	LT	LEFT
	LWL	LOW WATER LEVEL
M		
	M	MOTOR
	MAINT	MAINTENANCE
	MAN	MANUAL
	MASY	MASONRY
	MATL	MATERIAL
	MAU	MAKE-UP AIR UNIT
	MAX	MAXIMUM
	MB	MACHINE BOLT
	MC	MECHANICAL COUPLING
	MCJ	MASONRY CONTROL JOINT
	MD	MOTORIZED DAMPER
	MECH	MECHANICAL
	MET	METAL
	MFR	MANUFACTURER
	MG/L	MILLIGRAMS PER LITER
	MGD	MILLION GALLONS PER DAY
	MH	MANHOLE
	MIN	MINIMUM
	MISC	MISCELLANEOUS
	MIX	MIXER
	MJ	MECHANICAL JOINT
	MK	MARK
	ML	MIXED LIQUOR
	MO	MASONRY OPENING
	MOD	MODIFIED
	MOIST	MOISTURE
	MON	MONUMENT
	MOS	MOISTURE SEPARATOR
	MPM	METERING PUMP
	MS	MOP SINK
	MTD	MOUNTED
N		
	N	NORTH, NEUTRAL
	NA	NOT APPLICABLE
	NC	NORMALLY CLOSED
	NEV	VALVE, NEEDLE
	NG	NATURAL GRADE, NATURAL OR LP GAS
	NIC	NOT IN CONTRACT
	NO., #	NUMBER
	NOM	NOMINAL
	NPT	NATIONAL PIPE THREAD
	NPW	NON-POTABLE WATER
	NS	NEAR SIDE
	NTS	NOT TO SCALE
O		
	O	OPEN
	OBD	OPPOSED BLADE DAMPER
	OC	ON CENTER
	OD	OUTSIDE DIAMETER, OUTSIDE DIMENSION
	OED	OPEN EQUIPMENT DRAIN
	O.F.	OUTSIDE FACE
	OFL	OVERFLOW
	OPNG	OPENING
	OPP	OPPOSITE
	OPP HND	OPPOSITE HAND
	OZ	OUNCE
P		
	P	POLE
	PBL	POLYMER BLENDER
	PC	POINT OF CURVATURE
	PCC	PLANT CONTROL CENTER
	PCCP	PRESTRESSED CONCRETE CYLINDER PIPE
	PCP	PROGRESSIVE CAVITY PUMP
	PD	POSITIVE DISPLACEMENT, PLANT DRAIN
	PD, PLD	PULSATION DAMPENER
	PDP	POSITIVE DISPLACEMENT PUMP
	PE	PLAIN END
	PERP	PERPENDICULAR
	PG	PRESSURE GAUGE
	PH	PHASE, PHYSICALLY HANDICAPPED
	PI	POINT OF INTERSECTION
	PIV	POST INDICATOR VALVE
	PL	PLATE, PROPERTY LINE
	PLAS	PLASTIC
	PLCS	PLACES
	PLS	POLYMER SOLUTION
	PLWD	PLYWOOD
	PMP	PUMP
	PNL(S)	PANEL(S)
	POL	POLYMER
	POLY	POLYETHYLENE
	POS	POSITION
	POW	POTABLE WATER
	PP	POWER POLE
	PPMV	PARTS PER MILLION (VOLUME)
	PRC	POINT OF REVERSE CURVATURE
	PREFAB	PREFABRICATED
	PRG	PRESSURE REGULATOR
	PRI	PRIMARY
	PROJ	PROJECTION
	PRR	PRESSURE OR VACUUM RELIEF VALVE
	PRV	PRESSURE REDUCING VALVE, PRESSURE REGULATION VALVE, PRESSURE RELIEF VALVE
	PS	PUMP STATION, PIPE SUPPORT
	PSF	POUNDS PER SQUARE FOOT
	PSG	PRESSURE GAUGE
	PSI	POUNDS PER SQUARE INCH
	PSIG	POUNDS PER SQUARE INCH GAUGE
	PT	POINT, POINT OF TANGENCY
	PV	PLUG VALVE
	PVC	POINT OF VERTICAL CURVATURE, POLYVINYL CHLORIDE
	PVDF	POLYVINYLIDENE FLUORIDE
	PVI	POINT OF VERTICAL INTERSECTION
	PVMT	PAVEMENT
	PVT	POINT OF VERTICAL TANGENCY
	PLW	PLANT WATER
Q		
	QTY	QUANTITY
R		
	R	RISER
	R/W or R.O.W.	RIGHT OF WAY
	RAD	RADIUS, RADIAL
	RAS	RETURN ACTIVATED SLUDGE
	RCP	REINFORCED CONCRETE PIPE
	RCCP	REINFORCED CONCRETE CYLINDER PIPE
	RD	ROOF DRAIN
	RDL	ROOF DRAIN LINE
	RDOF	ROOF DRAIN OVERFLOW
	RECIRC	RECIRCULATING
	RED	REDUCER, ROOF EQUIPMENT DRAIN
	REF	REFERENCE
	REG	REGULATOR, REGULATING
	REINF	REINFORCE(D)(ING)(MENT)
	REJ	RUBBER EXPANSION JOINT
	REQD	REQUIRED
	RER	REACTOR
	RES	RESERVOIR
	REV	REVISION, REVERSE
	RF	RETURN FAN
	RG	RETURN GRILLE RUBBER GASKET
	RH	RIGHT HAND
	RHR	RIGHT HAND REVERSE
	RHRA	RIGHT HAND REVERSE ACTIVE
	RHRB	RIGHT HAND REVERSE BEVEL
	RLS	REGISTERED LAND SURVEYOR
	RM	ROOM
	RO	ROUGH OPENING
	ROT	ROTAMETER
	RP	RADIUS POINT
	RPM	REVOLUTIONS PER MINUTE
	RPMP	REINFORCED PLASTIC MORTAR PIPE
	RR	RETURN REGISTER
	RT	RIGHT
	RTF	ROTARY FEEDER
	RTU	ROOF TOP UNIT
	RUD	RUPTURE DISK
	RW	RECLAIMED WATER, REUSE WATER
	RWR	RECLAIMED WATER RETURN
	RWW	RAW WASTEWATER
S		
	S/W	SIDEWALK
	S	SOUTH, SWITCH, SLOPE
	SA	SAMPLE
	SC	SECONDARY CLARIFIER
	SCB	SCRUBBER
	SCD	SMOKE CONTROL DAMPER
	SCFM	STANDARD CUBIC FEET PER MINUTE
	SCH	SCHEDULE
	SCO	SURFACE CLEANOUT
	SCR	BAR SCREEN
	SCR	SILICON CONTROL RECTIFIER
	SD	SMOKE DETECTOR, SPLITTER DAMPER, STORM DRAIN
	SDL	SUMP DISCHARGE DRAIN LINE
	SDO	SLUDGE DRAWOFF
	SE	SECONDARY EFFLUENT
	SEC	SECONDARY, SECOND
	SECT	SECTION
	SED	SEDIMENTATION
	SEP	SEPTAGE
	SF	SUPPLY FAN
	SFW	SOFTENED WATER
	SG	SUPPLY GRILLE
	SGS	STORE FRONT GLAZING SYSTEM
	SHD	SHOWER DRAIN
	SHDR	SOLIDS HANDLING-RECYCLE
	SHR	SHOWER
	SHT	SHEET
	SIM	SIMILAR
	SK	SKIMMINGS
	SL	SLOPE, SLUDGE
	SLC	SLUDGE COLLECTOR DRIVE
	SLG	SLIDE GATE
	SLV	SLEEVE VALVE
	SMP	SAMPLER, SUMP PUMP
	SN	SUPERNATANT OR SUBNATANT
	SOL	SOLUTION
	SP	STATIC PRESSURE, SET POINT
	SPD	SUMP PUMP DRAIN
	SPDT	SINGLE POLE DOUBLE THROW
	SPEC(S)	SPECIFICATION(S)
	SPL	SPLITTER BOX
	SPR	SPARE
	SPS	SAMPLE SINK
	SPW	SAMPLE WATER
	SQ	SQUARE
	SQ FT	SQUARE FEET
	SQ IN(S)	SQUARE INCH(ES)
	SR	SHORT RADIUS, SUPPLY REGISTER
	SRL	SCRUBBER RECIRCULATION LIQUID (CAUSTIC)
	SS	SANITARY SEWER, SELECTOR SWITCH
	SSK	SERVICE SINK
	SSL	SECONDARY SLUDGE
	SST	STAINLESS STEEL
	ST	SLUDGE TRANSFER
	STA	STATION
	STB	STABILIZER
	STD(S)	STANDARDS(S)
	STIFF	STIFFENER
	STIR	STIRRUPS
	STL	STEEL
	STM	STEAM
	STP	STEEL PIPE
	STR	STRAINER
	STRUCT	STRUCTURAL
	SUG	SLUICE GATE
	SUPT	PIPE SUPPORT, SUPPORT
	SV	SERVICE VALVE, SHUTOFF VALVE, SOLENOID VALVE
	SW	SANITARY WASTE
	SWR	SEAL WATER
	SYM	SYMMETRICAL
	SYN	SYNTHETIC
T		
	T	TANGENT LENGTH, THERMOSTAT, TIMER, TREAD
	T&B	TOP AND BOTTOM
	TAS	THREADED ANCHOR STUD
	TBM	TEMPORARY BENCHMARK
	TC	TOP OF CURB
	TCV	TEMPERATURE CONTROL VALVE
	TDH	TOTAL DYNAMIC HEAD
	TDR	TIME DELAY RELAY, TOWEL DISPENSER/RECEPTACLE
	TEL	TELEPHONE
	TH	TEST HOLE
	THK	THICKENER, THICKNESS, THICK
	TKS	THICKENED SLUDGE
	TLV	TELESCOPING VALVE
	TMH	TELEPHONE MANHOLE
	TMP	TEMPERATURE
	TNK	TANK
	T.O.	TOP OF
	TOC	TOP OF CONCRETE
	TOG	TOP OF GRATING
	TOM	TOP OF MASONRY
	TOS	TOP OF STEEL
	T.O.W.	TOP OF WALL
	TR	TRIAD (THREE CONDUCTOR SHIELDED CABLE), TIMING RELAY
	TS	THICKENER SUPERNATANT OR SUBNATANT
	TSD	THICKENED SLUDGE DECANT
	TSPL	TURBIDIMETER SAMPLE
	TSTAT	THERMOSTAT
	TTB	TELEPHONE TERMINAL BOARD
	TUR	TURBINE
	TV	TURNING VANES
	TWV	THREE-WAY VALVE
	TYP	TYPICAL
U		
	UC	UNDERCUT
	UG	UNDERGROUND
	UHMWPE	ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE
	UHMW	ULTRA HIGH MOLECULAR WEIGHT
	UNO	UNLESS NOTED OTHERWISE
	US	UTILITY SINK
V		
	V	VALVE
	VAR	VARIES
	VB	VALVE BOX
	VCP	VITRIFIED CLAY PIPE
	VEC	VINYL ESTER COATING
	VERT	VERTICAL
	VFR	VOLUMETRIC FEEDER
	VG	VACUUM GAUGE, VALLEY GUTTER
	VOL	VOLUME
	VRV	VACUUM REGULATING VALVE
	VTR	VENT THROUGH ROOF
W		
	W	WEST, WIDTH
	W/	WITH
	W/O	WITHOUT
	WAS	WASTE ACTIVATED SLUDGE
	WCO	WALL CLEANOUT
	WEF	WALL EXHAUST FAN
	WF	WALL FITTING, WASH FOUNTAIN
	WH	WATER HEATER
	WI	WEIGHT INDICATOR
	WL	WALL LOUVER, WATER LEVEL
	WM	WATER METER
	WOD	WASTE OIL DRAIN
	WP	WEATHERPROOF, WATERPROOF
	WPT	WORKING POINT
	WRG	WEIR GATE
	WRS	WATER SOFTENER
	WS	WATER SURFACE
	WSTP	WATERSTOP
	WT	WALK THROUGH, WEIGHT
	WTF	WATER TREATMENT FACILITY
	WTP	WATER TREATMENT PLANT
	WTR	WATER
	WV	WATER CONTROL VALVE
	WW	WASTEWATER
	WWF	WELDED WIRE FABRIC
	WWTF	WASTEWATER TREATMENT FACILITY
	WWTP	WASTEWATER TREATMENT PLANT
Y		
	Y	WYE
	YCO	YARD CLEANOUT
	YH	YARD HYDRANT

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

carollo®

Onondaga County Department of WATER ENVIRONMENT PROTECTION

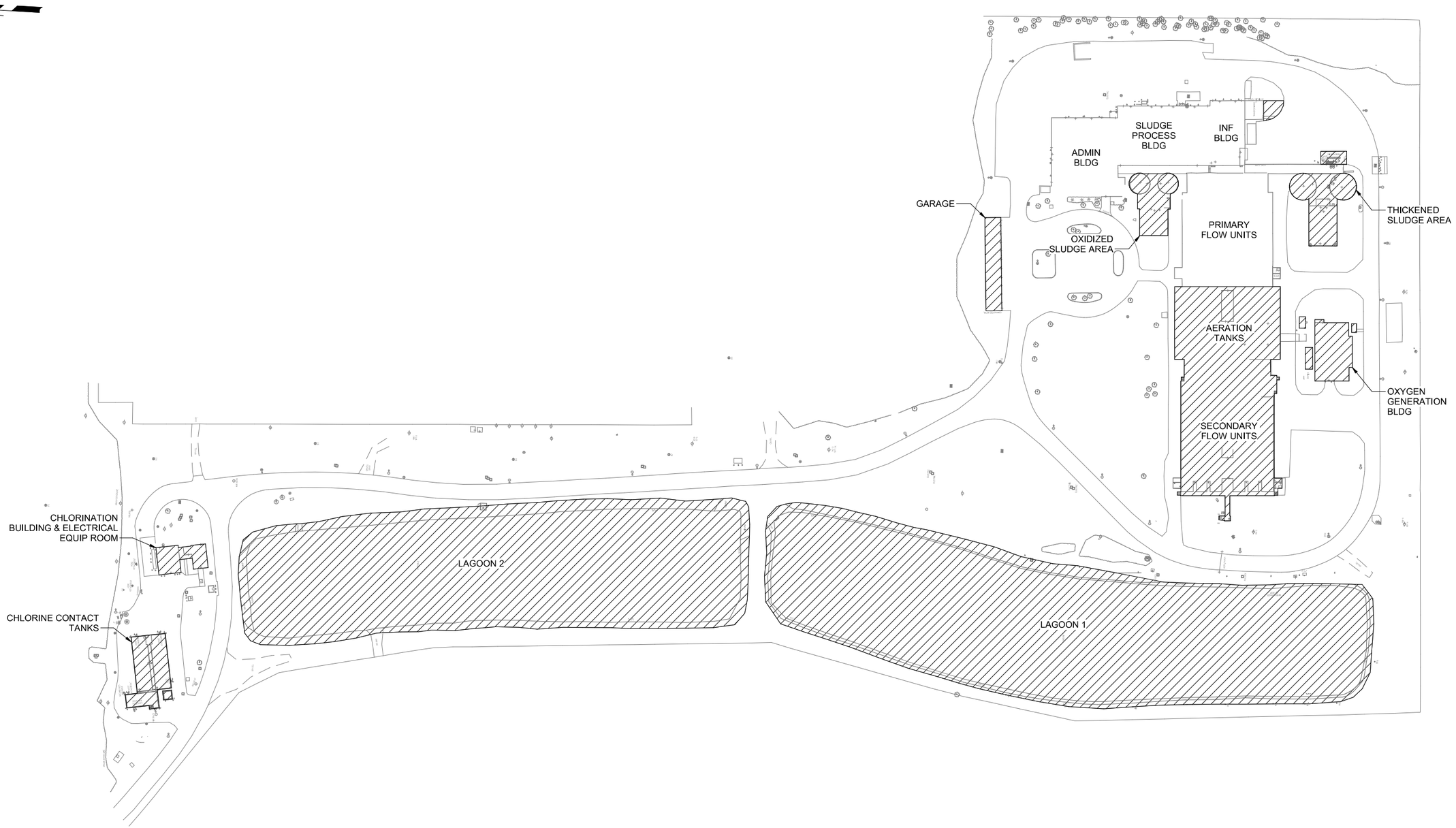
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
ABBREVIATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00G04
SHEET NO. 4 OF 30

LAST SAVED BY:

PROJECT NO. FILE NAME:



1 PLAN

SCALE: 1" = 80'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
SITE PLAN DEMO

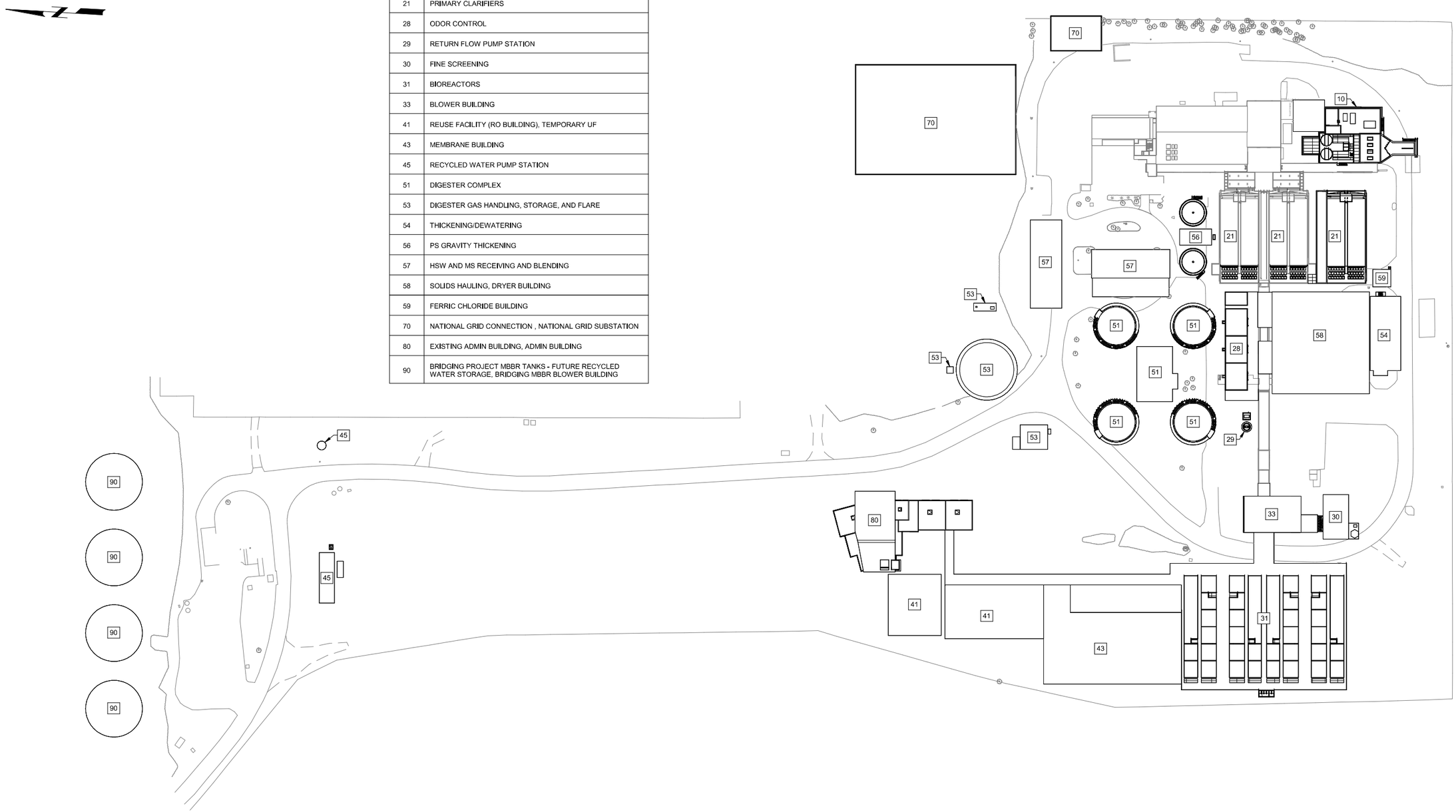
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 00G05
SHEET NO. 5 OF 30

PLOT DATE: 5/20/2025 9:25:27 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/00-G-3D-101.rvt

AREA CODE	AREAS
10	HEADWORKS
21	PRIMARY CLARIFIERS
28	ODOR CONTROL
29	RETURN FLOW PUMP STATION
30	FINE SCREENING
31	BIOREACTORS
33	BLOWER BUILDING
41	REUSE FACILITY (RO BUILDING), TEMPORARY UF
43	MEMBRANE BUILDING
45	RECYCLED WATER PUMP STATION
51	DIGESTER COMPLEX
53	DIGESTER GAS HANDLING, STORAGE, AND FLARE
54	THICKENING/DEWATERING
56	PS GRAVITY THICKENING
57	HSW AND MS RECEIVING AND BLENDING
58	SOLIDS HAULING, DRYER BUILDING
59	FERRIC CHLORIDE BUILDING
70	NATIONAL GRID CONNECTION , NATIONAL GRID SUBSTATION
80	EXISTING ADMIN BUILDING, ADMIN BUILDING
90	BRIDGING PROJECT MBBR TANKS - FUTURE RECYCLED WATER STORAGE, BRIDGING MBBR BLOWER BUILDING



1 PLAN
SCALE: 1" = 80'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

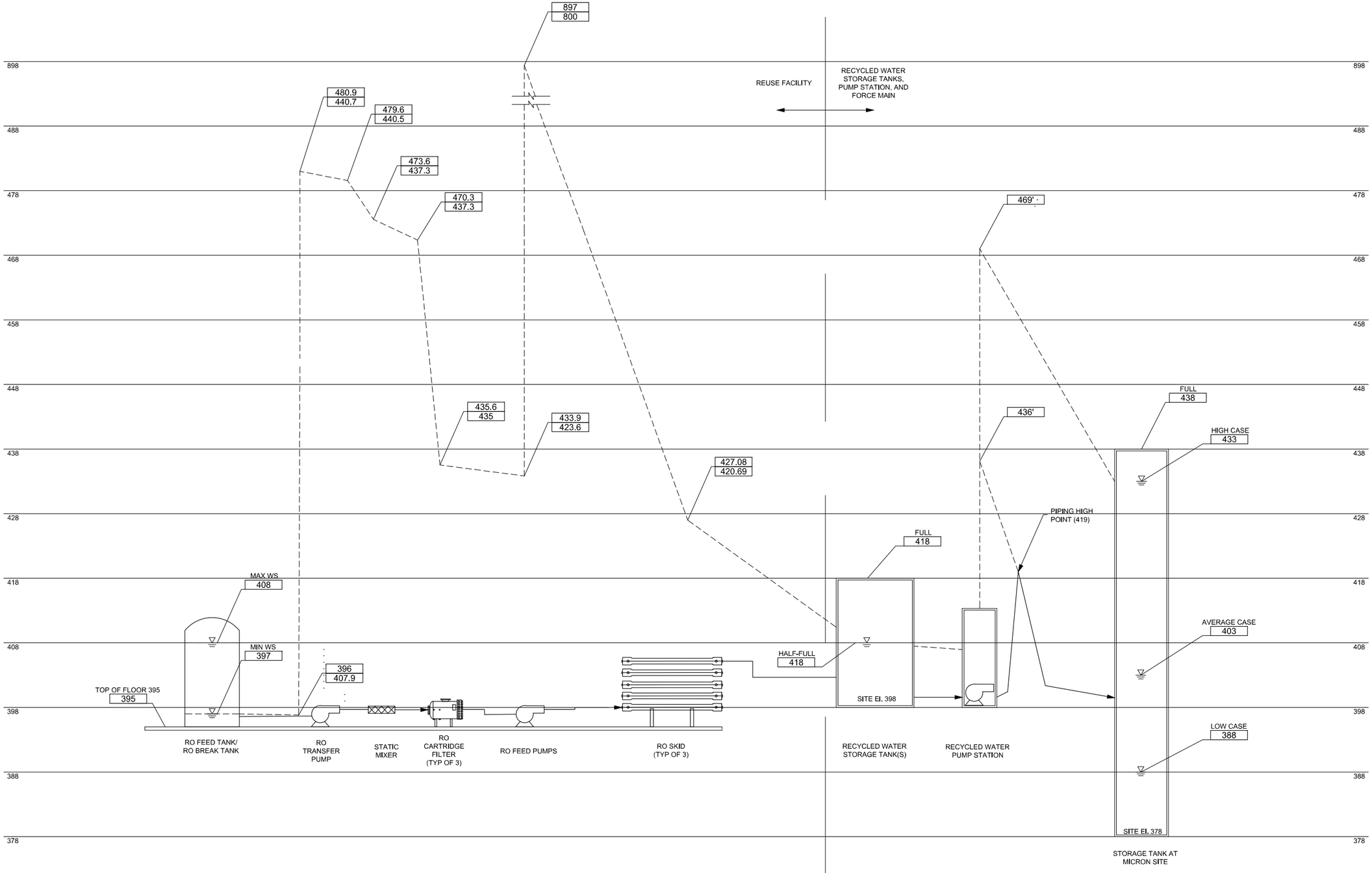
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
SITE PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 00G06
SHEET NO. 6 OF 30

PLOT DATE: 6/18/2025 3:13:20 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/00-G-3D-101.rvt



XXX = WS EL AT MAXIMUM FLOW OF 1.7 MGD AND FOULED MEMBRANES AND FILTERS
XXX = WS EL AT MINIMUM FLOW OF 0.6 MGD AND CLEAN MEMBRANES AND FILTERS

NOTE:
PUMP STATION SYSTEM ELEVATIONS ARE APPROXIMATE AND BASED ON A SITE ELEVATION OF 398'.

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
REUSE FACILITY - HYDRAULIC PROFILE

VERIFY SCALES
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0 1"
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JOB NO. 203580-60000
DRAWING NO. 00G07
SHEET NO. 7 OF 30

LAST SAVED BY:
PROJECT NO.
FILE NAME:

COLLECTION SYSTEM
3/8" CLIMBER BAR SCREENS
SCREENINGS
VORTEX GRIT REMOVAL
GRIT
INFLUENT FLOW METER
M
INFLUENT SAMPLE
ALUM
PLANT DRAIN
PRIMARY CLARIFIERS
2mm SCREENS
SCREENINGS
BIOREACTORS
MEMBRANE TANKS
RAS
WAS
PERMEATE PUMP
UV DISINFECTION
STANDPIPE
BRINE
EFFLUENT SAMPLE
EFFLUENT FLOW METER
INDUSTRIAL WASTEWATER TREATMENT PLANT EFFLUENT
ONEIDA RIVER
UTILITY WATER
SODIUM HYPOCHLORITE

REGIONAL BIOSOLIDS TREATMENT FACILITY

PRESSURIZED INLINE SLUDGE SCREENING
SCREENINGS
PRIMARY SLUDGE THICKENING
PLANT DRAIN
WASTE ACTIVATED SLUDGE THICKENING
PLANT DRAIN
FLARE
BIOGAS STORAGE
BOILERS AND DRYER

RECEIVING STATIONS
HIGH STRENGTH WASTE
RECEIVING STATIONS
MUNICIPAL SOLIDS (BREWERTON & METRO)
BLEND TANK
ANAEROBIC DIGESTERS
DIGESTED SLUDGE STORAGE
DEWATERING CETRIFUGES
PLANT DRAIN
CAKE STORAGE
HAULED DEWATERED CAKE
DRYER
NATURAL GAS OR BIOGAS
DRIED PRODUCT STORAGE
FUTURE ADVANCED THERMAL PROCESSING
HAULED DRIED PRODUCT

RECYCLED WATER FACILITY

NaOH
CHLORAMINES
REVERSE OSMOSIS FEED PUMPS
REVERSE OSMOSIS
BRINE
RECYCLED WATER STORAGE
RECYCLED WATER FLOW METER
RECYCLED WATER PUMP STATION
MICRON
RECYCLED WATER SAMPLE

REV	DATE	BY	DESCRIPTION

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
PROCESS FLOW DIAGRAM

VERIFY SCALES
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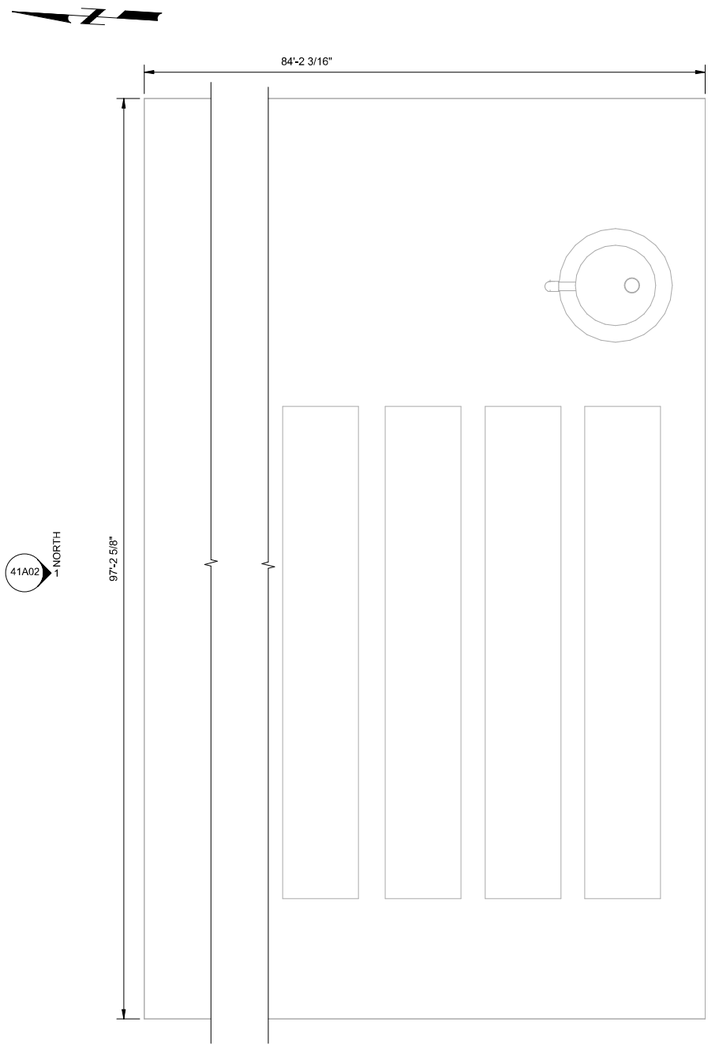
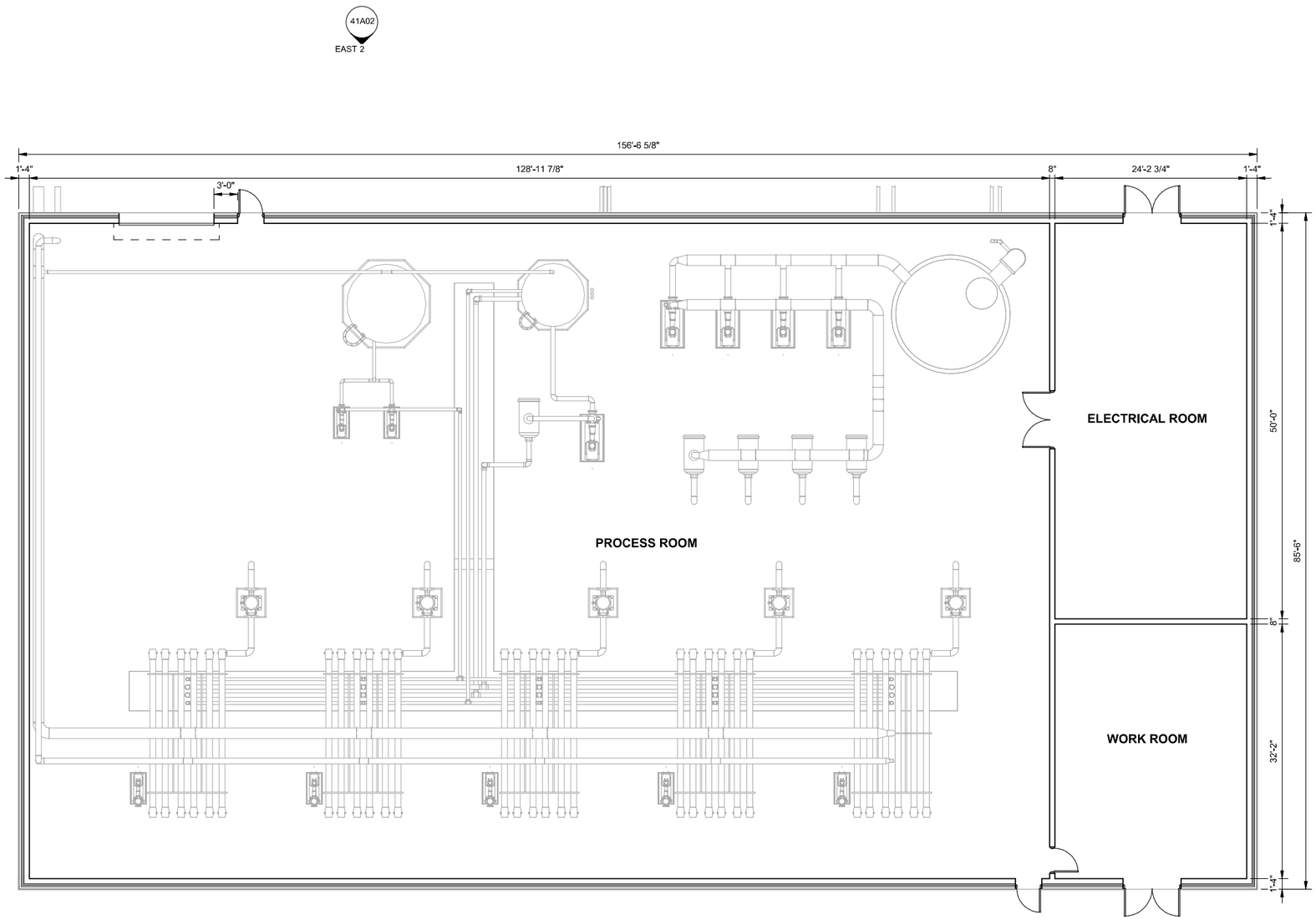
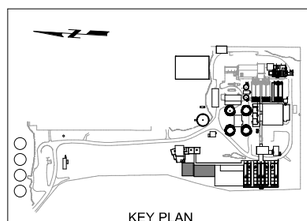
JOB NO. 203580-60000
DRAWING NO. 00G08
SHEET NO. 8 OF 30

LAST SAVED BY:
PROJECT NO.
FILE NAME:





1 **PLAN**
SCALE: 1/8" = 1'-0"



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DRAWN A. CHARDE
CHECKED Checker
DATE JUNE 2025

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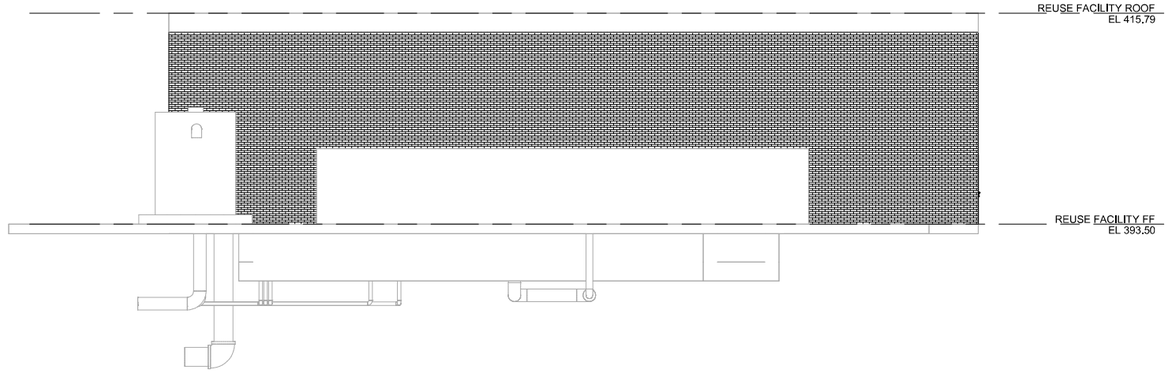
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
ARCHITECTURAL
REUSE FACILITY - PLAN AT EL. 393.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 41A01
SHEET NO. 9 OF 30

PLOT DATE: 6/17/2025 10:56:00 PM

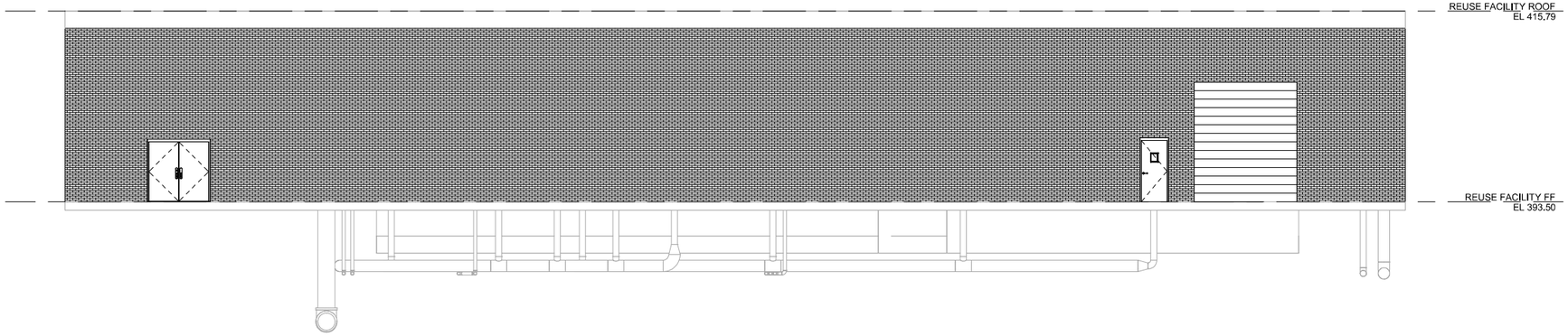
FILE NAME: Autodesk Docs://OCDWEP 203580/41-A-3D-101.rvt



NORTH ELEVATION

1 / 41A01 **ELEVATION**

SCALE: 1/8" = 1'-0"



EAST ELEVATION

2 / 41A01 **ELEVATION**

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - REUSE FACILITY

ARCHITECTURAL

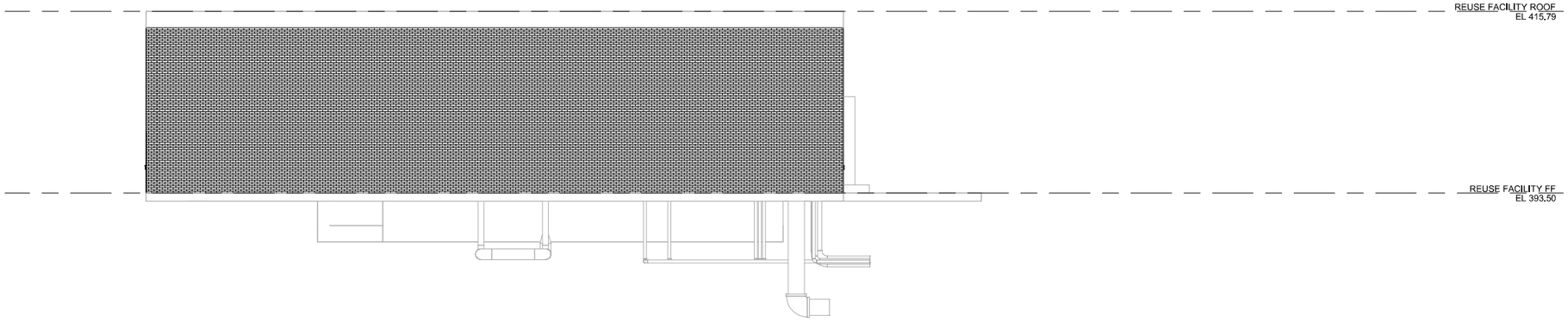
REUSE FACILITY - NORTH AND EAST ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 41A02
SHEET NO. 10 OF 30

PLOT DATE: 6/4/2025 12:18:05 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/41-A-3D-101.rvt

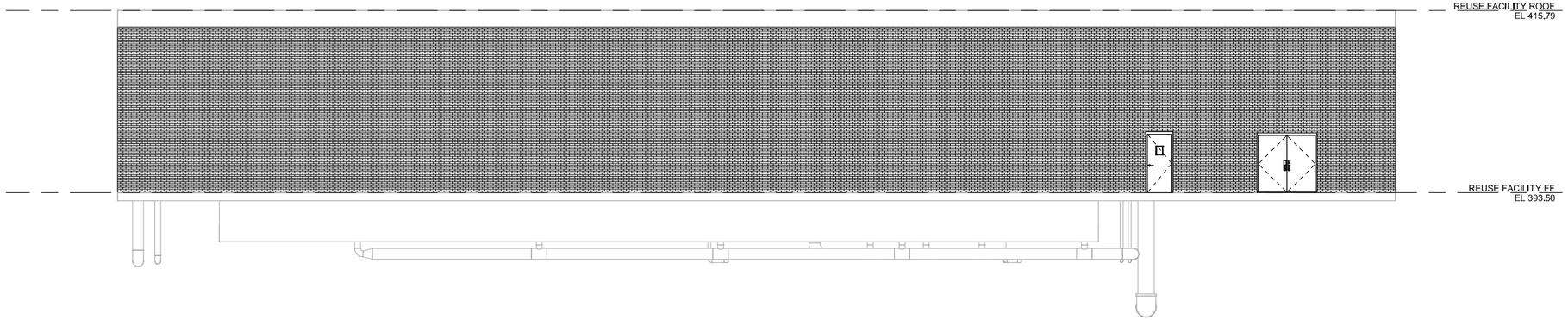


SOUTH ELEVATION

3 ELEVATION

41A01

SCALE: 1/8" = 1'-0"



WEST ELEVATION

4 ELEVATION

41A01

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DATE JUNE 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - REUSE FACILITY

ARCHITECTURAL

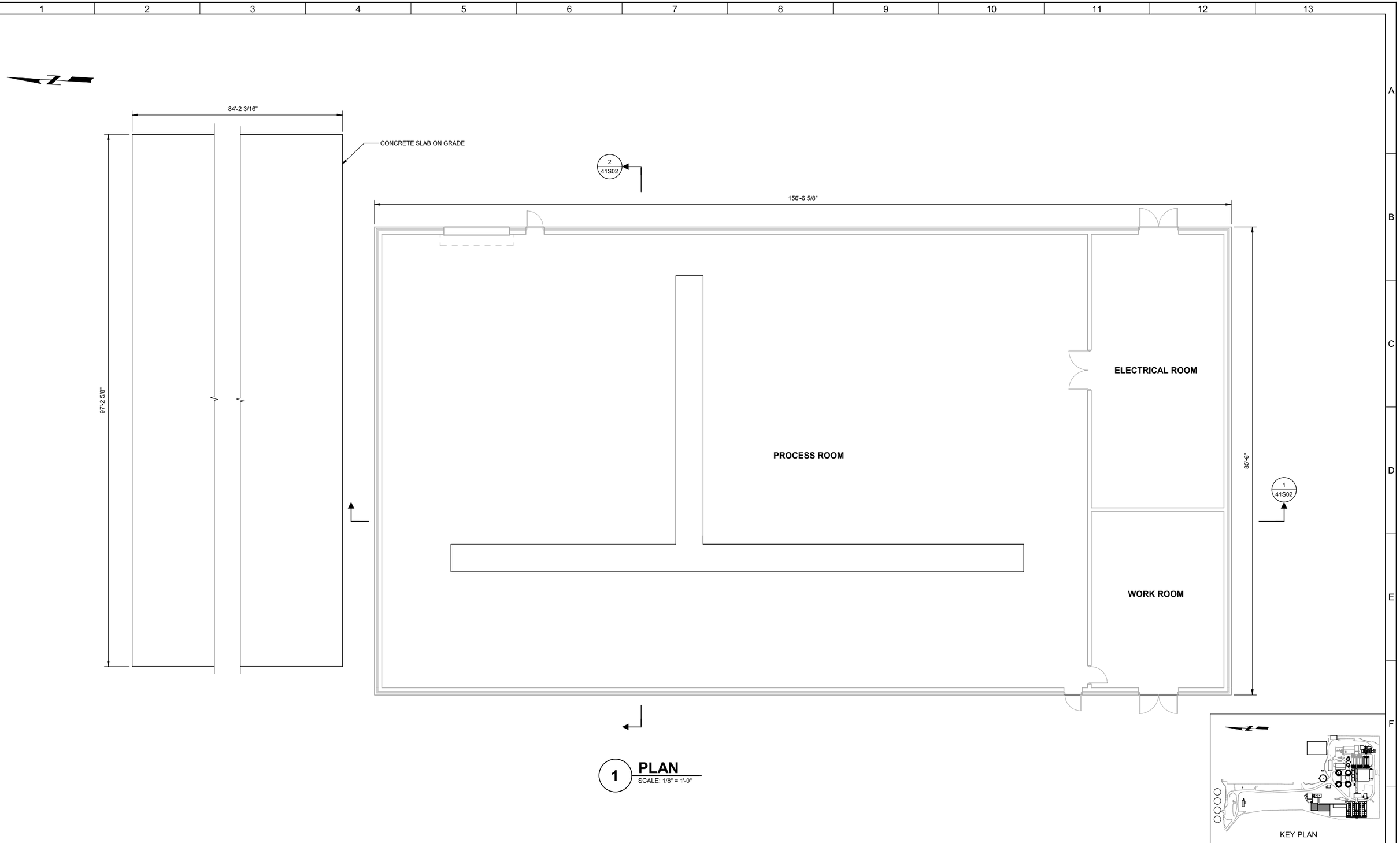
REUSE FACILITY - SOUTH AND WEST ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 41A03
SHEET NO. 11 OF 30

PLOT DATE: 6/4/2025 12:19:16 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/41-A-3D-101.rvt



1 **PLAN**
SCALE: 1/8" = 1'-0"

KEY PLAN

REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
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DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED Checker
DATE JUNE 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
STRUCTURAL
REUSE FACILITY - PLAN AT EL. 393.50'

VERIFY SCALES
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0 1"
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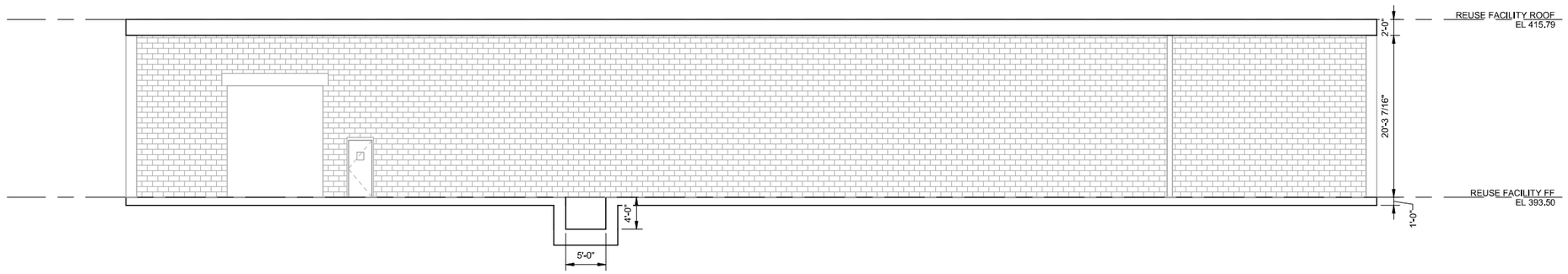
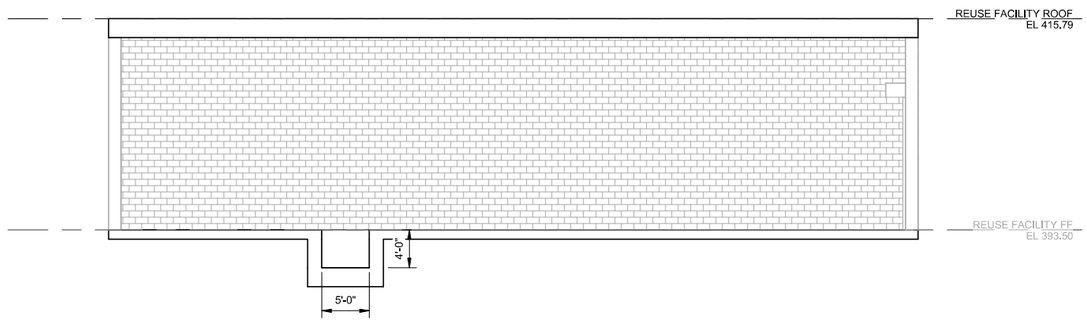
JOB NO. 203580
DRAWING NO. 41S01
SHEET NO. 12 OF 30

PLOT DATE: 6/17/2025 11:00:45 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/41-S-3D-101.rvt



1 SECTION
41S01 SCALE: 1/8" = 1'-0"



2 SECTION
41S01 SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
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DATE JUNE 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
STRUCTURAL
REUSE FACILITY - SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 41S02
SHEET NO. 13 OF 30

PLOT DATE: 6/3/2025 1:27:28 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/41-S-3D-101.rvt

PIPING SYMBOLS

DOUBLE LINE	SINGLE LINE	DESCRIPTION
		WELDED JOINT
		GROOVED END JOINT
		FLANGED JOINT
		HUB & SPIGOT JOINT (RUBBER GASKET)
		PUSH-ON JOINT (RESTRAINED)
		ADAPTER SIDE GROOVED END ADAPTER FLANGE
		FLANGED COUPLING ADAPTER
		FLANGED COUPLING ADAPTER WITH THRUST TIES
		FLEXIBLE COUPLING
		FLEXIBLE COUPLING WITH THRUST TIES
		METAL BELLOWS EXP JOINT
		ELASTOMER BELLOWS EXP JOINT
		FLEXIBLE COUPLING ADAPTER
		DISMANTLING JOINT
		EXPANSION COMPENSATOR
		ELBOW UP
		ELBOW DOWN
		TEE UP
		TEE DOWN
		LATERAL UP
		LATERAL DOWN
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER (FOT. FOB)
		UNION
		CAP
		ANCHOR
		ELBOW, 90 DEGREE
		CROSS
		TEE
		ELBOW, 45 DEGREE
		ELBOW, 22.5 DEGREE
		ELBOW, 11.25 DEGREE
		LATERAL

SINGLE LINE	DESCRIPTION
	GATE VALVE
K	KNIFE GATE VALVE
	BUTTERFLY VALVE
V	CHARACTERIZED BALL CONTROL VALVE
	BALL VALVE
	GLOBE VALVE
	3-WAY GLOBE TYPE MIXING VALVE
	FOUR WAY VALVE
	PINCH VALVE
	DIAPHRAGM VALVE
	PLUG VALVE
	LUBRICATED PLUG VALVE
	ECCENTRIC PLUG VALVE
	CONCENTRIC PLUG VALVE
	SWING CHECK VALVE
	WAFER CHECK VALVE
	BALL CHECK VALVE
	DUAL CHECK VALVE
	CHECK BACKFLOW PREVENTER
	HOSE VALVE
	MUD VALVE (PLAN VIEW)
	NEEDLE VALVE
	CONE VALVE
	PRESSURE RELIEF PRESSURE-REDUCING REGULATOR
	TELESCOPING VALVE
	THREE WAY VALVE AIR OPERATED
M	THREE WAY VALVE MOTOR OPERATED
S	THREE WAY VALVE SOLENOID OPERATED
	VACUUM VALVE
	BACKPRESSURE REGULATOR SELF-CONTAINED
	BACKPRESSURE REGULATOR W/ EXTERNAL PRESSURE TAP
	PRESSURE-REDUCING REGULATOR: SELF-CONTAINED
	PRESSURE-REDUCING REGULATOR W/EXTERNAL PRESSURE TAP

MECHANICAL SYMBOLS

SINGLE LINE	DESCRIPTION
	AIR OR CHEMICAL DIFFUSER
	QUICK DISCONNECT HIGH PRESSURE AIR OR FLUSHING
	BATCHMETER
	AIR VENT
	BASKET STRAINER
	BLOWER
	CALIBRATION COLUMN
	COMPRESSOR/TURBINE
	COMPRESSOR: RECIPROCATING
	DIAPHRAGM SEAL
	DRAIN
	EJECTOR OR EDUCTOR
M	ELECTRIC MOTOR
	EQUIPMENT DRAIN
	EXPANSION JOINT, FLEXIBLE VIBRATION JOINT
	FAN: EXHAUST/SUPPLY
	FILTER
	FIRE HYDRANT
	FLAME ARRESTER
	FLAME ARRESTER WITH THERMALLY OPERATED VALVE
	FLOOR DRAIN
	FLOW SWITCH
	GAUGE: PRESSURE
	GAUGE: DIFFERENTIAL PRESSURE
	WEIR
	MIXER
	OIL OR MOISTURE TRAP
	PRIMARY LEVEL ELEMENT: BUBBLER
	PRIMARY LEVEL ELEMENT: ELECTRODE
	PRIMARY LEVEL ELEMENT: FLOAT SWITCH
	PRIMARY LEVEL ELEMENT: FLUID
	PRIMARY LEVEL ELEMENT: INVERTED COLUMN

SINGLE LINE	DESCRIPTION
	PRIMARY LEVEL ELEMENT: RADAR
	PRIMARY LEVEL ELEMENT: ULTRASONIC
	PRIMARY FLOW ELEMENT: FLUME
X	PRIMARY FLOW ELEMENT: X = C - CORIOLIS X = M - MAGNETIC X = P - PROPELLER X = PT - PITOT TUBE X = R - ROTAMETER X = T - TURBINE X = TH - THERMAL X = U - ULTRASONIC X = D - DENSITY
	PRIMARY FLOW ELEMENT: ORIFICE PLATE
	PRIMARY FLOW ELEMENT: VENTURI TUBE
	PRIMARY FLOW ELEMENT: WEIR
	PULSATION DAMPENER
	PUMP: CENTRIFUGAL
	PUMP: DIAPHRAGM
	PUMP: METERING
	PUMP: PLUNGER
	PUMP: PERISTALTIC TUBE METERING
	PUMP: PROGRESSIVE CAVITY
	PUMP: RECIPROCATING
	PUMP: ROTARY
	PUMP: SCREW
	PUMP: SUBMERSIBLE
	PUMP: VERTICAL LIFT
	PIPE REDUCER: CONCENTRIC
	PIPE REDUCER: ECCENTRIC (FOT, FOB)
	ROTARY CHEMICAL FEEDER
	RUPTURE DISK
	SAMPLE PORT
	SIGHT GLASS
	SLIDE GATE
	SLUICE GATE
	STRAINER: WYE TYPE

SINGLE LINE	DESCRIPTION
	STRAINER: WYE TYPE WITH BLOWOFF
	THERMOMETER
	VALVE: ANGLE
	VALVE: AIR RELIEF
	PIPE MATERIAL CHANGE

IDENTIFICATION SYMBOLS

CHEMICAL INJECTION POINT — CHEMICAL / DWG NO.

PIPE DESIGNATOR — PIPE SIZE — FLOW STREAM — X" XXX

CONTINUATION TAG — UNIQUE IDENTIFIER — CONTINUATION FROM DWG NO. — CONTINUATION TO DWG NO. — A B C

EQUIPMENT / VALVE TAG — XXX-XX-XXXX

KEY TAG — X

LINE SYMBOLS

PIPE ABOVE OR BELOW GROUND

PIPE UNDERNEATH SLAB OR STRUCTURE

FUTURE

EXISTING

DEMO

PROCESS LINE SYMBOLS

PRIMARY PROCESS FLOW IN PIPE

SECONDARY PROCESS FLOW IN PIPE

PRIMARY PROCESS FLOW IN CHANNEL

SECONDARY PROCESS FLOW IN CHANNEL

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
MECHANICAL
GENERAL LEGEND AND SYMBOLS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00GM01
SHEET NO. 14 OF 30

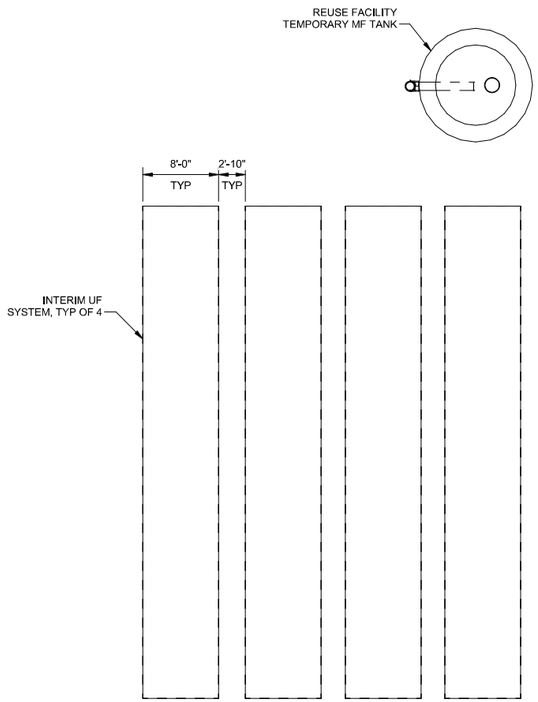
LAST SAVED BY:

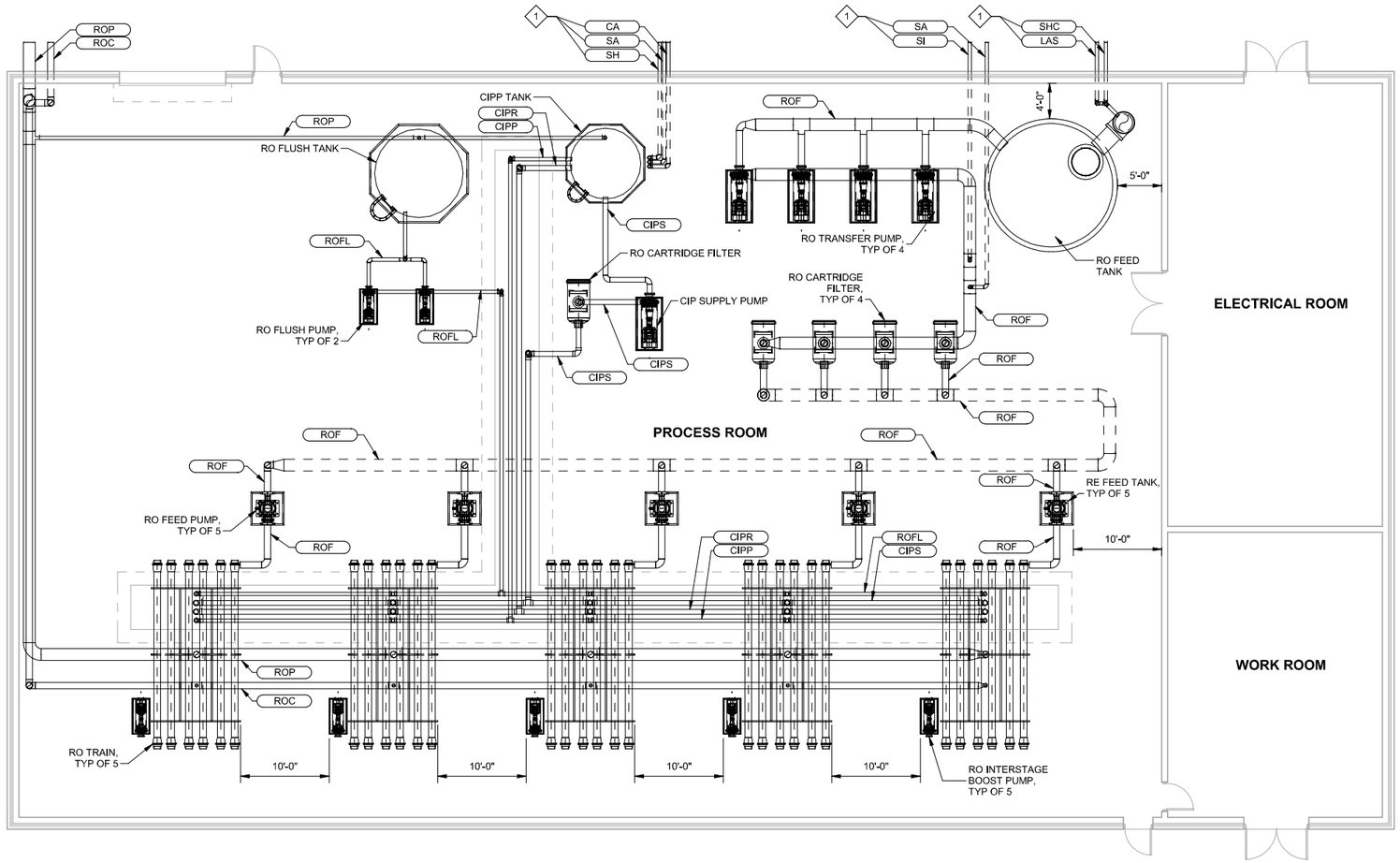
PROJECT NO.
FILE NAME:

Xref ..\d0224788\ProjNum34x22Border.dwg

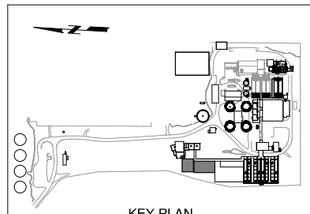
KEY NOTES

1. PFA CHEMICAL TUBING ROUTED INSIDE 4" PVC DOUBLE CONTAINMENT PIPING





1 **PLAN**
SCALE: 1/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
MECHANICAL
REUSE FACILITY - PLAN AT EL. 393.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 41M01
SHEET NO. 15 OF 30

PLOT DATE: 6/17/2025 11:03:21 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/41-M-3D-101.rvt

ELECTRICAL PLAN SYMBOLS

IDENTIFICATION SYMBOLS

EQUIP # — EQUIPMENT AND INSTRUMENT IDENTIFICATION

EQUIPMENT/INSTRUMENT LOCATOR

LUMINAIRE IDENTIFICATION
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED FROM
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF FIXTURE
X = LUMINAIRE TYPE, REFER TO THE LUMINAIRE SCHEDULE

XXXX — CONDUIT IDENTIFICATION
XXXX = CONDUIT NUMBER, REFER TO CONDUIT SCHEDULE
UNLESS OTHERWISE NOTED, GROUPED CONDUITS ARE LABELED LEFT TO RIGHT OR TOP TO BOTTOM.

INDICATES KEYNOTE X
(PERTAINS ONLY TO SHEET WHERE NOTE IS FOUND)

DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

CAMERA

LUMINAIRES

LINEAR FIXTURE

2' X 2' LAY-IN TROFFER

2' X 4' LAY-IN TROFFER

LUMINAIRE POLE MOUNTED

LUMINAIRE, EMERGENCY BATTERY-POWERED

LUMINAIRE, EMERGENCY/EXIT BATTERY-POWERED

LUMINAIRE, EMERGENCY BATTERY-POWERED REMOTE

LUMINAIRE, SURFACE OR PENDANT MOUNTED

LUMINAIRE, WALL MOUNTED

LUMINAIRE, FLOOD/SPOT

LUMINAIRE, EXIT ONE OR TWO FACES AS INDICATED. ARROW POINTS IN DIRECTION OF EGRESS.

SWITCHES/RECEPTACLES

SINGLE POLE SWITCH
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATED
c = TYPE
2 = DOUBLE POLE SWITCH
3 = THREE-WAY SWITCH
3P = THREE POSITION SWITCH
4 = FOUR-WAY SWITCH
K = KEY OPERATED SWITCH
F = SWITCH AND FUSESTAT HOLDER
P = SWITCH AND PILOT LIGHT
T = THERMOSTAT
D = DIMMER SWITCH
L = LOW VOLTAGE LIGHT SWITCH
M = MANUAL MOTOR STARTER
N = NETWORKED SINGLE OR MULTIPLE SWITCH LOCATIONS
WP = WEATHER PROOF
REFER TO ABBREVIATIONS LEGEND FOR ALL OTHER DESIGNATIONS.

OCCUPANCY SENSOR
X = REFERENCE LIGHTING CONTROL COMPONENT SCHEDULE
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATION
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF SENSOR

PE — PHOTOCELL

SWITCH AND SINGLE RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

DUPLEX RECEPTACLE

QUADRUPLEX RECEPTACLE

IN FLOOR DUPLEX RECEPTACLE

IN FLOOR QUADRUPLEX RECEPTACLE

DUPLEX RECEPTACLE w/SPLIT WIRE

DEDICATED RECEPTACLE

SPECIAL PURPOSE RECEPTACLE

WELDING RECEPTACLE
a = CIRCUIT DESIGNATION
b = DISCONNECT TYPE

TWIST LOCK RECEPTACLE
a = AMP RATING

TELEPHONE OUTLET

DATA COMMUNICATIONS OUTLET
a = NETWORK SWITCH

FIRE ALARM

FACP — FIRE ALARM CONTROL PANEL

RACEWAY

EXPOSED CONDUIT

BREAK AND CONTINUATION IN CONDUIT RUN

EXPOSED CONDUIT HIDDEN BEHIND WALLS, FLOORS OR OTHER STRUCTURES

UNDERGROUND CONDUIT, DIRECT BURIED OR IN DUCT BANK

CONDUIT IN SLAB

CONDUIT VERTICAL CHANGE IN DIRECTION

CONDUIT CAP

J — JUNCTION BOX

CONDUIT SEAL

CONDUIT TEE

DUCT BANK
APPROXIMATE DIMENSIONS SHOWN ON DUCT BANK SECTIONS

CONDUIT SIZE AND CONDUCTORS

INDIVIDUAL CONDUCTORS

W"C-(3-X (Ø), 1-Y (N) & 1-Z (G))

W"C (WHERE INDICATED): W = CONDUIT TRADE SIZE

3-X (Ø):
3 = QUANTITY
X = SIZE OF CONDUCTORS
(Ø) = DESIGNATES PHASE CONDUCTORS

1-Y (N) (WHERE INDICATED):
1 = QUANTITY
Y = SIZE OF CONDUCTORS
(N) = DESIGNATES NEUTRAL CONDUCTORS

1-Z (G) (WHERE INDICATED):
1 = QUANTITY
Z = SIZE OF CONDUCTORS
(G) = DESIGNATES GROUND CONDUCTORS

U{3-X (Ø) & 1-X (G)}
U = NUMBER OF PARALLEL RUNS

VFD CONDUCTORS

U{[N/C-X (Ø) & INTEGRAL (G)]:VFD}
U = NUMBER OF PARALLEL RUNS
N/C = NUMBER OF PHASE CONDUCTORS IN CABLE
X = SIZE OF CONDUCTORS
VFD = VFD CABLE

MULTI CONDUCTOR CABLES

K/2/C#16S
K (WHERE INDICATED) = NUMBER OF PAIRS
2/C#16S = TWO CONDUCTOR, 16 GAUGE, TWISTED SHIELDED PAIR

K/3/C#16S
K (WHERE INDICATED) = NUMBER OF TRIPLETS
3/C#16S = THREE CONDUCTOR, 16 GAUGE, TWISTED SHIELDED TRIPLETS

U{[N/C-X (Ø) & INTEGRAL (G)]:MC}
U = NUMBER OF PARALLEL RUNS
MC = MULTICONDUCTOR CABLE
N/C = NUMBER OF PHASE CONDUCTORS IN THE CABLE
X = SIZE OF CONDUCTORS

FIBER OPTIC CABLES

FO/N
N = NUMBER OF INDIVIDUAL FIBERS

GROUNDING

UNDERGROUND GROUND CABLE
#4/0 SDBC UNLESS OTHERWISE NOTED

GROUND ROD

GROUND ROD AND GROUND WELL

ELECTRICAL ONE-LINE SYMBOLS

MEDIUM VOLTAGE

CIRCUIT BREAKER, MEDIUM VOLTAGE
a = CIRCUIT BREAKER NUMBER
b = FRAME SIZE

ANSI RELAY DEVICE
a = ANSI DEVICE FUNCTION
b = QUANTITY

MEDIUM VOLTAGE DISCONNECT SWITCH NON-FUSED CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE SINGLE FUSE CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE DOUBLE FUSE CUT OUT

MEDIUM VOLTAGE SINGLE FUSE

MEDIUM VOLTAGE DOUBLE FUSE

MEDIUM VOLTAGE LIVE FRONT TERMINATOR

MEDIUM VOLTAGE ELBOW

MEDIUM VOLTAGE TEE

MEDIUM VOLTAGE CONTACTOR

MEDIUM VOLTAGE STARTER

MOV-ELBOW ARRESTER

LOW VOLTAGE

LOW VOLTAGE CIRCUIT BREAKER
a = TYPE
MCP = MOTOR CIRCUIT PROTECTOR
TM = THERMAL MAGNETIC
SS = SOLID STATE
b = FRAME SIZE (MANUFACTURER TO DETERMINE FRAME SIZE UNLESS INDICATED)
c = NUMBER OF POLES
d = TRIP SETTING (AT = AMP TRIP) (AC = MCP CONTINUOUS RATING)
e = DESIGNATION
f = INTERRUPTING RATING

LOW VOLTAGE CIRCUIT BREAKER AUXILIARY OPERATOR
* = S = SHUNT TRIP
= G = GROUND FAULT INTERRUPTER
= V = SOLENOID KEY RELEASE

DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

FUSED DISCONNECT SWITCH
B = TYPE, REFER TO DISCONNECT SCHEDULE
b = FUSE RATING

FUSE

COMBINATION STARTER WITH CONTROL POWER TRANSFORMER
a = CIRCUIT BREAKER DISCONNECT, TYPE AS NOTED
b = STARTER TYPE REFER TO THE SPECIFICATIONS FOR STARTER DEFINITIONS.
c = NEMA STARTER SIZE
d = OVERLOAD

MOTOR STARTER/DRIVES:
a = DEVICE TYPE
VFD-6 = 6-PULSE VFD
VFD-18 = 18-PULSE VFD
VFD-RH = REDUCED HARMONIC VFD (18-PULSE OR ACTIVE FRONT END AS DEFINED IN THE SPECIFICATIONS)
RVSS = REDUCED VOLTAGE SOLID STATE STARTER
RVAT = REDUCED VOLTAGE AUTO TRANSFORMER
a/B = DEVICE WITH BYPASS STARTER, REFER TO THE SPECIFICATIONS

b = INPUT OPTIONS
LL = LINE REACTOR
PHF = PASSIVE HARMONIC FILTER

c = OUTPUT OPTIONS
LR = LOAD REACTOR
DV/DT = Dv/dt FILTER
SWF = SINE WAVE FILTER

EQUIPMENT ENCLOSURE

MISCELLANEOUS

HP — MOTOR
HP = HORSEPOWER RATING
FULL LOAD AMPS AS NOTED

PACKAGED EQUIPMENT
LOAD RATING AS INDICATED
a = RATED LOAD
b = UNIT(HP, KW, KVA) AS INDICATED

TRANSFORMER
a = DEVICE I.D.
b = KVA RATING
c = NUMBER OF PHASES
d = PRIMARY VOLTAGE
e = SECONDARY VOLTAGE
f,g = CONNECTION TYPE SYMBOL
h = IMPEDANCE

GROUNDED WYE CONNECTION

DELTA CONNECTION

G — ENGINE-GENERATOR RATINGS AS INDICATED ON THE DRAWINGS
a = KVA/KW
b = VOLTAGE/CONNECTION
c = PHASE
d = WIRE
e = PF

CURRENT TRANSFORMER WITH SHORTING TERMINAL BLOCK
a = QUANTITY
b = RATIO

POTENTIAL TRANSFORMER
a = QUANTITY
b = RATIO
c,d = CONNECTION TYPE SYMBOL

SSM — SOLID STATE MULTIFUNCTION METER

ATP — AMPERE TEST POINT

VTP — VOLTAGE TEST POINT

UTILITY METER

LIGHTNING ARRESTER

SPD — SURGE PROTECTIVE DEVICE

DRAWOUT CONNECTION

GROUND

CAPACITOR

BATTERY

K — KIRK KEY INTERLOCK

LOAD BANK

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED W. FLETCHER
DRAWN A. CHARDE
CHECKED
DATE JUNE 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
ELECTRICAL
GENERAL LEGEND AND SYMBOLS

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ABBREVIATIONS

A	AMP
ABS	ABSOLUTE
AC	ALTERNATING CURRENT
ACK	ACKNOWLEDGE
ACTR	ACTUATOR
AF	AMP FRAME
AFC	AUTOMATIC FREQUENCY CONTROL
AIC	AMP INTERRUPTING CAPACITY
AM	AMMETER
ANN	ANNUNCIATOR
ANT	ANTENNA
APU	AUXILIARY POWER UNIT
ARM	ARMORED CABLE
AS	AMMETER SWITCH
ASYM	ASYMMETRICAL
AT	AMP TRIP
ATO	AUTOMATIC THROW OVER
ATP	AMMETER TEST POINT
ATS	AUTOMATIC TRANSFER SWITCH
AUTO XFMR	AUTOMATIC TRANSFORMER
AUX	AUXILIARY
AWG	AMERICAN WIRE GAGE
B	BELL
BAT	BATTERY
BFG	BELOW FINISHED GRADE
BHP	BRAKE HORSEPOWER
BKR	BREAKER
BRF	BELOW RAISED FLOOR
C	CONDUIT / CONTINUOUS LOAD
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CCW	COUNTER CLOCKWISE
CKT	CIRCUIT
COAX	COAXIAL CABLE
COM	COMMON
COMM	COMMUNICATION
CPT	CONTROL POWER TRANSFORMER
CR	CONTROLLED RECEPTACLE
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
CV	CONTROL VALVE
CW	CLOCKWISE / COOL WHITE
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DCU - X	DISTRIBUTED CONTROL UNIT NO. X
DEMO	DEMOLITION
DISC	DISCONNECT SWITCH
DM	DEMAND METER
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DS	DOOR SWITCH
E/G	EMERGENCY GENERATOR
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSURE
ENG	ENGINE
ENT	ELECTRICAL NON-METALLIC TUBING
EP	EXPLOSION PROOF
ETM	ELAPSED TIME METER
F	SUB-FED
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FDR	FEEDER
FLA	FULL LOAD AMPS
FLX	FLEXIBLE CONDUIT
FO	FIBER OPTIC
FRC	FIBERGLASS RIGID CONDUIT
FREQ	FREQUENCY
FU	FUSE
FU SW	FUSED SWITCH
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
FWD	FORWARD

G	GROUND / EQUIPMENT GROUND / GROUND FAULT
GEN	GENERATOR
GRC	GALVANIZED STEEL RIGID CONDUIT
GFCI	GROUND FAULT CIRCUIT INTERRUPTER (RECEPTACLE)
GFI	GROUND FAULT INTERRUPTER (BREAKER)
GFR	GROUND FAULT RELAY
H	HOT-LEG
HF	HIGH FREQUENCY
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HSTAT	HUMIDISTAT
HV	HIGH VOLTAGE
HVAC	HEATING/VENTILATION/AIR CONDITIONING
HZ	HERTZ
I	INSTANTANEOUS / INTERMITTENT LOAD
IC	INTERRUPTING CAPACITY
IJB	INSTRUMENT JUNCTION BOX
IMC	INTERMEDIATE METAL CONDUIT
INST	INSTANTANEOUS
INT	INTERLOCK
INTERCOM	INTERCOMMUNICATION
J	JUNCTION BOX
K	KEY INTERLOCK
KA	KILOAMP
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAR	KILOVAR (REACTANCE)
KW	KILOWATT
KWD	KILOWATT DEMAND
KWH	KILOWATT HOUR
L	LONG-TIME
L-B	LINE-BUS
L-G	LINE-GROUND
LA	LIGHTNING ARRESTOR
LBL	LABEL
LC	LIGHTING CONTACTOR
LCP- X	LOCAL CONTROL PANEL NO. X
LL	LEAD-LAG LOAD REACTOR
LP	LIGHT POLE
LP - X	LIGHTING PANEL NO. X
LTG	LIGHTING
LV	LOW VOLTAGE
LVL	LEVEL
M-X	MOTOR CONTROLLER NO. X
MA	MILLIAMPERE
MCA	MOTOR CIRCUIT AMPS
MCC - X	MOTOR CONTROL CENTER NO. X
MCP	MOTOR CIRCUIT PROTECTOR
MH	MANHOLE / MOUNTING HEIGHT
MLO	MAIN LUGS ONLY
MOD	MOTOR OPERATED DAMPER
MOV	METAL OXIDE VARISTOR
MPR	MOTOR PROTECTION RELAY
MS-X	MOTOR STARTER NO. X
MSP	MOTOR STARTING PANEL
MTO	MANUAL THROW OVER
MTR-X	MOTOR NO. X
MTS	MANUAL TRANSFER SWITCH
MV	MEGAVOLT
MVA	MEGAVOLT-AMPERES
MVS	MEDIUM VOLTAGE SWITCH
MW	MEGAWATT
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NFC	NONMETALLIC FLEXIBLE CONDUIT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NP	NAMEPLATE

O	OPEN OR OPENED
OH	OVERHEAD
OL	OVERLOAD RELAY
P	POLE
PA	PUBLIC ADDRESS
PB	PUSHBUTTON / PULL BOX
PCS	PVC COATED GALVANIZED STEEL CONDUIT
PCM	PROCESS CONTROL MODULE
PE	PHOTOCELL
PF	POWER FACTOR
PFCC	POWER FACTOR CORRECTION CAPACITOR
PFR	PHASE FAILURE RELAY
PH	PHASE
PNL	PANEL
PPX	POWER PANEL NO. X
PRI	PRIMARY
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE RIGID PLASTIC CONDUIT
PWR	POWER
RAC	RIGID ALUMINUM CONDUIT
RECPT	RECEPTACLE
REV	REVERSE
RF	RADIO FREQUENCY
RMS	ROOT MEAN SQUARED
RVAT	REDUCED VOLTAGE AUTO TRANSFORMER
RVNR	REDUCED VOLTAGE NON-REVERSING
RVSS	REDUCED VOLTAGE SOLID STATE
S	SHIELD / SHORT-TIME
SA	SURGE ARRESTER
SC	SHORT CIRCUIT
SDBC	SOFT DRAWN BARE COPPER
SFL	SUB FEED LUGS
SLT	SEALTIGHT LIQUIDTIGHT FLEXIBLE CONDUIT
SM	SURFACE MOUNTED
SP	SINGLE POLE
SPD	SURGE PROTECTIVE DEVICE
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SPKR	SPEAKER
SS	SOLID STATE
STB	SHORTING TERMINAL BLOCK
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
TACH	TACHOMETER
TB - X	TERMINAL BLOCK - UNIT X
TC	THERMOCOUPLE / TIME CLOCK / TRAY CABLE
TD	TEMPERATURE DETECTOR RELAY
TE	TOTALLY ENCLOSED
TEFC	TOTALLY ENCLOSED FAN COOLED
TENV	TOTALLY ENCLOSED NON-VENTILATED
TERM	TERMINAL
TJB	TERMINAL JUNCTION BOX
TM	THERMAL MAGNETIC
TP	TWISTED PAIR
TS	TEMPERATURE SWITCH
TS1W	TWO SPEED CONSEQUENT POLE, ONE WINDING
TS2W	TWO SPEED SEPARATE WINDING
TSTAT	THERMOSTAT
UHF	ULTRA HIGH FREQUENCY
UNG	UNGROUNDED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UVR	UNDER VOLTAGE RELAY

V	VOLT
VA	VOLT AMPERE
VAR	VARMETER
VCP	VENDOR CONTROL PANEL
VFD	VARIABLE FREQUENCY DRIVE
VHF	VERY HIGH FREQUENCY
VM	VOLTMETER
VP	VAPORPROOF
VR	VOLTAGE REGULATOR
VS	VOLTAGE SWITCH
VT	VOLTAGE TRANSFORMER
VTP	VOLTAGE TEST POINT
W	WATT / WEST
WT	WATER TIGHT
WP	WEATHER PROOF
XFMR	TRANSFORMER

NOTES:

1. REFER TO SPECIFICATIONS AND OTHER DRAWINGS FOR ADDITIONAL ABBREVIATIONS.

POWER DEVICE FUNCTION NUMBERS

1	MASTER ELEMENT
2	TIME-DELAY STARTING OR CLOSING RELAY
3	CHECKING OR INTERLOCKING RELAY
4	MASTER CONTACTOR
5	STOPPING DEVICE
6	STARTING CIRCUIT BREAKER
7	ANODE CIRCUIT BREAKER
8	CONTROL POWER DISCONNECTING DEVICE
9	REVERSING DEVICE
10	UNIT SEQUENCE SWITCH
11	MULTIFUNCTION DEVICE
12	OVER-SPEED DEVICE
13	SYNCHRONOUS-SPEED DEVICE
14	UNDER-SPEED DEVICE
15	SPEED OR FREQUENCY MATCHING DEVICE
16	DATA COMMUNICATIONS DEVICE
17	SHUNTING OR DISCHARGE SWITCH
18	ACCELERATING OR DECELERATING DEVICE
19	STARTING-TO-RUNNING TRANSITION CONTACTOR
20	ELECTRICALLY OPERATED VALVE
21	DISTANCE RELAY
22	EQUALIZER CIRCUIT BREAKER
23	TEMPERATURE CONTROL DEVICE
24	VOLTS PER HERTZ RELAY
25	SYNCHRONIZING OR SYNCHRONISM-CHECK DEVICE
26	APPARATUS THERMAL DEVICE
27	UNDERVOLTAGE RELAY
27N	GROUND FAULT UNDERVOLTAGE RELAY
28	FLAME DETECTOR
29	ISOLATING CONTACTOR
30	ANNUNCIATOR RELAY
31	SEPARATE EXCITATION DEVICE
32	DIRECTIONAL POWER RELAY
33	POSITION SWITCH
34	MASTER SEQUENCE DEVICE
35	BRUSH-OPERATING OR SLIP-RING SHORT-CIRCUITING DEVICE
36	POLARITY DEVICE
37	UNDERCURRENT OR UNDERPOWER RELAY
38	BEARING PROTECTIVE DEVICE
39	MECHANICAL CONDITION MONITOR
40	FIELD RELAY
41	FIELD CIRCUIT BREAKER
42	RUNNING CIRCUIT BREAKER
43	MANUAL TRANSFER OR SELECTOR DEVICE
44	UNIT SEQUENCE STARTING RELAY
45	ABNORMAL ATMOSPHERIC CONDITION MONITOR
46	REVERSE-PHASE OR BALANCE CURRENT RELAY
47	PHASE-BALANCE OR PHASE-SEQUENCE VOLTAGE RELAY
48	INCOMPLETE SEQUENCE RELAY
49	MACHINE OR TRANSFORMER THERMAL RELAY
50	INSTANTANEOUS OVERCURRENT RELAY
51	AC TIME OVERCURRENT RELAY
52	AC CIRCUIT BREAKER
53	FIELD EXCITATION RELAY
54	TURNING GEAR ENGAGING DEVICE
55	POWER FACTOR RELAY
56	FIELD APPLICATION RELAY
57	SHORT-CIRCUITING OR GROUNDING DEVICE
58	RECTIFICATION FAILURE RELAY
59	OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT BALANCE RELAY
61	DENSITY SWITCH OR SENSOR
62	TIME-DELAY STOPPING OR OPENING RELAY
63	PRESSURE SWITCH
64	GROUND DETECTOR RELAY
65	GOVERNOR
66	NOTCHING OR JOGGING DEVICE
67	AC DIRECTIONAL OVERCURRENT RELAY
68	BLOCKING OR OUT OF STEP RELAY
69	PERMISSIVE CONTROL DEVICE
70	RHEOSTAT
71	LIQUID LEVEL SWITCH
72	DC CIRCUIT BREAKER
73	LOAD-RESISTOR CONTACTOR
74	ALARM RELAY
75	POSITION CHANGING MECHANISM
76	DC OVERCURRENT RELAY
77	TELEMETERING DEVICE
78	PHASE-ANGLE MEASURING RELAY
79	AC RECLOSING RELAY
80	FLOW SWITCH
81	FREQUENCY RELAY
82	DC LOAD MEASURING RECLOSING RELAY
83	AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY
84	OPERATING MECHANISM
85	PILOT COMMUNICATIONS, CARRIER OR PILOT-WIRE RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTIVE RELAY
88	AUXILIARY MOTOR OR MOTOR GENERATOR
89	LINE SWITCH
90	REGULATING DEVICE
91	VOLTAGE DIRECTIONAL RELAY
92	VOLTAGE AND POWER DIRECTIONAL RELAY
93	FIELD-CHANGING CONTACTOR
94	TRIPPING OR TRIP-FREE RELAY

COMMONLY USED SUFFIX LETTER APPLIED TO POWER DEVICE FUNCTION NUMBERS

A	ALARM ONLY
B	BUS PROTECTION
G	GROUND FAULT PROTECTION (RELAY CT IN A SYSTEM NEUTRAL CIRCUIT OR GENERATOR PROTECTION)
GS	GROUND FAULT PROTECTION (RELAY CT IN TOROIDAL OR GROUND SENSOR TYPE)
L	LINE PROTECTION
M	MOTOR PROTECTION
N	GROUND FAULT PROTECTION (RELAY COIL CONNECTED IN RESIDUAL CT CIRCUIT)
T	TRANSFORMER PROTECTION
V	VOLTAGE
P	PHASE PROTECTION

ABBREVIATIONS

AFD	ARC FLASH DETECTOR
CLK	CLOCK OR RIMING SOURCE
DDR	DYNAMIC DISTURBANCE RECORDER
DFR	DIGITAL FAULT RECORDER
ENV	ENVIRONMENTAL DATA
HIZ	HIGH IMPEDANCE FAULT DETECTOR
HMI	HUMAN MACHINE INTERFACE
HST	HISTORIAN
LGC	SCHEME LOGIC
MET	SUBSTATION METERING
PDC	PHASOR DATA CONCENTRATOR
PMU	PHASOR MEASUREMENT UNIT
PQM	POWER QUALITY MONITOR
RIO	REMOTE I/O DEVICE
RTU	REMOTE TELEMETRY UNIT/REMOTE TERMINAL UNIT
SER	SEQUENCE OF EVENTS RECORDER
TCM	TRIP CIRCUIT MONITOR

REV	DATE	BY	DESCRIPTION

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DESIGNED W. FLETCHER
DRAWN A. CHARDE
CHECKED
DATE JUNE 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
ELECTRICAL
ABBREVIATIONS

VERIFY SCALES
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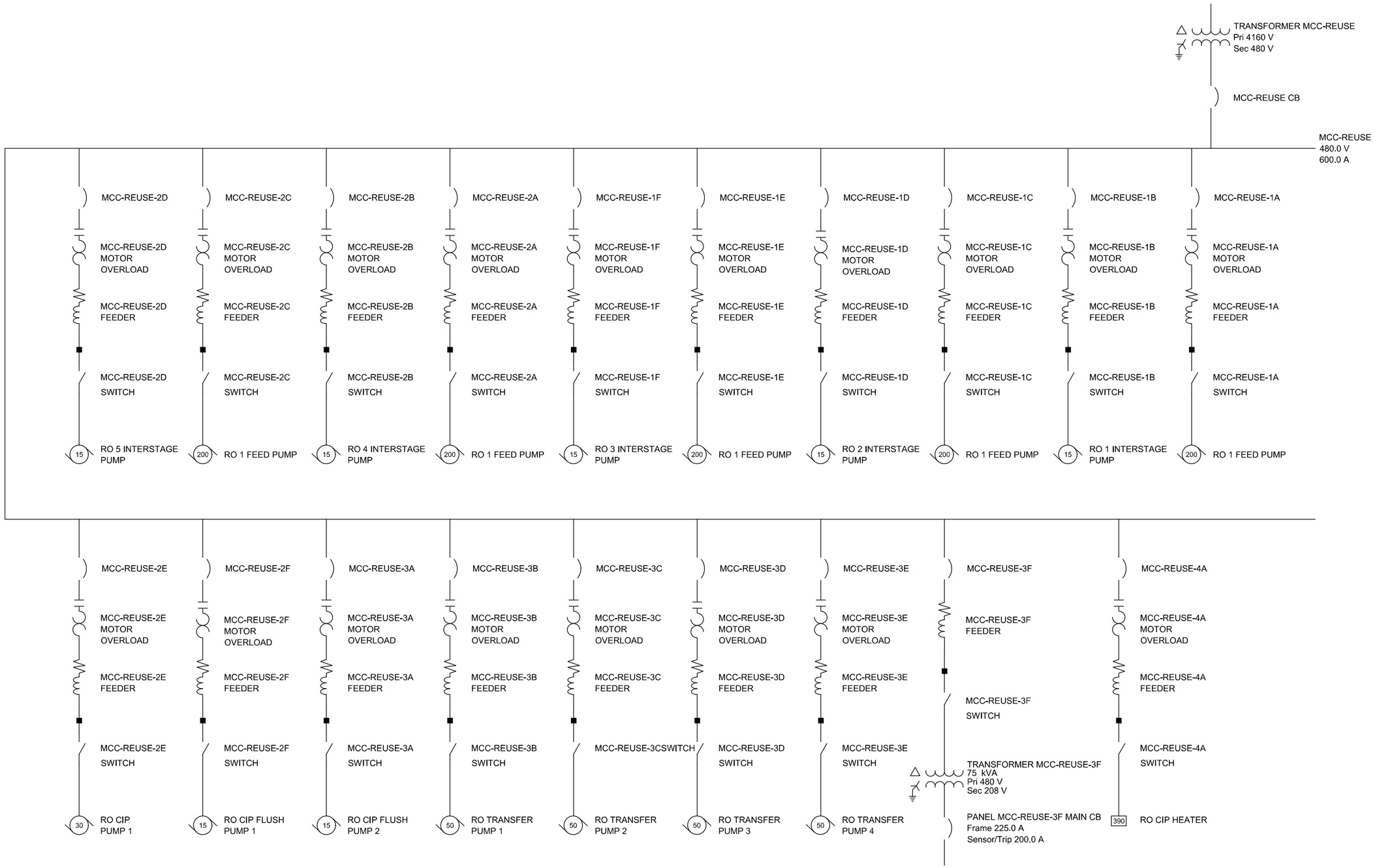
BLDG.41 - REUSE BUILDING



REV	DATE	BY	DESCRIPTION

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DRAWN A. CHARDE
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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - REUSE FACILITY

ELECTRICAL

REUSE FACILITY - ONE - LINE DIAGRAM

VERIFY SCALES
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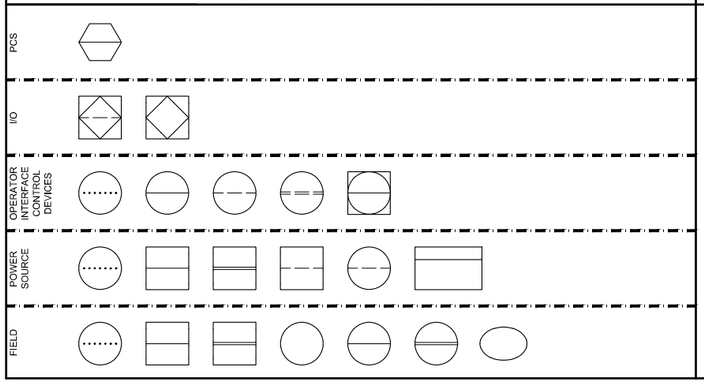
SYMBOL	DRAWING VISIBLE FIELDS	FIELD - 1	FIELD - 2	FIELD - 3	FIELD - 4	FIELD - 5	FIELD - 6	FIELD - 7	FIELD - 8
HMI/SCADA SYSTEM OPERATOR INTERFACE TERMINAL	1 - TAG111 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - DESCRIPTION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	ACTION ALARM SP - NUMERIC STATUS - SET POINT TREND	DESCRIPTION 2 5	DESCRIPTION	E - EXISTING F - FUTURE		
HARDWIRED I/O POINT	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE 7 - IO TABLE	REFER 1 2 4	REFER 3	AI - ANALOG INPUT AO - ANALOG OUTPUT DI - DISCRETE INPUT DO - DISCRETE OUTPUT RTD - RTD INPUT	DESCRIPTION	PAC - PROGRAMMABLE AUTOMATION CONTROLLER NO. PLC - PROGRAMMABLE LOGIC CONTROLLER NO. RIO - REMOTE I/O VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
NETWORK / SOFT I/O	1 - TAG 2 - LOOP NUMBER 3 - PROTOCOL 4 - PANEL 5 - PLC 6 - EXISTING/FUTURE 7 - IO TABLE 8 - SWITCH/SEGMENT	REFER 1 2	REFER 3	COMMUNICATION PROTOCOL CNET - CONTROLNET DNET - DEVICENET EIP - ETHERNET/IP FF - FOUNDATION FIELDBUS HART-IP - HART OVER ETHERNET MANF - MFR. PROPRIETARY MBRTU - MODBUS RTU MB+ - MODBUS PLUS MBTCP - MODBUS TCP DP - PROFIBUS DP PA - PROFIBUS PA PNET - PROFINET SNMP - SNMPv3 HTTP - WEB SERVER (TCP/IP)	DESCRIPTION	PAC - PROGRAMMABLE AUTOMATION CONTROLLER NO. PLC - PROGRAMMABLE LOGIC CONTROLLER NO. RIO - REMOTE I/O VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
LOCAL OPERATOR INTERFACE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	ACTION ALARM SP - NUMERIC STATUS - SET POINT TREND	DESCRIPTION	LOI - LOCAL OPERATOR INTERFACE NO. LCP - LOCAL CONTROL PANEL NO. PCM - PROCESS CONTROL MODULE NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
PILOT DEVICE OPERATOR INTERFACE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	AM - AUTO/MANUAL BYPASS - BY PASS ESD - EQUIPMENT SHUTDOWN HOA - HAND/OFF/AUTO LOR - LOCAL/OFF/REMOTE LOS - LOCK OUT STOP LS - LEAD/STANDBY LSR - LOCAL/STOP/REMOTE OC - OPEN/CLOSE OO - OFF/ON OSC - OPEN/STOP/CLOSE RST - RESET SEL - SELECT SPD - SPEED SS - START/STOP ST - STOP	DESCRIPTION 2 5	LCP - LOCAL CONTROL PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. RVSS - REDUCED VOLTAGE SOLID STARTER NO. VCP - VENDOR CONTROL PANEL NO. VFD - VARIABLE FREQUENCY DRIVE NO.	E - EXISTING F - FUTURE		
POWER DEVICE PRIMARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - VOLTAGE-POLE 5 - LOCATION 6 - EXISTING/FUTURE	CB - CIRCUIT BREAKER DISC - DISCONNECT FU - FUSE	REFER 3	TM - THERMAL MAGNETIC CIRCUIT BREAKER	24VDC - 1P 24VDC - 2P 24VAC - 1P 48VDC - 2P 120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	DP - DISTRIBUTION PANEL NO. LCP - LOCAL CONTROL PANEL NO. LP - LIGHTING PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. PP - POWER PANEL NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
POWER DEVICE AUXILIARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - DESCRIPTION 4 - DESCRIPTION 5 - DESCRIPTION 6 - EXISTING/FUTURE	DISC - DISCONNECT	REFER 3	DESCRIPTION	DESCRIPTION	DESCRIPTION	E - EXISTING F - FUTURE		
POWER DEVICE PRIMARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - VOLTAGE-POLE 5 - LOCATION 6 - EXISTING/FUTURE	CB - CIRCUIT BREAKER FU - FUSE	REFER 3	MCP - MOTOR CIRCUIT PROTECTOR SS - SOLID STATE CIRCUIT BREAKER TM - THERMAL MAGNETIC CIRCUIT BREAKER	24VDC - 1P 24VDC - 2P 24VAC - 1P 48VDC - 2P 120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	DP - DISTRIBUTION PANEL NO. LCP - LOCAL CONTROL PANEL NO. LP - LIGHTING PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. PP - POWER PANEL NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT STARTER / DRIVE CUBICLE / CABINET	1 - TAG 2 - LOOP NUMBER 3 - TYPE 4 - VOLTAGE-POLE 5 - POWER SOURCE 6 - EXISTING/FUTURE	MS - MOTOR STARTER RVAT - REDUCED VOLTAGE AUTO TRANSFORMER STARTER RVSS - REDUCED VOLTAGE SOLID STATE STARTER VFD - VARIABLE FREQUENCY DRIVE	REFER 3	FVNR - FULL VOLTAGE NON-REVERSING STARTER FVR - FULL VOLTAGE REVERSING STARTER PWS - PART-WINDING STARTER RVAT - REDUCED VOLTAGE AUTO RVSS - REDUCED VOLTAGE SOLID STATE STARTER TS1W - TWO SPEED SINGLE WINDING TS2W - TWO SPEED TWO WINDINGS VFD - VARIABLE FREQUENCY DRIVE	120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	LCP - LOCAL CONTROL PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		

SYMBOL	DRAWING VISIBLE FIELDS	FIELD - 1	FIELD - 2	FIELD - 3	FIELD - 4	FIELD - 5	FIELD - 6	FIELD - 7	FIELD - 8
INSTRUMENT PRIMARY ELEMENT	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION 5	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT PRIMARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - DESCRIPTION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION 5	DESCRIPTION 6 7	DESCRIPTION INT - INTEGRAL REM - REMOTE	E - EXISTING F - FUTURE		OUT - OUTDOOR
INSTRUMENT/ CONTROL ELEMENT AUXILIARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT PRIMARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 3 XR - PROTECTION RELAY CR - CONTROL RELAY XR - INTERPOSING RELAY	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT AUXILIARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 3 XR - PROTECTION RELAY CR - CONTROL RELAY XR - INTERPOSING RELAY	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
FIELD EQUIPMENT NON-POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION/SIZE 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT PRIMARY FUNCTION POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT AUXILIARY FUNCTION POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	MWH - MOTOR WINDING HEATER TSH - TEMPERATURE SWITCH XSH - TORQUE SWITCH	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		

INSTRUMENT BUBBLE LOCATIONS



NOTES

1. INSTRUMENT TAG IDENTIFICATION LETTERS TABLE
2. OPERATOR PILOT DEVICE LEGEND
3. EQUIPMENT TAGGING TABLE
4. I/O TYPE DESIGNATIONS
5. INSTRUMENT TYPE DESIGNATIONS TABLE
6. FURNISHED BY:
   - FBO FURNISHED BY OWNER
   - FBV FURNISHED BY VENDOR
7. PROVIDED BY:
   - PBO PROVIDED BY OWNER
   - PBV PROVIDED BY VENDOR

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - REUSE FACILITY

INSTRUMENTATION

SYMBOLS AND ABBREVIATIONS 1

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 00GN01
SHEET NO. 19 OF 30

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PROJECT NO.

FILE NAME:

INSTRUMENT TAG IDENTIFICATION LETTERS

	MEASURED VARIABLE / INSTRUMENTATION FUNCTION	ELEMENT	TRANSMITTER	INDICATING TRANSMITTER	CONVERTER TRANSDUCER, RELAY SPECIAL DEVICES	INDICATOR	RECORDER	CONTROL/COMMAND	INDICATING CONTROLLER	RECORDING CONTROLLER	SWITCH	SWITCH LOW LOW	SWITCH LOW	SWITCH HIGH	SWITCH HIGH HIGH	SWITCH COMBINATION HIGH LOW	ACTION	ALARM LOW LOW	ALARM LOW	ALARM HIGH	ALARM HIGH HIGH	TOTALIZE INDICATOR TRANSMITTER	VALVE	GAUGE	LIGHT	SPEED SETTING
A	ANALYSIS	AE	AT	AIT	AY	AI	AR	AC	AIC	ARC	AS	ASLL	ASL	ASH	ASHH	ASHL		AALL	AAL	AAH	AAHH				AL	
C	CONDUCTIVITY	CE	CT	CIT	CY	CI	CR	CC	CIC	CRC	CS	CSLL	CSL	CSH	CSHH	CSHL		CALL	CAL	CAH	CAHH				CL	
D	DENSITY	DE	DT	DIT	DY	DI	DR	DC	DIC	DRC	DS	DSLL	DSL	DSH	DSHH	DSHL		DALL	DAL	DAH	DAHH				DL	
E	VOLTAGE												ESL													
F	FLOW	FE	FT	FIT	FY	FI	FR	FC	FIC	FRC	FS	FSLL	FSL	FSH	FSHH	FSHL		FALL	FAL	FAH	FAHH	FQI	FCV	FG	FL	
H	HAND (MANUAL)*							HC			HS*						HA*						HV		HL	HSS
I	CURRENT		IT	IIT	IY	II	IR	IC	IIC	IRC	IS	ISLL	ISL	ISH	ISHH			IALL	IAL	IAH	IAHH				IL	
J	POWER					JS																				
K	TIME				KY	KI	KR	KC	KIC	KRC	KS	KSLL	KSL	KSH	KSHH			KALL	KAL	KAH	KAHH		KV		KL	
L	LEVEL	LE	LT	LIT	LY	LI	LR	LC	LIC	LRC	LS	LSLL	LSL	LSH	LSHH	LSHL		LALL	LAL	LAH	LAHH		LCV	LG	LL	
M	MOISTURE OR HUMIDITY	ME	MT	MIT	MY	MI	MR	MC	MIC	MRC	MS	MSLL	MSL	MSH	MSHH			MALL	MAL	MAH	MAHH				ML	
N	USER'S CHOICE																									
P	PRESSURE OR VACUUM	PE	PT	PIT	PY	PI	PR	PC	PIC	PRC	PS	PSLL	PSL	PSH	PSHH	PSHL		PALL	PAL	PAH	PAHH		PCV		PL	
PD	DIFFERENTIAL PRESSURE		PDT	PDIT	PDY	PDI	PDR	PDC	PDIC	PDRC	PDS	PDSLL	PDSL	PDSH	PDSHH			PDALL	PDAL	PDAH	PDAHH		PDCV		PDL	
Q	QUANTITY	QE	QT	QIT	QY	QI	QR				QS	QSLL	QSL	QSH	QSHH			QALL	QAL	QAH	QAHH					
R	RADIATION																									
S	SPEED	SE	ST	SIT	SY	SI	SR	SC	SIC	SRC	SS	SSLL	SSL	SSH	SSHH			SALL	SAL	SAH	SAHH					
T	TEMPERATURE	TE	TT	TIT	TY	TI	TR	TC	TIC	TRC	TS	TSLL	TSL	TSH	TSHH	TSHL		TALL	TAL	TAH	TAHH		TCV		TL	
TD	DIFFERENTIAL TEMPERATURE		TDT	TDIT	TDY	TDI	TDR	TDC	TDIC	TDRC	TDS	TDSLL	TDSL	TDSH	TDSHH			TDALL	TDAL	TDAH	TDAHH		TDCV		TDL	
U	MULTIVARIABLE					UI	UR	UC	UIC	URC	US														UL	
V	VISCOSITY	VE	VT	VIT	VY	VI	VR	VC	VIC	VRC	VS	VSLL	VSL	VSH	VSHH			VALL	VAL	VAH	VAHH				VL	
W	WEIGHT	WE	WT	WIT	WY	WI	WR				WS	WSLL	WSL	WSH	WSHH			WALL	WAL	WAH	WAHH					
X	UNCLASSIFIED	XE	XT	XIT	XY	XI	XR	XC	XIC	XRC	XS	XSLL	XSL	XSH	XSHH			XALL	XAL	XAH	XAHH		XCV	XG	XL	
XV	VIBRATION	XVE	XVT		XVY	XVI	XVR				XVS			XVSH	XVSHH					XVAH	XVAHH				XVL	
Y	STATUS					YI																			YL	
Z	POSITION	ZE	ZT	ZIT	ZY	ZI		ZC**			ZS**												ZV		ZL**	

OPERATOR PILOT DEVICE LEGEND

DEVICE TYPE / PILOT DEVICE FUNCTION	LOCAL-OFF-REMOTE (LOR) OR LOCAL-STOP-REMOTE (LSR)	STOP(SP)	START (ST)	HAND-OFF-AUTO (HOA) HAND-OFF-REMOTE (HOR)	OFF-ON (OO)	SELECT (SEL)	OPEN-STOP-CLOSE (OSC)	JOG OPEN-HOLD-CLOSE (JOHC)	SEMIAUTO-AUTO-MANUAL (SAAM)	LEAD-LAG-STANDBY (LLGS)	AUTO-MANUAL (AM)	OPEN-CLOSE (OC)	LOW-HIGH (LH)	RESET (RST)	SPEED (SPD)	START-STOP (STSP)	EQUIPMENT SHUTDOWN (ESD)	BYPASS (BYP)			SILENCE	POSITION (POS)
PILOT DEVICE TAG (HAND SWITCHES)	HSA	HSB	HSC	HSD	HSE	HSF	HSG	HSH	HIS	HSJ	HSM	HSO	HSQ	HSR	HSS	HST	HSU	HSV	HSW	HSX	HSY	HSZ

I/O TYPE DESIGNATIONS

RNG	RUNNING	SPDC	SPEED COMMAND
FAIL	FAILED/FAULT	SPDF	SPEED FEEDBACK
FWD	RUNNING FORWARD	REM	LOR IN REMOTE
FAST	RUNNING HIGH	LOC	LOR IN LOCAL
SLOW	RUNNING LOW	AUTO	HOA IN AUTO
REV	RUNNING REVERSE	HAND	HOA IN HAND
SVC	SOLENOID VALVE CLOSE	RST	RESET
SVO	SOLENOID VALVE OPEN		
RUN	RUN		
SLWC	MOTOR START LOW		
REVC	MOTOR START REVERSE		

INSTRUMENT TYPE DESIGNATIONS

CGD	COMBUSTIBLE GAS DETECTOR	PTOF	PULSE TIME OF FLIGHT
COND	CONDUCTIVITY	RTD	RESISTANCE TEMP DETECTOR
DO	DISSOLVED OXYGEN	SB	SLUDGE BLANKET
FMCW	FREQ. MODULATED CONT. WAVE	SC	STREAMING CURRENT
ISB	INTRINSIC SAFETY BARRIER	SD	SLUDGE DEPTH
LEL	LOWER EXPLOSIVE LIMIT	TDR	TIME DOMAIN REFLECTOMETRY
MLSS	MIXED LIQUOR SUSPENDED SOLIDS	TOC	TOTAL ORGANIC CARBON
ORG	UV 504	TSS	TOTAL SUSPENDED SOLIDS
ORP	OXIDATION REDUCTION POTENTIAL	TURB	TURBIDITY
PSUB	PRESSURE SUBMERSIBLE	UVI	UV INTENSITY
PC	PARTICLE COUNTER	UVT	UV TRANSMITTANCE

SPECIFIC ABBREVIATIONS

HTR	HEATER
HTU	HEAT TRACE UNIT
MWH	MOTOR WINDING HEATER
SV	SOLENOID VALVE
SPD	SURGE PROTECTIVE DEVICE
UPS	UNINTERRUPTIBLE POWER SUPPLY
YLA	STATUS AUTO PILOT LIGHT
YLR	STATUS REMOTE PILOT LIGHT
YL1	STATUS RUNNING PILOT LIGHT
YL2	ALARM FAILED/FAULT PILOT LIGHT

P&ID LINE SYMBOLS

- INSTRUMENT OR CONNECTION TO PROCESS
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- HYDRAULIC SIGNAL
- CAPILLARY TUBE
- INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)

PROCESS LINE SYMBOLS

- PRIMARY PROCESS FLOW IN PIPE
- SECONDARY PROCESS FLOW IN PIPE
- PRIMARY PROCESS FLOW IN CHANNEL
- SECONDARY PROCESS FLOW IN CHANNEL
- HEAT TRACE

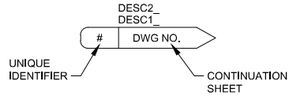
DESIGNATIONS

- EQUIPMENT ENCLOSURE
- EXISTING
- FUTURE

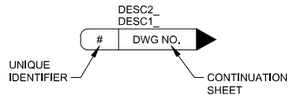


MISCELLANEOUS P&ID SYMBOLS

- PROCESS CONTINUATION



- SIGNAL CONTINUATION



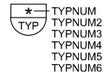
- PIPE CALLOUT



- SCHEMATIC DETAIL



- TYPICAL DETAIL



REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
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DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
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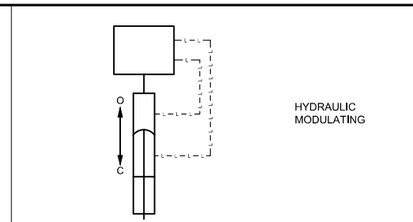
ACTUATORS

- DIAPHRAGM
- ELECTRIC HYDRAULIC
- ELECTRIC
- HAND
- HYDRAULIC
- MOTOR
- PNEUMATIC
- SOLENOID



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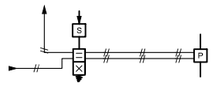

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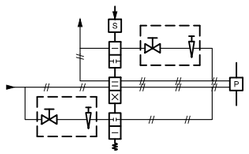

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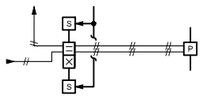

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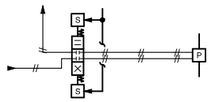

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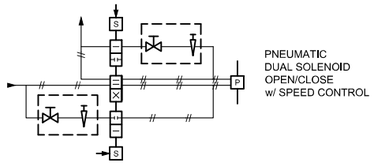

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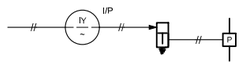

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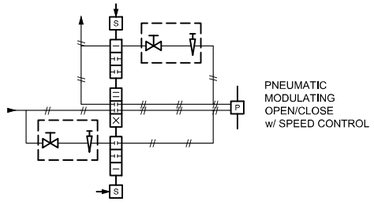


PNEUMATIC MODULATING OPEN/CLOSE w/ SPEED CONTROL

PIPING



AIR GAP



BLIND FLANGE



CAPPED OR PLUGGED



CONCENTRIC INCREASER



CONCENTRIC REDUCER



DRAIN



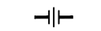
ECCENTRIC INCREASER



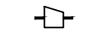
FLANGED CONNECTION



TEE



UNION



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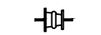
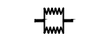


EXPANSION COUPLING



EXPANSION JOINT VIBRATION CENTER



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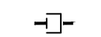


QUICK DISCONNECT

PUMPS



AIR DRIVEN



CENTRIFUGAL



CHEMICAL FEED DIAPHRAGM



DIAPHRAGM



GEAR



LOBE



PERISTALTIC OR HOSE



PISTON



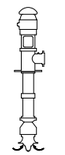
PROGRESSIVE CAVITY



OR



SUBMERSIBLE



VERTICAL TURBINE



VERTICAL CHOPPER



WATER CHAMP

BLOWERS/ COMPRESSORS/FANS



CENTRIFUGAL SINGLE STAGE BLOWER/FAN



CENTRIFUGAL MULTI STAGE BLOWER



RECIPROCATING COMPRESSOR

SCREW COMPRESSOR

FAN

LIQUID RING COMPRESSOR

ROTARY LOBE BLOWER

CHECK VALVES

- BACK FLOW PREVENTER
- BALL
- DIAPHRAGM CHECK
- DOUBLE FLAP
- FLAPPER
- SLANTING CHECK VALVE
- SPRING LOADED GENERAL
- SPRING LOADED SWING
- SWING

PRESSURE VALVES

- BACKPRESSURE REGULATING SELF CONTAINED
- BACKPRESSURE REGULATING EXTERNAL TAP
- PRESSURE REDUCING SELF CONTAINED
- PRESSURE REDUCING EXTERNAL PRESSURE TAP
- REGULATING
- PRESSURE RELIEF
- VACUUM RELIEF

VALVES

- 3-WAY
- 3-WAY PLUG
- 4-WAY
- AIR-RELIEF
- ANGLE
- BALL
- BALL V-NOTCH
- BUTTERFLY
- BUTTERFLY-BURIED VALVE BOX
- CONE
- DIAPHRAGM
- FLOAT
- GATE
- GATE-BURIED VALVE BOX
- GLOBE
- HOSE
- MISCELLANEOUS
- MUD
- NEEDLE
- PINCH
- PLUG ECCENTRIC
- PLUG ECCENTRIC w-VALVE BOX
- PLUG ECCENTRIC LUBRICATED
- PLUG ECCENTRIC LUBRICATED BURIED VALVE BOX
- PLUG CONCENTRIC
- PLUG CONCENTRIC -BURIED VALVE BOX
- PLUG CONCENTRIC LUBRICATED
- PLUG CONCENTRIC LUBRICATED BURIED VALVE BOX
- PUMP DISCHARGE
- TELESCOPING

VALVE DESIGNATIONS	
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
FO	FAIL OPEN
FC	FAIL CLOSE
FLP	FAIL LAST POSITION

MISC

- AIR / CHEMICAL DIFFUSER
- BASKET STRAINER
- BLOW-OFF SILENCER
- CALIBRATION COLUMN
- COALESCER
- DESICCANT DRYER
- EDUCTOR/EJECTOR
- EQUIPMENT/ INSTRUMENT LOCATOR
- EYEWASH
- FILTER
- FILTER SEPARATOR
- FINE FILTER
- FIRE ALARM/SENSOR
- FLAME ARRESTER
- FLAME ARRESTER w/THERMALLY OPERATED VALVE
- FLOW CONDITIONER
- GAS CANNON
- GRINDER
- HEAT EXCHANGER
- HOIST
- HORIZONTAL MIXER
- HOSE CONNECTION
- INLET STRAINER
- INLINE STATIC MIXER
- INLINE DUCT BALANCING DAMPER
- LOUVER OR BACKDRAFT DAMPER
- MATERIAL CHANGE
- MIXER
- NOZZLE
- ORIFICE RESTRICTION
- PERISTALTIC COMPOSITE SAMPLER
- OR
- PULSATION DAMPENER
- REFRIGERATED DRYER
- RUPTURE DISK
- SAMPLE PORT
- SIGHT TUBE
- SMOKE DETECTOR
- STRAINER - MECHANICALLY CLEANED
- STRAINER WITH BLOW OFF
- STRAINER WYE TYPE
- VAPOR HEATER
- VAPORIZER
- VENT
- VENT TO ATMOSPHERE

REV	DATE	BY	DESCRIPTION

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NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
INSTRUMENTATION
SYMBOLS AND ABBREVIATIONS 3

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 00GN03
SHEET NO. 21 OF 30

LAST SAVED BY:
PROJECT NO.
FILE NAME:

FLOW

- CORIOLIS
- MAGNETIC
- ORIFICE
- PADDLE WHEEL
- PISTON
- ANNUBAR
- PITOT TUBE
- POSITIVE-DISPLACEMENT
- PROPELLER-TURBINE
- ROTAMETER
- SHUTTLE
- THERMAL
- ULTRASONIC
- ULTRASONIC BIOGAS
- V-CONE
- VENTURI TUBE OR FLOW NOZZLE
- VORTEX

FLUMES

- LEOPOLD-LAGCO
- PALMER-BOWLUS
- PARSHALL
- REGULAR CUTTHROAT
- TRAPEZOIDAL

GATES

SIDE VIEW	PLAN VIEW
	FLAP
	KNIFE
SLIDE	SLIDE
SLUICE	SLUICE
STOP	STOP
	WEIR
	BUTTERFLY

LEVELS

- BUBBLER
- CAPACITANCE
- DIFFERENTIAL PRESSURE (TANK)
- DISPLACEMENT
- ELECTRODE
- BALL FLOAT
- INVERTED COLUMN
- PROBE
- RADAR PTOF
- RADAR (FREQUENCY MODULATED CONTINUOUS WAVE)
- RADAR TDR
- SUSPENDED/ SUBMERSIBLE
- TUNING FORK
- ULTRASONIC

NETWORKS

CABLE CALLOUTS AND ABBREVIATIONS

- 24/FO-SM — FIBER LINE REPRESENTS ONE 24-STRAND FIBER OPTIC CABLE
- (2) 24/FO-SM — FIBER LINE REPRESENTS TWO 24-STRAND FIBER OPTIC CABLES
- (1) 24/FO-SM EA. — EACH FIBER LINE REPRESENTS ONE 24-STRAND FIBER OPTIC CABLE
- (4) — COPPER LINE REPRESENTS FOUR COPPER ETHERNET CABLES
- (2) EA. — EACH COPPER LINE REPRESENTS TWO COPPER ETHERNET CABLES

FIBER ABBREVIATIONS

###/FO-XX
- ## = STRAND COUNT
- FO = FIBER OPTIC

XX = MODE
- SM = SINGLE MODE
- MM = MULTIMODE

NETWORK ABBREVIATIONS

BMS	= BUILDING MANAGEMENT SYSTEM
BSN	= BUSINESS NETWORK
FCN	= FIELD CONTROL NETWORK
MIN	= MAINTENANCE INFORMATION NETWORK
PCN	= PROCESS CONTROL NETWORK
PLCN	= PLC NETWORK
SCN	= SECURITY CONTROL NETWORK
PCN-W	= WIRELESS PROCESS CONTROL NETWORK
NR	= NETWORK RACK
NP	= NETWORK PANEL
ES	= ETHERNET SWITCH
FPP	= FIBER PATCH PANEL

VLAN SYMBOLS

- = BUSINESS NETWORK
- = SECURITY CONTROL NETWORK
- = BUILDING MANAGEMENT SYSTEM
- = PROCESS CONTROL NETWORK
- = WIRELESS PROCESS CONTROL NETWORK
- = MAINTENANCE INFORMATION NETWORK
- = PLC NETWORK
- = FIELD CONTROL NETWORK

PRESSURE/VACUUM

PRESSURE

- PI — GAUGE
- PSH / PE — PRESSURE SWITCH
- PIT / PE — PRESSURE TRANSMITTER
- MANOMETER

DIFFERENTIAL PRESSURE

- PDI — GAUGE DIFFERENTIAL INDICATOR
- PDSL / PDE — DIFFERENTIAL PRESSURE SWITCH
- PDIT / PDE — DIFFERENTIAL PRESSURE TRANSMITTER

PRESSURE SEALS

- SEAL ANNULAR
- SEAL DIAPHRAGM
- SEAL SANITARY

EXAMPLE

PSH / PE — PRESSURE SWITCH

TEMPERATURE

- TEMPERATURE w/THERMOWELL
- TEMPERATURE GAUGE
- T — THERMOMETER

WEIGHT

- PLATFORM SCALE

WEIRS

SIDE VIEW	PLAN VIEW
RECTANGULAR w/o END CONTRACTIONS	RECTANGULAR w/o END CONTRACTIONS
RECTANGULAR w/ END CONTRACTIONS	RECTANGULAR w/ END CONTRACTIONS
V-NOTCH (TRIANGULAR)	V-NOTCH (TRIANGULAR)
TRAPEZOIDAL (CIPOLLETTI)	TRAPEZOIDAL (CIPOLLETTI)

NETWORK LINE SYMBOLS

COPPER ETHERNET	— C — C — C — C — C — C —
DUPLEX FIBER PATCH	— FP — FP — FP — FP — FP — FP —
FIBER OPTIC ETHERNET	— F — F — F — F — F — F —
WIRELESS	— W — W — W — W — W — W —
PROFIBUS DP	— PBD — PBD — PBD — PBD — PBD — PBD —
PROFIBUS PA	— PBA — PBA — PBA — PBA — PBA — PBA —
SERIAL DATA	—o—o—o—o—o—o—o—o—o—o—o—o—o—o—

MISCELLANEOUS NETWORK SYMBOLS

NETWORK CABLE CONTINUATIONS

TOP OF PAGE STYLE CONTINUATION
- DESC 3 / DESC 2 / DESC 1 — CONTINUATION SHEET
- DWG NO. — UNIQUE IDENTIFIER
- (#)

BOTTOM/LEFT OF PAGE STYLE CONTINUATION
- UNIQUE IDENTIFIER
- CONTINUATION SHEET
- (#) — DWG NO. / DESC 1 / DESC 2 / DESC 3

FIELD NETWORK DEVICE

PLC TAG / PANEL TAG — PROTOCOL SEGMENT #
DEVICE SPECIFIC SYMBOL
TAG
DESC 1
DESC 2
DESC 3
P&ID DRAWING REFERENCE

NETWORK EQUIPMENT CALLOUT

TAG
DESC 1

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DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
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OOWWTP EXPANSION PROGRAM - REUSE FACILITY
INSTRUMENTATION
SYMBOLS AND ABBREVIATIONS 4

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DRAWING NO. 00GN04
SHEET NO. 22 OF 30

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PROCESS SWITCHES

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION


LEVEL SWITCH
CLOSE ON RISING LEVEL


LEVEL SWITCH
OPEN ON RISING LEVEL


PRESSURE SWITCH
CLOSE ON RISING PRESSURE


PRESSURE SWITCH
OPEN ON RISING PRESSURE


TEMPERATURE SWITCH
CLOSE ON RISING TEMPERATURE


TEMPERATURE SWITCH
OPEN ON RISING TEMPERATURE


FLOW SWITCH
CLOSE ON INCREASE IN FLOW


FLOW SWITCH
OPEN ON INCREASE IN FLOW


VIBRATION SWITCH
OPEN ON RISING VIBRATION


VIBRATION SWITCH
CLOSE ON RISING VIBRATION


TORQUE SWITCH
OPEN ON HIGH TORQUE


TORQUE SWITCH
CLOSE ON HIGH TORQUE


NORMALLY CLOSED
LIMIT SWITCH


NORMALLY CLOSED
HELD OPEN LIMIT SWITCH


NORMALLY OPEN
LIMIT SWITCH


NORMALLY OPEN
HELD CLOSED LIMIT SWITCH

HAND SWITCHES

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a/b/c = POSITION
x = DENOTES POSITION CONTACTS CLOSED IN


NORMALLY OPEN
MOMENTARY PUSHBUTTON


NORMALLY CLOSED
MOMENTARY PUSHBUTTON


MUSHROOM HEAD PUSHBUTTON
NORMALLY OPEN


MUSHROOM HEAD PUSHBUTTON
NORMALLY CLOSED


PUSH-PULL PUSHBUTTON
MAINTAINED CONTACT


PUSH-PULL PUSHBUTTON
NORMALLY CLOSED


PADLOCK SWITCH


PULL CORD SWITCH


STOP-LOCKOUT PUSHBUTTON


THREE POSITION SELECTOR SWITCH


TWO POSITION SELECTOR SWITCH
NORMALLY OPEN


TWO POSITION SELECTOR SWITCH
NORMALLY CLOSED


SPRING-RETURN

RELAYS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = TYPE
CR- CONTROL RELAY
TD- TIME DELAY RELAY
M - MOTOR STARTER COIL
L - MOTOR STARTER COIL - LOW SPEED
H - MOTOR STARTER COIL - HIGH SPEED
F - MOTOR STARTER COIL - FORWARD
R - MOTOR STARTER COIL - REVERSE

b = TIME DELAY STATE
TDON - TIME DELAY ON ENERGIZATION
TDOFF - TIME DELAY ON DEENERGIZATION

c = TIMING RANGE/SETTING


RELAY COIL


NORMALLY OPEN
CONTROL CONTACT


NORMALLY CLOSED
CONTROL CONTACT


TIME DELAY CONTACT
NORMALLY OPEN
TIMED CLOSING

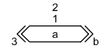

TIME DELAY CONTACT
NORMALLY CLOSED
TIMED OPENING

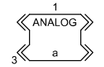

TIME DELAY CONTACT
NORMALLY OPEN
TIMED OPENING

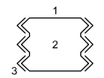

TIME DELAY CONTACT
NORMALLY CLOSED
TIMED CLOSING

I/O

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = INPUT/OUTPUT
b = I/O VOLTAGE


PLC DISCRETE


PLC ANALOG


DIGITAL BUS

MISC

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION


SOLENOID

CIRCUIT BREAKER

DISCONNECT

FUSE

TRANSIENT SURGE
PROTECTION

MOTOR WINDING HEATER

MOTORS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = HORSEPOWER

MOTOR - 1 PHASE

MOTOR - 3 PHASE

INDICATORS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = LENS COLOR
R - RED
G - GREEN
W - WHITE
A - AMBER
B - BLUE
Y - YELLOW
C - CLEAR

PILOT LIGHT

PUSH-TO-TEST LIGHT

BEACON

HORN

VARISTOR

CAPACITOR

RESISTOR

BATTERY

DIODE

MOTOR OVERLOAD
HEATERS

OVERLOAD CONTACT

DRAWOUT CONNECTION

GROUND

LIGHTNING ARRESTOR

CONTROL POWER
TRANSFORMER

ELAPSED TIME METER

RTD

MISC PORT

ETHERNET PORT

SURGE PROTECTION DEVICE

TRANSFORMER
LINE/LOAD REACTOR

SPEED SWITCH

SPEED POTENTIOMETER

SHIELDED WIRE

LOOP

MOTORS

REV	DATE	BY	DESCRIPTION

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DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
INSTRUMENTATION
SCHEMATIC SYMBOLS

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DRAWING NO. 00GN05
SHEET NO. 23 OF 30

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PROJECT NO.
FILE NAME:

EQUIPMENT DESCRIPTOR			
XXX		**XXX**	
AB	AERATION BASIN	GRI	GRINDER
AER	AERATOR	GRD	GRIT DEWATERING UNIT (CYCLONE)
AHU	AIR HANDLING UNIT	GRW	GRIT WASHER
ARC	AIR COMPRESSOR	GTW	GATEWAY
ARF	AIR FILTER	HPU	HYDRAULIC POWER UNIT
ARR	ARRESTOR	IC	ISOLATION CONTACTOR
ATS	AUTOMATIC TRANSFER SWITCH	INJ	INJECTOR
AUG	AUGER	LAG	LAGOON
AVR	AIR VACUUM RELIEF	INM	INDUCTION MIXER
BAR	BAR SCREEN	MAU	MAKE-UP AIR UNIT
BAS	BASIN	MIX	MIXER
BC	BYPASS CONTACTOR	MS	MOTOR STARTER
BFP	BELT FILTER PRESS	MPR	MOTOR PROTECTION RELAY
BIT	BIO TOWER	MTR	MOTOR
BLO	BLOWER	NP	NETWORK PANEL
BOI	BOILER	NR	NETWORK RACK
BUR	BURNER	OZG	OZONE GENERATOR
CAL	CALIBRATION COLUMN	PBU	POLYMER BLENDING UNIT
CB	CIRCUIT BREAKER	PCM	PROCESS CONTROL MODULE
CC	COMMUNICATIONS CABINET	PDC	POWER DISTRIBUTION CENTER
CEN	CENTRIFUGE	PLO	PLOW
CHI	CHILLER	PMP	PUMP
CHL	CHLORINATOR	PPR	PUMP PROTECTION RELAY
CLA	CLASSIFIER	PQM	POWER QUALITY METER
CLR	CLARIFIER	PRE	PRESS
CLU	CLUTCH	PUD	PULSATION DAMPENER
COA	COALESCER	REC	RECEIVER
COL	COLLECTOR	RVSS	REDUCED VOLTAGE STARTER
CON	CONVEYOR	RIO	REMOTE IO PANEL
COO	COOLER	RES	RESERVOIR
COS	COMPOSITE SAMPLER	RUD	ROLL UP DOOR
CPT	CONTROL POWER TRANSFORMER	SCB	SCRUBBER
CF	CARTRIDGE FILTER	SCR	SCREEN
CR	CONTROL RELAY	SCW	SCREW
CRN	BRIDGE CRANE/HOIST/MONORAIL	SEL	SEAL
CYC	CYCLONE CLASSIFER	SF	SUPPLY FAN
DAM	DAMPER	SHA	SHAKER
DCD	DC DRIVE	SLA	SLAKER
DEC	DECARBONATOR	SLC	SLUDGE COLLECTOR
DGC	DIGESTER GAS CONDITIONING	SPD	SURGE PROTECTION DEVICE
DIF	DIFFUSER	SRR	STIRRER
DIG	ANAEROBIC DIGESTER	STR	STRAINER
DIS	DISTRIBUTOR	SV	SOLENOID VALVE
DISC	DISCONNECT	SWC	SCREENING WASHER COMPACTOR
DRY	DRYER	THI	THICKENER
DSC	DUST COLLECTOR	TIP	TIPPING TROUGH
EDU	EDUCTOR	TNK	TANK
EF	EXHAUST FAN	TRA	TRAP
ES_	ETHERNET SWITCH	UPS	UNINTERRUPTIBLE POWER SUPPLY
ERD	ENERGY RECOVERY DEVICE	UVB	UV BANK
EUH	ELECTRIC UNIT HEATER	UVR	ULTRAVIOLET REACTOR
EVP	EVAPORATOR	VAL	VALVE
EXC	EXCHANGER	LCP	LOCAL CONTROL PANEL
FACP	FIRE ALARM CONTROL PANEL	VCP	VENDOR CONTROL PANEL
FAN	FAN	VFD	VARIABLE FREQUENCY DRIVE
FDR	FEEDER	WEL	WELL
FLA	FLARE	*CV	* CONTROL VALVE
FLC	FLOCCULATOR	*V	* VALVE
FLT	FILTER	*CG	* CONTROL GATE
FU	FUSE	*G	* GATE
GAT	GATE		* = A (ANALYTICAL), F (FLOW), L (LEVEL)
GEN	ENGINE GENERATOR		P (PRESSURE), T (TEMPERATURE)
GRC	GRIT CHAMBER		

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

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OOWWTP EXPANSION PROGRAM - REUSE FACILITY
INSTRUMENTATION
EQUIPMENT TAGGING

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 00GN06
SHEET NO. 24 OF 30

LAST SAVED BY:
PROJECT NO.
FILE NAME:

SCADA

RIC-1
RO PLC

MCC

RO TRANSFER PUMP 1 SPEED — SI
RO TRANSFER PUMP 1 SPEED COMMAND — SC
RO TRANSFER PUMP 1 HIGH RUNNING — YS
RO TRANSFER PUMP 1 RUN COMMAND — HC
RO TRANSFER PUMP 1 IN REMOTE — HS
RO TRANSFER PUMP 1 VFD FAULT — YA
RO TRANSFER PUMP 1 HIGH TEMP ALARM — TAH
RO TRANSFER PUMP 1 HIGH PRESSURE ALARM — PAH
RO TRANSFER PUMP 1 LOW FLOW ALARM — LAL

IO TYPICAL OF RO TRANSFER PUMP 1 (×4)

41-VFD-?? (×5)

KEYNOTES:

1. SKID MOUNTED RO TRANSFER PUMPS AND EQUIPMENT WITHIN DOTTED LINE INCLUDED IN ROMS SCOPE.

FROM STORAGE TANK

LIQUID AMMONIUM SULFATE

SODIUM HYPOCHLORITE

FROM RO PERMEATE

RO FEED TANK

RO TRANSFER PUMP 1
RO TRANSFER PUMP 2
RO TRANSFER PUMP 3
RO TRANSFER PUMP 4

PI, TSH, PSH, M, ΔT, CVK, D

TO RO CARTRIDGE FILTERS

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - REUSE FACILITY
INSTRUMENTATION
P&ID
RO TRANSFER PUMPS

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 41N01
SHEET NO. 25 OF 30

LAST SAVED BY:
PROJECT NO.
FILE NAME:

SCADA

RIO-1
RO PLC

MCC

RO FEED TOC
LIT

RO FEED CONDUCTIVITY
LIT

RO FEED PH
LIT

RO FEED PH
LIT

RO FEED ORP
LIT

KEYNOTES:

1. EQUIPMENT WITHIN DOTTED LINE INCLUDED IN ROMS SCOPE

AIT
AE
COND

AIT
AE
PH/TEMP
TE

AIT
AE
ORP

RO FEED
ANALYSER PANEL

D

SCALE INHIBITOR

SULFURIC ACID
SULFURIC ACID

FROM RO FEED
TRANSFER PUMPS

TO RO FEED
CARTRIDGE FILTERS

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

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OOWWTP EXPANSION PROGRAM - REUSE FACILITY

INSTRUMENTATION

P&ID
RO PRETREATMENT

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 41N02
SHEET NO. 26 OF 30

LAST SAVED BY:

PROJECT NO.

FILE NAME:

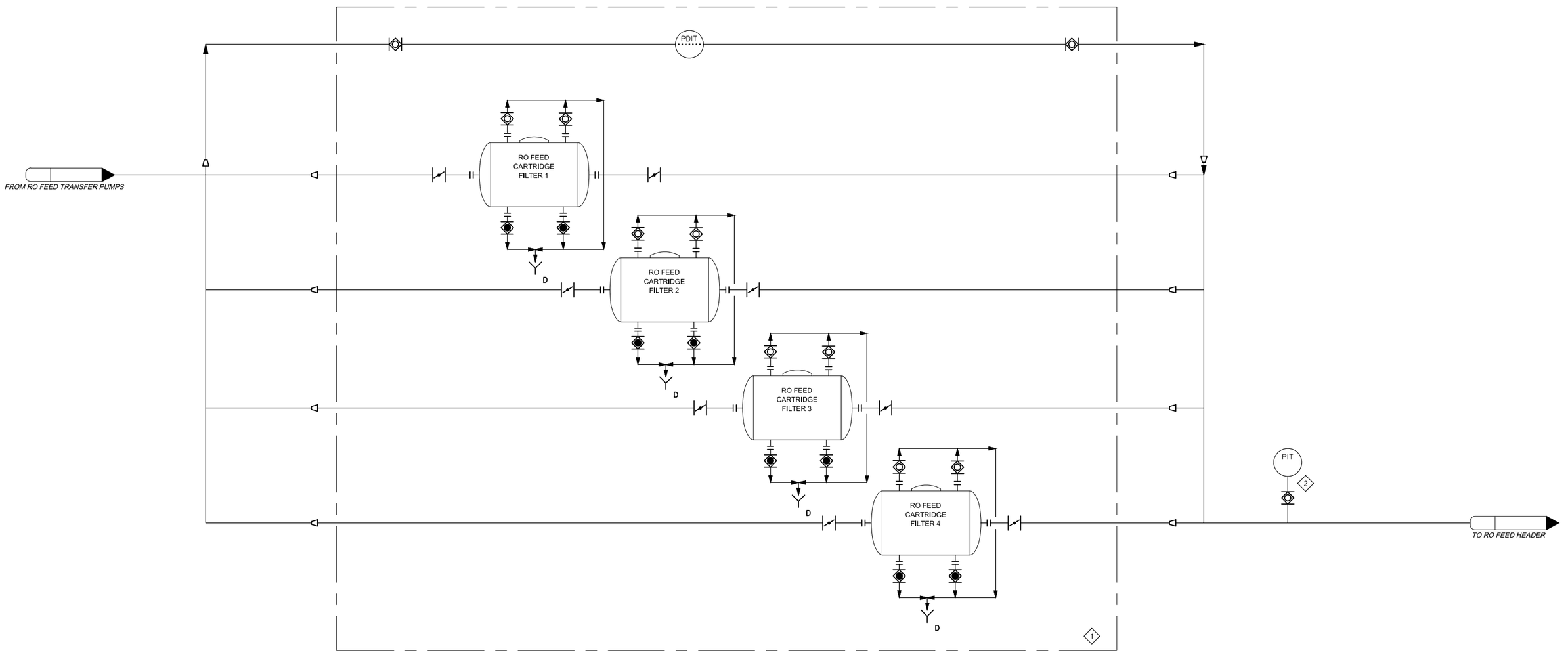
SCADA

RIO-1
RO PLC

MCC

KEYNOTES:

1. EQUIPMENT WITHIN DOTTED LINE INCLUDED IN ROMS SCOPE
2. PIT INCLUDED IN ROMS SCOPE



REV	DATE	BY	DESCRIPTION

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INSTRUMENTATION

P&ID
RO CARTRIDGE FILTERS

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JOB NO. 203580-60000
DRAWING NO. 41N03
SHEET NO. 27 OF 30

LAST SAVED BY:

PROJECT NO.

FILE NAME:

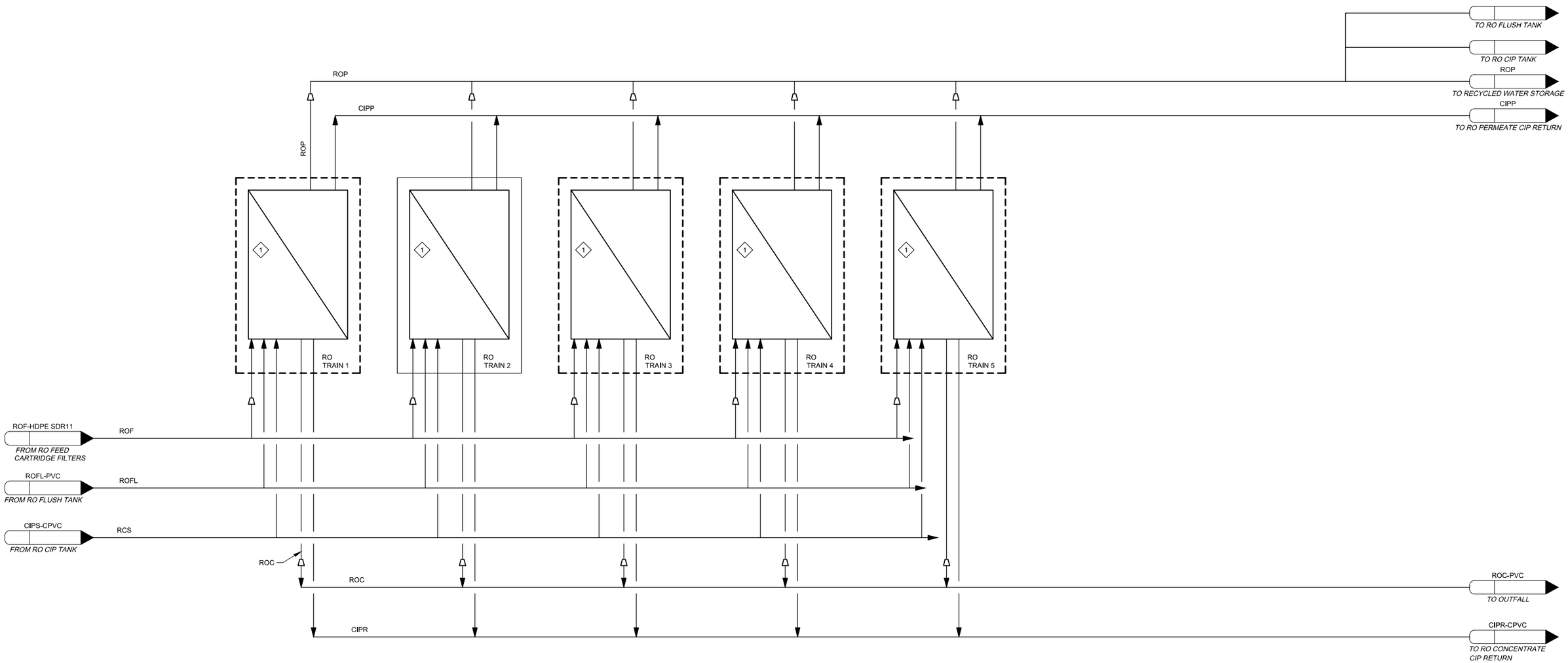
SCADA

RIO-1
RO PLC

MCC

KEYNOTES:

1. EACH RO TRAIN CONSISTS OF TWO SEPARATE STAGES REPRESENTED WITHIN THIS AREA. DETAILS OF THE RO TRAIN STAGES ARE DESCRIBED IN THE BODR.



REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. FONTAINE
DRAWN A. CHARDE
CHECKED E. STEINLE-DARLING
DATE JUNE 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - REUSE FACILITY

INSTRUMENTATION

P&ID
RO SYSTEM

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 41N04
SHEET NO. 24 OF 30

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA

RIO-1
RO PLC

MCC

RO CIP TANK TEMPERATURE — TIT
RO CIP TANK HEATER ON — YS
RO CIP TANK HEATER ALARM — YA
RO CIP PERMEATE VALVE IN REMOTE — HS
RO CIP TANK TEMPERATURE — ZSO
RO CIP PERMEATE VALVE CLOSE — ZSC
RO CIP TANK PERMEATE VALVE POSITION — ZI
RO CIP TANK PERMEATE VALVE POSITION COMMAND — ZC
RO CIP TANK LEVEL — LIT
RO CIP PUMP 1 SPEED — SI
RO CIP PUMP 1 SPEED COMMAND — SC
RO CIP PUMP 1 RUNNING — YS
RO CIP PUMP 1 RUN COMMAND — HC
RO CIP PUMP 1 IN REMOTE — HS
RO CIP PUMP 1 VFD FAULT — YA
RO CIP PUMP 1 HIGH TEMP ALARM — TAH
RO CIP PUMP 1 HIGH PRESSURE ALARM — PAH
RO CIP PUMP 1 LOW FLOW ALARM — LAL
IO TYPICAL OF RO CIP PUMP 1
RO CIP FLOW — LIT

PSV
-SA — SULFURIC ACID
-SH — SODIUM HYDROXIDE
-CA — CITRIC ACID
CIPC-CPVC — CIP CONCENTRATE RETURN
CIPC-PVC — CIP PERMEATE RETURN
ROP-PVC — FROM RO PERMEATE
CV
M
480V
RO-CIR-HEATER CONTROL PANEL
8"-OF-CPVC
TIT
HTR
130 KW
HTR
130 KW
RO CIP TANK
RCS-CPVS
-OF — TO WASTE
CIPS-CPVS
LIT
PI
TSH
FSL
PSH
PI
RO CIP PUMP 1
30 HP
8"-RCS-CPVC
CLEANING CHEMICALS FROM DRUM
ES
LIT
FE
PDI
RO CIP CARTRIDGE FILTER
CIPS-CPVS — TO RO TRAINS

REV	DATE	BY	DESCRIPTION

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OOWWTP EXPANSION PROGRAM - REUSE FACILITY
INSTRUMENTATION
P&ID
CIP SYSTEM

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JOB NO. 203580-60000
DRAWING NO. 41N05
SHEET NO. 29 OF 30

LAST SAVED BY:
PROJECT NO.
FILE NAME:

SCADA

RO FLUSH PERMEATE VALVE IN REMOTE — HS
RO FLUSH PERMEATE VALVE OPENED — ZSO
RO FLUSH PERMEATE VALVE CLOSED — ZSC
RO FLUSH PERMEATE VALVE POSITION — ZI
RO FLUSH PERMEATE VALVE POSITION COMMAND — ZC
RO FLUSH PERMEATE VALVE IN REMOTE — LIT
RO FLUSH PUMP 1 SPEED — SI
RO FLUSH PUMP 1 SPEED COMMAND — SC
RO FLUSH PUMP 1 RUNNING — YS
RO FLUSH PUMP 1 RUN COMMAND — HC
RO FLUSH PUMP 1 IN REMOTE — HS
RO FLUSH PUMP 1 VFD FAULT — YA
RO FLUSH PUMP 1 HIGH PUMP ALARM — TAH
RO FLUSH PUMP 1 HIGH PRESSURE ALARM — PAH
RO FLUSH PUMP 1 LOW FLOW ALARM — LAL
IO TYPICAL OF RO FLUSH PUMP 1
RO FLUSH PUMP DISCHARGE PRESSURE — LIT

RIO-1 RO PLC

MCC

ROP-PVC
A 41N04
FROM RO PERMEATE

4"-ROP-PVC

CV
M 3

D

RO FLUSH TANK 2

OF-PVC

D-PVC

OF
TO WASTE

CV 1

PI

TSH
M

FSL

PSH

PI

ROFL-PVC

1 1/2" x 3"

ΔT

RO FLUSH PUMP 1
15 HP

CKV

ROFL-PVC

M

CV

D

ROFL-PVC
A 41N04
TO RO TRAINS STAGE 1

TSH
M

FSL

PSH

PI

CKV

ROFL-PVC

1 1/2" x 3"

ΔT

RO FLUSH PUMP 2
15 HP

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OOWWTP EXPANSION PROGRAM - REUSE FACILITY

INSTRUMENTATION

P&ID
RO FLUSH SYSTEM

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 41N06
SHEET NO. 30 OF 30

LAST SAVED BY:

PROJECT NO.

FILE NAME:

APPENDIX K

RECYCLED WATER PUMP STATION AND FORCEMAIN DRAFT 25 PERCENT DESIGN DRAWINGS

Onondaga County Department of WATER ENVIRONMENT PROTECTION

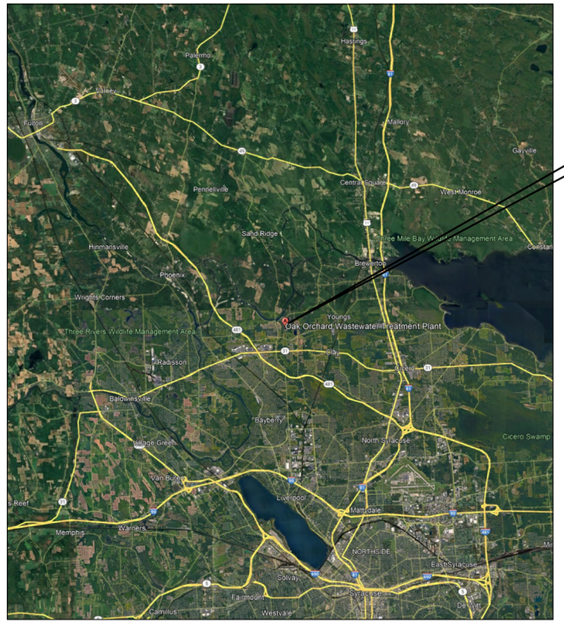
ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

25% DESIGN SUBMITTAL

JUNE 2025

VOLUME 3 OF 4



VICINITY MAP



LOCATION MAP

REV	DATE	BY	DESCRIPTION
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DESIGNED J. DAVIDSON
DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

GENERAL

COVER SHEET

VERIFY SCALES
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00G01
SHEET NO. 1 OF 32

LAST SAVED BY:

PROJECT NO.

FILE NAME:

DRAWING NO.	DRAWING TITLE
GENERAL	
00G01	COVER SHEET
00G02	DRAWING INDEX
00G03	NOTES, LEGEND, AND SYMBOLS
00G04	ABBREVIATIONS
00G05	SITE PLAN DEMO
00G06	SITE PLAN
00G07	RECYCLED WATER PUMP STATION - HYDRAULIC PROFILE
00G08	PROCESS FLOW DIAGRAM
ARCHITECTURAL	
45A02	RECYCLED WATER PUMP STATION - PLAN AT EL. 392.50'
45A03	RECYCLED WATER PUMP STATION - ELEVATIONS
CIVIL	
45C01	YARD PIPING
STRUCTURAL	
45S01	RECYCLED WATER PUMP STATION - OVERALL
45S02	RECYCLED WATER PUMP STATION - PLAN AT EL. 392.50'
45S03	RECYCLED WATER PUMP STATION - SECTION
PROCESS MECHANICAL	
00GM01	GENERAL LEGEND AND SYMBOLS
45M01	RECYCLED WATER PUMP STATION - PLAN AT EL. 392.50'
45M02	RECYCLED WATER PUMP STATION - SECTIONS
45M03	RECYCLED WATER STORAGE STANDPIPE - PLAN AND SECTIONS
45M04	RECYCLED WATER STORAGE STANDPIPE TANK - SECTIONS
90M01	BRIDGING PROJECT MMBR TANKS - PLAN
90M02	BRIDGING PROJECT MMBR TANKS - TYPICAL SECTIONS
ELECTRICAL	
00GE01	GENERAL LEGEND AND SYMBOLS
00GE02	ABBREVIATIONS
45E01	RECYCLED WATER PUMP STATION ONE - LINE DIAGRAM
INSTRUMENTATION	
00N01	SYMBOLS AND ABBREVIATIONS 1
00N02	SYMBOLS AND ABBREVIATIONS 2
00N03	SYMBOLS AND ABBREVIATIONS 3
00N04	SYMBOLS AND ABBREVIATIONS 4
00N05	SCHEMATIC SYMBOLS
00N06	EQUIPMENT TAGGING
45N01	P&ID STORAGE TANK (TYP)
45N02	P&ID RECYCLED WATER PUMP STATION

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - REUSE FACILITY
GENERAL
DRAWING INDEX

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JOB NO. 203580-60000
DRAWING NO. 00G02
SHEET NO. 2 OF 32

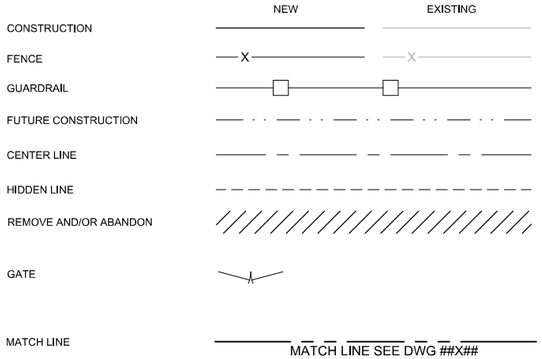
LAST SAVED BY:
PROJECT NO.
FILE NAME:

GENERAL NOTES

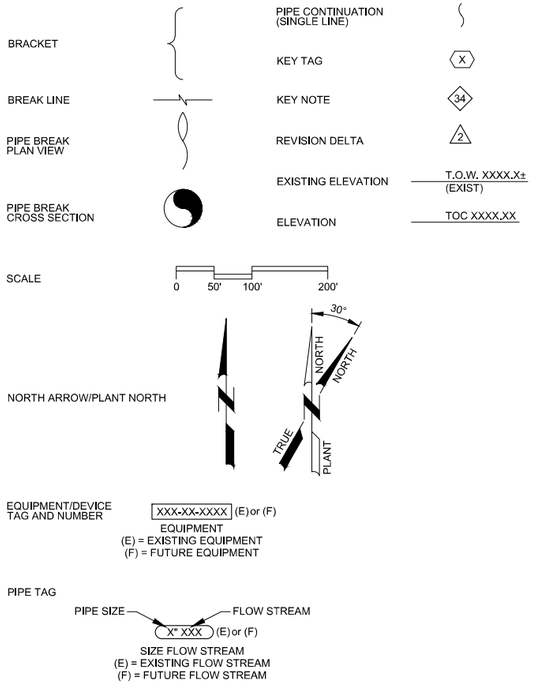
1. FOLLOWING NOTES ARE GENERAL AND APPLY TO ALL SHEETS OF THESE CONTRACT DOCUMENTS AS IF THEY WERE WRITTEN IN THEIR ENTIRETY ON EACH SHEET.
2. THIS SUBMITTAL IS INTENDED AS A REPRESENTATIVE DESIGN ONLY. VERIFICATION OF DESIGN IS THE REPONSIBILITY OF THE FINAL DESIGN CONSULTANT.
3. CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK AND SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING ALL EXISTING CONDITIONS INCLUDING LOCATION AND DIMENSIONS OF ALL EXISTING CONSTRUCTION AND UTILITIES. CONTRACTOR SHALL NOTIFY ENGINEER IF THERE IS A CONFLICT BETWEEN THE CONTRACT DOCUMENTS AND EXISTING CONSTRUCTION BEFORE PROCEEDING WITH WORK.
4. UNLESS DETAILED, SPECIFIED, OR OTHERWISE INDICATED ON THE DRAWINGS, CONSTRUCTION SHALL BE AS INDICATED IN THE APPLICABLE TYPICAL DETAILS AND GENERAL NOTES. TYPICAL DETAILS SHALL APPLY EVEN THOUGH NOT REFERENCED AT SPECIFIC LOCATIONS ON DRAWINGS.
5. WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF WORK. DETAILS SHALL BE IN THE SAME AS FOR OTHER SIMILAR WORK.
6. CONTRACTOR SHALL COMPLY WITH LOCAL CONSTRUCTION STORM WATER DISCHARGE REGULATIONS AND REQUIREMENTS.
7. PRIOR TO EXCAVATION FOR NEW STRUCTURES, ELECTRICAL CONDUIT, FABRICATION OF NEW PIPING AND/OR OTHER PROPOSED UTILITIES, CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING PIPING AND UTILITIES IN THE CONSTRUCTION AREA. THE CONTRACTOR SHALL TEMPORARILY RELOCATE CONFLICTING EXISTING UTILITIES AT TIE-IN/CONNECTION LOCATIONS AND REINSTALL THEM AS REQUIRED TO ELIMINATE THE CONFLICT AT NO ADDITIONAL COST TO THE OWNER.
8. ALL PIPELINES 12" AND LARGER SHALL HAVE A MINIMUM COVER OF 36" UNLESS THE COVER DEPTH IS SPECIFICALLY INDICATED ON THE DRAWINGS. PIPE SMALLER THAN 12" SHALL HAVE A MINIMUM COVER OF 30" UNLESS NOTED OTHERWISE. PIPES SHALL BE ROUTED AS SHOWN UNLESS MINOR REVISIONS ARE NECESSARY TO MISS EXISTING PIPES, STRUCTURES, ETC. CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING ALL FITTINGS AND ADAPTERS REQUIRED TO MAKE THE ROUTING CHANGES AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR SHALL INCLUDE COST FOR THIS IN THE BID.
9. EXISTING FACILITY AND UTILITY INFORMATION SHOWN ON THE DRAWINGS WAS OBTAINED FROM AVAILABLE RECORDS OR ELECTRONIC FILES. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR FACILITIES AND UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS, SIZES, MATERIAL TYPES, AND ELEVATIONS SHOWN AROUND OR NEAR AREAS OF NEW CONSTRUCTION PRIOR TO START OF CONSTRUCTION.
10. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT FROM DAMAGE EXISTING FACILITIES AND UTILITIES SHOWN OR NOT SHOWN THAT ARE TO REMAIN IN PLACE. ALL FACILITIES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED TO THE ORIGINAL OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE WITHOUT ADDITIONAL COMPENSATION.
11. CONTRACTOR SHALL MAKE CONNECTIONS TO EXISTING PIPE, EQUIPMENT, ETC. AS REQUIRED AND SHALL PROVIDE ALL FITTINGS, ADAPTERS, AND APPURTENANCES REQUIRED TO MAKE THE CONNECTIONS. PROVIDE ALL SUPPORTS REQUIRED FOR A RIGIDLY SUPPORTED COMPLETE AND WORKING SYSTEM.
12. ADJUST ALL VALVE BOXES, VAULTS, PULL BOXES, AND MANHOLES TO FINISHED GRADE UNLESS OTHERWISE SHOWN OR DIRECTED. MANHOLES IN OPEN FIELDS SHALL BE SET TWELVE INCHES ABOVE FINISHED GRADE AND VAULTS SHALL BE SIX INCHES ABOVE FINISHED GRADE.
13. THE CONTRACTOR SHALL CONTACT THE PROPER UTILITY REPRESENTATIVE AS FOLLOWS FOR QUESTIONS OR COORDINATION OF CONSTRUCTION RELATED TO EXISTING UTILITIES.

    STATE/REGION/MUNICIPALITY SPECIFIC: 1-800-XXX-XXXX
14. CONTRACTOR SHALL VERIFY THAT PIPING SHOWN TO BE ABANDONED OR AS ABANDONED PREVIOUSLY IS NO LONGER IN SERVICE. LINES IN SERVICE SHALL BE MAINTAINED UNTIL NO LONGER REQUIRED BY THE PLANT.
15. ALL EXISTING PIPES THAT ARE TO BE ABANDONED IN PLACE OR REMOVED MAY NOT BE SHOWN. WHERE PIPING IS TO BE ABANDONED AND MUST REMAIN IN SERVICE UNTIL COMPLETION OF OTHER PHASES OF WORK, AND IT CONFLICTS WITH NEW PIPING, TEMPORARILY RELOCATE PIPING AS REQUIRED TO MAINTAIN SERVICE BY THE PLANT.
16. CONTRACTOR SHALL REROUTE THE EXISTING PIPING IF REQUIRED TO MISS THE PROPOSED STRUCTURES. THE EXISTING PIPE SHALL REMAIN IN SERVICE UNTIL NEW PIPING IS READY TO BE PLACED INTO SERVICE. DOWNTIME SHALL BE A MAXIMUM OF 2 HOURS, UNLESS SPECIFIED OR SHOWN OTHERWISE.
17. ALL SIDEWALKS TO BE 3'-0" WIDE UNLESS SHOWN OTHERWISE.
18. THE CONTRACTOR SHALL TAKE SPECIAL PRECAUTIONS IN THE VICINITY OF ANY OVERHEAD ELECTRIC LINES. CONTRACTOR SHALL ABIDE BY THE NATIONAL ELECTRIC CODE AND ANY REQUIREMENT BY THE OWNER OF THE ELECTRIC LINES.
19. PROVIDE ALL SHEETING/SHORING REQUIRED TO PROTECT EXISTING STRUCTURES, PIPES AND FACILITIES.
20. CONTRACTOR SHALL VERIFY LOCATION OF ALL ARCHITECTURAL, MECHANICAL, AND ELECTRICAL ITEMS BEFORE PLACING ANY STRUCTURAL STEEL OR CONCRETE. ALSO, STRUCTURAL DIMENSIONS AND OPENINGS CONTROLLED BY ARCHITECTURAL, MECHANICAL, OR ELECTRICAL EQUIPMENT SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
21. MECHANICAL AND ELECTRICAL EQUIPMENT SUPPORTS, ANCHORAGES, OPENINGS, RECESSES, AND REVEALS NOT SHOWN ON THE STRUCTURAL DRAWINGS, THAT ARE REQUIRED BY OTHER CONTRACT DRAWINGS, SHALL BE PROVIDED PRIOR TO CASTING CONCRETE.

LINE WORK



SYMBOLS



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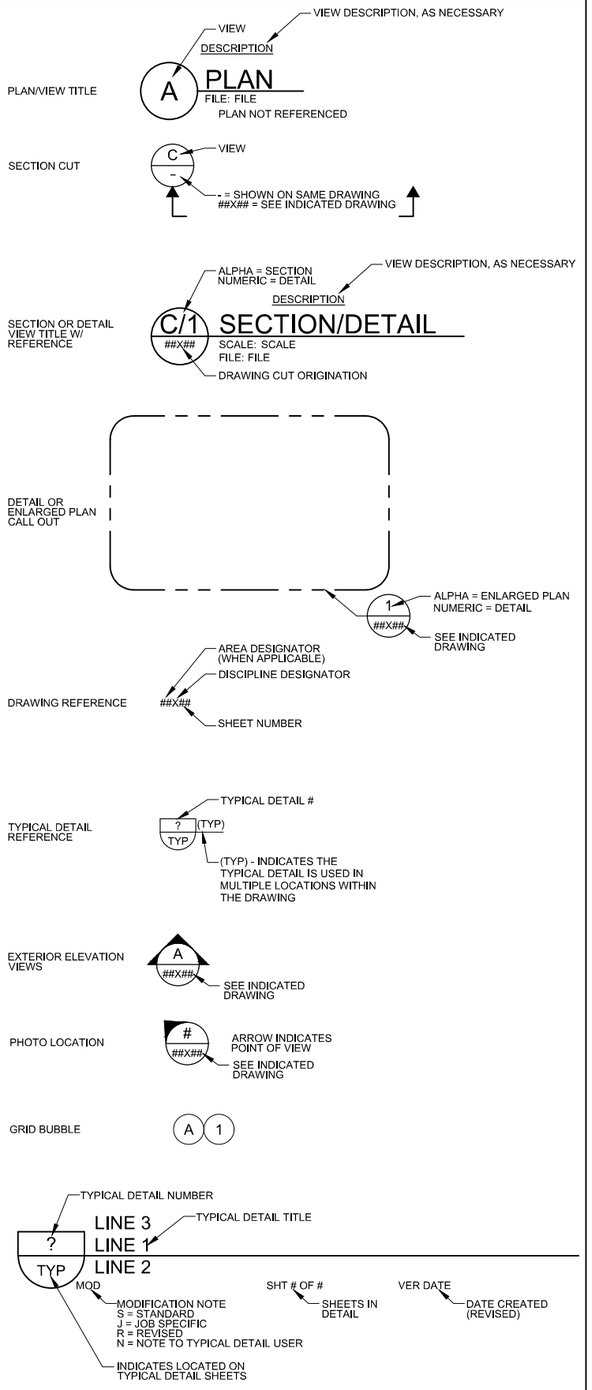
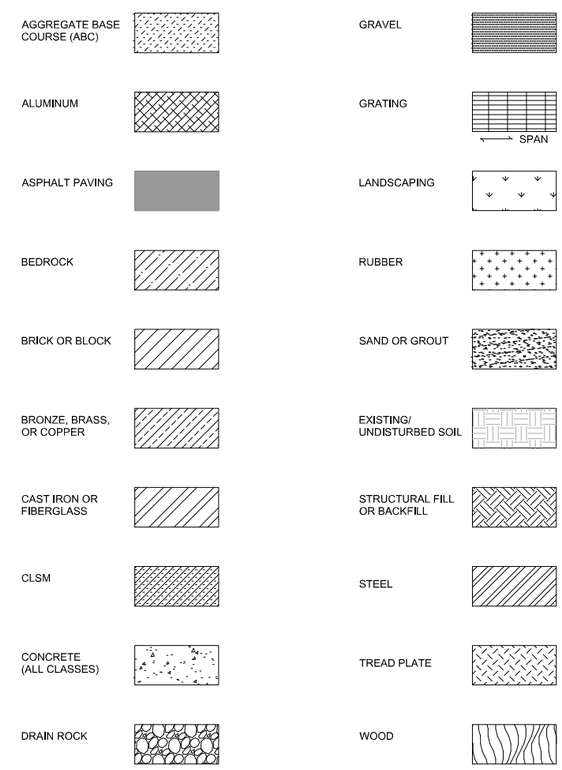
811 or 800-272-4480

DETAIL REFERENCES



HATCH PATTERNS



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DRAWN A. CHARDE
CHECKED S. DAVIS
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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
GENERAL
NOTES, LEGEND, AND SYMBOLS

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JOB NO. 203580-60000
DRAWING NO. 00G03
SHEET NO. 3 OF 32

LAST SAVED BY:
PROJECT NO.
FILE NAME:

@	AT (MEASUREMENT)	
△	DEFLECTION ANGLE, CENTRAL ANGLE	
#	NUMBER (REBAR Ø)	
A		
AB	ANCHOR BOLT	
ABC	AGGREGATE BASE COURSE	
ABS	ACRYLONITRILE BUTADIENE STYRENE	
AC	ASPHALTIC CONCRETE	
ACB	AIR CIRCUIT BREAKER	
ACI	AMERICAN CONCRETE INSTITUTE	
ACP	ASBESTOS CEMENT PIPE	
ACU	AIR CONDITIONING UNIT	
AD	AREA DRAIN	
ADDL	ADDITIONAL	
ADJ	ADJACENT, ADJUST, ADJUSTABLE	
ADMIN	ADMINISTRATION	
ADR	ACCESS DOOR	
AED	AREA EQUIPMENT DRAIN	
AER	AERAT(ION)(OR)	
AFC	AFTERCOOLER	
AFF	ABOVE FINISHED FLOOR	
AFM	AIR FLOW MONITOR	
AHU	AIR HANDLING UNIT	
AIC	AIR COMPRESSOR	
AIL	AIR INTAKE LOUVER	
ALT	ALTERNATE	
AL	ALUMINUM	
ANCH	ANCHOR	
ANV	ANGLE VALVE	
APPROX	APPROXIMATE, APPROXIMATELY	
ARCH	ARCHITECTURAL	
ARV	AIR RELEASE VALVE	
ASSY	ASSEMBLY	
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	
AV	ACID VENT	
AVG	AVERAGE	
AVV	AIR AND VACUUM VALVE	
AW	ACID WASTE	
B		
BC	BEGIN CURVE, BRASS CAP, BACK OF CURB, BOLT CIRCLE	
BCKR	BACKER BOARD	
BCM	BATCHMETER	
BD	BOARD	
BDD	BACKDRAFT DAMPER	
BDR	BASIN DRAIN LINE	
BF	BLIND FLANGE	
BFG	BELOW FINISHED GRADE	
BFP	BELT FILTER PRESS	
BFV	BUTTERFLY VALVE	
BG	BREAK GLASS HAND SWITCH	
BKW	BACKWASH	
BLDG	BUILDING	
BLK	BLOCK	
BLKHD	BULKHEAD	
BLR	PROCESS BLOWER	
BM	BEAM, BENCH MARK	
BO	BOTTOM OF	
BOTT	BOTTOM	
BOTTS	BOTTOM SLUDGE	
BPV	BACK PRESSURE VALVE	
BRG	BEARING	
BSP	BLACK STEEL PIPE	
BTU	BRITISH THERMAL UNITS	
BTWN	BETWEEN	
BV	BALL VALVE	
BWCCP	BAR-WRAPPED CONCRETE CYLINDER PIPE	
C		
C	CLOSE, CONDUIT CHANNEL (STRUCTURAL)	
CA	CONCRETE ANCHOR	
CAUSTIC	CAUSTIC SOLUTION (CONCENTRATED OR DILUTE)	
CB	CATCH BASIN	
CC	CENTER OF CURVATURE, CENTER TO CENTER	
CCB	CHLORINE CONTACT BASIN	
CD	CEILING DIFFUSER, CONDENSATE DRAIN	
CDL	CHEMICAL DRAIN LINE	
CDT	CONDUIT	
CEF	CEILING EXHAUST FAN	
CF	CUBIC FEET	
CFM	CUBIC FEET PER MINUTE	
CFS	CUBIC FEET PER SECOND	
CHEMD	CHEMICAL DRAIN	
CHF	CHEMICAL FEEDER	
CHKD PL	CHECKERED PLATE	
CI	CAST IRON	
CIP	CAST IRON PIPE	
CIRC	CIRCUMFERENTIAL/CIRCUMFERENCE	
CJ	CONSTRUCTION JOINT	
CKA	CHECK VALVE, ANGLE	
CKB	CHECK VALVE, BALL	
CKF	CHECK VALVE, FLAP	
CKS	CHECK VALVE, SWING	
CL	CENTER LINE	
CLK	CHAIN LINK	
CLD	CHLORINE LEAK DETECTOR	
CLL	CHLORINE LIQUID	
CLP	CHLORINE GAS (PRESSURE)	
CLR	CLEAR	
CLS	CHLORINE SOLUTION	
CLSM	CONTROLLED LOW STRENGTH MATERIAL	
CLV	CHLORINE GAS (VACUUM)	
CML	CEMENT MORTAR LINED	
CMLC	CEMENT MORTAR LINED AND COATED	
CMP	CORRUGATED METAL PIPE	
CMU	CONCRETE MASONRY UNIT	
CNV	CONVEYOR	
CO	CLEANOUT	
COL(S)	COLUMN(S)	
CONC	CONCRETE	
CONN	CONNECT, CONNECTION	
CONST	CONSTRUCTION	
CONT	CONTINUOUS OR CONTINUATION OR (D) (OUS)	
CORR	CORRUGATE(D), CORROSION	
CP	CONTROL POINT	
CPLG	COUPLING	
CPT	CARPET	
CPVC	CHLORINATED POLYVINYL CHLORIDE	
CS	CARBON STEEL, CIRCULATING SLUDGE	
CSP	CHEMICAL SUMP PUMP, CORRUGATED STEEL PIPE	
CT	CURRENT TRANSFORMER, CERAMIC TILE	
CTJ	CONTROL JOINT	
CTL	CONTROL	
CTR	CENTER, CENTERED	
CTSK	COUNTERSUNK	
CU	CUBIC	
CUP	COPPER PIPE	
CV	CHECK VALVE	
CW	COLD WATER	
CWV	COMBINATION WASTE AND VENT	
CY	CUBIC YARD	
D		
D	DEPTH, DIGITAL OR DISCRETE, DRAIN	
D/W	DRIVEWAY	
DBL	DOUBLE	
DDR	DESICCANT DRYER	
DEG or °	DEGREE	
DEMO	DEMOLISH, DEMOLITION	
DET	DETAIL	
DFL	DECANT/FILTRATE	
DG	DOOR GRILLE	
DIA or Ø	DIAMETER	
DIAG	DIAGONAL	
DIF	DIFFUSER	
DIG	DIGESTER	
DIM	DIMENSION	
DIP	DUCTILE IRON PIPE	
DISCH	DISCHARGE	
DIW	DEIONIZED WATER	
DL	DEAD LOAD, DRAIN LINE	
DLV	DOOR LOUVER	
DMP	DAMPER	
DMS	DIAPHRAGM SEAL	
DN	DOWN	
do	DITTO	
DO	DOOR OPENING	
DP	DEEP (OR DEPTH)	
DPV	DIAPHRAGM VALVE	
DR	DOOR, DRAIN	
DRCY	DENITRIFIED RECYCLE	
DRT	DRIP TRAP	
DRV	DRAIN VALVE	
DS	DIGESTED SLUDGE, DOWN SPOUT	
DSW	DISTILLED WATER, DOOR SWITCH	
DUC	DUST COLLECTOR	
DUH	DUCT HEATER UNIT	
DW	DISTILLED WATER	
DWD	DEWATERING DRAIN	
DWG(S)	DRAWING(S)	
DWL(S)	DOWEL(S)	
E		
E	EAST	
EA	EACH	
EC	END OF CURVE	
ECC RED	ECCENTRIC REDUCER	
ECU	EVAPORATOR COOLING UNIT	
ED	EQUIPMENT DRAIN	
EF	EXHAUST FAN, EACH FACE	
EFF	EFFLUENT	
EG	EXHAUST GRILLE	
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM	
EJ	EXPANSION JOINT	
EJR	INJECTOR/EDUCTOR	
EL	ELEVATION	
ELEC	ELECTRICAL	
ELL	ELBOW	
EMBED	EMBEDMENT	
EMH	ELECTRICAL MANHOLE	
EP	EDGE OF PAVEMENT	
EPS	EXPANDED POLYSTYRENE	
EPV	ECCENTRIC PLUG VALVE	
EQ	EQUAL	
EQUIP	EQUIPMENT	
ER	EXHAUST REGISTER	
ES	EACH SIDE	
ESEW	EMERGENCY SHOWER AND EYE WASH	
ESMT	EASEMENT	
ESS	EMERGENCY HAND SWITCH	
ET	ELECTRICALLY HEAT TRACED	
EUH	ELECTRIC UNIT HEATER	
EVR	EVAPORATOR	
EW	EACH WAY	
EWC	ELECTRIC WATER COOLER	
EWEF	EACH WAY EACH FACE	
EWH	ELECTRIC WATER HEATER, EXHAUST	
EX	EXISTING	
EXIST	EXISTING	
EXP	EXPANSION, EXPANSION TANK	
EXPO	EXPOSED	
EXT	EXTERIOR	
F		
FACT	FACTORY	
FAD	FOUL AIR DUCT	
FB	FLAT BAR	
FBW	FILTER BACKWASH	
FC	FACE OF CURB, FLEXIBLE COUPLING	
FCA	FLANGE COUPLING ADAPTER	
FCO	FLOOR CLEANOUT	
FCU	FAN COIL UNIT	
FD	FIRE DAMPER, FLOOR DRAIN, FOUND	
FDC	FIRE DEPARTMENT CONNECTION	
FDL	FLOOR DRAIN LINE	
FDR	FEEDER	
FEFF	FINAL EFFLUENT	
FG	FLAP GATE	
FH	FIRE HYDRANT	
FILT	FILTRATE	
FIN	FINISH	
FIN FL	FINISHED FLOOR	
FIN GR	FINISHED GRADE	
FL	FLOOR, FLOW LINE	
FLA	FOUL AIR	
FLD	FILTER DRAIN	
FLE	FILTER EFFLUENT	
FLEX	FLEXIBLE	
FLG	FLANGE, OR FLANGED	
FLR	FILTER	
FM	FORCE MAIN	
FND	FOUNDATION	
FO	FUEL OIL	
FOB	FLAT ON BOTTOM	
FOT	FLAT ON TOP	
FPM	FEET PER MINUTE	
FPP	FLEXIBLE PLASTIC PIPE	
FRP	FIBERGLASS REINFORCED PLASTIC	
FRPP	FIBERGLASS REINFORCED PLASTIC PIPE	
FRS	FROTH SPRAY	
FS	FAR SIDE	
FSTN	FASTEN(ED)	
FT or '	FOOT, FEET	
FTG	FOOTING	
FUP	FUEL DISPENSER	
FV	FLAP VALVE	
FW	FLUSHING WATER, FINISHED WATER	
FX	FIRE EXTINGUISHER	
FXC	FIRE EXTINGUISHER CABINET	
FXE	FIRE EXTINGUISHER - ELECTRICAL	
G		
G	GAS, GROUND, GUTTER	
GA	GAUGE or GAGE	
GAL	GALLONS	
GALV	GALVANIZE(D)	
GAV	GRAVITY VENTILATOR	
GB	GRADE BREAK	
GBT	GRAVITY BELT THICKENER	
GC	GROOVED COUPLING	
GEL	GRAVITY EXHAUST LOUVER	
GEN	GENERAL, GENERATOR	
GL	GLASS	
GLV	GLOBE VALVE	
GM	GAS METER	
GND	GROUND	
GPD	GALLONS PER DAY	
GPM	GALLONS PER MINUTE	
GR	GRADE	
GRTG	GRATING	
GRV	GRAVITY VENTILATOR	
GSP	GALVANIZED STEEL PIPE	
GV	GATE VALVE	
GYP	GYPSUM	
H		
H	EXPLOSION-PROOF, HIGH, HORIZONTAL	
H1E	HOOK ONE END	
H2E	HOOK TWO ENDS	
HAS	HEADED ANCHOR STUD	
HB	HOSE BIBB	
HDPE	HIGH DENSITY POLYETHYLENE	
HDW	HARDWARE	
HDWL	HEADWALL	
HEF	HOOD EXHAUST FAN	
HGT	HEIGHT	
HORIZ	HORIZONTAL	
HP	HEAT PUMP, HORSEPOWER, HIGH PRESSURE	
HPA	HIGH PRESSURE AIR	
HPT	HIGH POINT	
HPU	HEAT PUMP UNIT AIR	
HR	HANDRAIL, HOSE REEL, HOUR	
HSF	HOOD SUPPLY FAN	
HSS	HOLLOW STRUCTURAL SECTION (STEEL)	
HTX	HEAT EXCHANGER	
HV	HOSE VALVE	
HW	HOT WATER	
HWL	HIGH WATER LEVEL	
HWR	HOT WATER RETURN	
HWS	HOT WATER SUPPLY	
HxW	HEIGHT BY WIDTH	
HYD	HYDRANT	
I		
IA	INSTRUMENT AIR	
ID	INSIDE DIAMETER, INSIDE DIMENSION, IDENTIFICATION	
I.F.	INSIDE FACE	
IN or "	INCHES	
INCL	INCLUDE, INCLUDING	
INF	INFLUENT	
INJ	INJECTOR	
INSTR	INSTRUMENTATION	
INSUL	INSULATE(ED)(ING)(ION)	
INT	INTERIOR	
INV	INVERT	
IP	IRON PIPE	
ISR	INTRINSICALLY SAFE RELAY	
J		
JST	JOIST	
JT	JOINT	
K		
KGV	KNIFE GATE VALVE	
L		
L	ANGLE (STRUCTURAL), LENGTH, LOUVER	
LAB	LABORATORY	
LAV	LAVATORY	
LB(S)	POUND(S)	
LDF	LIQUID DIESEL FUEL	
LDFR	LIQUID DIESEL FUEL RETURN	
LF	LINEAL FEET	
LG	LONG	
LH	LEFT HAND	
LHR	LEFT HAND REVERSE	
LHRA	LEFT HAND REVERSE ACTIVE	
LHRB	LEFT HAND REVERSE BEVEL	
LL	LIVE LOAD	
LLH	LONG LEG HORIZONTAL	
LLV	LONG LEG VERTICAL	
LP	LOW PRESSURE	
LPA	LOW PRESSURE AIR	
LPG	LIQUIFIED PROPANE GAS	
LPT	LOW POINT	
LR	LONG RADIUS	
LS	LAB SINK	
LT	LEFT	
LWL	LOW WATER LEVEL	
M		
M	MOTOR	
MAINT	MAINTENANCE	
MAN	MANUAL	
MASY	MASONRY	
MATL	MATERIAL	
MAU	MAKE-UP AIR UNIT	
MAX	MAXIMUM	
MB	MACHINE BOLT	
MC	MECHANICAL COUPLING	
MCJ	MASONRY CONTROL JOINT	
MD	MOTORIZED DAMPER	
MECH	MECHANICAL	
MET	METAL	
MFR	MANUFACTURER	
MG/L	MILLIGRAMS PER LITER	
MGD	MILLION GALLONS PER DAY	
MH	MANHOLE	
MIN	MINIMUM	
MISC	MISCELLANEOUS	
MIX	MIXER	
MJ	MECHANICAL JOINT	
MK	MARK	
ML	MIXED LIQUOR	
MO	MASONRY OPENING	
MOD	MODIFIED	
MOIST	MOISTURE	
MON	MONUMENT	
MOS	MOISTURE SEPARATOR	
MPM	METERING PUMP	
MS	MOP SINK	
MTD	MOUNTED	
N		
N	NORTH, NEUTRAL	
NA	NOT APPLICABLE	
NC	NORMALLY CLOSED	
NEV	VALVE, NEEDLE	
NG	NATURAL GRADE, NATURAL OR LP GAS	
NIC	NOT IN CONTRACT	
NO., #	NUMBER	
NOM	NOMINAL	
NPT	NATIONAL PIPE THREAD	
NPW	NON-POTABLE WATER	
NRCY	NITRIFIED RECYCLE	
NS	NEAR SIDE	
NTS	NOT TO SCALE	
O		
O	OPEN	
OBD	OPPOSED BLADE DAMPER	
OC	ON CENTER	
OD	OUTSIDE DIAMETER, OUTSIDE DIMENSION	
OED	OPEN EQUIPMENT DRAIN	
O.F.	OUTSIDE FACE	
OFL	OVERFLOW	
OPNG	OPENING	
OPP	OPPOSITE	
OPP HND	OPPOSITE HAND	
OZ	OUNCE	
P		
P	POLE	
PBL	POLYMER BLENDER	
PC	POINT OF CURVATURE	
PCC	PLANT CONTROL CENTER	
PCCP	PRESTRESSED CONCRETE CYLINDER PIPE	
PCE	PRIMARY CLARIFIED EFFLUENT	
PCP	PROGRESSIVE CAVITY PUMP	
PD	POSITIVE DISPLACEMENT, PLANT DRAIN	
PD, PLD	PULSATION DAMPENER	
PDP	POSITIVE DISPLACEMENT PUMP	
PE	PLAIN END	
PERP	PERPENDICULAR	
PG	PRESSURE GAUGE	
PH	PHASE, PHYSICALLY HANDICAPPED	
PI	POINT OF INTERSECTION	
PIV	POST INDICATOR VALVE	
PL	PLATE, PROPERTY LINE	
PLAS	PLASTIC	
PLCS	PLACES	
PLS	POLYMER SOLUTION	
PLWD	PLYWOOD	
PMP	PUMP	
PNL(S)	PANEL(S)	
POL	POLYMER	
POLY	POLYETHYLENE	
POS	POSITION	
POW	POTABLE WATER	
PP	POWER POLE	
PPMV	PARTS PER MILLION (VOLUME)	
PRC	POINT OF REVERSE CURVATURE	
PREFAB	PREFABRICATED	
PRG	PRESSURE REGULATOR	
PRI	PRIMARY	
PROJ	PROJECTION	
PRR	PRESSURE OR VACUUM RELIEF VALVE	
PRV	PRESSURE REDUCING VALVE, PRESSURE REGULATION VALVE, PRESSURE RELIEF VALVE	
PS	PUMP STATION, PIPE SUPPORT	
PSF	POUNDS PER SQUARE FOOT	
PSG	PRESSURE GAUGE	
PSI	POUNDS PER SQUARE INCH	
PSIG	POUNDS PER SQUARE INCH GAUGE	
PT	POINT, POINT OF TANGENCY	
PV	PLUG VALVE	
PVC	POINT OF VERTICAL CURVATURE, POLYVINYL CHLORIDE	
PVDF	POLYVINYLIDENE FLUORIDE	
PVI	POINT OF VERTICAL INTERSECTION	
PVMT	PAVEMENT	
PVT	POINT OF VERTICAL TANGENCY	
PLW	PLANT WATER	
Q		
QTY	QUANTITY	
R		
R	RISER	
R/W or R.O.W.	RIGHT OF WAY	
RAD	RADIUS, RADIAL	
RAS	RETURN ACTIVATED SLUDGE	
RCP	REINFORCED CONCRETE PIPE	
RCCP	REINFORCED CONCRETE CYLINDER PIPE	
RD	ROOF DRAIN	
RDL	ROOF DRAIN LINE	
RDOF	ROOF DRAIN OVERFLOW	
RECIRC	RECIRCULATING	
RED	REDUCER, ROOF EQUIPMENT DRAIN	
REF	REFERENCE	
REG	REGULATOR, REGULATING	
REINF	REINFORCE(D)(ING)(MENT)	
REJ	RUBBER EXPANSION JOINT	
REQD	REQUIRED	
RER	REACTOR	
RES	RESERVOIR	
REV	REVISION, REVERSE	
RF	RETURN FAN	
RG	RETURN GRILLE RUBBER GASKET	
RH	RIGHT HAND	
RHR	RIGHT HAND REVERSE	
RHRA	RIGHT HAND REVERSE ACTIVE	
RHRB	RIGHT HAND REVERSE BEVEL	
RLS	REGISTERED LAND SURVEYOR	
RM	ROOM	
RO	ROUGH OPENING	
ROT	ROTAMETER	
RP	RADIUS POINT	
RPM	REVOLUTIONS PER MINUTE	
RPMP	REINFORCED PLASTIC MORTAR PIPE	
RR	RETURN REGISTER	
RT	RIGHT	
RTF	ROTARY FEEDER	
RTU	ROOF TOP UNIT	
RUD	RUPTURE DISK	
RW	RECLAIMED WATER, REUSE WATER	
RWR	RECLAIMED WATER RETURN	
RWW	RAW WASTEWATER	
S		
S/W	SIDEWALK	
S	SOUTH, SWITCH, SLOPE	
SA	SAMPLE	
SC	SECONDARY CLARIFIER	
SCB	SCRUBBER	
SCD	SMOKE CONTROL DAMPER	
SCFM	STANDARD CUBIC FEET PER MINUTE	
SCH	SCHEDULE	
SCO	SURFACE CLEANOUT	
SCR	BAR SCREEN	
SCR	SILICON CONTROL RECTIFIER	
SD	SMOKE DETECTOR, SPLITTER DAMPER, STORM DRAIN	
SDL	SUMP DISCHARGE DRAIN LINE	
SDO	SLUDGE DRAWOFF	
SE	SECONDARY EFFLUENT	
SEC	SECONDARY, SECOND	
SECT	SECTION	
SED	SEDIMENTATION	
SEP	SEPTAGE	
SF	SUPPLY FAN	
SFW	SOFTENED WATER	
SG	SUPPLY GRILLE	
SGS	STORE FRONT GLAZING SYSTEM	
SHD	SHOWER DRAIN	
SHDR	SOLIDS HANDLING-RECYCLE	
SHR	SHOWER	
SHT	SHEET	
SIM	SIMILAR	
SK	SKIMMINGS	
SL	SLOPE, SLUDGE	
SLC	SLUDGE COLLECTOR DRIVE	
SLG	SLIDE GATE	
SLV	SLEEVE VALVE	
SMP	SAMPLER, SUMP PUMP	
SN	SUPERNATANT OR SUBNATANT	
SOL	SOLUTION	
SP	STATIC PRESSURE, SET POINT	
SPD	SUMP PUMP DRAIN	
SPDT	SINGLE POLE DOUBLE THROW	
SPEC(S)	SPECIFICATION(S)	
SPL	SPLITTER BOX	
SPR	SPARE	
SPS	SAMPLE SINK	
SPW	SAMPLE WATER	
SQ	SQUARE	
SQ FT	SQUARE FEET	
SQ IN(S)	SQUARE INCH(ES)	
SR	SHORT RADIUS, SUPPLY REGISTER	
SRL	SCRUBBER RECIRCULATION LIQUID (CAUSTIC)	
SS	SANITARY SEWER, SELECTOR SWITCH	
SSK	SERVICE SINK	
SSL	SECONDARY SLUDGE	
SST	STAINLESS STEEL	
ST	SLUDGE TRANSFER	
STA	STATION	
STB	STABILIZER	
STD(S)	STANDARDS(S)	
STIFF	STIFFENER	
STIR	STIRRUPS	
STL	STEEL	
STM	STEAM	
STP	STEEL PIPE	
STR	STRAINER	
STRUCT	STRUCTURAL	
SUG	SLUICE GATE	
SUPT	PIPE SUPPORT, SUPPORT	
SV	SERVICE VALVE, SHUTOFF VALVE, SOLENOID VALVE	
SW	SANITARY WASTE	
SWR	SEAL WATER	
SYM	SYMMETRICAL	
SYN	SYNTHETIC	
T		
T	TANGENT LENGTH, THERMOSTAT, TIMER, TREAD	
T&B	TOP AND BOTTOM	
TAS	THREADED ANCHOR STUD	
TBM	TEMPORARY BENCHMARK	
TC	TOP OF CURB	
TCV	TEMPERATURE CONTROL VALVE	
TDH	TOTAL DYNAMIC HEAD	
TDR	TIME DELAY RELAY, TOWEL DISPENSER/RECEPTACLE	
TEL	TELEPHONE	
TH	TEST HOLE	
THK	THICKENER, THICKNESS, THICK	
TKS	THICKENED SLUDGE	
TLV	TELESCOPING VALVE	
TMH	TELEPHONE MANHOLE	
TMP	TEMPERATURE	
TNK	TANK	
T.O.	TOP OF	
TOC	TOP OF CONCRETE	
TOG	TOP OF GRATING	
TOM	TOP OF MASONRY	
TOS	TOP OF STEEL	
T.O.W.	TOP OF WALL	
TR	TRIAD (THREE CONDUCTOR SHIELDED CABLE), TIMING RELAY	
TS	THICKENER SUPERNATANT OR SUBNATANT	
TSD	THICKENED SLUDGE DECANT	
TSPL	TURBIDIMETER SAMPLE	
TSTAT	THERMOSTAT	
TTB	TELEPHONE TERMINAL BOARD	
TUR	TURBINE	
TV	TURNING VANES	
TWV	THREE-WAY VALVE	
TYP	TYPICAL	
U		
UC	UNDERCUT	
UG	UNDERGROUND	
UHMWPE	ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE	
UHMW	ULTRA HIGH MOLECULAR WEIGHT	
UNO	UNLESS NOTED OTHERWISE	
US	UTILITY SINK	
V		
V	VALVE	
VAR	VARIES	
VB	VALVE BOX	
VCP	VITRIFIED CLAY PIPE	
VEC	VINYL ESTER COATING	
VERT	VERTICAL	
VFR	VOLUMETRIC FEEDER	
VG	VACUUM GAUGE, VALLEY GUTTER	
VOL	VOLUME	
VRV	VACUUM REGULATING VALVE	
VTR	VENT THROUGH ROOF	
W		
W	WEST, WIDTH	
W/	WITH	
W/O	WITHOUT	
WAS	WASTE ACTIVATED SLUDGE	
WCO	WALL CLEANOUT	
WEF	WALL EXHAUST FAN	
WF	WALL FITTING, WASH FOUNTAIN	
WH	WATER HEATER	
WI	WEIGHT INDICATOR	
WL	WALL LOUVER, WATER LEVEL	
WM	WATER METER	
WOD	WASTE OIL DRAIN	
WP	WEATHERPROOF, WATERPROOF	
WPT	WORKING POINT	
WRG	WEIR GATE	
WRS	WATER SOFTENER	
WS	WATER SURFACE	
WSTP	WATERSTOP	
WT	WALK THROUGH, WEIGHT	
WTF	WATER TREATMENT FACILITY	
WTP	WATER TREATMENT PLANT	
WTR	WATER	
WV	WATER CONTROL VALVE	
WW	WASTEWATER	
WWF	WELDED WIRE FABRIC	
WWTF	WASTEWATER TREATMENT FACILITY	
WWTP	WASTEWATER TREATMENT PLANT	
Y		
Y	WYE	
YCO	YARD CLEANOUT	
YH	YARD HYDRANT	

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CHECKED S. DAVIS
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

GENERAL

ABBREVIATIONS

VERIFY SCALES
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DRAWING NO. 00G04
SHEET NO. 4 OF 32

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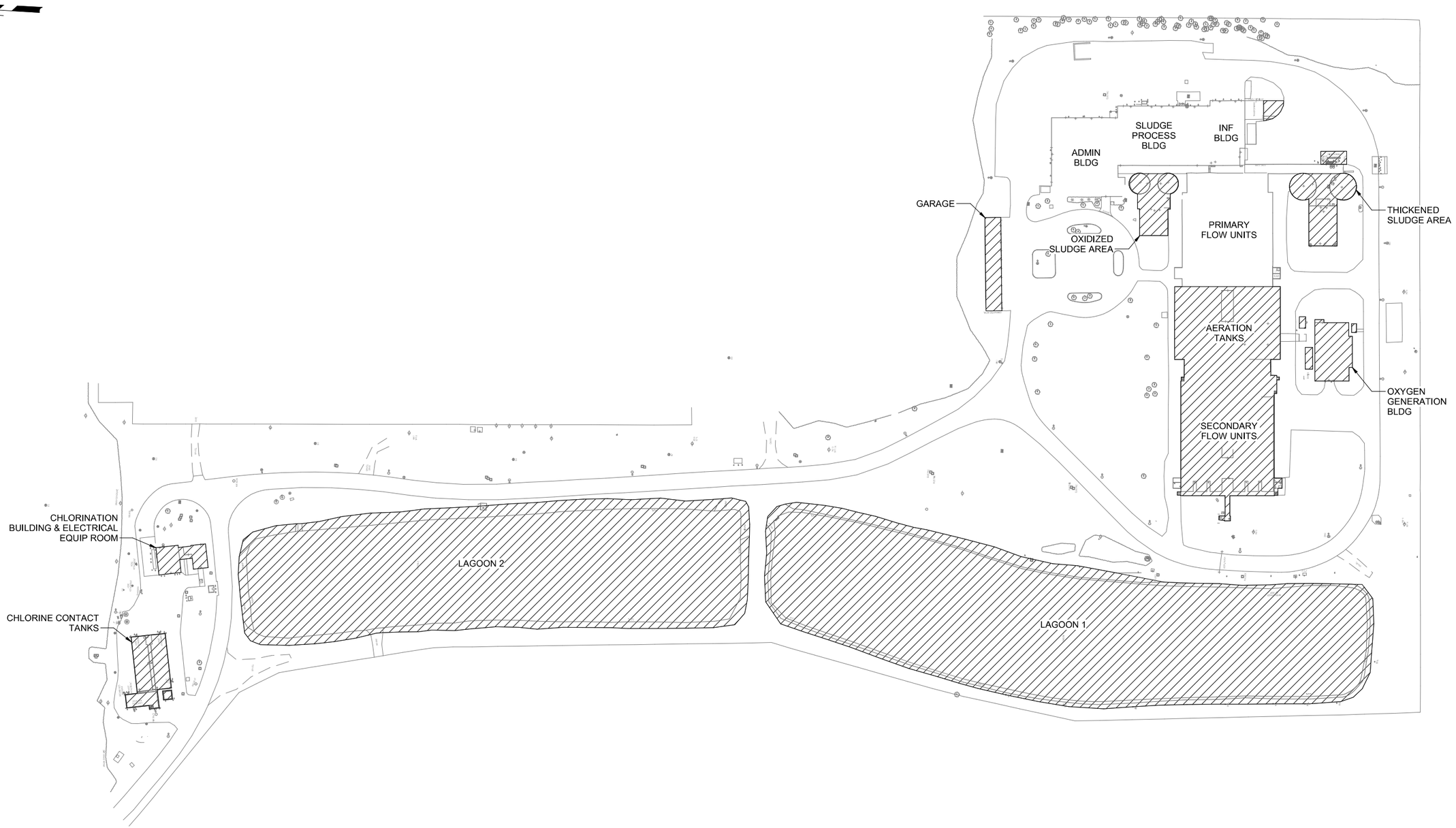

1 **PLAN**
SCALE: 1" = 80'-0"

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GENERAL
SITE PLAN DEMO

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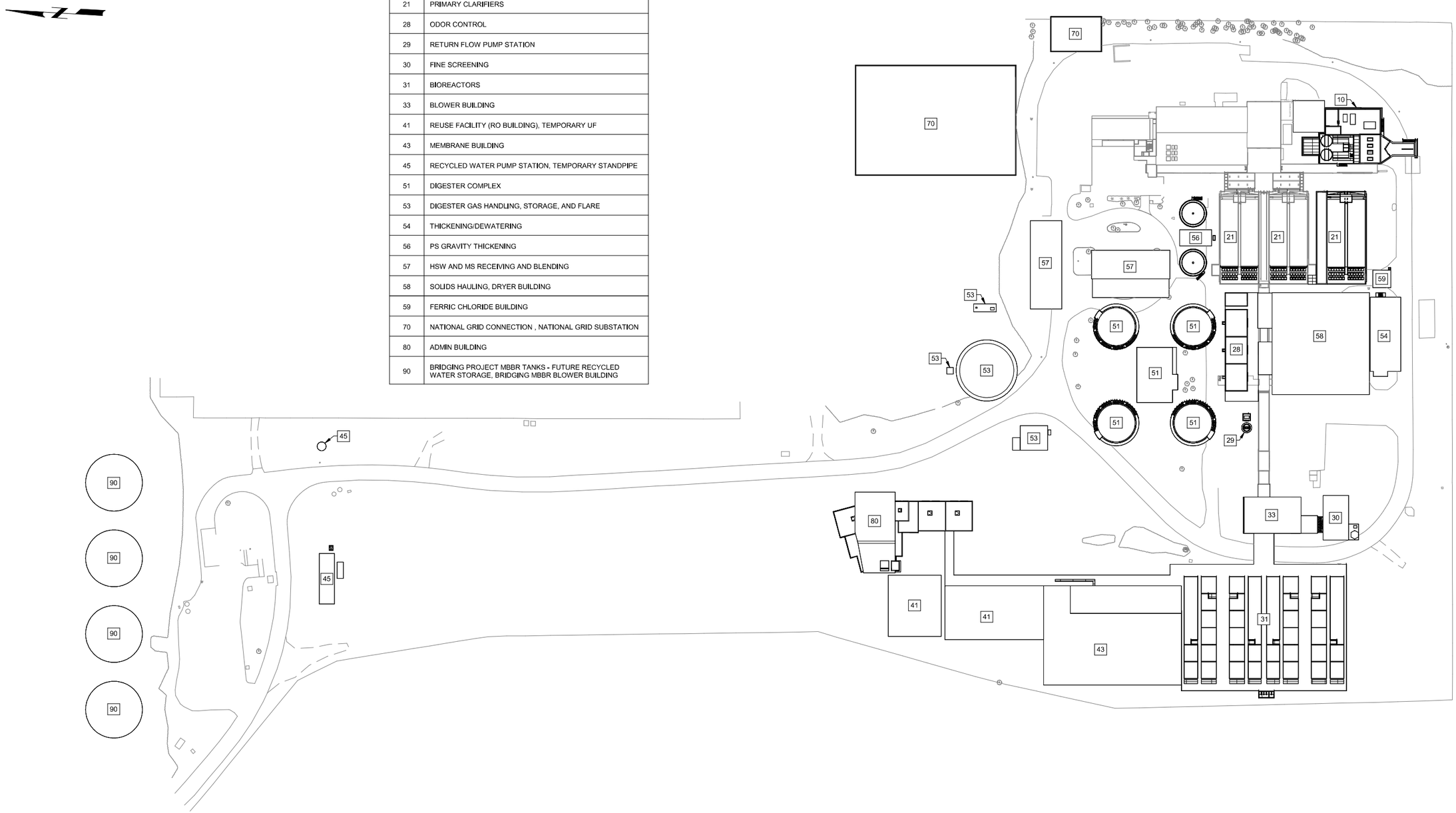
DRAWING NO. 00G05
SHEET NO. 5 OF 32

PLOT DATE: 5/20/2025 9:28:31 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/00-G-3D-101.rvt

AREA CODE	AREAS
10	HEADWORKS
21	PRIMARY CLARIFIERS
28	ODOR CONTROL
29	RETURN FLOW PUMP STATION
30	FINE SCREENING
31	BIOREACTORS
33	BLOWER BUILDING
41	REUSE FACILITY (RO BUILDING), TEMPORARY UF
43	MEMBRANE BUILDING
45	RECYCLED WATER PUMP STATION, TEMPORARY STANDPIPE
51	DIGESTER COMPLEX
53	DIGESTER GAS HANDLING, STORAGE, AND FLARE
54	THICKENING/DEWATERING
56	PS GRAVITY THICKENING
57	HSW AND MS RECEIVING AND BLENDING
58	SOLIDS HAULING, DRYER BUILDING
59	FERRIC CHLORIDE BUILDING
70	NATIONAL GRID CONNECTION , NATIONAL GRID SUBSTATION
80	ADMIN BUILDING
90	BRIDGING PROJECT MBBR TANKS - FUTURE RECYCLED WATER STORAGE, BRIDGING MBBR BLOWER BUILDING



1 **PLAN**
SCALE: 1" = 80'-0"

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
GENERAL
SITE PLAN

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SHEET NO. 6 OF 32

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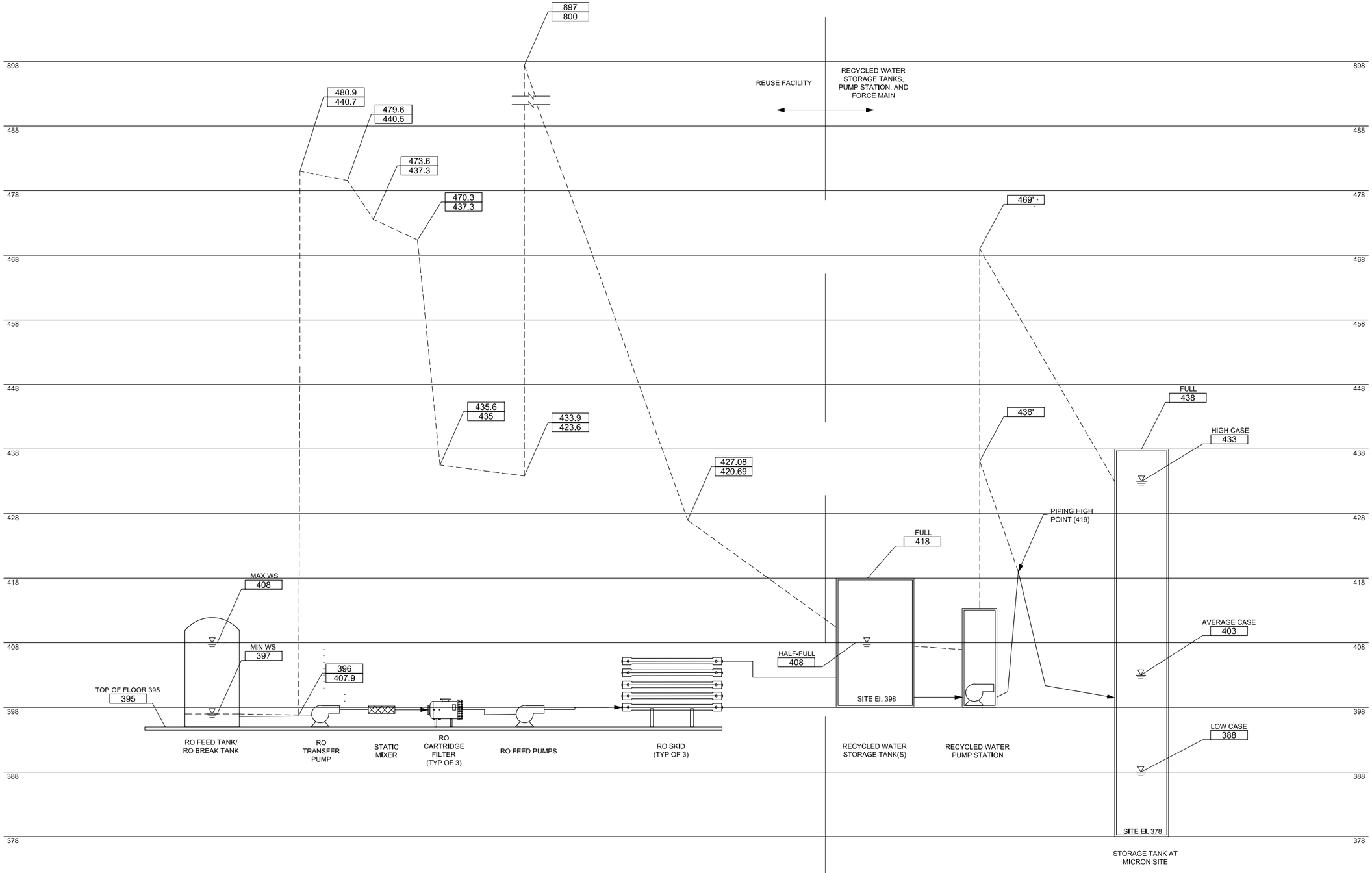

XXX = WS EL AT MAXIMUM FLOW OF 1.7 MGD AND FOULED MEMBRANES AND FILTERS
XXX = WS EL AT MINIMUM FLOW OF 0.6 MGD AND CLEAN MEMBRANES AND FILTERS

NOTE:
PUMP STATION SYSTEM ELEVATIONS ARE APPROXIMATE AND BASED ON A SITE ELEVATION OF 398'.

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
GENERAL
RECYCLED WATER PUMP STATION - HYDRAULIC PROFILE

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SHEET NO. 7 OF 32

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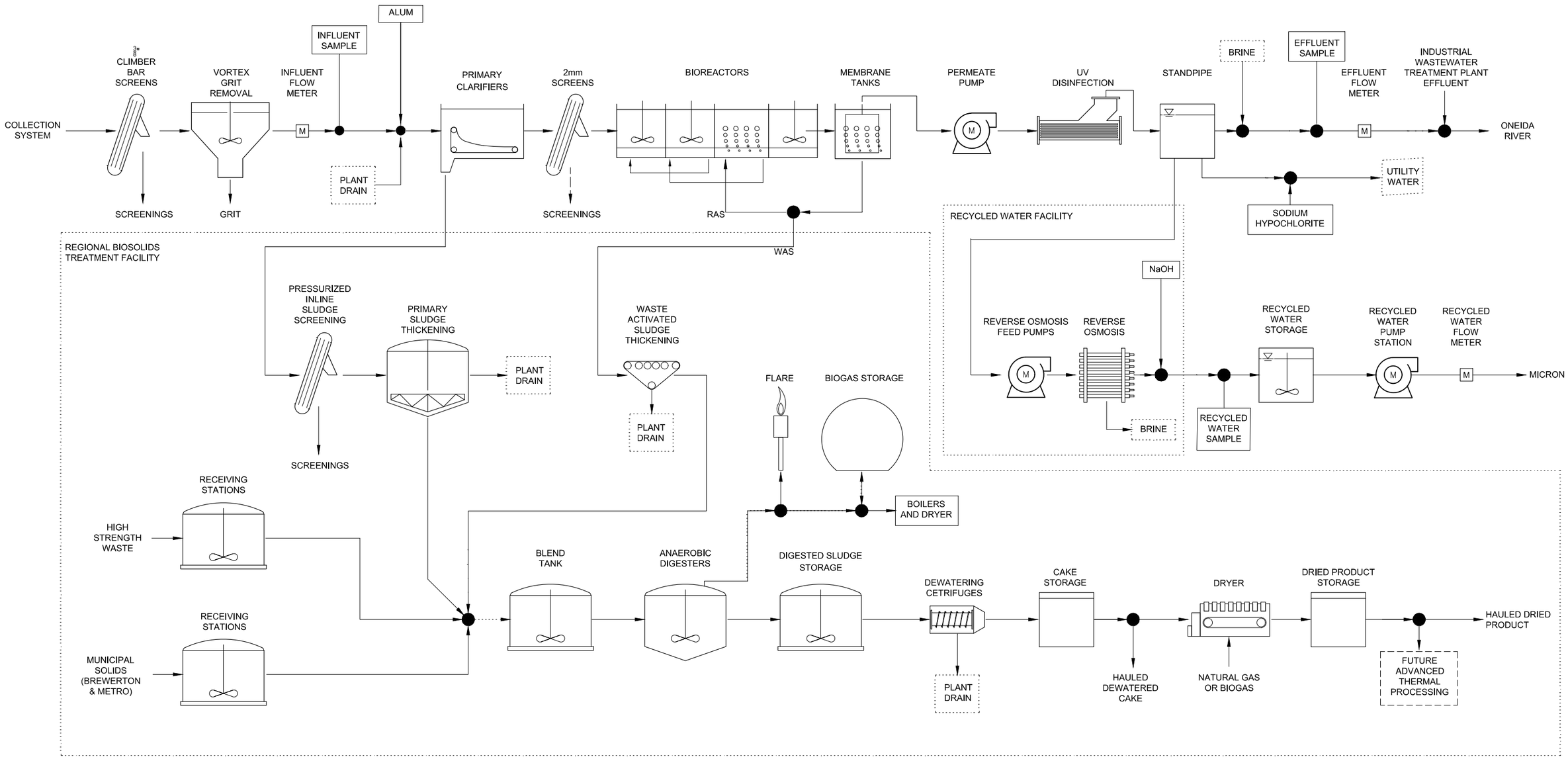

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

GENERAL

PROCESS FLOW DIAGRAM

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DRAWING NO. 00G08
SHEET NO. 8 OF 32

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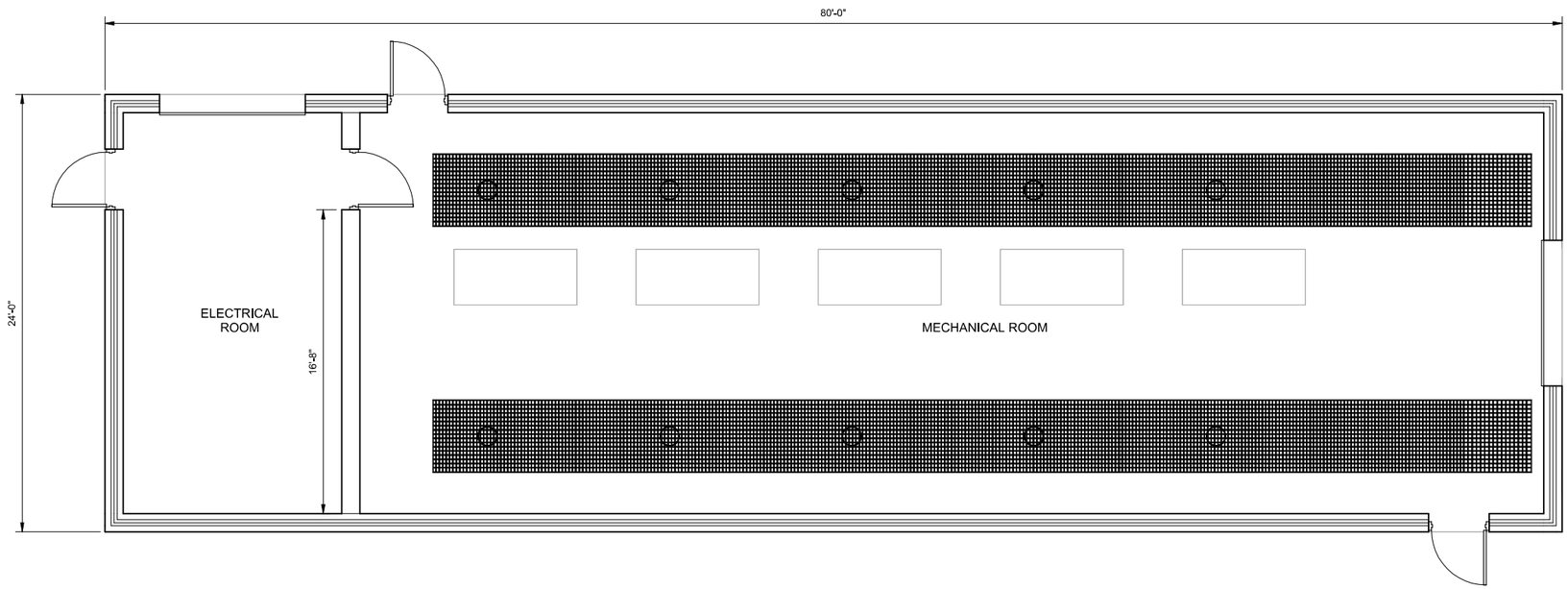
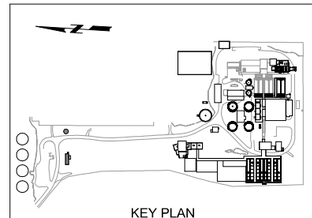


1 PLAN

SCALE: 1/4" = 1'-0"



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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

ARCHITECTURAL

RECYCLED WATER PUMP STATION - PLAN AT EL. 392.50'

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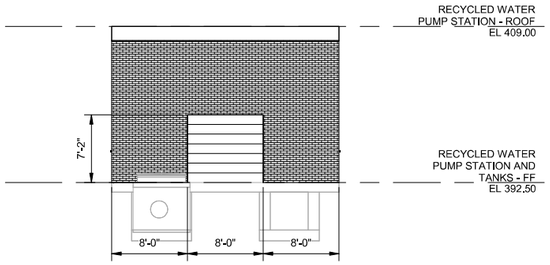
DRAWING NO. 45A02
SHEET NO. 9 OF 32

PLOT DATE: 6/24/2025 1:52:40 PM

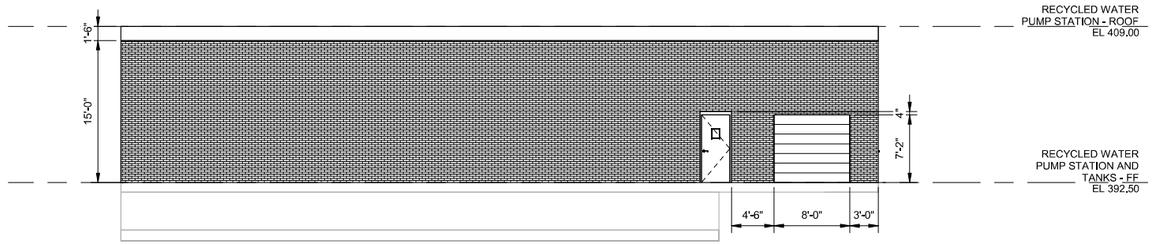
FILE NAME: Autodesk Docs://OCDWEP 203580/45-A-3D-101.rvt



EAST ELEVATION

4 ELEVATION

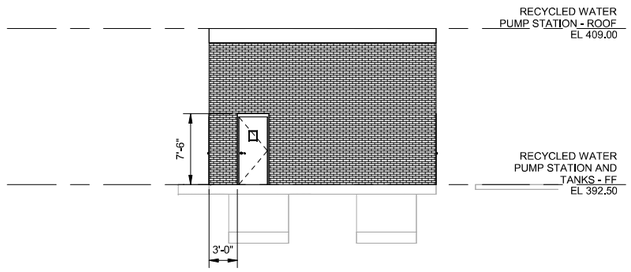
SCALE: 1/8" = 1'-0"



NORTH ELEVATION

2 ELEVATION

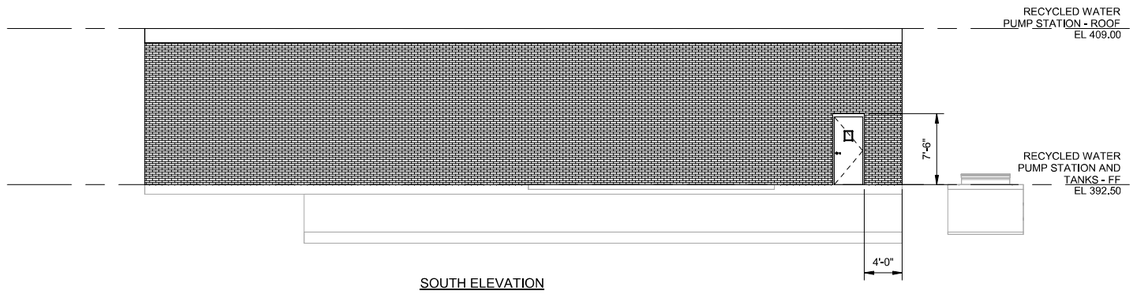
SCALE: 1/8" = 1'-0"



WEST ELEVATION

5 ELEVATION

SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

3 ELEVATION

SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED D. GIOVINE
DRAWN A. CHARDE
CHECKED Checker
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

ARCHITECTURAL

RECYCLED WATER PUMP STATION - ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
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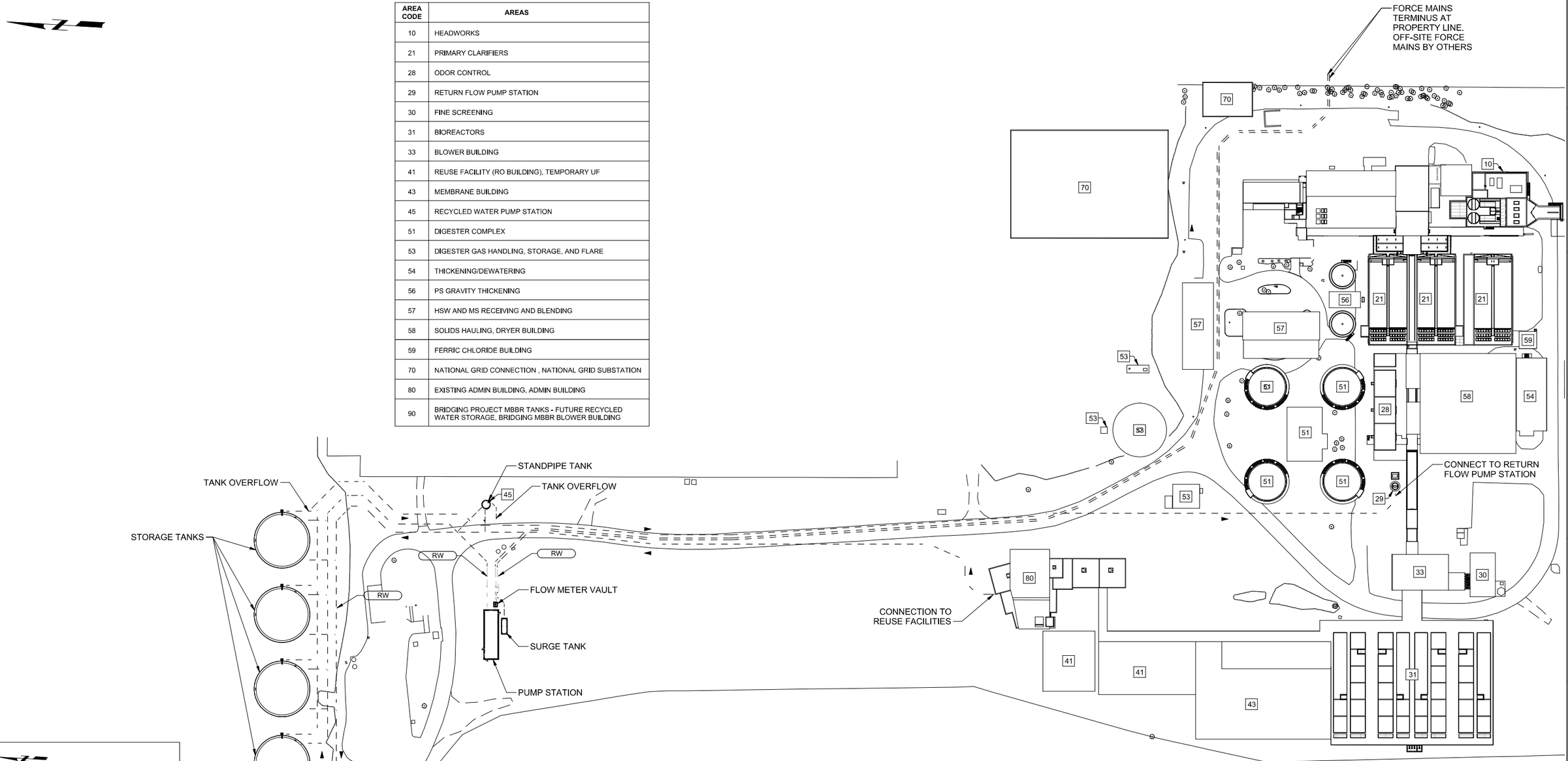
JOB NO. 203580
DRAWING NO. 45A03
SHEET NO. 10 OF 32

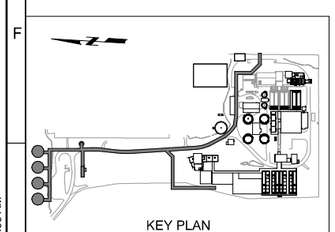
PLOT DATE: 6/4/2025 1:08:35 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/45-A-3D-101.rvt

AREA CODE	AREAS
10	HEADWORKS
21	PRIMARY CLARIFIERS
28	ODOR CONTROL
29	RETURN FLOW PUMP STATION
30	FINE SCREENING
31	BIOREACTORS
33	BLOWER BUILDING
41	REUSE FACILITY (RO BUILDING), TEMPORARY UF
43	MEMBRANE BUILDING
45	RECYCLED WATER PUMP STATION
51	DIGESTER COMPLEX
53	DIGESTER GAS HANDLING, STORAGE, AND FLARE
54	THICKENING/DEWATERING
56	PS GRAVITY THICKENING
57	HSW AND MS RECEIVING AND BLENDING
58	SOLIDS HAULING, DRYER BUILDING
59	FERRIC CHLORIDE BUILDING
70	NATIONAL GRID CONNECTION , NATIONAL GRID SUBSTATION
80	EXISTING ADMIN BUILDING, ADMIN BUILDING
90	BRIDGING PROJECT MBBR TANKS - FUTURE RECYCLED WATER STORAGE, BRIDGING MBBR BLOWER BUILDING



1 **PLAN**
SCALE: 1" = 80'-0"



KEY PLAN

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DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

CIVIL

YARD PIPING PLAN

VERIFY SCALES
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0 1"
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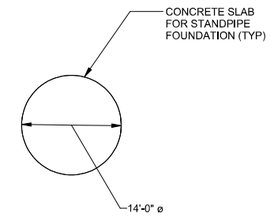
JOB NO. 203580
DRAWING NO. 45C01
SHEET NO. 11 OF 32

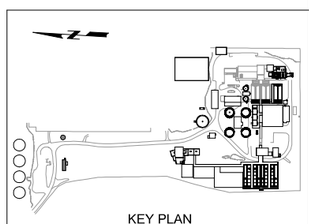
PLOT DATE: 6/27/2025 11:31:38 AM

FILE NAME: Autodesk Docs://OCDWEP 203580/45-M-3D-101.rvt





1 PLAN
SCALE: 3/32" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED Checker
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

STRUCTURAL

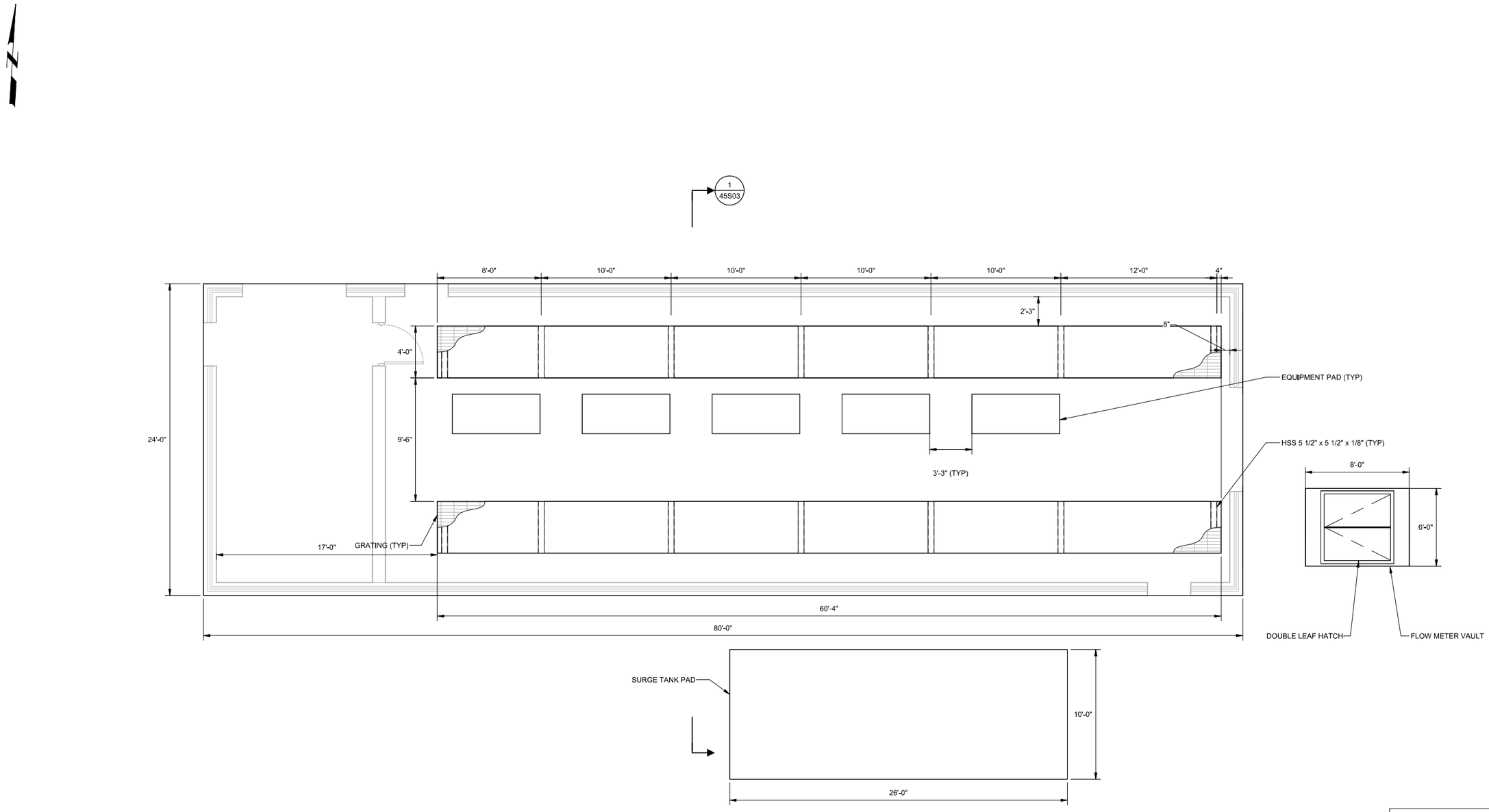
RECYCLED WATER PUMP STATION - OVERALL PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

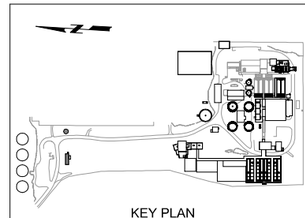
JOB NO. 203580
DRAWING NO. 45S01
SHEET NO. 12 OF 32

PLOT DATE: 6/24/2025 1:16:18 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/45-S-3D-101.rvt



1 **PLAN**
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. FICK
DRAWN A. CHARDE
CHECKED Checker
DATE JULY 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
STRUCTURAL
RECYCLED WATER PUMP STATION - PLAN AT EL. 392.50'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
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JOB NO. 203580
DRAWING NO. 45S02
SHEET NO. 13 OF 32

PLOT DATE: 6/26/2025 3:07:17 PM

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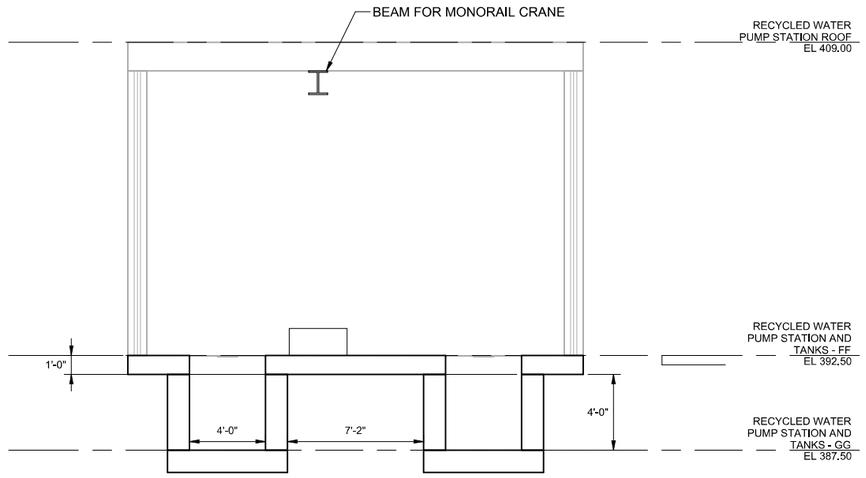

1 / 45S02 SECTION
SCALE: 1/4" = 1'-0"

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DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
STRUCTURAL
RECYCLED WATER PUMP STATION - SECTION

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 45S03
SHEET NO. 14 OF 32

PLOT DATE: 6/5/2025 1:46:16 PM
FILE NAME: Autodesk Docs://OCDWEP 203580/45-S-3D-101.rvt

PIPING SYMBOLS

DOUBLE LINE	SINGLE LINE	DESCRIPTION
		WELDED JOINT
		GROOVED END JOINT
		FLANGED JOINT
		HUB & SPIGOT JOINT (RUBBER GASKET)
		PUSH-ON JOINT (RESTRAINED)
		ADAPTER SIDE GROOVED END ADAPTER FLANGE
		FLANGED COUPLING ADAPTER
		FLANGED COUPLING ADAPTER WITH THRUST TIES
		FLEXIBLE COUPLING
		FLEXIBLE COUPLING WITH THRUST TIES
		METAL BELLOWS EXP JOINT
		ELASTOMER BELLOWS EXP JOINT
		FLEXIBLE COUPLING ADAPTER
		DISMANTLING JOINT
		EXPANSION COMPENSATOR
		ELBOW UP
		ELBOW DOWN
		TEE UP
		TEE DOWN
		LATERAL UP
		LATERAL DOWN
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER (FOT. FOB)
		UNION
		CAP
		ANCHOR
		ELBOW, 90 DEGREE
		CROSS
		TEE
		ELBOW, 45 DEGREE
		ELBOW, 22.5 DEGREE
		ELBOW, 11.25 DEGREE
		LATERAL

SINGLE LINE	DESCRIPTION
	GATE VALVE
K	KNIFE GATE VALVE
	BUTTERFLY VALVE
V	CHARACTERIZED BALL CONTROL VALVE
	BALL VALVE
	GLOBE VALVE
	3-WAY GLOBE TYPE MIXING VALVE
	FOUR WAY VALVE
	PINCH VALVE
	DIAPHRAGM VALVE
	PLUG VALVE
	LUBRICATED PLUG VALVE
	ECCENTRIC PLUG VALVE
	CONCENTRIC PLUG VALVE
	SWING CHECK VALVE
	WAFER CHECK VALVE
	BALL CHECK VALVE
	DUAL CHECK VALVE
	CHECK BACKFLOW PREVENTER
	HOSE VALVE
	MUD VALVE (PLAN VIEW)
	NEEDLE VALVE
	CONE VALVE
	PRESSURE RELIEF PRESSURE-REDUCING REGULATOR
	TELESCOPING VALVE
	THREE WAY VALVE AIR OPERATED
M	THREE WAY VALVE MOTOR OPERATED
S	THREE WAY VALVE SOLENOID OPERATED
	VACUUM VALVE
	BACKPRESSURE REGULATOR SELF-CONTAINED
	BACKPRESSURE REGULATOR W/ EXTERNAL PRESSURE TAP
	PRESSURE-REDUCING REGULATOR: SELF-CONTAINED
	PRESSURE-REDUCING REGULATOR W/EXTERNAL PRESSURE TAP

MECHANICAL SYMBOLS

SINGLE LINE	DESCRIPTION
	AIR OR CHEMICAL DIFFUSER
	QUICK DISCONNECT HIGH PRESSURE AIR OR FLUSHING
	BATCHMETER
	AIR VENT
	BASKET STRAINER
	BLOWER
	CALIBRATION COLUMN
	COMPRESSOR/TURBINE
	COMPRESSOR: RECIPROCATING
	DIAPHRAGM SEAL
	DRAIN
	EJECTOR OR EDUCTOR
M	ELECTRIC MOTOR
	EQUIPMENT DRAIN
	EXPANSION JOINT, FLEXIBLE VIBRATION JOINT
	FAN: EXHAUST/SUPPLY
	FILTER
	FIRE HYDRANT
	FLAME ARRESTER
	FLAME ARRESTER WITH THERMALLY OPERATED VALVE
	FLOOR DRAIN
	FLOW SWITCH
	GAUGE: PRESSURE
	GAUGE: DIFFERENTIAL PRESSURE
	WEIR
	MIXER
	OIL OR MOISTURE TRAP
	PRIMARY LEVEL ELEMENT: BUBBLER
	PRIMARY LEVEL ELEMENT: ELECTRODE
	PRIMARY LEVEL ELEMENT: FLOAT SWITCH
	PRIMARY LEVEL ELEMENT: FLUID
	PRIMARY LEVEL ELEMENT: INVERTED COLUMN

SINGLE LINE	DESCRIPTION
	PRIMARY LEVEL ELEMENT: RADAR
	PRIMARY LEVEL ELEMENT: ULTRASONIC
	PRIMARY FLOW ELEMENT: FLUME
X	PRIMARY FLOW ELEMENT: X = C - CORIOLIS X = M - MAGNETIC X = P - PROPELLER X = PT - PITOT TUBE X = R - ROTAMETER X = T - TURBINE X = TH - THERMAL X = U - ULTRASONIC X = D - DENSITY
	PRIMARY FLOW ELEMENT: ORIFICE PLATE
	PRIMARY FLOW ELEMENT: VENTURI TUBE
	PRIMARY FLOW ELEMENT: WEIR
	PULSATION DAMPENER
	PUMP: CENTRIFUGAL
	PUMP: DIAPHRAGM
	PUMP: METERING
	PUMP: PLUNGER
	PUMP: PERISTALTIC TUBE METERING
	PUMP: PROGRESSIVE CAVITY
	PUMP: RECIPROCATING
	PUMP: ROTARY
	PUMP: SCREW
	PUMP: SUBMERSIBLE
	PUMP: VERTICAL LIFT
	PIPE REDUCER: CONCENTRIC
	PIPE REDUCER: ECCENTRIC (FOT, FOB)
	ROTARY CHEMICAL FEEDER
	RUPTURE DISK
	SAMPLE PORT
	SIGHT GLASS
	SLIDE GATE
	SLUICE GATE
	STRAINER: WYE TYPE

SINGLE LINE	DESCRIPTION
	STRAINER: WYE TYPE WITH BLOWOFF
	THERMOMETER
	VALVE: ANGLE
	VALVE: AIR RELIEF
	PIPE MATERIAL CHANGE

IDENTIFICATION SYMBOLS

CHEMICAL INJECTION POINT — CHEMICAL / DWG NO.

PIPE DESIGNATOR — PIPE SIZE — FLOW STREAM — X" XXX

CONTINUATION TAG — UNIQUE IDENTIFIER — CONTINUATION FROM DWG NO. — CONTINUATION TO DWG NO. — A B C

EQUIPMENT / VALVE TAG — XXX-XX-XXXX

KEY TAG — X

LINE SYMBOLS

PIPE ABOVE OR BELOW GROUND

PIPE UNDERNEATH SLAB OR STRUCTURE

FUTURE

EXISTING

DEMO

PROCESS LINE SYMBOLS

PRIMARY PROCESS FLOW IN PIPE

SECONDARY PROCESS FLOW IN PIPE

PRIMARY PROCESS FLOW IN CHANNEL

SECONDARY PROCESS FLOW IN CHANNEL

REV	DATE	BY	DESCRIPTION
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DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

GENERAL LEGEND AND SYMBOLS

VERIFY SCALES
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00GM01
SHEET NO. 15 OF 32

LAST SAVED BY:

PROJECT NO.

FILE NAME:

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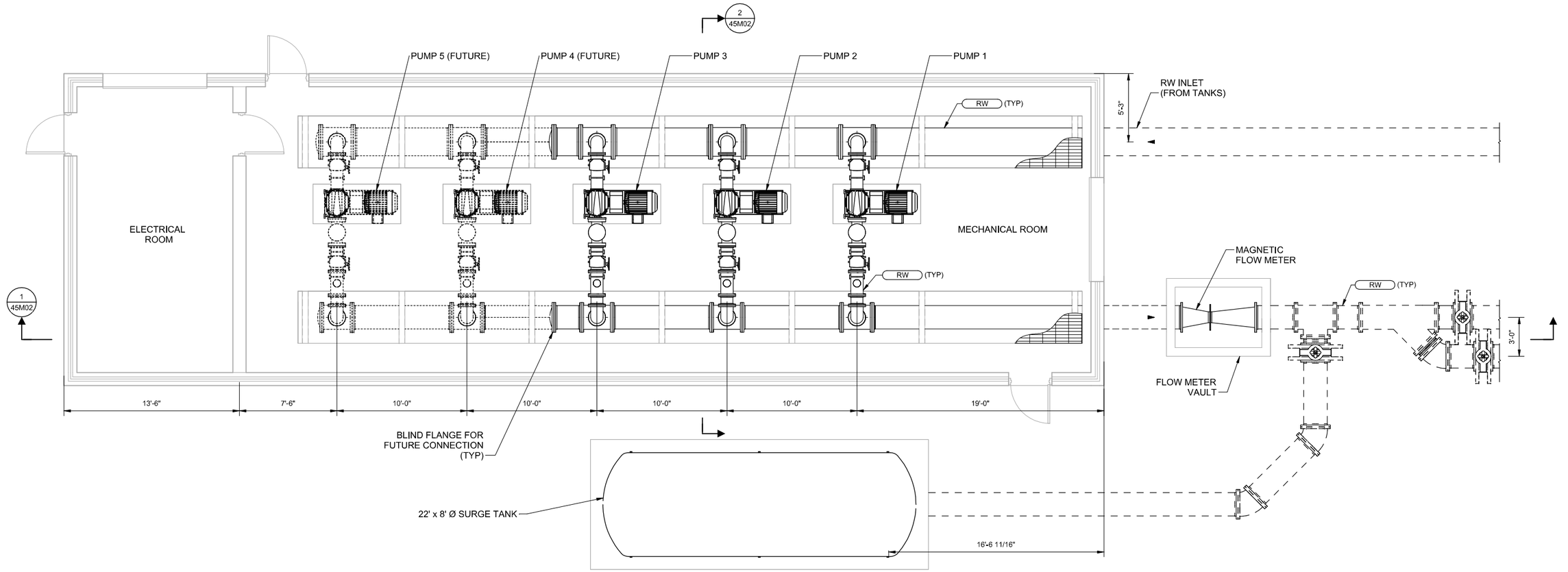
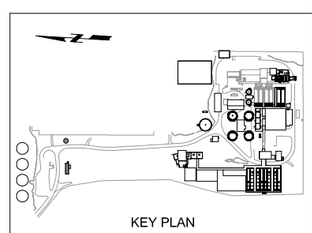


1 PLAN
SCALE: 1/4" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

RECYCLED WATER PUMP STATION - PLAN AT EL. 392.50'

VERIFY SCALES
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0 1"
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JOB NO. 203580
DRAWING NO. 45M01
SHEET NO. 16 OF 32

PLOT DATE: 6/24/2025 2:07:58 PM

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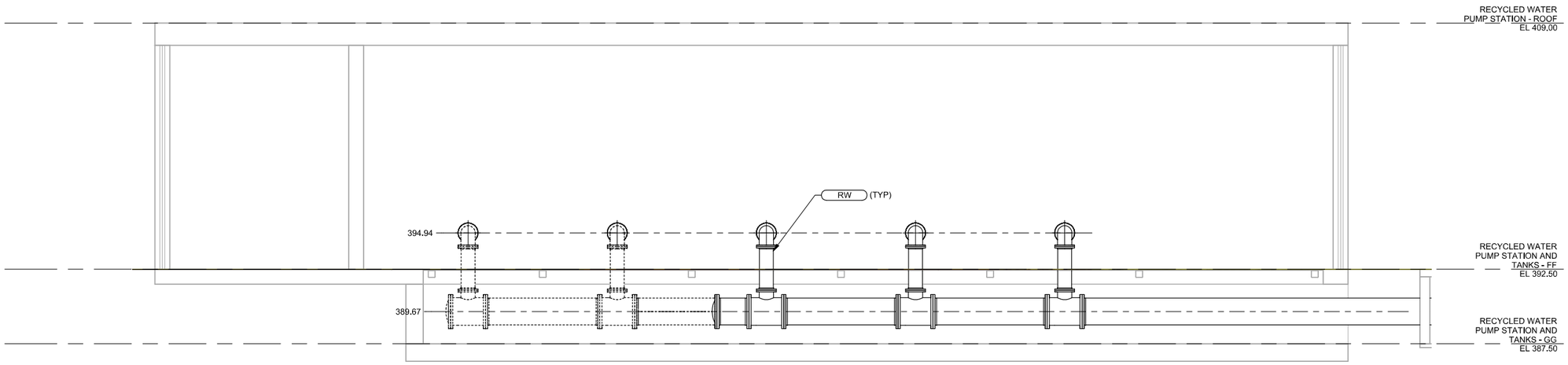
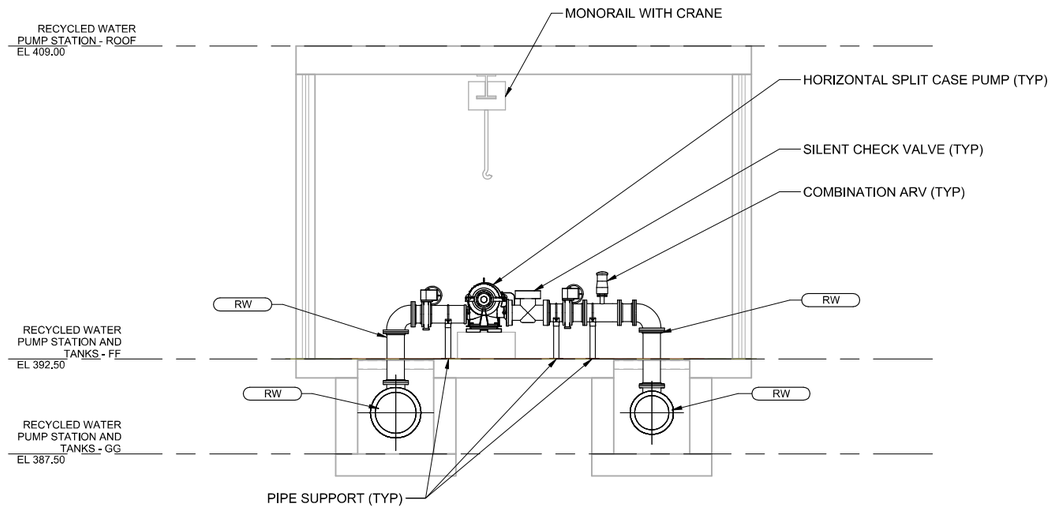


1 SECTION
45M01 SCALE: 1/4" = 1'-0"



2 SECTION
45M01 SCALE: 1/4" = 1'-0"

REV	DATE	BY	DESCRIPTION
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DATE JULY 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
MECHANICAL
RECYCLED WATER PUMP STATION - SECTIONS

VERIFY SCALES
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0 1"
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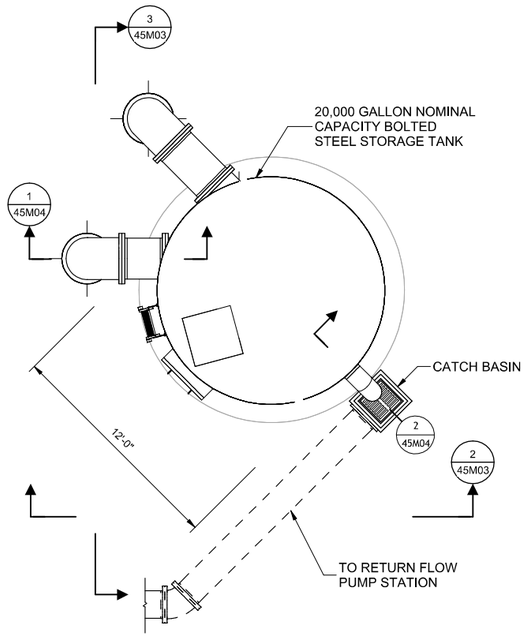
JOB NO. 203580
DRAWING NO. 45M02
SHEET NO. 17 OF 32

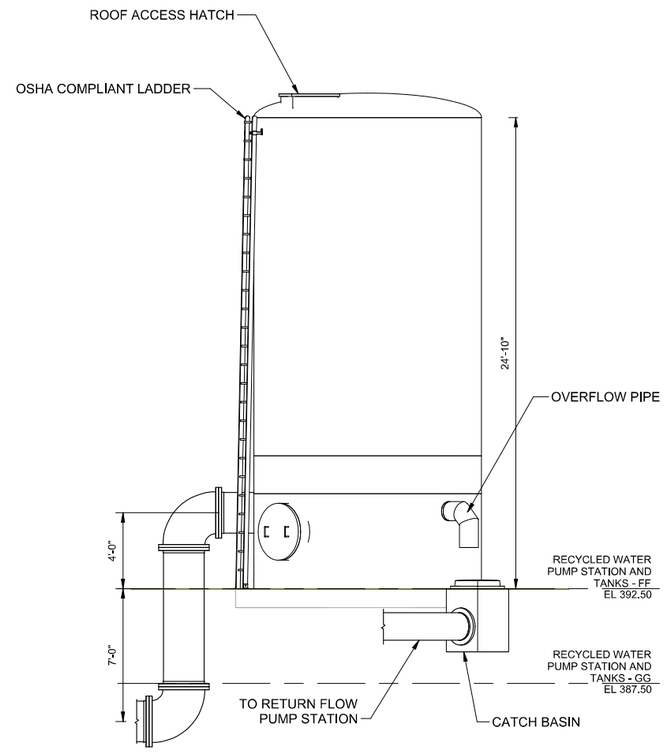
PLOT DATE: 6/24/2025 2:09:37 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/45-M-3D-101.rvt



PLAN AT EL. 392.50

1 PLAN
SCALE: 1/4" = 1'-0"



2 SECTION (45M03)
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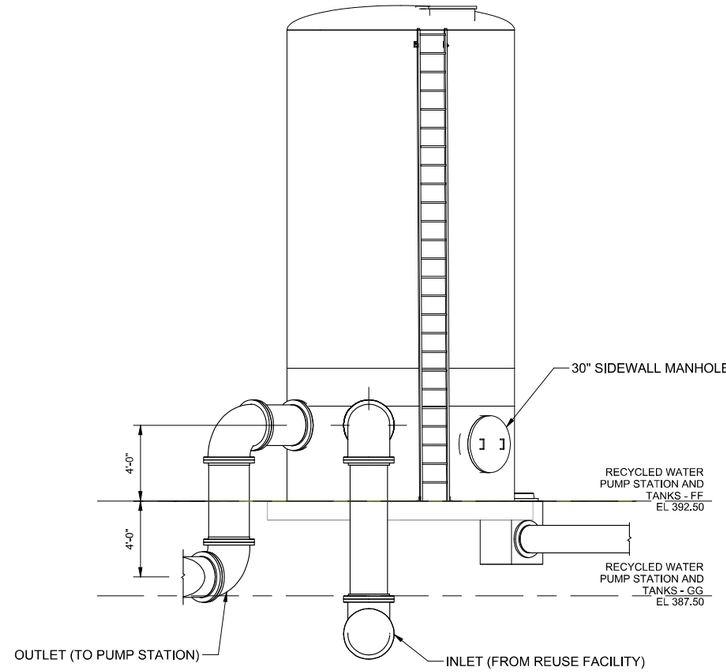

3 SECTION (45M03)
SCALE: 1/4" = 1'-0"

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
MECHANICAL
RECYCLED WATER STORAGE STANDPIPE - PLAN AND SECTIONS

VERIFY SCALES
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0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 45M03
SHEET NO. 18 OF 32

PLOT DATE: 6/25/2025 6:34:48 PM

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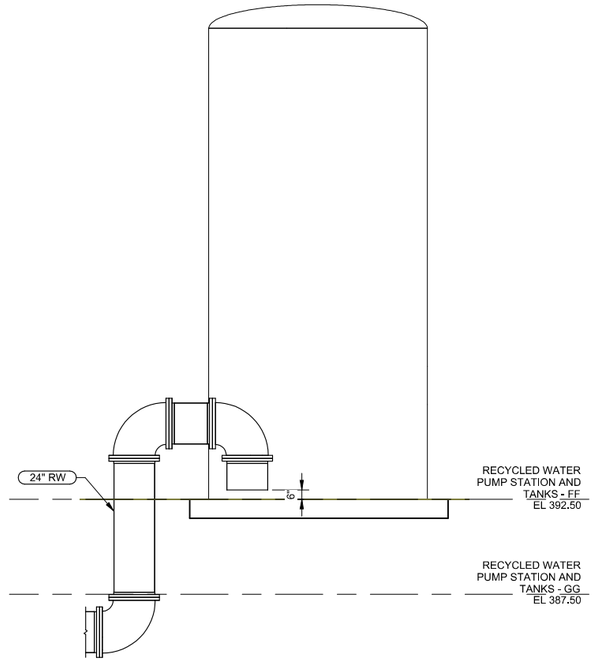
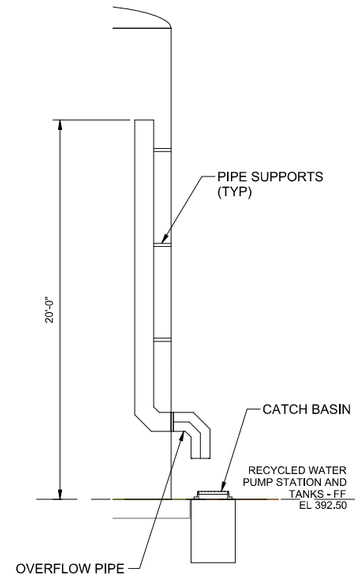


1 SECTION
45M03
SCALE: 1/4" = 1'-0"



2 SECTION
45M03
SCALE: 1/4" = 1'-0"

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
MECHANICAL
RECYCLED WATER STORAGE STANDPIPE TANK - SECTIONS

VERIFY SCALES
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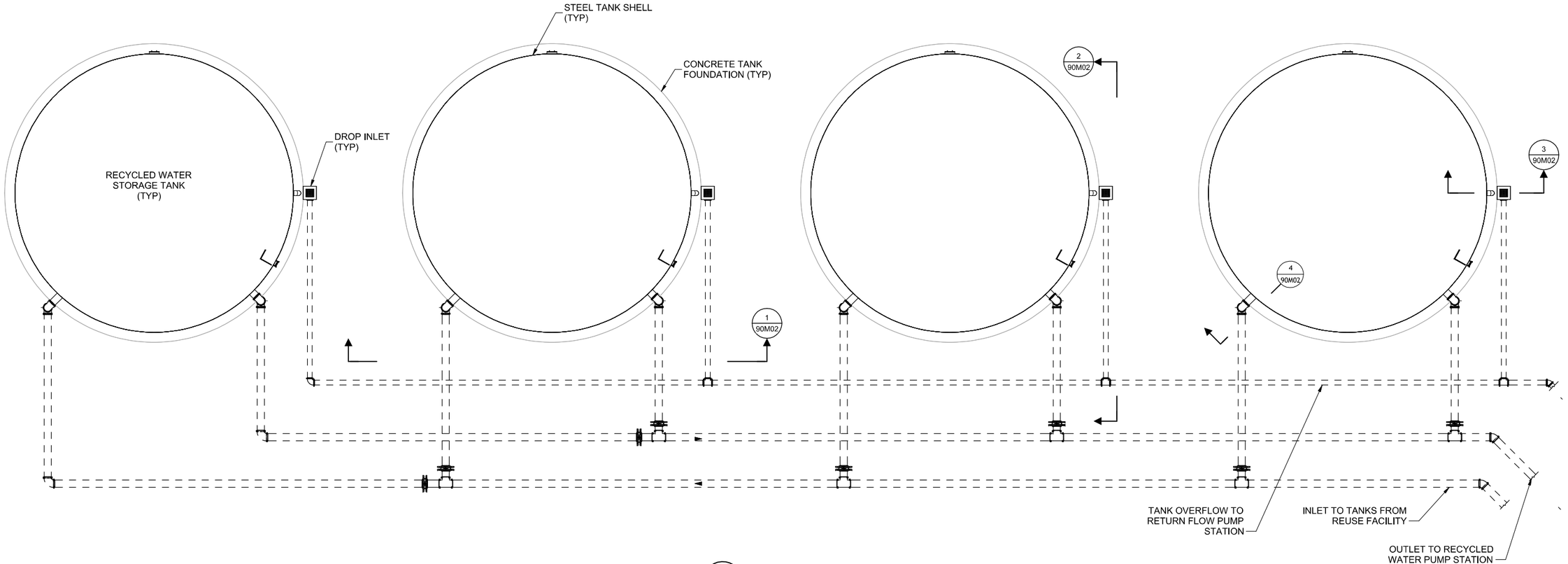
JOB NO. 203580
DRAWING NO. 45M04
SHEET NO. 19 OF 32

PLOT DATE: 6/25/2025 6:35:32 PM

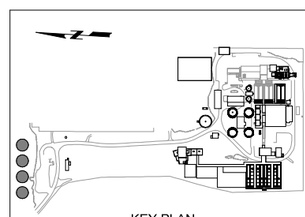
FILE NAME: Autodesk Docs://OCDWEP 203580/45-M-3D-101.rvt

GENERAL NOTE:

1. STORAGE TANKS TO BE PROVIDED BY OTHERS (MBBR BRIDGING PROJECT). FURNISH AND INSTALL PIPING AND APPURTENANCES SHOWN HEREON.



1 PLAN
SCALE: 1/16" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. DAVIDSON
DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

MECHANICAL

BRIDGING PROJECT MBBR TANKS - PLAN AT EL. 392.50'

VERIFY SCALES
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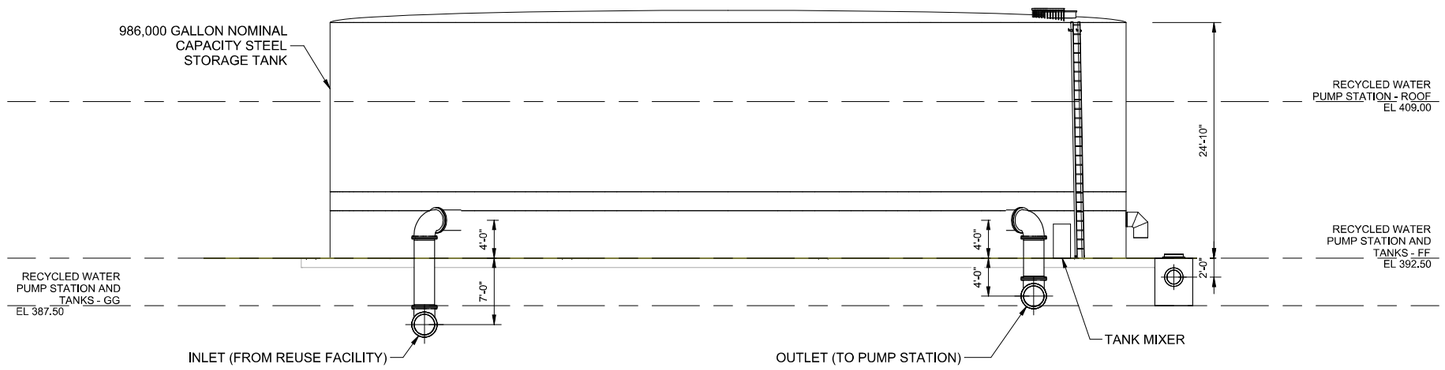
JOB NO. 203580
DRAWING NO. 90M01
SHEET NO. 20 OF 32

PLOT DATE: 6/26/2025 3:10:59 PM

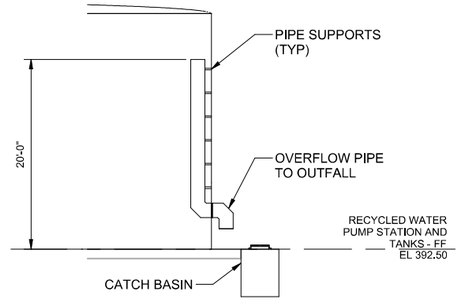
FILE NAME: Autodesk Docs://OCDWEP 203580/45-M-3D-101.rvt

GENERAL NOTE:

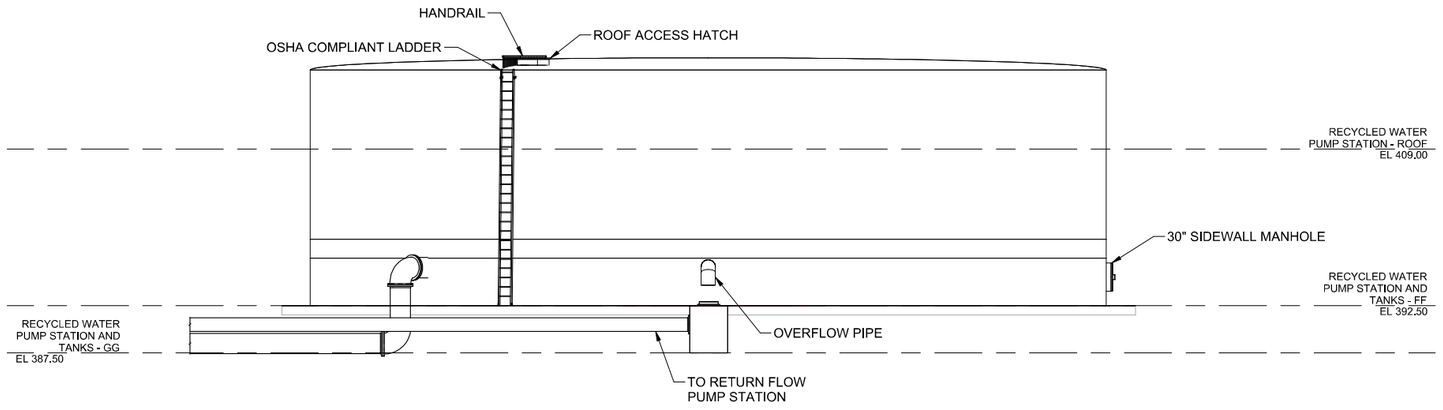
1. STORAGE TANKS TO BE PROVIDED BY OTHERS (MBBR BRIDGING PROJECT). RECYCLED WATER PUMP STATION TO PROVIDE PIPING AND APPURTENANCES SHOWN HEREON.



1 90M01 **SECTION**
SCALE: 1/8" = 1'-0"



3 90M01 **SECTION**
SCALE: 1/8" = 1'-0"



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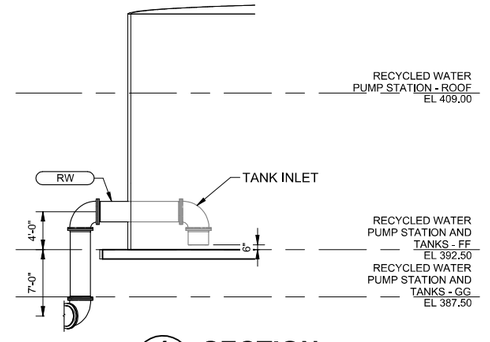

4 90M01 **SECTION**
SCALE: 1/8" = 1'-0"

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED J. DAVIDSON
DRAWN A. CHARDE
CHECKED S. DAVIS
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carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
MECHANICAL
BRIDGING PROJECT MBBR TANKS - TYPICAL SECTIONS

VERIFY SCALES
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JOB NO. 203580
DRAWING NO. 90M02
SHEET NO. 21 OF 32

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FILE NAME: Autodesk Docs://OCDWEP 203580/45-M-3D-101.rvt

ELECTRICAL PLAN SYMBOLS

IDENTIFICATION SYMBOLS

EQUIP # — EQUIPMENT AND INSTRUMENT IDENTIFICATION

EQUIPMENT/INSTRUMENT LOCATOR

LUMINAIRE IDENTIFICATION
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED FROM
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF FIXTURE
X = LUMINAIRE TYPE, REFER TO THE LUMINAIRE SCHEDULE

XXXX — CONDUIT IDENTIFICATION
XXXX = CONDUIT NUMBER, REFER TO CONDUIT SCHEDULE
UNLESS OTHERWISE NOTED, GROUPED CONDUITS ARE LABELED LEFT TO RIGHT OR TOP TO BOTTOM.

INDICATES KEYNOTE X
(PERTAINS ONLY TO SHEET WHERE NOTE IS FOUND)

DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

CAMERA

LUMINAIRES

LINEAR FIXTURE

2' X 2' LAY-IN TROFFER

2' X 4' LAY-IN TROFFER

LUMINAIRE POLE MOUNTED

LUMINAIRE, EMERGENCY BATTERY-POWERED

LUMINAIRE, EMERGENCY/EXIT BATTERY-POWERED

LUMINAIRE, EMERGENCY BATTERY-POWERED REMOTE

LUMINAIRE, SURFACE OR PENDANT MOUNTED

LUMINAIRE, WALL MOUNTED

LUMINAIRE, FLOOD/SPOT

LUMINAIRE, EXIT ONE OR TWO FACES AS INDICATED. ARROW POINTS IN DIRECTION OF EGRESS.

SWITCHES/RECEPTACLES

SINGLE POLE SWITCH
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATED
c = TYPE
2 = DOUBLE POLE SWITCH
3 = THREE-WAY SWITCH
3P = THREE POSITION SWITCH
4 = FOUR-WAY SWITCH
K = KEY OPERATED SWITCH
F = SWITCH AND FUSESTAT HOLDER
P = SWITCH AND PILOT LIGHT
T = THERMOSTAT
D = DIMMER SWITCH
L = LOW VOLTAGE LIGHT SWITCH
M = MANUAL MOTOR STARTER
N = NETWORKED SINGLE OR MULTIPLE SWITCH LOCATIONS
WP = WEATHER PROOF
REFER TO ABBREVIATIONS LEGEND FOR ALL OTHER DESIGNATIONS.

OCCUPANCY SENSOR
X = REFERENCE LIGHTING CONTROL COMPONENT SCHEDULE
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATION
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF SENSOR

PE — PHOTOCELL

SWITCH AND SINGLE RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

DUPLEX RECEPTACLE

QUADRUPLEX RECEPTACLE

IN FLOOR DUPLEX RECEPTACLE

IN FLOOR QUADRUPLEX RECEPTACLE

DUPLEX RECEPTACLE w/SPLIT WIRE

DEDICATED RECEPTACLE

SPECIAL PURPOSE RECEPTACLE

WELDING RECEPTACLE
a = CIRCUIT DESIGNATION
b = DISCONNECT TYPE

TWIST LOCK RECEPTACLE
a = AMP RATING

TELEPHONE OUTLET

DATA COMMUNICATIONS OUTLET
a = NETWORK SWITCH

FIRE ALARM

FACP — FIRE ALARM CONTROL PANEL

RACEWAY

EXPOSED CONDUIT

BREAK AND CONTINUATION IN CONDUIT RUN

EXPOSED CONDUIT HIDDEN BEHIND WALLS, FLOORS OR OTHER STRUCTURES

UNDERGROUND CONDUIT, DIRECT BURIED OR IN DUCT BANK

CONDUIT IN SLAB

CONDUIT VERTICAL CHANGE IN DIRECTION

CONDUIT CAP

J — JUNCTION BOX

CONDUIT SEAL

CONDUIT TEE

DUCT BANK
APPROXIMATE DIMENSIONS SHOWN ON DUCT BANK SECTIONS

CONDUIT SIZE AND CONDUCTORS

INDIVIDUAL CONDUCTORS

W"C-(3-X (Ø), 1-Y (N) & 1-Z (G))

W"C (WHERE INDICATED): W = CONDUIT TRADE SIZE

3-X (Ø):
3 = QUANTITY
X = SIZE OF CONDUCTORS
(Ø) = DESIGNATES PHASE CONDUCTORS

1-Y (N) (WHERE INDICATED):
1 = QUANTITY
Y = SIZE OF CONDUCTORS
(N) = DESIGNATES NEUTRAL CONDUCTORS

1-Z (G) (WHERE INDICATED):
1 = QUANTITY
Z = SIZE OF CONDUCTORS
(G) = DESIGNATES GROUND CONDUCTORS

U{3-X (Ø) & 1-X (G)}
U = NUMBER OF PARALLEL RUNS

VFD CONDUCTORS

U{[N/C-X (Ø) & INTEGRAL (G)]:VFD}
U = NUMBER OF PARALLEL RUNS
N/C = NUMBER OF PHASE CONDUCTORS IN CABLE
X = SIZE OF CONDUCTORS
VFD = VFD CABLE

MULTI CONDUCTOR CABLES

K/2/C#16S
K (WHERE INDICATED) = NUMBER OF PAIRS
2/C#16S = TWO CONDUCTOR, 16 GAUGE, TWISTED SHIELDED PAIR

K/3/C#16S
K (WHERE INDICATED) = NUMBER OF TRIPLETS
3/C#16S = THREE CONDUCTOR, 16 GAUGE, TWISTED SHIELDED TRIPLETS

U{[N/C-X (Ø) & INTEGRAL (G)]:MC}
U = NUMBER OF PARALLEL RUNS
MC = MULTICONDUCTOR CABLE
N/C = NUMBER OF PHASE CONDUCTORS IN THE CABLE
X = SIZE OF CONDUCTORS

FIBER OPTIC CABLES

FO/N
N = NUMBER OF INDIVIDUAL FIBERS

GROUNDING

UNDERGROUND GROUND CABLE
#4/0 SDBC UNLESS OTHERWISE NOTED

GROUND ROD

GROUND ROD AND GROUND WELL

ELECTRICAL ONE-LINE SYMBOLS

MEDIUM VOLTAGE

CIRCUIT BREAKER, MEDIUM VOLTAGE
a = CIRCUIT BREAKER NUMBER
b = FRAME SIZE

ANSI RELAY DEVICE
a = ANSI DEVICE FUNCTION
b = QUANTITY

MEDIUM VOLTAGE DISCONNECT SWITCH NON-FUSED CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE SINGLE FUSE CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE DOUBLE FUSE CUT OUT

MEDIUM VOLTAGE SINGLE FUSE

MEDIUM VOLTAGE DOUBLE FUSE

MEDIUM VOLTAGE LIVE FRONT TERMINATOR

MEDIUM VOLTAGE ELBOW

MEDIUM VOLTAGE TEE

MEDIUM VOLTAGE CONTACTOR

MEDIUM VOLTAGE STARTER

MOV-ELBOW ARRESTER

LOW VOLTAGE

LOW VOLTAGE CIRCUIT BREAKER
a = TYPE
MCP = MOTOR CIRCUIT PROTECTOR
TM = THERMAL MAGNETIC
SS = SOLID STATE
b = FRAME SIZE (MANUFACTURER TO DETERMINE FRAME SIZE UNLESS INDICATED)
c = NUMBER OF POLES
d = TRIP SETTING (AT = AMP TRIP) (AC = MCP CONTINUOUS RATING)
e = DESIGNATION
f = INTERRUPTING RATING

LOW VOLTAGE CIRCUIT BREAKER AUXILIARY OPERATOR
* = S = SHUNT TRIP
= G = GROUND FAULT INTERRUPTER
= V = SOLENOID KEY RELEASE

DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

FUSED DISCONNECT SWITCH
B = TYPE, REFER TO DISCONNECT SCHEDULE
b = FUSE RATING

FUSE

COMBINATION STARTER WITH CONTROL POWER TRANSFORMER
a = CIRCUIT BREAKER DISCONNECT, TYPE AS NOTED
b = STARTER TYPE REFER TO THE SPECIFICATIONS FOR STARTER DEFINITIONS.
c = NEMA STARTER SIZE
d = OVERLOAD

MOTOR STARTER/DRIVES:
a = DEVICE TYPE
VFD-6 = 6-PULSE VFD
VFD-18 = 18-PULSE VFD
VFD-RH = REDUCED HARMONIC VFD (18-PULSE OR ACTIVE FRONT END AS DEFINED IN THE SPECIFICATIONS)
RVSS = REDUCED VOLTAGE SOLID STATE STARTER
RVAT = REDUCED VOLTAGE AUTO TRANSFORMER
a/B = DEVICE WITH BYPASS STARTER, REFER TO THE SPECIFICATIONS

b = INPUT OPTIONS
LL = LINE REACTOR
PHF = PASSIVE HARMONIC FILTER

c = OUTPUT OPTIONS
LR = LOAD REACTOR
DV/DT = Dv/dt FILTER
SWF = SINE WAVE FILTER

EQUIPMENT ENCLOSURE

MISCELLANEOUS

HP — MOTOR
HP = HORSEPOWER RATING
FULL LOAD AMPS AS NOTED

PACKAGED EQUIPMENT
LOAD RATING AS INDICATED
a = RATED LOAD
b = UNIT(HP, KW, KVA) AS INDICATED

TRANSFORMER
a = DEVICE I.D.
b = KVA RATING
c = NUMBER OF PHASES
d = PRIMARY VOLTAGE
e = SECONDARY VOLTAGE
f,g = CONNECTION TYPE SYMBOL
h = IMPEDANCE

GROUNDED WYE CONNECTION

DELTA CONNECTION

G — ENGINE-GENERATOR RATINGS AS INDICATED ON THE DRAWINGS
a = KVA/KW
b = VOLTAGE/CONNECTION
c = PHASE
d = WIRE
e = PF

CURRENT TRANSFORMER WITH SHORTING TERMINAL BLOCK
a = QUANTITY
b = RATIO

POTENTIAL TRANSFORMER
a = QUANTITY
b = RATIO
c,d = CONNECTION TYPE SYMBOL

SSM — SOLID STATE MULTIFUNCTION METER

ATP — AMPERE TEST POINT

VTP — VOLTAGE TEST POINT

UTILITY METER

LIGHTNING ARRESTER

SPD — SURGE PROTECTIVE DEVICE

DRAWOUT CONNECTION

GROUND

CAPACITOR

BATTERY

K — KIRK KEY INTERLOCK

LOAD BANK

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED W. FLETCHER
DRAWN A. CHARDE
CHECKED
DATE JULY 2025

PDG POPLI DESIGN GROUP | carollo | Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
ELECTRICAL
GENERAL LEGEND AND SYMBOLS

VERIFY SCALES
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0 1"
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JOB NO. 203580-60000
DRAWING NO. 00GE01
SHEET NO. 22 OF 32

LAST SAVED BY:
PROJECT NO.
FILE NAME:

ABBREVIATIONS

A	AMP
ABS	ABSOLUTE
AC	ALTERNATING CURRENT
ACK	ACKNOWLEDGE
ACTR	ACTUATOR
AF	AMP FRAME
AFC	AUTOMATIC FREQUENCY CONTROL
AIC	AMP INTERRUPTING CAPACITY
AM	AMMETER
ANN	ANNUNCIATOR
ANT	ANTENNA
APU	AUXILIARY POWER UNIT
ARM	ARMORED CABLE
AS	AMMETER SWITCH
ASYM	ASYMMETRICAL
AT	AMP TRIP
ATO	AUTOMATIC THROW OVER
ATP	AMMETER TEST POINT
ATS	AUTOMATIC TRANSFER SWITCH
AUTO XFMR	AUTOMATIC TRANSFORMER
AUX	AUXILIARY
AWG	AMERICAN WIRE GAGE
B	BELL
BAT	BATTERY
BFG	BELOW FINISHED GRADE
BHP	BRAKE HORSEPOWER
BKR	BREAKER
BRF	BELOW RAISED FLOOR
C	CONDUIT / CONTINUOUS LOAD
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CCW	COUNTER CLOCKWISE
CKT	CIRCUIT
COAX	COAXIAL CABLE
COM	COMMON
COMM	COMMUNICATION
CPT	CONTROL POWER TRANSFORMER
CR	CONTROLLED RECEPTACLE
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
CV	CONTROL VALVE
CW	CLOCKWISE / COOL WHITE
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DCU - X	DISTRIBUTED CONTROL UNIT NO. X
DEMO	DEMOLITION
DISC	DISCONNECT SWITCH
DM	DEMAND METER
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DS	DOOR SWITCH
E/G	EMERGENCY GENERATOR
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSURE
ENG	ENGINE
ENT	ELECTRICAL NON-METALLIC TUBING
EP	EXPLOSION PROOF
ETM	ELAPSED TIME METER
F	SUB-FED
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FDR	FEEDER
FLA	FULL LOAD AMPS
FLX	FLEXIBLE CONDUIT
FO	FIBER OPTIC
FRC	FIBERGLASS RIGID CONDUIT
FREQ	FREQUENCY
FU	FUSE
FU SW	FUSED SWITCH
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
FWD	FORWARD

G	GROUND / EQUIPMENT GROUND / GROUND FAULT
GEN	GENERATOR
GRC	GALVANIZED STEEL RIGID CONDUIT
GFCI	GROUND FAULT CIRCUIT INTERRUPTER (RECEPTACLE)
GFI	GROUND FAULT INTERRUPTER (BREAKER)
GFR	GROUND FAULT RELAY
H	HOT-LEG
HF	HIGH FREQUENCY
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HSTAT	HUMIDISTAT
HV	HIGH VOLTAGE
HVAC	HEATING/VENTILATION/AIR CONDITIONING
HZ	HERTZ
I	INSTANTANEOUS / INTERMITTENT LOAD
IC	INTERRUPTING CAPACITY
IJB	INSTRUMENT JUNCTION BOX
IMC	INTERMEDIATE METAL CONDUIT
INST	INSTANTANEOUS
INT	INTERLOCK
INTERCOM	INTERCOMMUNICATION
J	JUNCTION BOX
K	KEY INTERLOCK
KA	KILOAMP
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAR	KILOVAR (REACTANCE)
KW	KILOWATT
KWD	KILOWATT DEMAND
KWH	KILOWATT HOUR
L	LONG-TIME
L-B	LINE-BUS
L-G	LINE-GROUND
LA	LIGHTNING ARRESTOR
LBL	LABEL
LC	LIGHTING CONTACTOR
LCP- X	LOCAL CONTROL PANEL NO. X
LL	LEAD-LAG LOAD REACTOR
LP	LIGHT POLE
LP - X	LIGHTING PANEL NO. X
LTG	LIGHTING
LV	LOW VOLTAGE
LVL	LEVEL
M-X	MOTOR CONTROLLER NO. X
MA	MILLIAMPERE
MCA	MOTOR CIRCUIT AMPS
MCC - X	MOTOR CONTROL CENTER NO. X
MCP	MOTOR CIRCUIT PROTECTOR
MH	MANHOLE / MOUNTING HEIGHT
MLO	MAIN LUGS ONLY
MOD	MOTOR OPERATED DAMPER
MOV	METAL OXIDE VARISTOR
MPR	MOTOR PROTECTION RELAY
MS-X	MOTOR STARTER NO. X
MSP	MOTOR STARTING PANEL
MTO	MANUAL THROW OVER
MTR-X	MOTOR NO. X
MTS	MANUAL TRANSFER SWITCH
MV	MEGAVOLT
MVA	MEGAVOLT-AMPERES
MVS	MEDIUM VOLTAGE SWITCH
MW	MEGAWATT
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NFC	NONMETALLIC FLEXIBLE CONDUIT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NP	NAMEPLATE

O	OPEN OR OPENED
OH	OVERHEAD
OL	OVERLOAD RELAY
P	POLE
PA	PUBLIC ADDRESS
PB	PUSHBUTTON / PULL BOX
PCS	PVC COATED GALVANIZED STEEL CONDUIT
PCM	PROCESS CONTROL MODULE
PE	PHOTOCELL
PF	POWER FACTOR
PFCC	POWER FACTOR CORRECTION CAPACITOR
PFR	PHASE FAILURE RELAY
PH	PHASE
PNL	PANEL
PPX	POWER PANEL NO. X
PRI	PRIMARY
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE RIGID PLASTIC CONDUIT
PWR	POWER
RAC	RIGID ALUMINUM CONDUIT
RECPT	RECEPTACLE
REV	REVERSE
RF	RADIO FREQUENCY
RMS	ROOT MEAN SQUARED
RVAT	REDUCED VOLTAGE AUTO TRANSFORMER
RVNR	REDUCED VOLTAGE NON-REVERSING
RVSS	REDUCED VOLTAGE SOLID STATE
S	SHIELD / SHORT-TIME
SA	SURGE ARRESTER
SC	SHORT CIRCUIT
SDBC	SOFT DRAWN BARE COPPER
SFL	SUB FEED LUGS
SLT	SEALTIGHT LIQUIDTIGHT FLEXIBLE CONDUIT
SM	SURFACE MOUNTED
SP	SINGLE POLE
SPD	SURGE PROTECTIVE DEVICE
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SPKR	SPEAKER
SS	SOLID STATE
STB	SHORTING TERMINAL BLOCK
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
TACH	TACHOMETER
TB - X	TERMINAL BLOCK - UNIT X
TC	THERMOCOUPLE / TIME CLOCK / TRAY CABLE
TD	TEMPERATURE DETECTOR RELAY
TE	TOTALLY ENCLOSED
TEFC	TOTALLY ENCLOSED FAN COOLED
TENV	TOTALLY ENCLOSED NON-VENTILATED
TERM	TERMINAL
TJB	TERMINAL JUNCTION BOX
TM	THERMAL MAGNETIC
TP	TWISTED PAIR
TS	TEMPERATURE SWITCH
TS1W	TWO SPEED CONSEQUENT POLE, ONE WINDING
TS2W	TWO SPEED SEPARATE WINDING
TSTAT	THERMOSTAT
UHF	ULTRA HIGH FREQUENCY
UNG	UNGROUNDED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UVR	UNDER VOLTAGE RELAY

V	VOLT
VA	VOLT AMPERE
VAR	VARMETER
VCP	VENDOR CONTROL PANEL
VFD	VARIABLE FREQUENCY DRIVE
VHF	VERY HIGH FREQUENCY
VM	VOLTMETER
VP	VAPORPROOF
VR	VOLTAGE REGULATOR
VS	VOLTAGE SWITCH
VT	VOLTAGE TRANSFORMER
VTP	VOLTAGE TEST POINT
W	WATT / WEST
WT	WATER TIGHT
WP	WEATHER PROOF
XFMR	TRANSFORMER

NOTES:

1. REFER TO SPECIFICATIONS AND OTHER DRAWINGS FOR ADDITIONAL ABBREVIATIONS.

POWER DEVICE FUNCTION NUMBERS

1	MASTER ELEMENT
2	TIME-DELAY STARTING OR CLOSING RELAY
3	CHECKING OR INTERLOCKING RELAY
4	MASTER CONTACTOR
5	STOPPING DEVICE
6	STARTING CIRCUIT BREAKER
7	ANODE CIRCUIT BREAKER
8	CONTROL POWER DISCONNECTING DEVICE
9	REVERSING DEVICE
10	UNIT SEQUENCE SWITCH
11	MULTIFUNCTION DEVICE
12	OVER-SPEED DEVICE
13	SYNCHRONOUS-SPEED DEVICE
14	UNDER-SPEED DEVICE
15	SPEED OR FREQUENCY MATCHING DEVICE
16	DATA COMMUNICATIONS DEVICE
17	SHUNTING OR DISCHARGE SWITCH
18	ACCELERATING OR DECELERATING DEVICE
19	STARTING-TO-RUNNING TRANSITION CONTACTOR
20	ELECTRICALLY OPERATED VALVE
21	DISTANCE RELAY
22	EQUALIZER CIRCUIT BREAKER
23	TEMPERATURE CONTROL DEVICE
24	VOLTS PER HERTZ RELAY
25	SYNCHRONIZING OR SYNCHRONISM-CHECK DEVICE
26	APPARATUS THERMAL DEVICE
27	UNDERVOLTAGE RELAY
27N	GROUND FAULT UNDERVOLTAGE RELAY
28	FLAME DETECTOR
29	ISOLATING CONTACTOR
30	ANNUNCIATOR RELAY
31	SEPARATE EXCITATION DEVICE
32	DIRECTIONAL POWER RELAY
33	POSITION SWITCH
34	MASTER SEQUENCE DEVICE
35	BRUSH-OPERATING OR SLIP-RING SHORT-CIRCUITING DEVICE
36	POLARITY DEVICE
37	UNDERCURRENT OR UNDERPOWER RELAY
38	BEARING PROTECTIVE DEVICE
39	MECHANICAL CONDITION MONITOR
40	FIELD RELAY
41	FIELD CIRCUIT BREAKER
42	RUNNING CIRCUIT BREAKER
43	MANUAL TRANSFER OR SELECTOR DEVICE
44	UNIT SEQUENCE STARTING RELAY
45	ABNORMAL ATMOSPHERIC CONDITION MONITOR
46	REVERSE-PHASE OR BALANCE CURRENT RELAY
47	PHASE-BALANCE OR PHASE-SEQUENCE VOLTAGE RELAY
48	INCOMPLETE SEQUENCE RELAY
49	MACHINE OR TRANSFORMER THERMAL RELAY
50	INSTANTANEOUS OVERCURRENT RELAY
51	AC TIME OVERCURRENT RELAY
52	AC CIRCUIT BREAKER
53	FIELD EXCITATION RELAY
54	TURNING GEAR ENGAGING DEVICE
55	POWER FACTOR RELAY
56	FIELD APPLICATION RELAY
57	SHORT-CIRCUITING OR GROUNDING DEVICE
58	RECTIFICATION FAILURE RELAY
59	OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT BALANCE RELAY
61	DENSITY SWITCH OR SENSOR
62	TIME-DELAY STOPPING OR OPENING RELAY
63	PRESSURE SWITCH
64	GROUND DETECTOR RELAY
65	GOVERNOR
66	NOTCHING OR JOGGING DEVICE
67	AC DIRECTIONAL OVERCURRENT RELAY
68	BLOCKING OR OUT OF STEP RELAY
69	PERMISSIVE CONTROL DEVICE
70	RHEOSTAT
71	LIQUID LEVEL SWITCH
72	DC CIRCUIT BREAKER
73	LOAD-RESISTOR CONTACTOR
74	ALARM RELAY
75	POSITION CHANGING MECHANISM
76	DC OVERCURRENT RELAY
77	TELEMETERING DEVICE
78	PHASE-ANGLE MEASURING RELAY
79	AC RECLOSING RELAY
80	FLOW SWITCH
81	FREQUENCY RELAY
82	DC LOAD MEASURING RECLOSING RELAY
83	AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY
84	OPERATING MECHANISM
85	PILOT COMMUNICATIONS, CARRIER OR PILOT-WIRE RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTIVE RELAY
88	AUXILIARY MOTOR OR MOTOR GENERATOR
89	LINE SWITCH
90	REGULATING DEVICE
91	VOLTAGE DIRECTIONAL RELAY
92	VOLTAGE AND POWER DIRECTIONAL RELAY
93	FIELD-CHANGING CONTACTOR
94	TRIPPING OR TRIP-FREE RELAY

COMMONLY USED SUFFIX LETTER APPLIED TO POWER DEVICE FUNCTION NUMBERS

A	ALARM ONLY
B	BUS PROTECTION
G	GROUND FAULT PROTECTION (RELAY CT IN A SYSTEM NEUTRAL CIRCUIT OR GENERATOR PROTECTION)
GS	GROUND FAULT PROTECTION (RELAY CT IN TOROIDAL OR GROUND SENSOR TYPE)
L	LINE PROTECTION
M	MOTOR PROTECTION
N	GROUND FAULT PROTECTION (RELAY COIL CONNECTED IN RESIDUAL CT CIRCUIT)
T	TRANSFORMER PROTECTION
V	VOLTAGE
P	PHASE PROTECTION

ABBREVIATIONS

AFD	ARC FLASH DETECTOR
CLK	CLOCK OR RIMING SOURCE
DDR	DYNAMIC DISTURBANCE RECORDER
DFR	DIGITAL FAULT RECORDER
ENV	ENVIRONMENTAL DATA
HIZ	HIGH IMPEDANCE FAULT DETECTOR
HMI	HUMAN MACHINE INTERFACE
HST	HISTORIAN
LGC	SCHEME LOGIC
MET	SUBSTATION METERING
PDC	PHASOR DATA CONCENTRATOR
PMU	PHASOR MEASUREMENT UNIT
PQM	POWER QUALITY MONITOR
RIO	REMOTE I/O DEVICE
RTU	REMOTE TELEMETRY UNIT/REMOTE TERMINAL UNIT
SER	SEQUENCE OF EVENTS RECORDER
TCM	TRIP CIRCUIT MONITOR

REV	DATE	BY	DESCRIPTION
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DESIGNED W. FLETCHER
DRAWN A. CHARDE
CHECKED
DATE JULY 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

ELECTRICAL

ABBREVIATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

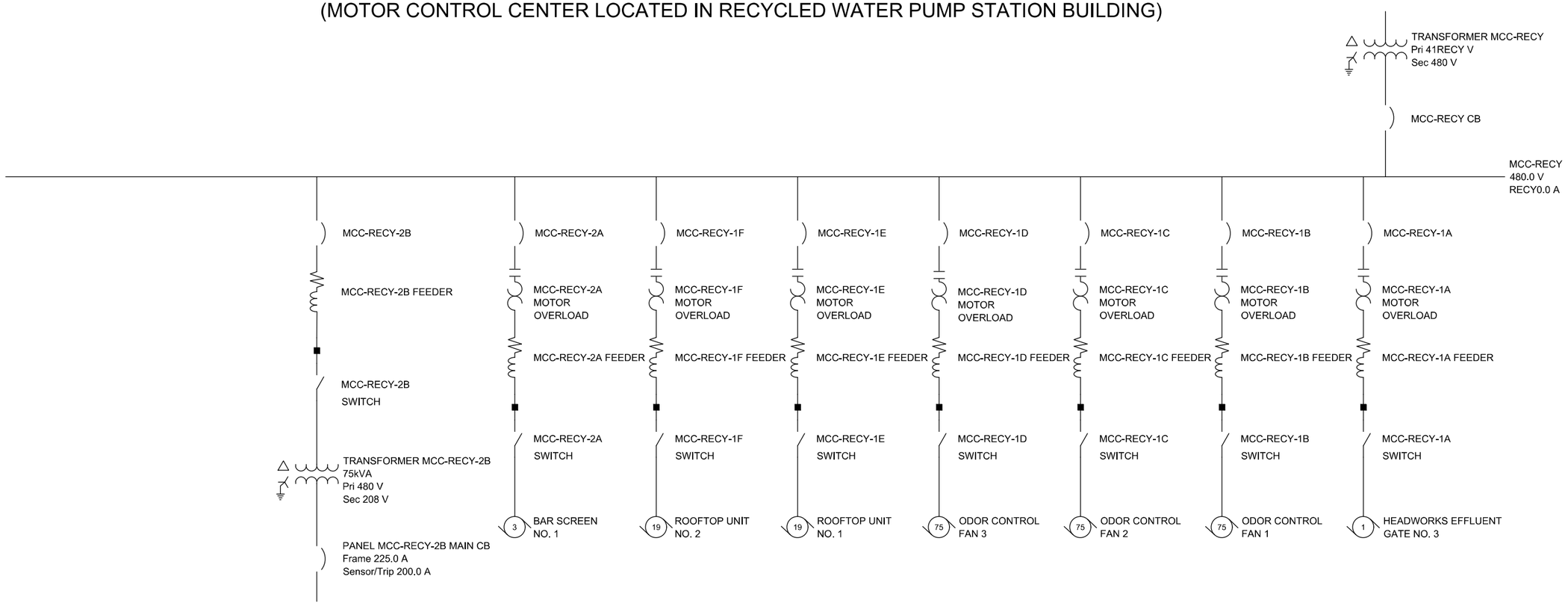
JOB NO. 203580-60000
DRAWING NO. 00GE02
SHEET NO. 23 OF 32

LAST SAVED BY:

PROJECT NO.

FILE NAME:

PROCESS 45 - RECYCLED WATER PUMP STATION
(MOTOR CONTROL CENTER LOCATED IN RECYCLED WATER PUMP STATION BUILDING)



REV	DATE	BY	DESCRIPTION
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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

ELECTRICAL

RECYCLED WATER PUMP STATION
ONE - LINE DIAGRAM

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 45E01
SHEET NO. 24 OF 32

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SYMBOL	DRAWING VISIBLE FIELDS	FIELD - 1	FIELD - 2	FIELD - 3	FIELD - 4	FIELD - 5	FIELD - 6	FIELD - 7	FIELD - 8
HMI/SCADA SYSTEM OPERATOR INTERFACE TERMINAL	1 - TAG111 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - DESCRIPTION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	ACTION ALARM SP - NUMERIC STATUS - SET POINT TREND	DESCRIPTION 2 5	DESCRIPTION	E - EXISTING F - FUTURE		
HARDWIRED I/O POINT	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE 7 - IO TABLE	REFER 1 2 4	REFER 3	AI - ANALOG INPUT AO - ANALOG OUTPUT DI - DISCRETE INPUT DO - DISCRETE OUTPUT RTD - RTD INPUT	DESCRIPTION	PAC - PROGRAMMABLE AUTOMATION CONTROLLER NO. PLC - PROGRAMMABLE LOGIC CONTROLLER NO. RIO - REMOTE I/O VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
NETWORK / SOFT I/O	1 - TAG 2 - LOOP NUMBER 3 - PROTOCOL 4 - PANEL 5 - PLC 6 - EXISTING/FUTURE 7 - IO TABLE 8 - SWITCH/SEGMENT	REFER 1 2	REFER 3	COMMUNICATION PROTOCOL CNET - CONTROLNET DNET - DEVICENET EIP - ETHERNET/IP FF - FOUNDATION FIELDBUS HART-IP - HART OVER ETHERNET MANF - MFR. PROPRIETARY MBRTU - MODBUS RTU MB+ - MODBUS PLUS MBTCP - MODBUS TCP DP - PROFIBUS DP PA - PROFIBUS PA PNET - PROFINET SNMP - SNMPv3 HTTP - WEB SERVER (TCP/IP)	DESCRIPTION	PAC - PROGRAMMABLE AUTOMATION CONTROLLER NO. PLC - PROGRAMMABLE LOGIC CONTROLLER NO. RIO - REMOTE I/O VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
LOCAL OPERATOR INTERFACE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	ACTION ALARM SP - NUMERIC STATUS - SET POINT TREND	DESCRIPTION	LOI - LOCAL OPERATOR INTERFACE NO. LCP - LOCAL CONTROL PANEL NO. PCM - PROCESS CONTROL MODULE NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
PILOT DEVICE OPERATOR INTERFACE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	AM - AUTO/MANUAL BYPASS - BY PASS ESD - EQUIPMENT SHUTDOWN HOA - HAND/OFF/AUTO LOR - LOCAL/OFF/REMOTE LOS - LOCK OUT STOP LS - LEAD/STANDBY LSR - LOCAL/STOP/REMOTE OC - OPEN/CLOSE OO - OFF/ON OSC - OPEN/STOP/CLOSE RST - RESET SEL - SELECT SPD - SPEED SS - START/STOP ST - STOP	DESCRIPTION 2 5	LCP - LOCAL CONTROL PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. RVSS - REDUCED VOLTAGE SOLID STARTER NO. VCP - VENDOR CONTROL PANEL NO. VFD - VARIABLE FREQUENCY DRIVE NO.	E - EXISTING F - FUTURE		
POWER DEVICE PRIMARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - VOLTAGE-POLE 5 - LOCATION 6 - EXISTING/FUTURE	CB - CIRCUIT BREAKER DISC - DISCONNECT FU - FUSE	REFER 3	TM - THERMAL MAGNETIC CIRCUIT BREAKER	24VDC - 1P 24VDC - 2P 24VAC - 1P 48VDC - 2P 120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	DP - DISTRIBUTION PANEL NO. LCP - LOCAL CONTROL PANEL NO. LP - LIGHTING PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. PP - POWER PANEL NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
POWER DEVICE AUXILIARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - DESCRIPTION 4 - DESCRIPTION 5 - DESCRIPTION 6 - EXISTING/FUTURE	DISC - DISCONNECT	REFER 3	DESCRIPTION	DESCRIPTION	DESCRIPTION	E - EXISTING F - FUTURE		
POWER DEVICE PRIMARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - VOLTAGE-POLE 5 - LOCATION 6 - EXISTING/FUTURE	CB - CIRCUIT BREAKER FU - FUSE	REFER 3	MCP - MOTOR CIRCUIT PROTECTOR SS - SOLID STATE CIRCUIT BREAKER TM - THERMAL MAGNETIC CIRCUIT BREAKER	24VDC - 1P 24VDC - 2P 24VAC - 1P 48VDC - 2P 120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	DP - DISTRIBUTION PANEL NO. LCP - LOCAL CONTROL PANEL NO. LP - LIGHTING PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. PP - POWER PANEL NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT STARTER / DRIVE CUBICLE / CABINET	1 - TAG 2 - LOOP NUMBER 3 - TYPE 4 - VOLTAGE-POLE 5 - POWER SOURCE 6 - EXISTING/FUTURE	MS - MOTOR STARTER RVAT - REDUCED VOLTAGE AUTO TRANSFORMER STARTER RVSS - REDUCED VOLTAGE SOLID STATE STARTER VFD - VARIABLE FREQUENCY DRIVE	REFER 3	FVNR - FULL VOLTAGE NON-REVERSING STARTER FVR - FULL VOLTAGE REVERSING STARTER PWS - PART-WINDING STARTER RVAT - REDUCED VOLTAGE AUTO RVSS - REDUCED VOLTAGE SOLID STATE STARTER TS1W - TWO SPEED SINGLE WINDING TS2W - TWO SPEED TWO WINDINGS VFD - VARIABLE FREQUENCY DRIVE	120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	LCP - LOCAL CONTROL PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		

SYMBOL	DRAWING VISIBLE FIELDS	FIELD - 1	FIELD - 2	FIELD - 3	FIELD - 4	FIELD - 5	FIELD - 6	FIELD - 7	FIELD - 8
INSTRUMENT PRIMARY ELEMENT	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION 5	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT PRIMARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - DESCRIPTION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION 5	DESCRIPTION 6 7	DESCRIPTION INT - INTEGRAL REM - REMOTE	E - EXISTING F - FUTURE		OUT - OUTDOOR
INSTRUMENT/ CONTROL ELEMENT AUXILIARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT PRIMARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 3 XR - PROTECTION RELAY CR - CONTROL RELAY XR - INTERPOSING RELAY	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT AUXILIARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 3 XR - PROTECTION RELAY CR - CONTROL RELAY XR - INTERPOSING RELAY	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
FIELD EQUIPMENT NON-POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION/SIZE 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT PRIMARY FUNCTION POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT AUXILIARY FUNCTION POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	MWH - MOTOR WINDING HEATER TSH - TEMPERATURE SWITCH XSH - TORQUE SWITCH	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		

INSTRUMENT BUBBLE LOCATIONS

PCS

I/O

OPERATOR INTERFACE CONTROL DEVICES

POWER SOURCE

FIELD

NOTES

1. INSTRUMENT TAG IDENTIFICATION LETTERS TABLE
2. OPERATOR PILOT DEVICE LEGEND
3. EQUIPMENT TAGGING TABLE
4. I/O TYPE DESIGNATIONS
5. INSTRUMENT TYPE DESIGNATIONS TABLE
6. FURNISHED BY:
   - FBO FURNISHED BY OWNER
   - FBV FURNISHED BY VENDOR
7. PROVIDED BY:
   - PBO PROVIDED BY OWNER
   - PBV PROVIDED BY VENDOR

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION
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DESIGNED J. DAVIDSON
DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

INSTRUMENTATION

SYMBOLS AND ABBREVIATIONS 1

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 00GN01
SHEET NO. 25 OF 32

PROJECT NO.
FILE NAME:

INSTRUMENT TAG IDENTIFICATION LETTERS

MEASURED VARIABLE	INSTRUMENTATION FUNCTION	ELEMENT	TRANSMITTER	INDICATING TRANSMITTER	CONVERTER TRANSDUCER, RELAY SPECIAL DEVICES	INDICATOR	RECORDER	CONTROL/COMMAND	INDICATING CONTROLLER	RECORDING CONTROLLER	SWITCH	SWITCH LOW LOW	SWITCH LOW	SWITCH HIGH	SWITCH HIGH HIGH	SWITCH COMBINATION HIGH LOW	ACTION	ALARM LOW LOW	ALARM LOW	ALARM HIGH	ALARM HIGH HIGH	TOTALIZE INDICATOR TRANSMITTER	VALVE	GAUGE	LIGHT	SPEED SETTING
A	ANALYSIS	AE	AT	AIT	AY	AI	AR	AC	AIC	ARC	AS	ASLL	ASL	ASH	ASHH	ASHL		AALL	AAL	AAH	AAHH				AL	
C	CONDUCTIVITY	CE	CT	CIT	CY	CI	CR	CC	CIC	CRC	CS	CSLL	CSL	CSH	CSHH	CSHL		CALL	CAL	CAH	CAHH				CL	
D	DENSITY	DE	DT	DIT	DY	DI	DR	DC	DIC	DRC	DS	DSLL	DSL	DSH	DSHH	DSHL		DALL	DAL	DAH	DAHH				DL	
E	VOLTAGE												ESL													
F	FLOW	FE	FT	FIT	FY	FI	FR	FC	FIC	FRC	FS	FSLL	FSL	FSH	FSHH	FSHL		FALL	FAL	FAH	FAHH	FQI	FCV	FG	FL	
H	HAND (MANUAL)*							HC			HS*						HA*						HV		HL	HSS
I	CURRENT		IT	IIT	IY	II	IR	IC	IIC	IRC	IS	ISLL	ISL	ISH	ISHH			IALL	IAL	IAH	IAHH				IL	
J	POWER					JS																				
K	TIME				KY	KI	KR	KC	KIC	KRC	KS	KSLL	KSL	KSH	KSHH			KALL	KAL	KAH	KAHH		KV		KL	
L	LEVEL	LE	LT	LIT	LY	LI	LR	LC	LIC	LRC	LS	LSLL	LSL	LSH	LSHH	LSHL		LALL	LAL	LAH	LAHH		LCV	LG	LL	
M	MOISTURE OR HUMIDITY	ME	MT	MIT	MY	MI	MR	MC	MIC	MRC	MS	MSLL	MSL	MSH	MSHH			MALL	MAL	MAH	MAHH				ML	
N	USER'S CHOICE																									
P	PRESSURE OR VACUUM	PE	PT	PIT	PY	PI	PR	PC	PIC	PRC	PS	PSLL	PSL	PSH	PSHH	PSHL		PALL	PAL	PAH	PAHH		PCV		PL	
PD	DIFFERENTIAL PRESSURE		PDT	PDIT	PDY	PDI	PDR	PDC	PDIC	PDRC	PDS	PDSLL	PDSL	PDSH	PDSHH			PDALL	PDAL	PDAH	PDAHH		PDCV		PDL	
Q	QUANTITY	QE	QT	QIT	QY	QI	QR				QS	QSLL	QSL	QSH	QSHH			QALL	QAL	QAH	QAHH					
R	RADIATION																									
S	SPEED	SE	ST	SIT	SY	SI	SR	SC	SIC	SRC	SS	SSLL	SSL	SSH	SSHH			SALL	SAL	SAH	SAHH					
T	TEMPERATURE	TE	TT	TIT	TY	TI	TR	TC	TIC	TRC	TS	TSLL	TSL	TSH	TSHH	TSHL		TALL	TAL	TAH	TAHH		TCV		TL	
TD	DIFFERENTIAL TEMPERATURE		TDT	TDIT	TDY	TDI	TDR	TDC	TDIC	TDRC	TDS	TDSLL	TDSL	TDSH	TDSHH			TDALL	TDAL	TDAH	TDAHH		TDCV		TDL	
U	MULTIVARIABLE					UI	UR	UC	UIC	URC	US														UL	
V	VISCOSITY	VE	VT	VIT	VY	VI	VR	VC	VIC	VRC	VS	VSLL	VSL	VSH	VSHH			VALL	VAL	VAH	VAHH				VL	
W	WEIGHT	WE	WT	WIT	WY	WI	WR				WS	WSLL	WSL	WSH	WSHH			WALL	WAL	WAH	WAHH					
X	UNCLASSIFIED	XE	XT	XIT	XY	XI	XR	XC	XIC	XRC	XS	XSLL	XSL	XSH	XSHH			XALL	XAL	XAH	XAHH		XCV	XG	XL	
XV	VIBRATION	XVE	XVT		XVY	XVI	XVR				XVS			XVSH	XVSHH					XVAH	XVAHH				XVL	
Y	STATUS					YI																			YL	
Z	POSITION	ZE	ZT	ZIT	ZY	ZI		ZC**			ZS**												ZV		ZL**	

OPERATOR PILOT DEVICE LEGEND

DEVICE TYPE / PILOT DEVICE FUNCTION	LOCAL-OFF-REMOTE (LOR) OR LOCAL-STOP-REMOTE (LSR)	STOP(SP)	START (ST)	HAND-OFF-AUTO (HOA) HAND-OFF-REMOTE (HOR)	OFF-ON (OO)	SELECT (SEL)	OPEN-STOP-CLOSE (OSC)	JOG OPEN-HOLD-CLOSE (JOHC)	SEMIAUTO-AUTO-MANUAL (SAAM)	LEAD-LAG-STANDBY (LLGS)	AUTO-MANUAL (AM)	OPEN-CLOSE (OC)	LOW-HIGH (LH)	RESET (RST)	SPEED (SPD)	START-STOP (STSP)	EQUIPMENT SHUTDOWN (ESD)	BYPASS (BYP)			SILENCE	POSITION (POS)
PILOT DEVICE TAG (HAND SWITCHES)	HSA	HSB	HSC	HSD	HSE	HSF	HSG	HSH	HIS	HSJ	HSM	HSO	HSQ	HSR	HSS	HST	HSU	HSV	HSW	HSX	HSY	HSZ

I/O TYPE DESIGNATIONS

RNG	RUNNING	SPDC	SPEED COMMAND
FAIL	FAILED/FAULT	SPDF	SPEED FEEDBACK
FWD	RUNNING FORWARD	REM	LOR IN REMOTE
FAST	RUNNING HIGH	LOC	LOR IN LOCAL
SLOW	RUNNING LOW	AUTO	HOA IN AUTO
REV	RUNNING REVERSE	HAND	HOA IN HAND
SVC	SOLENOID VALVE CLOSE	RST	RESET
SVO	SOLENOID VALVE OPEN		
RUN	RUN		
SLWC	MOTOR START LOW		
REVC	MOTOR START REVERSE		

INSTRUMENT TYPE DESIGNATIONS

CGD	COMBUSTIBLE GAS DETECTOR	PTOF	PULSE TIME OF FLIGHT
COND	CONDUCTIVITY	RTD	RESISTANCE TEMP DETECTOR
DO	DISSOLVED OXYGEN	SB	SLUDGE BLANKET
FMCW	FREQ. MODULATED CONT. WAVE	SC	STREAMING CURRENT
ISB	INTRINSIC SAFETY BARRIER	SD	SLUDGE DEPTH
LEL	LOWER EXPLOSIVE LIMIT	TDR	TIME DOMAIN REFLECTOMETRY
MLSS	MIXED LIQUOR SUSPENDED SOLIDS	TOC	TOTAL ORGANIC CARBON
ORG	UV 504	TSS	TOTAL SUSPENDED SOLIDS
ORP	OXIDATION REDUCTION POTENTIAL	TURB	TURBIDITY
PSUB	PRESSURE SUBMERSIBLE	UVI	UV INTENSITY
PC	PARTICLE COUNTER	UVT	UV TRANSMITTANCE

SPECIFIC ABBREVIATIONS

HTR	HEATER
HTU	HEAT TRACE UNIT
MWH	MOTOR WINDING HEATER
SV	SOLENOID VALVE
SPD	SURGE PROTECTIVE DEVICE
UPS	UNINTERRUPTIBLE POWER SUPPLY
YLA	STATUS AUTO PILOT LIGHT
YLR	STATUS REMOTE PILOT LIGHT
YL1	STATUS RUNNING PILOT LIGHT
YL2	ALARM FAILED/FAULT PILOT LIGHT

P&ID LINE SYMBOLS

INSTRUMENT OR CONNECTION TO PROCESS

PNEUMATIC SIGNAL

ELECTRIC SIGNAL

HYDRAULIC SIGNAL

CAPILLARY TUBE

INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)

PROCESS LINE SYMBOLS

PRIMARY PROCESS FLOW IN PIPE

SECONDARY PROCESS FLOW IN PIPE

PRIMARY PROCESS FLOW IN CHANNEL

SECONDARY PROCESS FLOW IN CHANNEL

HEAT TRACE

DESIGNATIONS

EQUIPMENT ENCLOSURE

EXISTING

FUTURE

FUTURE

MISCELLANEOUS P&ID SYMBOLS

PROCESS CONTINUATION — DESC2_ DESC1_ # DWG NO. — UNIQUE IDENTIFIER — CONTINUATION SHEET

SIGNAL CONTINUATION — DESC2_ DESC1_ # DWG NO. — UNIQUE IDENTIFIER — CONTINUATION SHEET

PIPE CALLOUT — PIPE SIZE

SCHEMATIC DETAIL — ? -

TYPICAL DETAIL — * TYP — TYPNUM, TYPNUM2, TYPNUM3, TYPNUM4, TYPNUM5, TYPNUM6

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION

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DESIGNED J. DAVIDSON
DRAWN A. CHARDE
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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
INSTRUMENTATION
SYMBOLS AND ABBREVIATIONS 2

VERIFY SCALES
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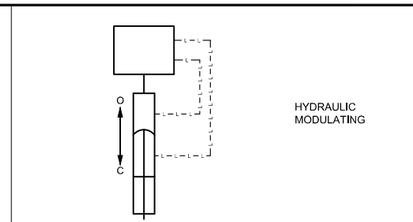
JOB NO. 203580-60000
DRAWING NO. 00GN02
SHEET NO. 26 OF 32

PROJECT NO.
FILE NAME:

ACTUATORS

- DIAPHRAGM
- ELECTRIC HYDRAULIC
- ELECTRIC
- HAND
- HYDRAULIC
- MOTOR
- PNEUMATIC
- SOLENOID



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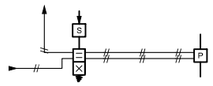
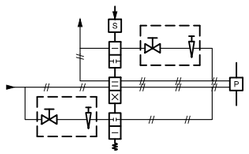


PNEUMATIC SINGLE SOLENOID OPEN/CLOSE



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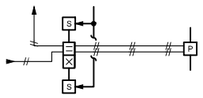

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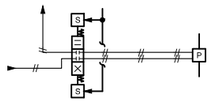
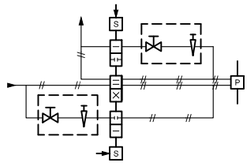
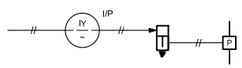


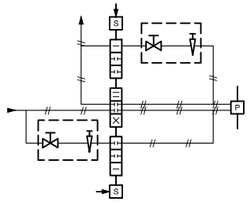
PNEUMATIC DUAL SOLENOID OPEN/HOLD/CLOSE



PNEUMATIC DUAL SOLENOID OPEN/CLOSE w/ SPEED CONTROL



PNEUMATIC MODULATING



PNEUMATIC MODULATING OPEN/CLOSE w/ SPEED CONTROL

PIPING

- AIR GAP
- BLIND FLANGE
- CAPPED OR PLUGGED
- CONCENTRIC INCREASER
- CONCENTRIC REDUCER
- DRAIN
- ECCENTRIC INCREASER
- FLANGED CONNECTION
- TEE
- UNION
- ECCENTRIC REDUCER
- EXPANSION COUPLING
- EXPANSION JOINT VIBRATION CENTER
- FLEXIBLE CONNECTION
- QUICK DISCONNECT

PUMPS

- AIR DRIVEN
- CENTRIFUGAL
- CHEMICAL FEED DIAPHRAGM
- DIAPHRAGM
- GEAR
- LOBE
- PERISTALTIC OR HOSE
- PISTON
- PROGRESSIVE CAVITY
- OR SUBMERSIBLE
- VERTICAL TURBINE
- VERTICAL CHOPPER
- WATER CHAMP

BLOWERS/ COMPRESSORS/FANS

- CENTRIFUGAL SINGLE STAGE BLOWER/FAN
- CENTRIFUGAL MULTI STAGE BLOWER
- RECIPROCATING COMPRESSOR
- SCREW COMPRESSOR
- FAN
- LIQUID RING COMPRESSOR
- ROTARY LOBE BLOWER

CHECK VALVES

- BACK FLOW PREVENTER
- BALL
- DIAPHRAGM CHECK
- DOUBLE FLAP
- FLAPPER
- SLANTING CHECK VALVE
- SPRING LOADED GENERAL
- SPRING LOADED SWING
- SWING

PRESSURE VALVES

- BACKPRESSURE REGULATING SELF CONTAINED
- BACKPRESSURE REGULATING EXTERNAL TAP
- PRESSURE REDUCING SELF CONTAINED
- PRESSURE REDUCING EXTERNAL PRESSURE TAP
- REGULATING
- PRESSURE RELIEF
- VACUUM RELIEF

VALVES

- 3-WAY
- 3-WAY PLUG
- 4-WAY
- AIR-RELIEF
- ANGLE
- BALL
- BALL V-NOTCH
- BUTTERFLY
- BUTTERFLY-BURIED VALVE BOX
- CONE
- DIAPHRAGM
- FLOAT
- GATE
- GATE-BURIED VALVE BOX
- GLOBE
- HOSE
- MISCELLANEOUS
- MUD
- NEEDLE
- PINCH
- PLUG ECCENTRIC
- PLUG ECCENTRIC w-VALVE BOX
- PLUG ECCENTRIC LUBRICATED
- PLUG ECCENTRIC LUBRICATED BURIED VALVE BOX
- PLUG CONCENTRIC
- PLUG CONCENTRIC -BURIED VALVE BOX
- PLUG CONCENTRIC LUBRICATED
- PLUG CONCENTRIC LUBRICATED BURIED VALVE BOX
- PUMP DISCHARGE
- TELESCOPING

VALVE DESIGNATIONS	
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
FO	FAIL OPEN
FC	FAIL CLOSE
FLP	FAIL LAST POSITION

MISC

- AIR / CHEMICAL DIFFUSER
- BASKET STRAINER
- BLOW-OFF SILENCER
- CALIBRATION COLUMN
- COALESCER
- DESICCANT DRYER
- EDUCTOR/EJECTOR
- EQUIPMENT/ INSTRUMENT LOCATOR
- EYEWASH
- FILTER
- FILTER SEPARATOR
- FINE FILTER
- FIRE ALARM/SENSOR
- FLAME ARRESTER
- FLAME ARRESTER w/THERMALLY OPERATED VALVE
- FLOW CONDITIONER
- GAS CANNON
- GRINDER
- HEAT EXCHANGER
- HOIST
- HORIZONTAL MIXER
- HOSE CONNECTION
- INLET STRAINER
- INLINE STATIC MIXER
- INLINE DUCT BALANCING DAMPER
- LOUVER OR BACKDRAFT DAMPER
- MATERIAL CHANGE
- MIXER
- NOZZLE
- ORIFICE RESTRICTION
- PERISTALTIC COMPOSITE SAMPLER
- OR PULSATION DAMPENER
- REFRIGERATED DRYER
- RUPTURE DISK
- SAMPLE PORT
- SIGHT TUBE
- SMOKE DETECTOR
- STRAINER - MECHANICALLY CLEANED
- STRAINER WITH BLOW OFF
- STRAINER WYE TYPE
- VAPOR HEATER
- VAPORIZER
- VENT
- VENT TO ATMOSPHERE

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DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

INSTRUMENTATION

SYMBOLS AND ABBREVIATIONS 3

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FLOW

- CORIOLIS
- MAGNETIC
- ORIFICE
- PADDLE WHEEL
- PISTON
- ANNUBAR
- PITOT TUBE
- POSITIVE-DISPLACEMENT
- PROPELLER-TURBINE
- ROTAMETER
- SHUTTLE
- THERMAL
- ULTRASONIC
- ULTRASONIC BIOGAS
- V-CONE
- VENTURI TUBE OR FLOW NOZZLE
- VORTEX

FLUMES

- LEOPOLD-LAGCO
- PALMER-BOWLUS
- PARSHALL
- REGULAR CUTTHROAT
- TRAPEZOIDAL

GATES

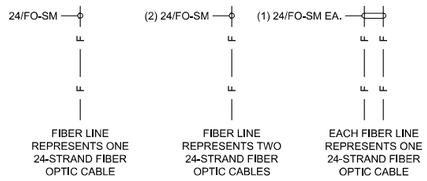
SIDE VIEW	PLAN VIEW
	FLAP
	KNIFE
SLIDE	SLIDE
SLUICE	SLUICE
STOP	STOP
	WEIR
	BUTTERFLY

LEVELS

- BUBBLER
- CAPACITANCE
- DIFFERENTIAL PRESSURE (TANK)
- DISPLACEMENT
- ELECTRODE
- BALL FLOAT
- INVERTED COLUMN
- PROBE
- RADAR PTOF
- RADAR (FREQUENCY MODULATED CONTINUOUS WAVE)
- RADAR TDR
- SUSPENDED/ SUBMERSIBLE
- TUNING FORK
- ULTRASONIC

NETWORKS

CABLE CALLOUTS AND ABBREVIATIONS



FIBER ABBREVIATIONS

###/FO-XX
- ## = STRAND COUNT
- FO = FIBER OPTIC

XX = MODE
- SM = SINGLE MODE
- MM = MULTIMODE

NETWORK ABBREVIATIONS

BMS	= BUILDING MANAGEMENT SYSTEM
BSN	= BUSINESS NETWORK
FCN	= FIELD CONTROL NETWORK
MIN	= MAINTENANCE INFORMATION NETWORK
PCN	= PROCESS CONTROL NETWORK
PLCN	= PLC NETWORK
SCN	= SECURITY CONTROL NETWORK
PCN-W	= WIRELESS PROCESS CONTROL NETWORK
NR	= NETWORK RACK
NP	= NETWORK PANEL
ES	= ETHERNET SWITCH
FPP	= FIBER PATCH PANEL

VLAN SYMBOLS

- = BUSINESS NETWORK
- = SECURITY CONTROL NETWORK
- = BUILDING MANAGEMENT SYSTEM
- = PROCESS CONTROL NETWORK
- = WIRELESS PROCESS CONTROL NETWORK
- = MAINTENANCE INFORMATION NETWORK
- = PLC NETWORK
- = FIELD CONTROL NETWORK

PRESSURE/VACUUM

PRESSURE

- PI — GAUGE
- PSH / PE — PRESSURE SWITCH
- PIT / PE — PRESSURE TRANSMITTER
- MANOMETER

DIFFERENTIAL PRESSURE

- PDI — GAUGE DIFFERENTIAL INDICATOR
- PDSL / PDE — DIFFERENTIAL PRESSURE SWITCH
- PDIT / PDE — DIFFERENTIAL PRESSURE TRANSMITTER

PRESSURE SEALS

- SEAL ANNULAR
- SEAL DIAPHRAGM
- SEAL SANITARY

EXAMPLE

PSH / PE — PRESSURE SWITCH

TEMPERATURE

- TEMPERATURE w/THERMOWELL
- TEMPERATURE GAUGE
- T — THERMOMETER

WEIGHT

- PLATFORM SCALE

WEIRS

SIDE VIEW	PLAN VIEW
RECTANGULAR w/o END CONTRACTIONS	RECTANGULAR w/o END CONTRACTIONS
RECTANGULAR w/ END CONTRACTIONS	RECTANGULAR w/ END CONTRACTIONS
V-NOTCH (TRIANGULAR)	V-NOTCH (TRIANGULAR)
TRAPEZOIDAL (CIPOLLETTI)	TRAPEZOIDAL (CIPOLLETTI)

NETWORK LINE SYMBOLS

COPPER ETHERNET	— C — C — C — C — C — C —
DUPLEX FIBER PATCH	— FP — FP — FP — FP — FP — FP —
FIBER OPTIC ETHERNET	— F — F — F — F — F — F —
WIRELESS	— W — W — W — W — W — W —
PROFIBUS DP	— PBD — PBD — PBD — PBD — PBD — PBD —
PROFIBUS PA	— PBA — PBA — PBA — PBA — PBA — PBA —
SERIAL DATA	—o—o—o—o—o—o—o—o—o—o—o—o—o—o—

MISCELLANEOUS NETWORK SYMBOLS

NETWORK CABLE CONTINUATIONS

TOP OF PAGE STYLE CONTINUATION

DESC 3
DESC 2
DESC 1
DWG NO.
(#)
— CONTINUATION SHEET
— UNIQUE IDENTIFIER

BOTTOM/LEFT OF PAGE STYLE CONTINUATION

(#)
DWG NO.
DESC 1
DESC 2
DESC 3
— UNIQUE IDENTIFIER
— CONTINUATION SHEET

FIELD NETWORK DEVICE

PLC TAG / PANEL TAG — PROTOCOL / SEGMENT #
DEVICE SPECIFIC SYMBOL
TAG
DESC 1
DESC 2
DESC 3
P&ID DRAWING REFERENCE

NETWORK EQUIPMENT CALLOUT

TAG
DESC 1

REV	DATE	BY	DESCRIPTION

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DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
INSTRUMENTATION
SYMBOLS AND ABBREVIATIONS 4

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PROCESS SWITCHES

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION

- LEVEL SWITCH CLOSE ON RISING LEVEL
- LEVEL SWITCH OPEN ON RISING LEVEL
- PRESSURE SWITCH CLOSE ON RISING PRESSURE
- PRESSURE SWITCH OPEN ON RISING PRESSURE
- TEMPERATURE SWITCH CLOSE ON RISING TEMPERATURE
- TEMPERATURE SWITCH OPEN ON RISING TEMPERATURE
- FLOW SWITCH CLOSE ON INCREASE IN FLOW
- FLOW SWITCH OPEN ON INCREASE IN FLOW
- VIBRATION SWITCH OPEN ON RISING VIBRATION
- VIBRATION SWITCH CLOSE ON RISING VIBRATION
- TORQUE SWITCH OPEN ON HIGH TORQUE
- TORQUE SWITCH CLOSE ON HIGH TORQUE
- NORMALLY CLOSED LIMIT SWITCH
- NORMALLY CLOSED HELD OPEN LIMIT SWITCH
- NORMALLY OPEN LIMIT SWITCH
- NORMALLY OPEN HELD CLOSED LIMIT SWITCH

HAND SWITCHES

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a/b/c = POSITION
x = DENOTES POSITION CONTACTS CLOSED IN

- NORMALLY OPEN MOMENTARY PUSHBUTTON
- NORMALLY CLOSED MOMENTARY PUSHBUTTON
- MUSHROOM HEAD PUSHBUTTON NORMALLY OPEN
- MUSHROOM HEAD PUSHBUTTON NORMALLY CLOSED
- PUSH-PULL PUSHBUTTON MAINTAINED CONTACT
- PUSH-PULL PUSHBUTTON NORMALLY CLOSED
- PADLOCK SWITCH
- PULL CORD SWITCH
- STOP-LOCKOUT PUSHBUTTON
- THREE POSITION SELECTOR SWITCH
- TWO POSITION SELECTOR SWITCH NORMALLY OPEN
- TWO POSITION SELECTOR SWITCH NORMALLY CLOSED
- SPRING-RETURN

RELAYS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = TYPE
CR- CONTROL RELAY
TD- TIME DELAY RELAY
M - MOTOR STARTER COIL
L - MOTOR STARTER COIL - LOW SPEED
H - MOTOR STARTER COIL - HIGH SPEED
F - MOTOR STARTER COIL - FORWARD
R - MOTOR STARTER COIL - REVERSE

b = TIME DELAY STATE
TDON - TIME DELAY ON ENERGIZATION
TDOFF - TIME DELAY ON DEENERGIZATION

c = TIMING RANGE/SETTING

- RELAY COIL
- NORMALLY OPEN CONTROL CONTACT
- NORMALLY CLOSED CONTROL CONTACT
- TIME DELAY CONTACT NORMALLY OPEN TIMED CLOSING (NCTC)
- TIME DELAY CONTACT NORMALLY CLOSED TIMED OPENING (NCTO)
- TIME DELAY CONTACT NORMALLY OPEN TIMED OPENING (NOTO)
- TIME DELAY CONTACT NORMALLY CLOSED TIMED CLOSING (NOTC)

I/O

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = INPUT/OUTPUT
b = I/O VOLTAGE

- PLC DISCRETE
- PLC ANALOG
- DIGITAL BUS

MISC

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION

- SOLENOID
- CIRCUIT BREAKER
- DISCONNECT
- FUSE
- TRANSIENT SURGE PROTECTION
- MOTOR WINDING HEATER

MOTORS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = HORSEPOWER

- MOTOR - 1 PHASE
- MOTOR - 3 PHASE

INDICATORS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = LENS COLOR
R - RED
G - GREEN
W - WHITE
A - AMBER
B - BLUE
Y - YELLOW
C - CLEAR

- PILOT LIGHT
- PUSH-TO-TEST LIGHT
- BEACON
- HORN

MISC

- VARISTOR
- CAPACITOR
- RESISTOR
- BATTERY
- DIODE
- MOTOR OVERLOAD HEATERS
- OVERLOAD CONTACT
- DRAWOUT CONNECTION
- GROUND
- LIGHTNING ARRESTOR
- CONTROL POWER TRANSFORMER (H1 H3 H2 H4 / X1 X2)

- ELAPSED TIME METER (ETM)
- RTD
- MISC PORT (a)
- ETHERNET PORT
- SURGE PROTECTION DEVICE (SPD)
- TRANSFORMER LINE/LOAD REACTOR
- SPEED SWITCH
- SPEED POTENTIOMETER
- SHIELDED WIRE
- LOOP

MOTORS

SCHEMATIC NUMBER — SCHEMATIC DESCRIPTION

DESCRIPTION

 # CONTROL SCHEMATIC

TAG ← LOOP
* = XXX ← XXX-
TAG NUMBER ← PRIMARY EQUIPMENT LOOP

REFERENCE DWG.
DWG1 DWG2
DWG1 → P&ID REFERENCE
DWG2 → ADDITIONAL REFERENCES

LOCATION LEGEND
XXX → ABBREVIATION
IN/AT XXX → LOCATION DESCRIPTION

REV	DATE	BY	DESCRIPTION

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DRAWN	A. CHARDE
CHECKED	S. DAVIS
DATE	JULY 2025

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INSTRUMENTATION

SCHEMATIC SYMBOLS

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PROJECT NO.

FILE NAME:

EQUIPMENT DESCRIPTOR			
XXX		**XXX**	
AB	AERATION BASIN	GRI	GRINDER
AER	AERATOR	GRD	GRIT DEWATERING UNIT (CYCLONE)
AHU	AIR HANDLING UNIT	GRW	GRIT WASHER
ARC	AIR COMPRESSOR	GTW	GATEWAY
ARF	AIR FILTER	HPU	HYDRAULIC POWER UNIT
ARR	ARRESTOR	IC	ISOLATION CONTACTOR
ATS	AUTOMATIC TRANSFER SWITCH	INJ	INJECTOR
AUG	AUGER	LAG	LAGOON
AVR	AIR VACUUM RELIEF	INM	INDUCTION MIXER
BAR	BAR SCREEN	MAU	MAKE-UP AIR UNIT
BAS	BASIN	MIX	MIXER
BC	BYPASS CONTACTOR	MS	MOTOR STARTER
BFP	BELT FILTER PRESS	MPR	MOTOR PROTECTION RELAY
BIT	BIO TOWER	MTR	MOTOR
BLO	BLOWER	NP	NETWORK PANEL
BOI	BOILER	NR	NETWORK RACK
BUR	BURNER	OZG	OZONE GENERATOR
CAL	CALIBRATION COLUMN	PBU	POLYMER BLENDING UNIT
CB	CIRCUIT BREAKER	PCM	PROCESS CONTROL MODULE
CC	COMMUNICATIONS CABINET	PDC	POWER DISTRIBUTION CENTER
CEN	CENTRIFUGE	PLO	PLOW
CHI	CHILLER	PMP	PUMP
CHL	CHLORINATOR	PPR	PUMP PROTECTION RELAY
CLA	CLASSIFIER	PQM	POWER QUALITY METER
CLR	CLARIFIER	PRE	PRESS
CLU	CLUTCH	PUD	PULSATION DAMPENER
COA	COALESCER	REC	RECEIVER
COL	COLLECTOR	RVSS	REDUCED VOLTAGE STARTER
CON	CONVEYOR	RIO	REMOTE IO PANEL
COO	COOLER	RES	RESERVOIR
COS	COMPOSITE SAMPLER	RUD	ROLL UP DOOR
CPT	CONTROL POWER TRANSFORMER	SCB	SCRUBBER
CF	CARTRIDGE FILTER	SCR	SCREEN
CR	CONTROL RELAY	SCW	SCREW
CRN	BRIDGE CRANE/HOIST/MONORAIL	SEL	SEAL
CYC	CYCLONE CLASSIFER	SF	SUPPLY FAN
DAM	DAMPER	SHA	SHAKER
DCD	DC DRIVE	SLA	SLAKER
DEC	DECARBONATOR	SLC	SLUDGE COLLECTOR
DGC	DIGESTER GAS CONDITIONING	SPD	SURGE PROTECTION DEVICE
DIF	DIFFUSER	SRR	STIRRER
DIG	ANAEROBIC DIGESTER	STR	STRAINER
DIS	DISTRIBUTOR	SV	SOLENOID VALVE
DISC	DISCONNECT	SWC	SCREENING WASHER COMPACTOR
DRY	DRYER	THI	THICKENER
DSC	DUST COLLECTOR	TIP	TIPPING TROUGH
EDU	EDUCTOR	TNK	TANK
EF	EXHAUST FAN	TRA	TRAP
ES_	ETHERNET SWITCH	UPS	UNINTERRUPTIBLE POWER SUPPLY
ERD	ENERGY RECOVERY DEVICE	UVB	UV BANK
EUH	ELECTRIC UNIT HEATER	UVR	ULTRAVIOLET REACTOR
EVP	EVAPORATOR	VAL	VALVE
EXC	EXCHANGER	LCP	LOCAL CONTROL PANEL
FACP	FIRE ALARM CONTROL PANEL	VCP	VENDOR CONTROL PANEL
FAN	FAN	VFD	VARIABLE FREQUENCY DRIVE
FDR	FEEDER	WEL	WELL
FLA	FLARE	*CV	* CONTROL VALVE
FLC	FLOCCULATOR	*V	* VALVE
FLT	FILTER	*CG	* CONTROL GATE
FU	FUSE	*G	* GATE
GAT	GATE		* = A (ANALYTICAL), F (FLOW), L (LEVEL)
GEN	ENGINE GENERATOR		P (PRESSURE), T (TEMPERATURE)
GRC	GRIT CHAMBER		

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DRAWN A. CHARDE
CHECKED S. DAVIS
DATE JULY 2025

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN
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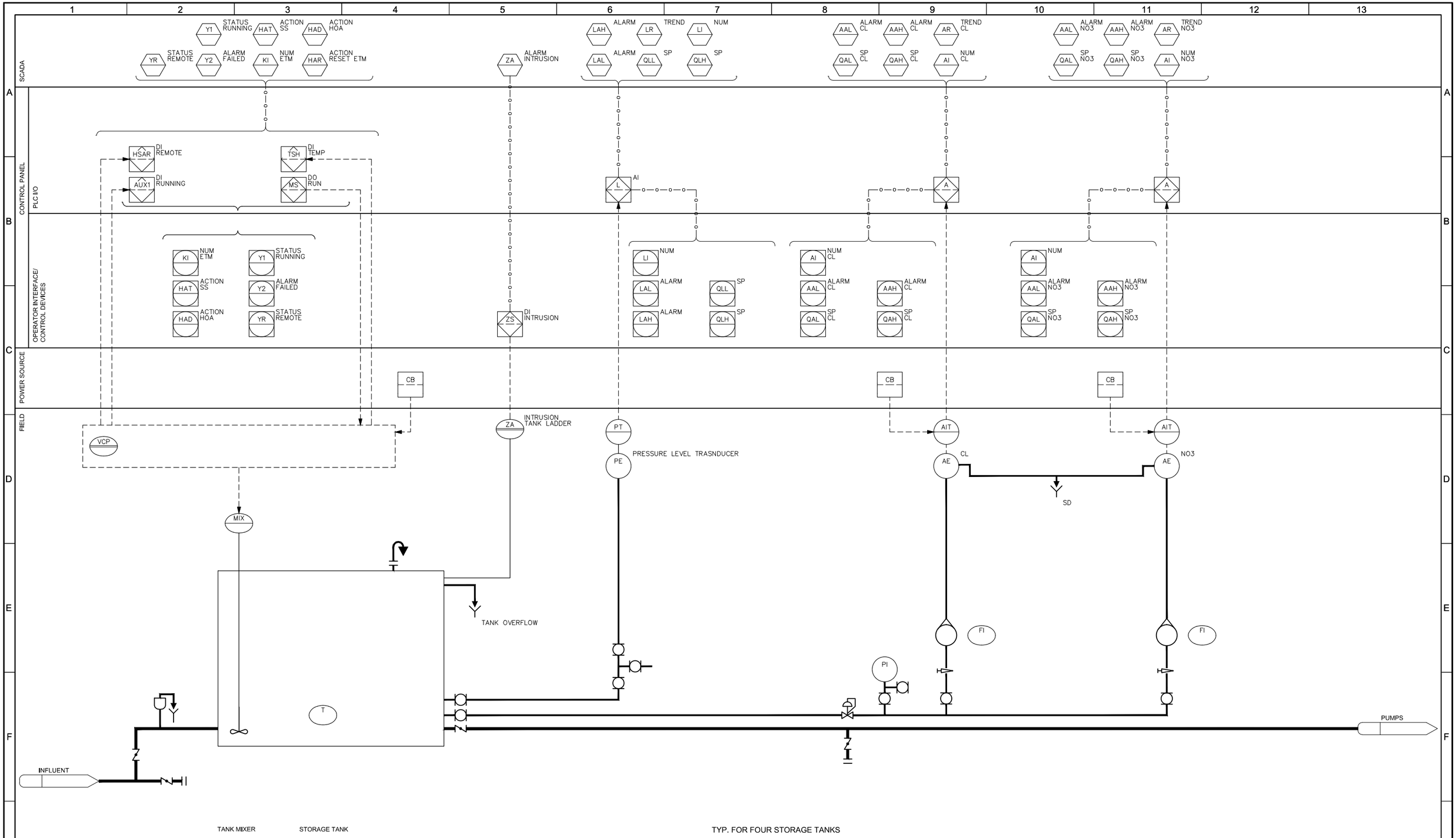

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OOWWTP EXPANSION PROGRAM - RECYCLED WATER PS AND FORCE MAIN

INSTRUMENTATION

P&ID
STORAGE TANK (TYP)

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SHEET NO. 31 OF 32

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA/HMI

CONTROL PANEL

PLC I/O

OPERATOR INTERFACE/
CONTROL DEVICES

POWER SOURCE

FIELD

FUTURE

FUTURE

ETHERNET/IP
VFD

ETHERNET/IP
VFD

ETHERNET/IP
VFD

ETHERNET/IP
VFD

ETHERNET/IP
VFD

CB

CB

CB

CB

VFD

VFD
480VAC-3P

VFD

VFD
480VAC-3P

VFD

VFD
480VAC-3P

VFD

VFD
480VAC-3P

VFD

VFD
480VAC-3P

PMP

MWH

TSH

PSL

PSH

PE

PRESS SW

RO PERMEATE

TANKS

M

RECYCLED WATER

BOOSTER PUMP NO. 1

BOOSTER PUMP NO. 2

BOOSTER PUMP NO. 3

BOOSTER PUMP NO. 4
(FUTURE)

BOOSTER PUMP NO. 5 (FUTURE)

LAST SAVED BY:

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INSTRUMENTATION

P&ID
RECYCLED WATER PUMP STATION

VERIFY SCALES
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DRAWING NO. 45N02

SHEET NO. 32 OF 32

PROJECT NO.

FILE NAME:

APPENDIX L

MOPO PROJECT DRAFT 25 PERCENT DESIGN DRAWINGS

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

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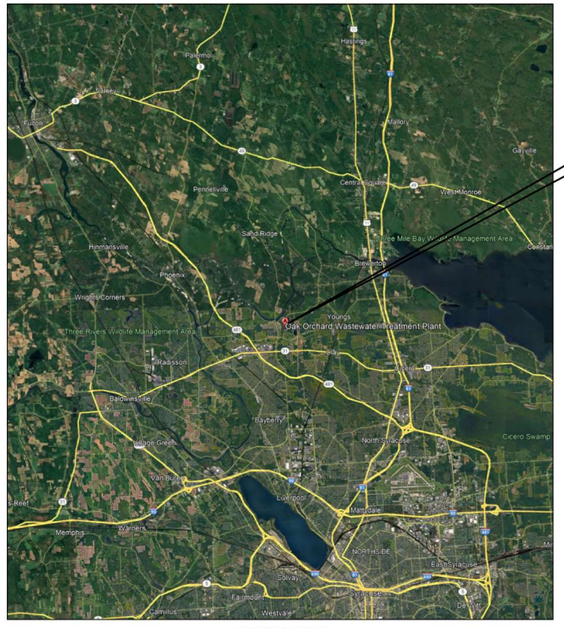
AUGUST 2025

VOLUME 4 OF 4



VICINITY MAP



LOCATION MAP

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DESIGNED	M. MORRIS
DRAWN	A. FAKIROV
CHECKED	S. DAVIS
DATE	SEPTEMBER 2025

carollo

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

GENERAL

COVER SHEET

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

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JOB NO. 203580-60000

DRAWING NO. 00G01

SHEET NO. 1 OF 29

LAST SAVED BY:

PROJECT NO.

FILE NAME:

DRAWING NO.	DRAWING TITLE
GENERAL	
00G01	COVER SHEET
00G02	DRAWING INDEX
00G03	NOTES, LEGEND, AND SYMBOLS
00G04	ABBREVIATIONS
00G05	INTERIM SITE PLAN
00G06	PROCESS FLOW DIAGRAM
ARCHITECTURAL	
90A01	BLOWER BUILDING – PLAN AT EL. 362.50’
90A02	BLOWER BUILDING – ELEVATIONS
90A03	ELECTRICAL BUILDING – PLAN AT EL. 390.00’
STRUCTURAL	
90S01	MBBR PUMP STATION – PLAN AT EL. 390.00’
90S02	MBBR PUMP STATION - SECTION
PROCESS MECHANICAL	
00GM01	GENERAL LEGEND AND SYMBOLS
90M01	MBBR PUMP STATION – MECHANICAL PLAN
90M02	MBBR PUMP STATION – SECTION
90M03	BLOWER BUILDING – MECHANICAL PLAN
90M04	MBBR TANKS – PLAN AT EL. 392.50'
90M05	MBBR TANKS – SECTIONS
ELECTRICAL	
00GE01	GENERAL LEGEND AND SYMBOLS
00GE02	ABBREVIATIONS
90E01	MBBR SYSTEM - ONE-LINE DIAGRAM
INSTRUMENTATION	
00N01	SYMBOLS AND ABBREVIATIONS 1
00N02	SYMBOLS AND ABBREVIATIONS 2
00N03	SYMBOLS AND ABBREVIATIONS 3
00N04	SYMBOLS AND ABBREVIATIONS 4
00N05	SCHEMATIC SYMBOLS
00N06	EQUIPMENT TAGGING
90N01	P&ID - MBBR BLOWERS
90N02	P&ID - MBBR PUMPS
90N03	P&ID - NAOH PUMPS

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

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JOB NO. 203580-60000
DRAWING NO. 00G02
SHEET NO. 2 OF 29

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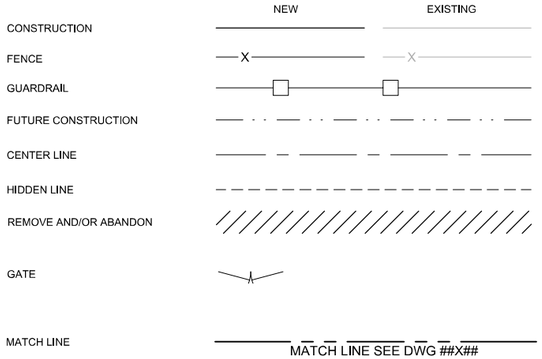
GENERAL NOTES

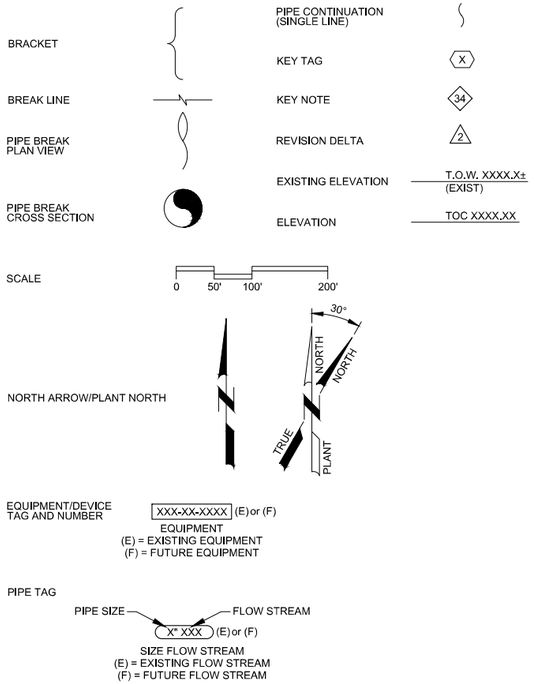
1. FOLLOWING NOTES ARE GENERAL AND APPLY TO ALL SHEETS OF THESE CONTRACT DOCUMENTS AS IF THEY WERE WRITTEN IN THEIR ENTIRETY ON EACH SHEET.
2. THIS SUBMITTAL IS INTENDED AS A REPRESENTATIVE DESIGN ONLY. VERIFICATION OF DESIGN IS THE REPONSIBILITY OF THE FINAL DESIGN CONSULTANT.
3. CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK AND SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING ALL EXISTING CONDITIONS INCLUDING LOCATION AND DIMENSIONS OF ALL EXISTING CONSTRUCTION AND UTILITIES. CONTRACTOR SHALL NOTIFY ENGINEER IF THERE IS A CONFLICT BETWEEN THE CONTRACT DOCUMENTS AND EXISTING CONSTRUCTION BEFORE PROCEEDING WITH WORK.
4. UNLESS DETAILED, SPECIFIED, OR OTHERWISE INDICATED ON THE DRAWINGS, CONSTRUCTION SHALL BE AS INDICATED IN THE APPLICABLE TYPICAL DETAILS AND GENERAL NOTES. TYPICAL DETAILS SHALL APPLY EVEN THOUGH NOT REFERENCED AT SPECIFIC LOCATIONS ON DRAWINGS.
5. WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF WORK. DETAILS SHALL BE IN THE SAME AS FOR OTHER SIMILAR WORK.
6. CONTRACTOR SHALL COMPLY WITH LOCAL CONSTRUCTION STORM WATER DISCHARGE REGULATIONS AND REQUIREMENTS.
7. PRIOR TO EXCAVATION FOR NEW STRUCTURES, ELECTRICAL CONDUIT, FABRICATION OF NEW PIPING AND/OR OTHER PROPOSED UTILITIES, CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING PIPING AND UTILITIES IN THE CONSTRUCTION AREA. THE CONTRACTOR SHALL TEMPORARILY RELOCATE CONFLICTING EXISTING UTILITIES AT TIE-IN/CONNECTION LOCATIONS AND REINSTALL THEM AS REQUIRED TO ELIMINATE THE CONFLICT AT NO ADDITIONAL COST TO THE OWNER.
8. ALL PIPELINES 12" AND LARGER SHALL HAVE A MINIMUM COVER OF 36" UNLESS THE COVER DEPTH IS SPECIFICALLY INDICATED ON THE DRAWINGS. PIPE SMALLER THAN 12" SHALL HAVE A MINIMUM COVER OF 30" UNLESS NOTED OTHERWISE. PIPES SHALL BE ROUTED AS SHOWN UNLESS MINOR REVISIONS ARE NECESSARY TO MISS EXISTING PIPES, STRUCTURES, ETC. CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING ALL FITTINGS AND ADAPTERS REQUIRED TO MAKE THE ROUTING CHANGES AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR SHALL INCLUDE COST FOR THIS IN THE BID.
9. EXISTING FACILITY AND UTILITY INFORMATION SHOWN ON THE DRAWINGS WAS OBTAINED FROM AVAILABLE RECORDS OR ELECTRONIC FILES. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR FACILITIES AND UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS, SIZES, MATERIAL TYPES, AND ELEVATIONS SHOWN AROUND OR NEAR AREAS OF NEW CONSTRUCTION PRIOR TO START OF CONSTRUCTION.
10. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT FROM DAMAGE EXISTING FACILITIES AND UTILITIES SHOWN OR NOT SHOWN THAT ARE TO REMAIN IN PLACE. ALL FACILITIES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED TO THE ORIGINAL OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE WITHOUT ADDITIONAL COMPENSATION.
11. CONTRACTOR SHALL MAKE CONNECTIONS TO EXISTING PIPE, EQUIPMENT, ETC. AS REQUIRED AND SHALL PROVIDE ALL FITTINGS, ADAPTERS, AND APPURTENANCES REQUIRED TO MAKE THE CONNECTIONS. PROVIDE ALL SUPPORTS REQUIRED FOR A RIGIDLY SUPPORTED COMPLETE AND WORKING SYSTEM.
12. ADJUST ALL VALVE BOXES, VAULTS, PULL BOXES, AND MANHOLES TO FINISHED GRADE UNLESS OTHERWISE SHOWN OR DIRECTED. MANHOLES IN OPEN FIELDS SHALL BE SET TWELVE INCHES ABOVE FINISHED GRADE AND VAULTS SHALL BE SIX INCHES ABOVE FINISHED GRADE.
13. THE CONTRACTOR SHALL CONTACT THE PROPER UTILITY REPRESENTATIVE AS FOLLOWS FOR QUESTIONS OR COORDINATION OF CONSTRUCTION RELATED TO EXISTING UTILITIES.

    STATE/REGION/MUNICIPALITY SPECIFIC: 1-800-XXX-XXXX
14. CONTRACTOR SHALL VERIFY THAT PIPING SHOWN TO BE ABANDONED OR AS ABANDONED PREVIOUSLY IS NO LONGER IN SERVICE. LINES IN SERVICE SHALL BE MAINTAINED UNTIL NO LONGER REQUIRED BY THE PLANT.
15. ALL EXISTING PIPES THAT ARE TO BE ABANDONED IN PLACE OR REMOVED MAY NOT BE SHOWN. WHERE PIPING IS TO BE ABANDONED AND MUST REMAIN IN SERVICE UNTIL COMPLETION OF OTHER PHASES OF WORK, AND IT CONFLICTS WITH NEW PIPING, TEMPORARILY RELOCATE PIPING AS REQUIRED TO MAINTAIN SERVICE BY THE PLANT.
16. CONTRACTOR SHALL REROUTE THE EXISTING PIPING IF REQUIRED TO MISS THE PROPOSED STRUCTURES. THE EXISTING PIPE SHALL REMAIN IN SERVICE UNTIL NEW PIPING IS READY TO BE PLACED INTO SERVICE. DOWNTIME SHALL BE A MAXIMUM OF 2 HOURS, UNLESS SPECIFIED OR SHOWN OTHERWISE.
17. ALL SIDEWALKS TO BE 3'-0" WIDE UNLESS SHOWN OTHERWISE.
18. THE CONTRACTOR SHALL TAKE SPECIAL PRECAUTIONS IN THE VICINITY OF ANY OVERHEAD ELECTRIC LINES. CONTRACTOR SHALL ABIDE BY THE NATIONAL ELECTRIC CODE AND ANY REQUIREMENT BY THE OWNER OF THE ELECTRIC LINES.
19. PROVIDE ALL SHEETING/SHORING REQUIRED TO PROTECT EXISTING STRUCTURES, PIPES AND FACILITIES.
20. CONTRACTOR SHALL VERIFY LOCATION OF ALL ARCHITECTURAL, MECHANICAL, AND ELECTRICAL ITEMS BEFORE PLACING ANY STRUCTURAL STEEL OR CONCRETE. ALSO, STRUCTURAL DIMENSIONS AND OPENINGS CONTROLLED BY ARCHITECTURAL, MECHANICAL, OR ELECTRICAL EQUIPMENT SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
21. MECHANICAL AND ELECTRICAL EQUIPMENT SUPPORTS, ANCHORAGES, OPENINGS, RECESSES, AND REVEALS NOT SHOWN ON THE STRUCTURAL DRAWINGS, THAT ARE REQUIRED BY OTHER CONTRACT DRAWINGS, SHALL BE PROVIDED PRIOR TO CASTING CONCRETE.

LINE WORK



SYMBOLS



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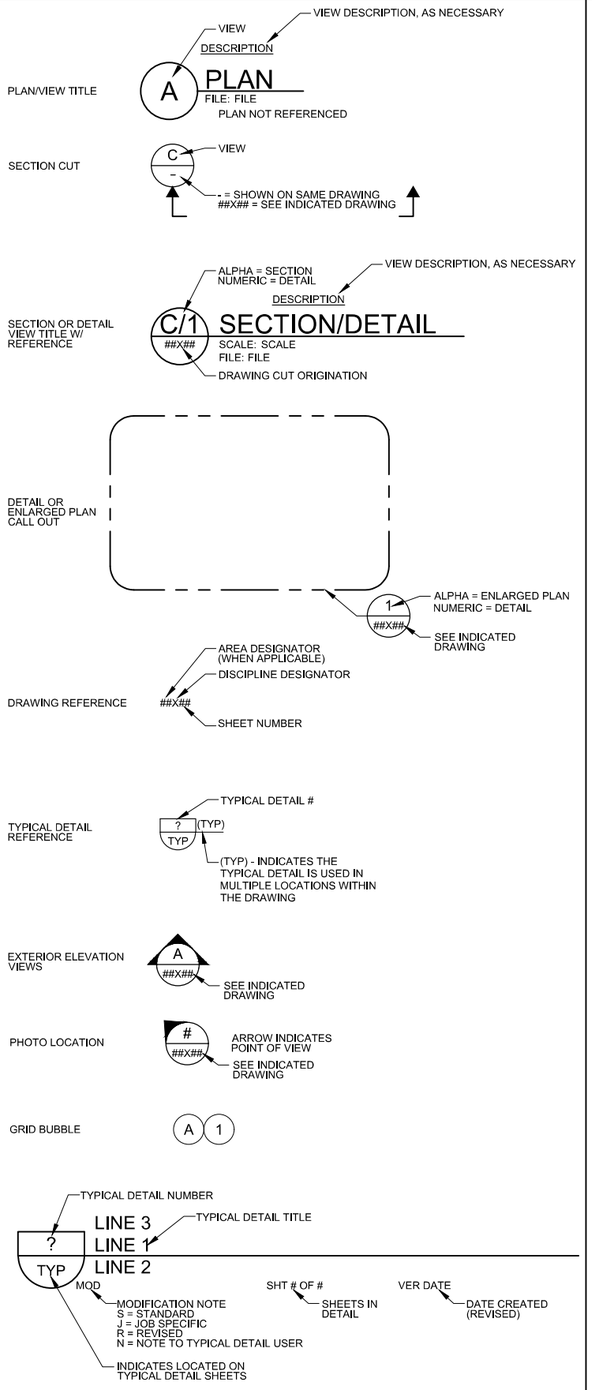
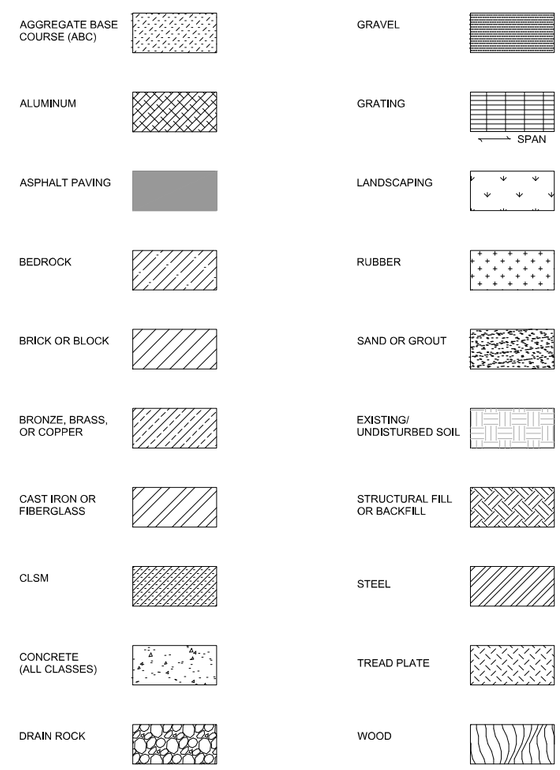
DETAIL REFERENCES



HATCH PATTERNS



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JOB NO. 203580-60000
DRAWING NO. 00G03
SHEET NO. 3 OF 29

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PROJECT NO.
FILE NAME:

@	AT (MEASUREMENT)
△	DEFLECTION ANGLE, CENTRAL ANGLE
#	NUMBER (REBAR Ø)

A

AB	ADHESIVE BOND
AC	ASPHALTIC CONCRETE
ACB	AIR CIRCUIT BREAKER
ACI	AMERICAN CONCRETE INSTITUTE
ACU	AIR CONDITIONING UNIT
AD	AREA DRAIN
ADDL	ADDITIONAL
ADJ	ADJACENT, ADJUST, ADJUSTABLE
ADMIN	ADMINISTRATION
ADR	ACCESS DOOR
AED	AREA EQUIPMENT DRAIN
AER	AERAT(ION)(OR)
AFC	AFTERCOOLER
AFF	ABOVE FINISHED FLOOR
AFM	AIR FLOW MONITOR
AHU	AIR HANDLING UNIT
AIC	AIR COMPRESSOR
AIL	AIR INTAKE LOUVER
AIR	AIR PIPE
ALT	ALTERNATE
AL	ALUMINUM
AM	AIR METHOD
ANCH	ANCHOR
ANV	ANGLE VALVE
APPROX	APPROXIMATE, APPROXIMATELY
AR	AIR SCOUR
ARCH	ARCHITECTURAL
ARV	AIR RELEASE VALVE
ASSY	ASSEMBLY
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AVG	AVERAGE
AVV	AIR AND VACUUM VALVE

B

BC	BEGIN CURVE, BRASS CAP, BACK OF CURB, BOLT CIRCLE
BDR	BASIN DRAIN LINE
BF	BLIND FLANGE
BFG	BELOW FINISHED GRADE
BFP	BELT FILTER PRESS
BFV	BUTTERFLY VALVE
BG	BREAK GLASS HAND SWITCH
BKW	BACKWASH
BLDG	BUILDING
BLK	BLOCK
BLKHD	BULKHEAD
BLR	PROCESS BLOWER
BM	BEAM, BENCH MARK
BO	BOTTOM OF
BOTT	BOTTOM
BOTTS	BOTTOM SLUDGE
BPV	BACK PRESSURE VALVE
BRG	BEARING
BS	BELL AND SPIGOT
BSP	BLACK STEEL PIPE
BT	BITUMINOUS COATING
BTU	BRITISH THERMAL UNITS
BTWN	BETWEEN
BV	BALL VALVE
BW	BACKWASH
BW	BUTT WELD
BWS	BACKWASH SUPPLY
BWCCP	BAR-WRAPPED CONCRETE CYLINDER PIPE

C

C	CLOSE, CONDUIT CHANNEL (STRUCTURAL)
CA	CONCRETE ANCHOR, CITRIC ACID
CB	CATCH BASIN
CC	CENTER OF CURVATURE, CENTER TO CENTER
CCB	CHLORINE CONTACT BASIN
CCP	CHEMICAL CARRIER PIPE
CDL	CHEMICAL DRAIN LINE
CDT	CONDUIT
CEF	CEILING EXHAUST FAN
CF	CUBIC FEET
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CHEMD	CHEMICAL DRAIN
CHF	CHEMICAL FEEDER
CI	CAST IRON
CIP	CAST IRON PIPE, CLEAN-IN-PLACE
CIPP	CIP PERMEATE
CIPR	CIP RETURN
CIPS	CIP SUPPLY
CIRC	CIRCUMFERENTIAL/CIRCUMFERENCE
CJ	CONSTRUCTION JOINT
CKA	CHECK VALVE, ANGLE
CKB	CHECK VALVE, BALL
CKF	CHECK VALVE, FLAP
CKS	CHECK VALVE, SWING
CL	CENTER LINE
CL	CLASS
CLK	CHAIN LINK
CLD	CHLORINE LEAK DETECTOR
CLL	CHLORINE LIQUID
CLR	CLEAR
CLS	CHLORINE SOLUTION
CLV	CHLORINE GAS (VACUUM)
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CNV	CONVEYOR
CO	CLEANOUT
COL(S)	COLUMN(S)
COMP	COMPRESSION
CON	CONTAINER/CARRIER
CONC	CONCRETE
CONN	CONNECT, CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS OR CONTINUATION OR (D) (OUS)
CORR	CORRUGATE(D), CORROSION
CP	CONTROL POINT, CATIONIC POLYMER
CPLG	COUPLING
CPT	CARPET
CPVC	CHLORINATED POLYVINYL CHLORIDE
CS	CARBON STEEL, CIRCULATING SLUDGE, CAUSTIC SODA
CSP	CHEMICAL SUMP PUMP, CORRUGATED STEEL PIPE
CTE	COAL TAR EPOXY
CTJ	CONTROL JOINT
CTL	CONTROL
CTR	CENTER, CENTERED
CU	CUBIC
CV	CHECK VALVE
CW	COLD WATER
CY	CUBIC YARD

D

D	DEPTH, DIGITAL OR DISCRETE, DRAIN
D/W	DRIVEWAY
DBL	DOUBLE
DEG OR °	DEGREE
DEMO	DEMOLISH, DEMOLITION
DET	DETAIL
DFL	DECANT/FILTRATE
DG	DOOR GRILLE
DIA OR Ø	DIAMETER
DIAG	DIAGONAL
DIF	DIFFUSER
DIG	DIGESTER
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DISCH	DISCHARGE
DIW	DEIONIZED WATER
DL	DEAD LOAD, DRAIN LINE
DLV	DOOR LOUVER
DMP	DAMPER
DMS	DIAPHRAGM SEAL
DN	DOWN
DO	DITTO
DO	DOOR OPENING
DP	DEEP (OR DEPTH)
DPV	DIAPHRAGM VALVE
DR	DOOR, DRAIN
DRN	DRAIN
DRCY	DENITRIFIED RECYCLE
DRT	DRIP TRAP
DRV	DRAIN VALVE
DS	DIGESTED SLUDGE, DOWN SPOUT
DSW	DISTILLED WATER, DOOR SWITCH
DUC	DUST COLLECTOR
DUH	DUCT HEATER UNIT
DW	DISTILLED WATER, DISINFECTED WATER
DWD	DEWATERING DRAIN
DWG(S)	DRAWING(S)
DWL(S)	DOWEL(S)

E

E	EAST
EA	EACH
EC	END OF CURVE
ECU	EVAPORATOR COOLING UNIT
ED	EQUIPMENT DRAIN
EF	EXHAUST FAN, EACH FACE
EFF	EFFLUENT
EG	EXHAUST GRILLE
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
EJR	INJECTOR/EDUCTOR
EL	ELEVATION
ELEC	ELECTRICAL
ELL	ELBOW
EMBED	EMBEDMENT
EMH	ELECTRICAL MANHOLE
EP	EDGE OF PAVEMENT
EPS	EXPANDED POLYSTYRENE
EQ	EQUAL
EQUIP	EQUIPMENT
ER	EXHAUST REGISTER
ES	EACH SIDE
ESEW	EMERGENCY SHOWER AND EYE WASH
ESMT	EASEMENT
ESS	EMERGENCY HAND SWITCH
ET	ELECTRICALLY HEAT TRACED
EUH	ELECTRIC UNIT HEATER
EVR	EVAPORATOR
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY EACH FACE
EWH	ELECTRIC WATER HEATER, EXHAUST
EX	EXISTING
EXIST	EXISTING
EXP	EXPANSION, EXPANSION TANK
EXPO	EXPOSED
EXT	EXTERIOR

F

F	FILTRATE
FA	FRESH AIR
FBW	FILTER BACKWASH
FC	FACE OF CURB, FLEXIBLE COUPLING, FERRIC CHLORIDE
FCA	FLANGE COUPLING ADAPTER
FD	FIRE DAMPER, FLOOR DRAIN, FOUND
FDC	FIRE DEPARTMENT CONNECTION
FDL	FLOOR DRAIN LINE
FDR	FEEDER
FEFF	FINAL EFFLUENT
FG	FLAP GATE
FH	FIRE HYDRANT
FILT	FILTRATE
FIN	FINISH
FIN FL	FINISHED FLOOR
FIN GR	FINISHED GRADE
FL	FLOOR, FLOW LINE
FL	FLANGE
FLA	FOUL AIR
FLD	FILTER DRAIN
FLE	FILTER EFFLUENT
FLEX	FLEXIBLE
FLG	FLANGE, OR FLANGED
FLR	FILTER
FM	FORCE MAIN, FLOW METER
FND	FOUNDATION
FO	FUEL OIL
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPP	FLEXIBLE PLASTIC PIPE
FRP	FIBERGLASS REINFORCED PLASTIC
FRPP	FIBERGLASS REINFORCED PLASTIC PIPE
FS	FAR SIDE
FT OR '	FOOT, FEET
FTG	FOOTING
FTW	FILTER TO WASTE
FV	FLAP VALVE
FW	FLUSHING WATER, FINISHED WATER, FILTERED WATER
FX	FIRE EXTINGUISHER

G

G	GAS, GROUND, GUTTER
GA	GAUGE OR GAGE
GAL	GALLONS
GALV	GALVANIZE(D)
GAV	GRAVITY VENTILATOR
GBT	GRAVITY BELT THICKENER
GEN	GENERAL, GENERATOR
GL	GLASS
GM	GAS METER
GND	GROUND
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
GR	GRADE
GR	GRAVITY METHOD
GRT	GRIT
GRTG	GRATING
GSP	GALVANIZED STEEL PIPE
GV	GATE VALVE

H

H	EXPLOSION-PROOF, HIGH, HORIZONTAL
HAS	HEADED ANCHOR STUD
HB	HOSE BIBB
HDW	HARDWARE
HDWL	HEADWALL
HEF	HOOD EXHAUST FAN
HGT	HEIGHT
HORIZ	HORIZONTAL
HP	HEAT PUMP, HORSEPOWER, HIGH PRESSURE
HPA	HIGH PRESSURE AIR, MIXING AIR
HPC	HIGH PERFORMANCE COATING (SEE SPECS)
HPT	HIGH POINT
HPU	HEAT PUMP UNIT AIR
HR	HANDRAIL, HOSE REEL, HOUR
HSS	HOLLOW STRUCTURAL SECTION (STEEL)
HSS	HEAT SHRINK SLEEVE
HTX	HEAT EXCHANGER
HV	HOSE VALVE
HW	HOT WATER
HWL	HIGH WATER LEVEL
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HYD	HYDRANT

I

IA	INSTRUMENT AIR
ID	INSIDE DIAMETER, INSIDE DIMENSION, IDENTIFICATION
I.F.	INSIDE FACE
IN OR "	INCHES
INCL	INCLUDE, INCLUDING
INF	INFLUENT
INJ	INJECTOR
INSTR	INSTRUMENTATION
INSUL	INSULAT(E)(ED)(ING)(ION)
INT	INTERIOR
INV	INVERT

J

JST	JOIST
JT	JOINT

L

L	ANGLE (STRUCTURAL), LENGTH, LOUVER
LAB	LABORATORY
LAS	LIQUID AMMONIUM SULFATE
LAV	LAVATORY
LB(S)	POUND(S)
LF	LINEAL FEET
LG	LONG
LH	LEFT HAND
LH	LOW HEAD METHOD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LP	LOW PRESSURE
LPA	LOW PRESSURE AIR, AERATION AIR
LPT	LOW POINT
LR	LONG RADIUS
LS	LAB SINK
LT	LEFT
LWL	LOW WATER LEVEL

M

M	MOTOR
MAINT	MAINTENANCE
MAN	MANUAL
MASY	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MD	MOTORIZED DAMPER
MECH	MECHANICAL
MET	METAL
MFR	MANUFACTURER
MG/L	MILLIGRAMS PER LITER
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MIX	MIXER
MJ	MECHANICAL JOINT
ML	MIXED LIQUOR
MOD	MODIFIED
MOIST	MOISTURE
MON	MONUMENT
MOS	MOISTURE SEPARATOR
MPM	METERING PUMP
MS	MOP SINK
MTD	MOUNTED

N

N	NORTH, NEUTRAL
NA OR N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NEV	VALVE, NEEDLE
NG	NATURAL GRADE, NATURAL OR LP GAS
NIC	NOT IN CONTRACT
NO., #	NUMBER
NOM	NOMINAL
NPW	NON-POTABLE WATER
NRCY	NITRIFIED RECYCLE
NS	NEAR SIDE
NTS	NOT TO SCALE

O

O	OPEN
OC	ON CENTER
OD	OUTSIDE DIAMETER, OUTSIDE DIMENSION
OED	OPEN EQUIPMENT DRAIN
O.F.	OUTSIDE FACE
OF	OVERFLOW
OFL	OVERFLOW
OPNG	OPENING
OPP	OPPOSITE
OZ	OUNCE

P

P	POLE
PA	PLANT AIR
PC	POINT OF CURVATURE
PC	PRESSURE CLASS
PCC	PLANT CONTROL CENTER
PCE	PRIMARY CLARIFIED EFFLUENT
PCP	PROGRESSIVE CAVITY PUMP
PE	PLAIN END
PE	POLYETHYLENE
PEE	POLYETHYLENE ENCASEMENT (SEE DIP SPEC)
PERP	PERPENDICULAR
PG	PRESSURE GAUGE
PH	PHASE, PHYSICALLY HANDICAPPED
PI	POINT OF INTERSECTION
PIV	POST INDICATOR VALVE
PL	PLATE, PROPERTY LINE
PLAS	PLASTIC
PLCS	PLACES
PLS	POLYMER SOLUTION
PM	CIRCULATE, PERMEATE
PMP	PUMP
PMR	PERMEATE RETURN
PNL(S)	PANEL(S)
POL	POLYMER
POLY	POLYETHYLENE
POS	POSITION
POW	POTABLE WATER
PP	POWER POLE
PPMV	PARTS PER MILLION (VOLUME)
PRC	POINT OF REVERSE CURVATURE
PREFAB	PREFABRICATED
PRG	PRESSURE REGULATOR
PRI	PRIMARY
PROJ	PROJECTION
PRR	PRESSURE OR VACUUM RELIEF VALVE
PRV	PRESSURE REDUCING VALVE, PRESSURE REGULATION VALVE, PRESSURE RELIEF VALVE
PS	PUMP STATION, PIPE SUPPORT
PSF	POUNDS PER SQUARE FOOT
PSG	PRESSURE GAUGE
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH GAUGE
PT	POINT, POINT OF TANGENCY
PTW	POLYETHYLENE TAPE WRAP
PU	POLYURETHANE
PV	PLUG VALVE
PVC	POINT OF VERTICAL CURVATURE, POLYVINYL CHLORIDE
PVDF	POLYVINYLIDENE FLUORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
PVT	POINT OF VERTICAL TANGENCY
PLW	PLANT WATER
PW	POTABLE WATER

Q

QTY	QUANTITY

R

R	RISER
R/W OR R.O.W.	RIGHT OF WAY
RAD	RADIUS, RADIAL
RAS	RETURN ACTIVATED SLUDGE
RCP	REINFORCED CONCRETE PIPE
RCCP	REINFORCED CONCRETE CYLINDER PIPE
RD	ROOF DRAIN
RDL	ROOF DRAIN LINE
RDOF	ROOF DRAIN OVERFLOW
RECIRC	RECIRCULATING
RED	REDUCER, ROOF EQUIPMENT DRAIN
REF	REFERENCE
REG	REGULATOR, REGULATING
REINF	REINFORCE(D)(ING)(MENT)
REJ	RUBBER EXPANSION JOINT
REQD	REQUIRED
RER	REACTOR
RES	RESERVOIR
REV	REVISION, REVERSE
RF	RETURN FAN
RG	RETURN GRILLE RUBBER GASKET
RH	RIGHT HAND
RHR	RIGHT HAND REVERSE
RHRA	RIGHT HAND REVERSE ACTIVE
RHRB	RIGHT HAND REVERSE BEVEL
RLS	REGISTERED LAND SURVEYOR
RM	ROOM
RO	ROUGH OPENING
ROC	RO CONCENTRATE
ROF	RO FEED
ROFL	RO FLUSH
ROT	ROTAMETER
ROP	RO PERMEATE
RP	RADIUS POINT
RPM	REVOLUTIONS PER MINUTE
RPMP	REINFORCED PLASTIC MORTAR PIPE
RR	RETURN REGISTER
RT	RIGHT
RTF	ROTARY FEEDER
RTU	ROOF TOP UNIT
RUD	RUPTURE DISK
RW	RECLAIMED WATER, REUSE WATER, RAW WATER, HYDRONIC SUPPLY
RWR	RECLAIMED WATER RETURN
RWW	RAW WASTEWATER

S

S	SOUTH, SWITCH, SLOPE
S/W	SIDEWALK
SA	SAMPLE, SULFURIC ACID
SC	SECONDARY CLARIFIER
SCB	SCRUBBER
SCD	SMOKE CONTROL DAMPER
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SCO	SURFACE CLEANOUT
SCR	BAR SCREEN
SCR	SILICON CONTROL RECTIFIER
SD	SMOKE DETECTOR, SPLITTER DAMPER, STORM DRAIN
SDL	SUMP DISCHARGE DRAIN LINE
SDO	SLUDGE DRAWOFF
SE	SECONDARY EFFLUENT
SEC	SECONDARY, SECOND
SECT	SECTION
SED	SEDIMENTATION
SEP	SEPTAGE
SF	SUPPLY FAN
SFW	SOFTENED WATER
SG	SUPPLY GRILLE
SGS	STORE FRONT GLAZING SYSTEM
SH	SODIUM HYDROXIDE
SHC	SODIUM HYPOCHLORITE
SHD	SHOWER DRAIN
SHDR	SOLIDS HANDLING-RECYCLE
SHR	SHOWER
SHT	SHEET
SI	SCALE INHIBITOR
SIM	SIMILAR
SJ	SOLDERED
SK	SKIMMINGS
SL	SLOPE, SLUDGE
SLC	SLUDGE COLLECTOR DRIVE
SLG	SLIDE GATE
SLV	SLEEVE VALVE
SMP	SAMPLER, SUMP PUMP
SN	SUPERNATANT OR SUBNATANT
SOL	SOLUTION
SP	STATIC PRESSURE, SET POINT
SPD	SUMP PUMP DRAIN
SPDT	SINGLE POLE DOUBLE THROW
SPEC(S)	SPECIFICATION(S)
SPL	SPLITTER BOX
SPR	SPARE
SPS	SAMPLE SINK
SPW	SAMPLE WATER
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN(S)	SQUARE INCH(ES)
SR	SHORT RADIUS, SUPPLY REGISTER
SRL	SCRUBBER RECIRCULATION LIQUID (CAUSTIC)
SS	SANITARY SEWER, SELECTOR SWITCH
SSK	SERVICE SINK
SSL	SECONDARY SLUDGE
SST	STAINLESS STEEL
ST	SLUDGE TRANSFER
STA	STATION
STB	STABILIZER
STD(S)	STANDARDS(S)
STM	STORM WATER
STIFF	STIFFENER
STIR	STIRRUPS
STL	STEEL
STM	STEAM
STP	STEEL PIPE
STR	STRAINER
STRUCT	STRUCTURAL
SUPT	PIPE SUPPORT, SUPPORT
SV	SERVICE VALVE, SHUTOFF VALVE, SOLENOID VALVE
SW	SANITARY WASTE, SETTLED WATER
SW	SOLVENT WELD
SYM	SYMMETRICAL
SYN	SYNTHETIC

T

T	TANGENT LENGTH, THERMOSTAT, TIMER, TREAD
T&B	TOP AND BOTTOM
TAS	THREADED ANCHOR STUD
TB	TEST AND BALANCE (HVAC)
TC	TOP OF CURB
TCV	TEMPERATURE CONTROL VALVE
TDR	TIME DELAY RELAY, TOWEL DISPENSER/RECEPTACLE
THK	THICKENER, THICKNESS, THICK
TKS	THICKENED SLUDGE
TMP	TEMPERATURE
TNK	TANK
T.O.	TOP OF
TOC	TOP OF CONCRETE
TOG	TOP OF GRATING
TOM	TOP OF MASONRY
TOS	TOP OF STEEL
T.O.W.	TOP OF WALL
TR	TRIAD (THREE CONDUCTOR SHIELDED CABLE), TIMING RELAY
TS	THICKENER SUPERNATANT OR SUBNATANT
TSD	THICKENED SLUDGE DECANT
TSTAT	THERMOSTAT
TUR	TURBINE
TW	TREATED WATER
TYP	TYPICAL

U

UC	UNDERCUT
UG	UNDERGROUND
US	UTILITY SINK

V

V	VALVE
VAC	VACCUM
VAR	VARIES
VB	VALVE BOX
VERT	VERTICAL
VOL	VOLUME
VTR	VENT THROUGH ROOF

W

W	WEST, WIDTH
W/	WITH
W/O	WITHOUT
WAS	WASTE ACTIVATED SLUDGE
WCO	WALL CLEANOUT
WEF	WALL EXHAUST FAN
WH	WATER HEATER
WI	WEIGHT INDICATOR
WL	WALL LOUVER, WATER LEVEL
WLD	WELD
WM	WATER METER
WOD	WASTE OIL DRAIN
WP	WORKING PRESSURE
WRS	WATER SOFTENER
WS	WATER SURFACE
WSTP	WATERSTOP
WT	WALK THROUGH, WEIGHT
WTF	WATER TREATMENT FACILITY
WTP	WATER TREATMENT PLANT
WTR	WATER
WV	WATER CONTROL VALVE
WW	WASTEWATER
WWTF	WASTEWATER TREATMENT FACILITY
WWTP	WASTEWATER TREATMENT PLANT

Z

ZP	ZINC PHOSPHATE
ZNC	ZINC COATING (SEE DIP SPEC)

REV	DATE	BY	DESCRIPTION
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DESIGNED M. MORRIS
DRAWN A. FAKIROV
CHECKED S. DAVIS
DATE SEPTEMBER 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

GENERAL

ABBREVIATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
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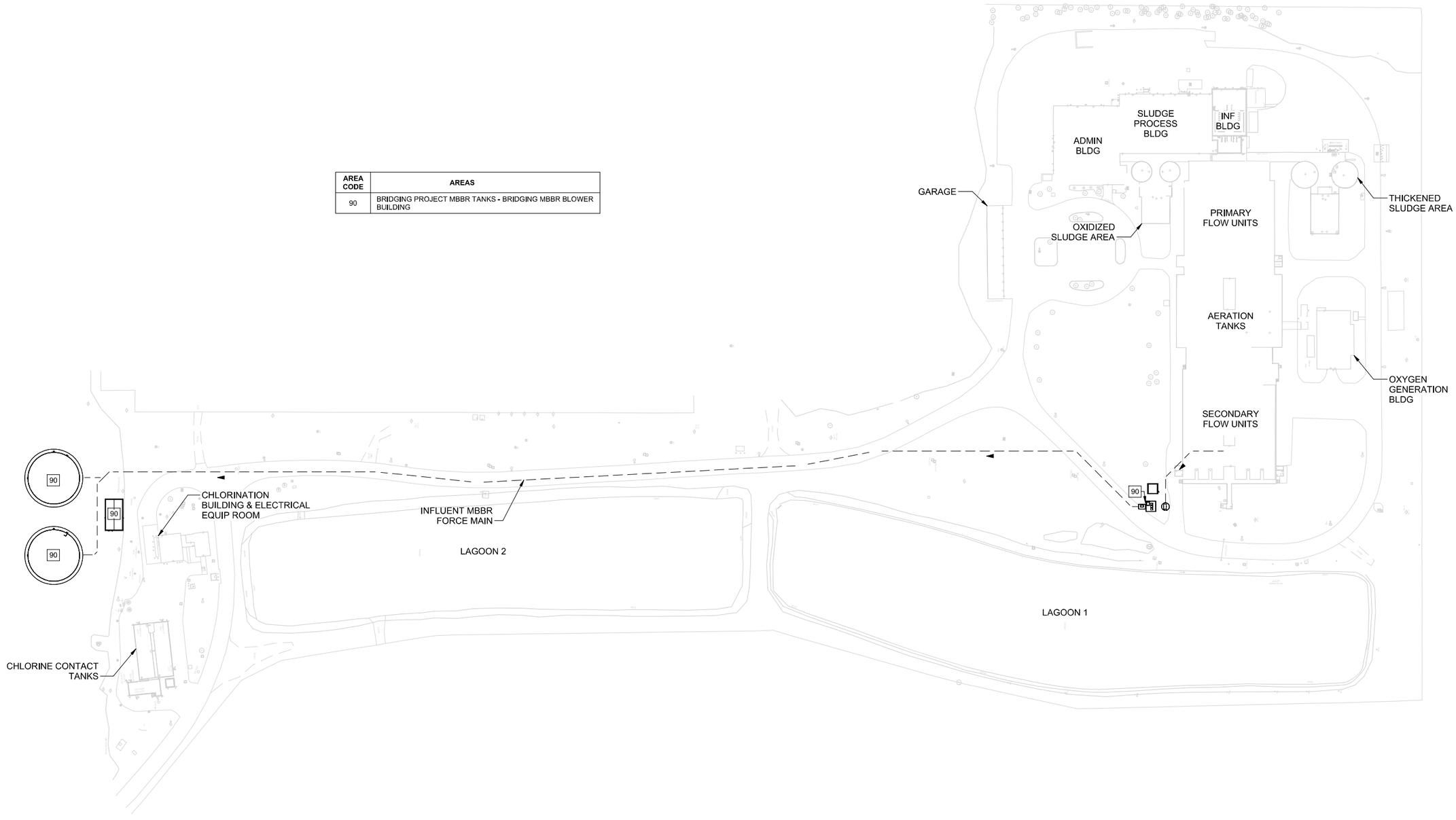
JOB NO. 203580-60000
DRAWING NO. 00G04
SHEET NO. 4 OF 29

LAST SAVED BY:

PROJECT NO. FILE NAME:

AREA CODE	AREAS
90	BRIDGING PROJECT MBBR TANKS - BRIDGING MBBR BLOWER BUILDING



1 **PLAN**
SCALE: 1" = 80'-0"

REV	DATE	BY	DESCRIPTION
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DATE SEPTEMBER 2025

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
GENERAL
INTERIM SITE PLAN

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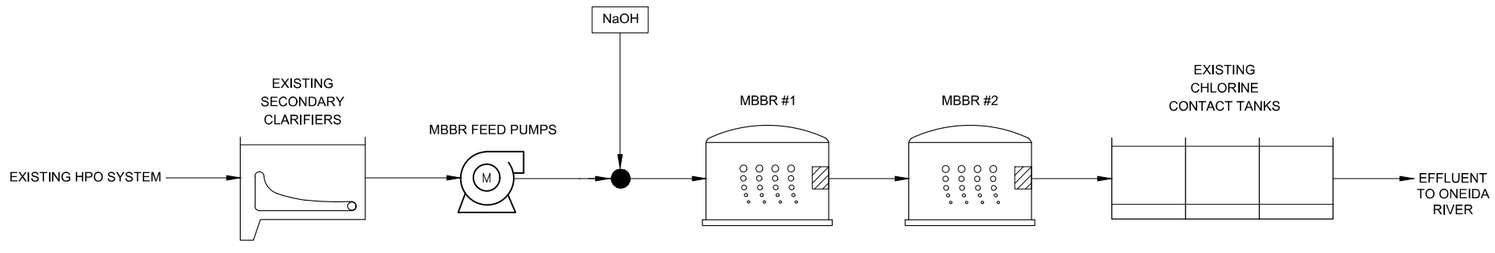
JOB NO. 203580
DRAWING NO. 00G05
SHEET NO. 5 OF 29

PLOT DATE: 8/13/2025 7:25:45 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/00-G-3D-101.rvt



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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

GENERAL

PROCESS FLOW DIAGRAM

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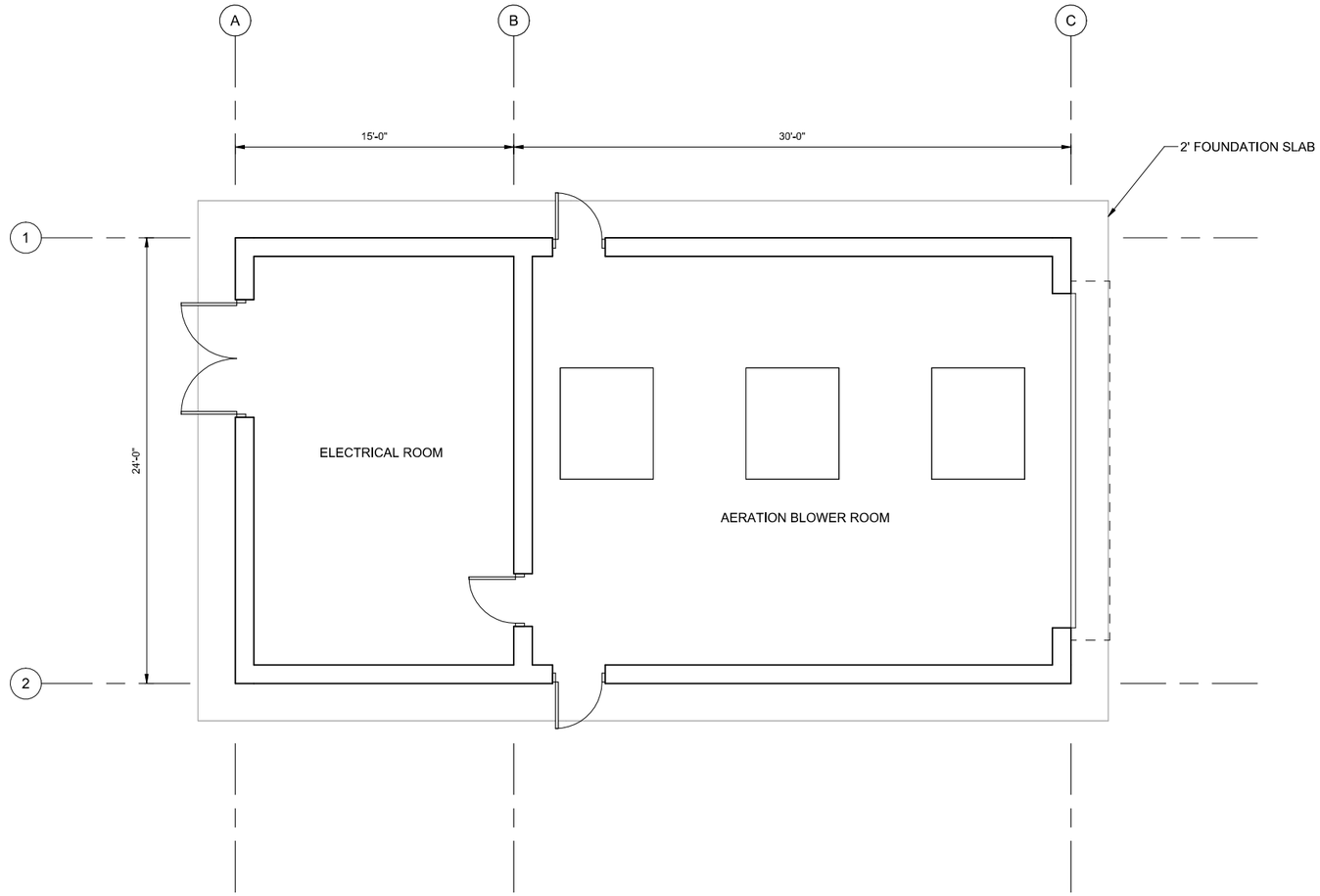
JOB NO. 203580-60000
DRAWING NO. 00G06
SHEET NO. 6 OF 29

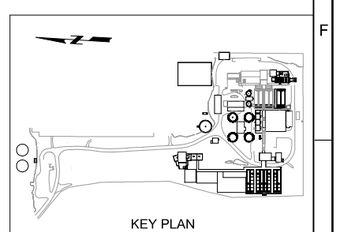
LAST SAVED BY:

PROJECT NO.

FILE NAME:



1 **PLAN**
SCALE: 1/4" = 1'-0"



KEY PLAN

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

ARCHITECTURAL

BLOWER BUILDING - PLAN AT EL. 392.50'

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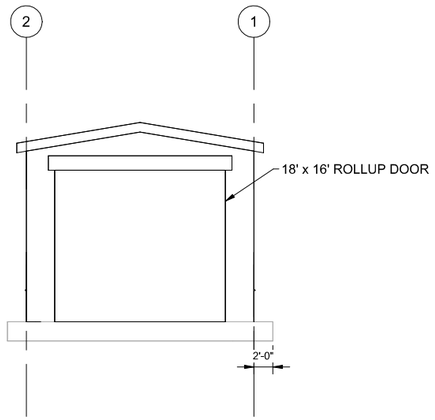
JOB NO. 203580
DRAWING NO. 90A01
SHEET NO. 7 OF 29

PLOT DATE: 8/14/2025 2:55:29 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/90-A-3D-101.rvt

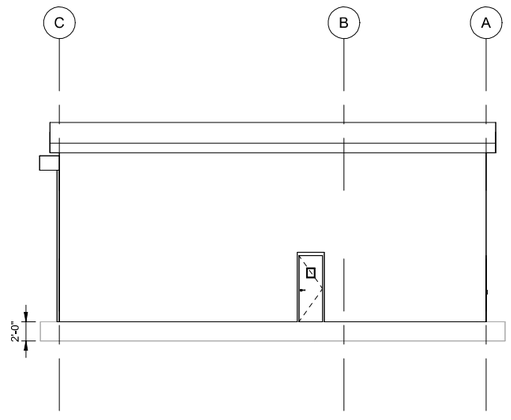


EAST ELEVATION

1 ELEVATION

90A01

SCALE: 1/8" = 1'-0"

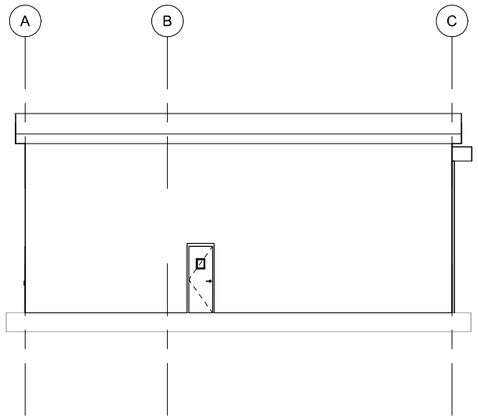


NORTH ELEVATION

2 ELEVATION

90A01

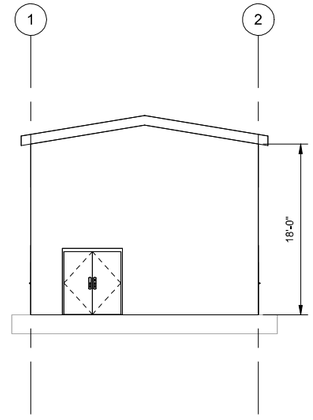
SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

3 ELEVATION

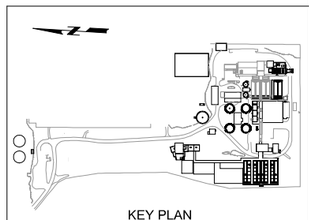
SCALE: 1/8" = 1'-0"



WEST ELEVATION

4 ELEVATION

SCALE: 1/8" = 1'-0"



KEY PLAN

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DRAWN A. FAKIROV
CHECKED S. DAVIS
DATE SEPTEMBER 2025

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ARCHITECTURAL

BLOWER BUILDING - ELEVATIONS

VERIFY SCALES
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0 1"
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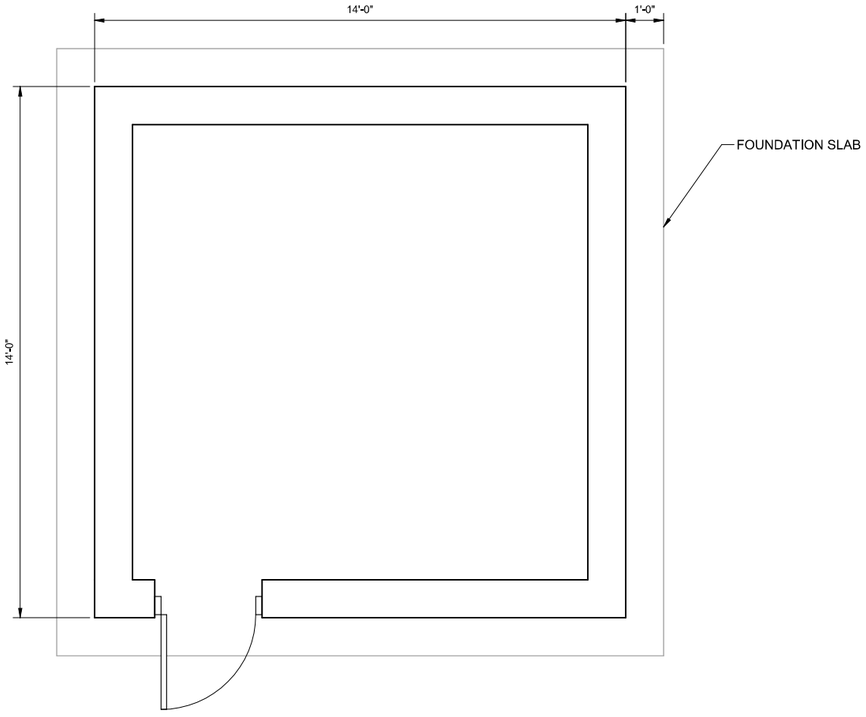
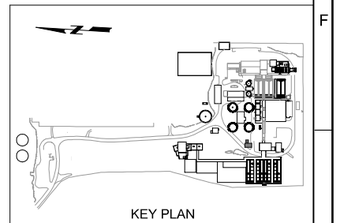
JOB NO. 203580
DRAWING NO. 90A02
SHEET NO. 8 OF 29

PLOT DATE: 8/11/2025 5:41:11 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/90-A-3D-101.rvt



1 **PLAN**
SCALE: 1/2" = 1'-0"



REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

ARCHITECTURAL

ELECTRICAL BUILDING - PLAN AT EL. 390.00'

VERIFY SCALES
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0 1"
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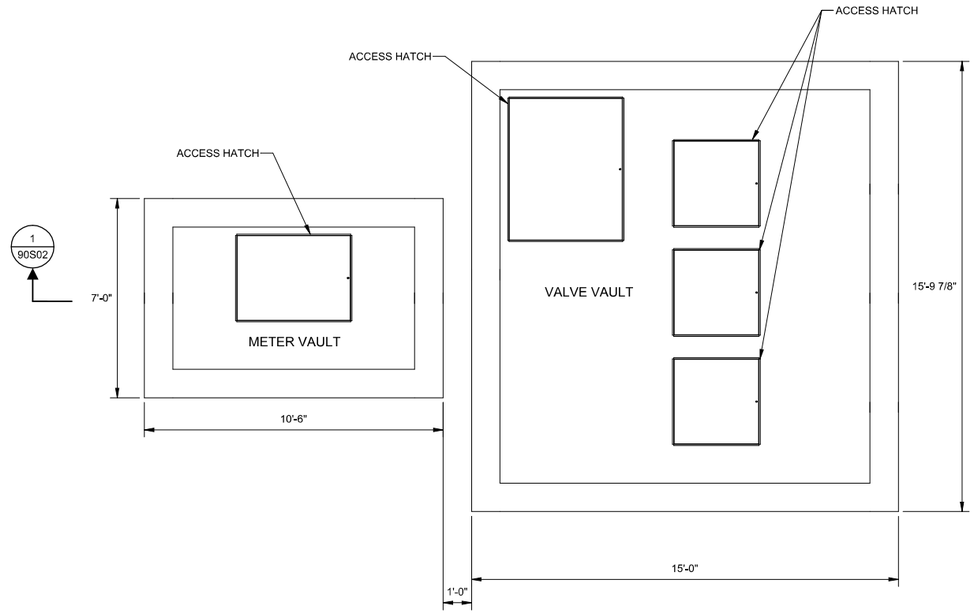
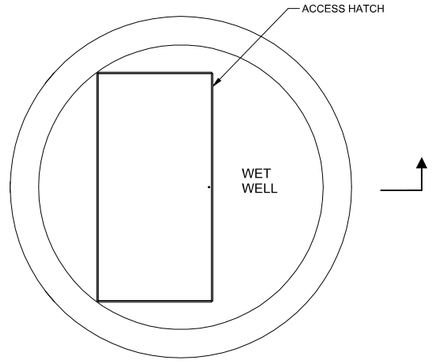
JOB NO. 203580
DRAWING NO. 90A03
SHEET NO. 9 OF 29

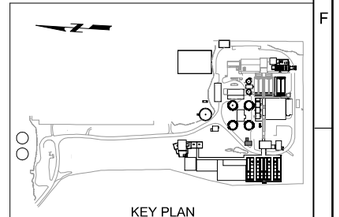
PLOT DATE: 8/11/2025 6:01:28 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/90-A-3D-101.rvt





1 **PLAN**
SCALE: 3/8" = 1'-0"



REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
STRUCTURAL
MBBR PUMP STATION - PLAN AT EL. 390'

VERIFY SCALES
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0 1"
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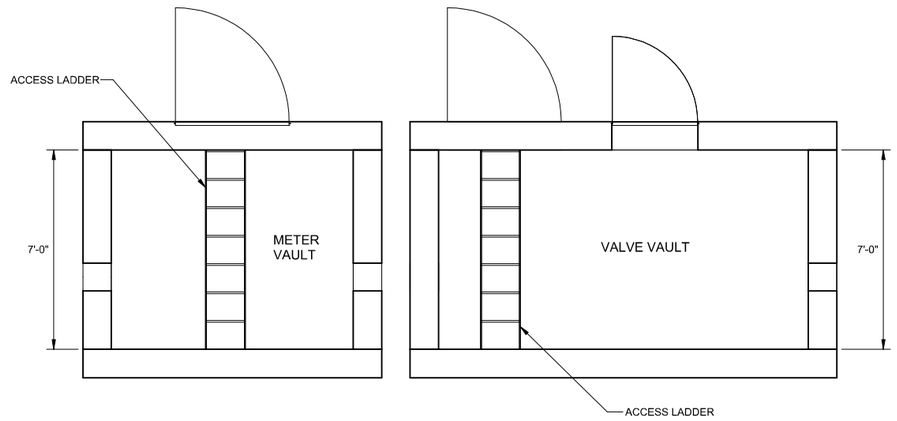
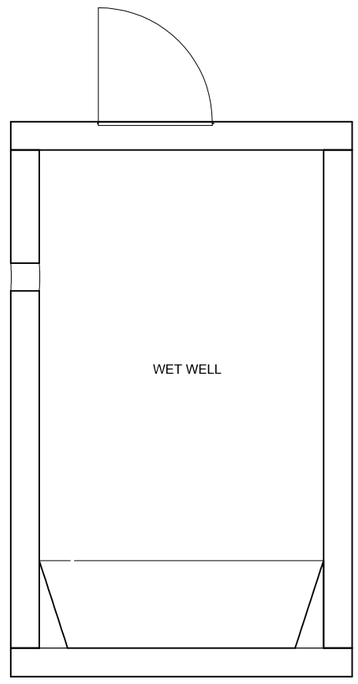
JOB NO. 203580
DRAWING NO. 90S01
SHEET NO. 10 OF 29

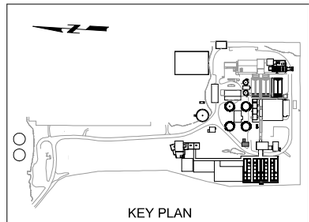
PLOT DATE: 8/13/2025 3:00:57 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/90-S-3D-101.rvt





1 / 90S01 **SECTION**
SCALE: 3/8" = 1'-0"


KEY PLAN

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
STRUCTURAL
MBBR PUMP STATION - SECTION

VERIFY SCALES
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580
DRAWING NO. 90S02
SHEET NO. 11 OF 29

PLOT DATE: 8/13/2025 3:01:06 PM
FILE NAME: Autodesk Docs://OCDWEP 203580/90-S-3D-101.rvt

PIPING SYMBOLS

DOUBLE LINE	SINGLE LINE	DESCRIPTION
		WELDED JOINT
		GROOVED END JOINT
		FLANGED JOINT
		HUB & SPIGOT JOINT (RUBBER GASKET)
		PUSH-ON JOINT (RESTRAINED)
		ADAPTER SIDE GROOVED END ADAPTER FLANGE
		FLANGED COUPLING ADAPTER
		FLANGED COUPLING ADAPTER WITH THRUST TIES
		FLEXIBLE COUPLING
		FLEXIBLE COUPLING WITH THRUST TIES
		METAL BELLOWS EXP JOINT
		ELASTOMER BELLOWS EXP JOINT
		FLEXIBLE COUPLING ADAPTER
		DISMANTLING JOINT
		EXPANSION COMPENSATOR
		ELBOW UP
		ELBOW DOWN
		TEE UP
		TEE DOWN
		LATERAL UP
		LATERAL DOWN
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER (FOT. FOB)
		UNION
		CAP
		ANCHOR
		ELBOW, 90 DEGREE
		CROSS
		TEE
		ELBOW, 45 DEGREE
		ELBOW, 22.5 DEGREE
		ELBOW, 11.25 DEGREE
		LATERAL

SINGLE LINE	DESCRIPTION
	GATE VALVE
K	KNIFE GATE VALVE
	BUTTERFLY VALVE
V	CHARACTERIZED BALL CONTROL VALVE
	BALL VALVE
	GLOBE VALVE
	3-WAY GLOBE TYPE MIXING VALVE
	FOUR WAY VALVE
	PINCH VALVE
	DIAPHRAGM VALVE
	PLUG VALVE
	LUBRICATED PLUG VALVE
	ECCENTRIC PLUG VALVE
	CONCENTRIC PLUG VALVE
	SWING CHECK VALVE
	WAFER CHECK VALVE
	BALL CHECK VALVE
	DUAL CHECK VALVE
	CHECK BACKFLOW PREVENTER
	HOSE VALVE
	MUD VALVE (PLAN VIEW)
	NEEDLE VALVE
	CONE VALVE
	PRESSURE RELIEF PRESSURE-REDUCING REGULATOR
	TELESCOPING VALVE
	THREE WAY VALVE AIR OPERATED
M	THREE WAY VALVE MOTOR OPERATED
S	THREE WAY VALVE SOLENOID OPERATED
	VACUUM VALVE
	BACKPRESSURE REGULATOR SELF-CONTAINED
	BACKPRESSURE REGULATOR W/ EXTERNAL PRESSURE TAP
	PRESSURE-REDUCING REGULATOR: SELF-CONTAINED
	PRESSURE-REDUCING REGULATOR W/EXTERNAL PRESSURE TAP

MECHANICAL SYMBOLS

SINGLE LINE	DESCRIPTION
	AIR OR CHEMICAL DIFFUSER
	QUICK DISCONNECT HIGH PRESSURE AIR OR FLUSHING
	BATCHMETER
	AIR VENT
	BASKET STRAINER
	BLOWER
	CALIBRATION COLUMN
	COMPRESSOR/TURBINE
	COMPRESSOR: RECIPROCATING
	DIAPHRAGM SEAL
	DRAIN
	EJECTOR OR EDUCTOR
M	ELECTRIC MOTOR
	EQUIPMENT DRAIN
	EXPANSION JOINT, FLEXIBLE VIBRATION JOINT
	FAN: EXHAUST/SUPPLY
	FILTER
	FIRE HYDRANT
	FLAME ARRESTER
	FLAME ARRESTER WITH THERMALLY OPERATED VALVE
	FLOOR DRAIN
	FLOW SWITCH
	GAUGE: PRESSURE
	GAUGE: DIFFERENTIAL PRESSURE
	WEIR
	MIXER
	OIL OR MOISTURE TRAP
	PRIMARY LEVEL ELEMENT: BUBBLER
	PRIMARY LEVEL ELEMENT: ELECTRODE
	PRIMARY LEVEL ELEMENT: FLOAT SWITCH
	PRIMARY LEVEL ELEMENT: FLUID
	PRIMARY LEVEL ELEMENT: INVERTED COLUMN

SINGLE LINE	DESCRIPTION
	PRIMARY LEVEL ELEMENT: RADAR
	PRIMARY LEVEL ELEMENT: ULTRASONIC
	PRIMARY FLOW ELEMENT: FLUME
X	PRIMARY FLOW ELEMENT: X = C - CORIOLIS X = M - MAGNETIC X = P - PROPELLER X = PT - PITOT TUBE X = R - ROTAMETER X = T - TURBINE X = TH - THERMAL X = U - ULTRASONIC X = D - DENSITY
	PRIMARY FLOW ELEMENT: ORIFICE PLATE
	PRIMARY FLOW ELEMENT: VENTURI TUBE
	PRIMARY FLOW ELEMENT: WEIR
	PULSATION DAMPENER
	PUMP: CENTRIFUGAL
	PUMP: DIAPHRAGM
	PUMP: METERING
	PUMP: PLUNGER
	PUMP: PERISTALTIC TUBE METERING
	PUMP: PROGRESSIVE CAVITY
	PUMP: RECIPROCATING
	PUMP: ROTARY
	PUMP: SCREW
	PUMP: SUBMERSIBLE
	PUMP: VERTICAL LIFT
	PIPE REDUCER: CONCENTRIC
	PIPE REDUCER: ECCENTRIC (FOT, FOB)
	ROTARY CHEMICAL FEEDER
	RUPTURE DISK
	SAMPLE PORT
	SIGHT GLASS
	SLIDE GATE
	SLUICE GATE
	STRAINER: WYE TYPE

SINGLE LINE	DESCRIPTION
	STRAINER: WYE TYPE WITH BLOWOFF
	THERMOMETER
	VALVE: ANGLE
	VALVE: AIR RELIEF
	PIPE MATERIAL CHANGE

IDENTIFICATION SYMBOLS

CHEMICAL INJECTION POINT — CHEMICAL / DWG NO.

PIPE DESIGNATOR — PIPE SIZE — FLOW STREAM — X" XXX

CONTINUATION TAG — UNIQUE IDENTIFIER — CONTINUATION FROM DWG NO. — CONTINUATION TO DWG NO. — A B C

EQUIPMENT / VALVE TAG — XXX-XX-XXXX

KEY TAG — X

LINE SYMBOLS

PIPE ABOVE OR BELOW GROUND

PIPE UNDERNEATH SLAB OR STRUCTURE

FUTURE

EXISTING

DEMO

PROCESS LINE SYMBOLS

PRIMARY PROCESS FLOW IN PIPE

SECONDARY PROCESS FLOW IN PIPE

PRIMARY PROCESS FLOW IN CHANNEL

SECONDARY PROCESS FLOW IN CHANNEL

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED N. GUHO
DRAWN A. FAKIROV
CHECKED A. CONKLIN
DATE SEPTEMBER 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

MECHANICAL

GENERAL LEGEND AND SYMBOLS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

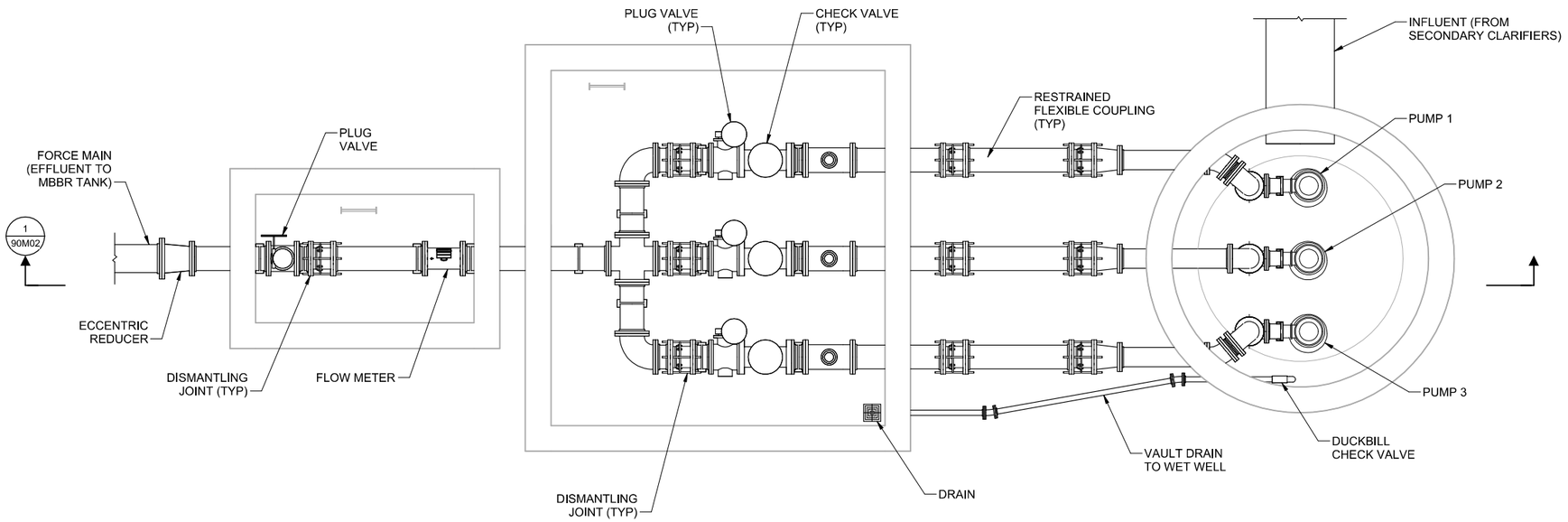
JOB NO. 203580-60000
DRAWING NO. 00GM01
SHEET NO. 12 OF 29

LAST SAVED BY:

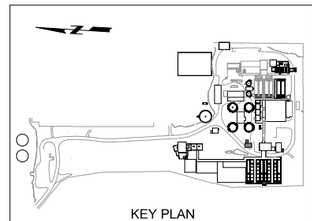
PROJECT NO.

FILE NAME:

Xref ..\d0224788\ProjNum34x22Border.dwg



1 PLAN
SCALE: 3/8" = 1'-0"



KEY PLAN

REV	DATE	BY	DESCRIPTION
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DRAWN A. FAKIROV
CHECKED J. DAVIDSON
DATE SEPTEMBER 2025

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
MECHANICAL
MBBR PUMP STATION - MECHANICAL PLAN

VERIFY SCALES
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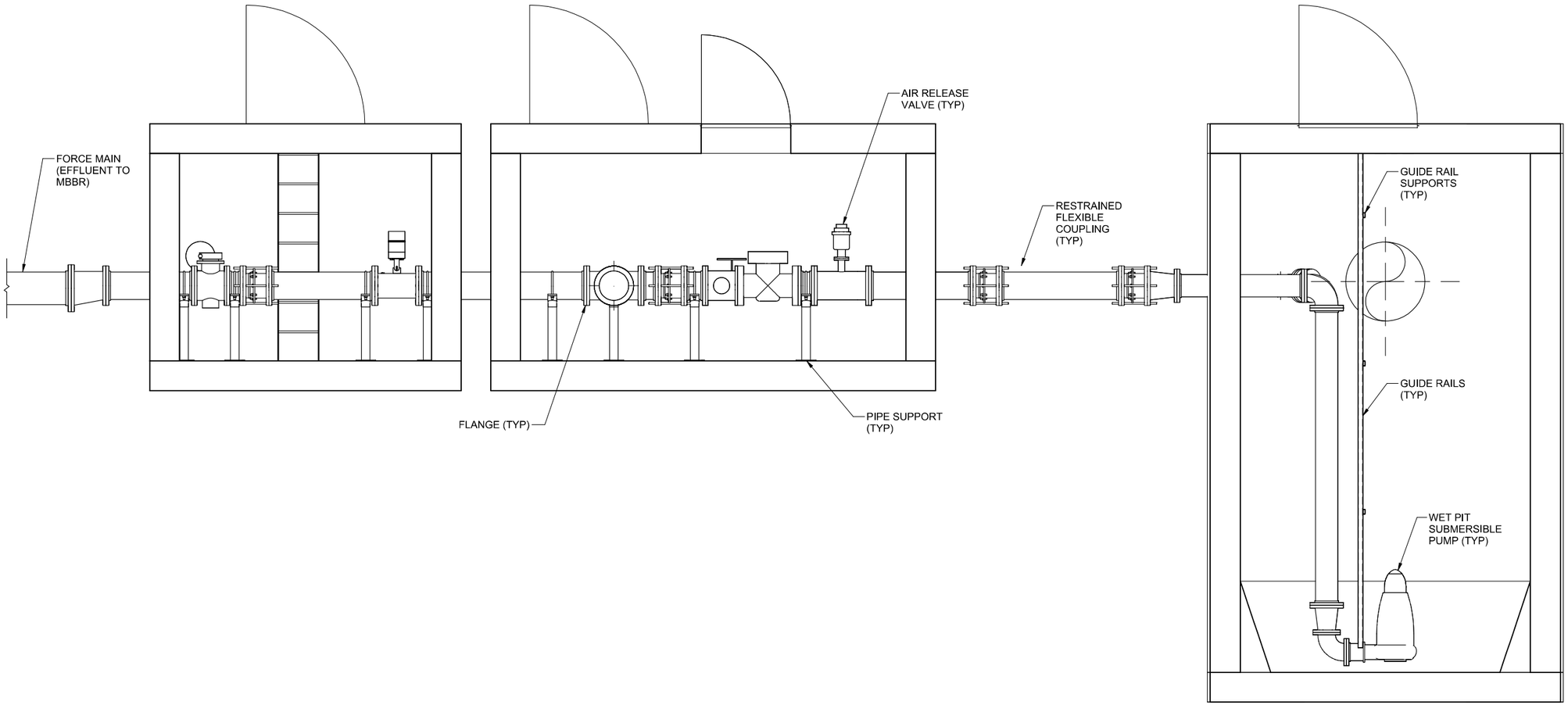
JOB NO. 203580
DRAWING NO. 90M01
SHEET NO. 13 OF 29

PLOT DATE: 8/13/2025 2:50:11 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/90-M-3D-101.rvt



1 / 90M01 **SECTION**

SCALE: 1/2" = 1'-0"

REV	DATE	BY	DESCRIPTION
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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

MECHANICAL

MBBR PUMP STATION - SECTION

VERIFY SCALES
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0 1"
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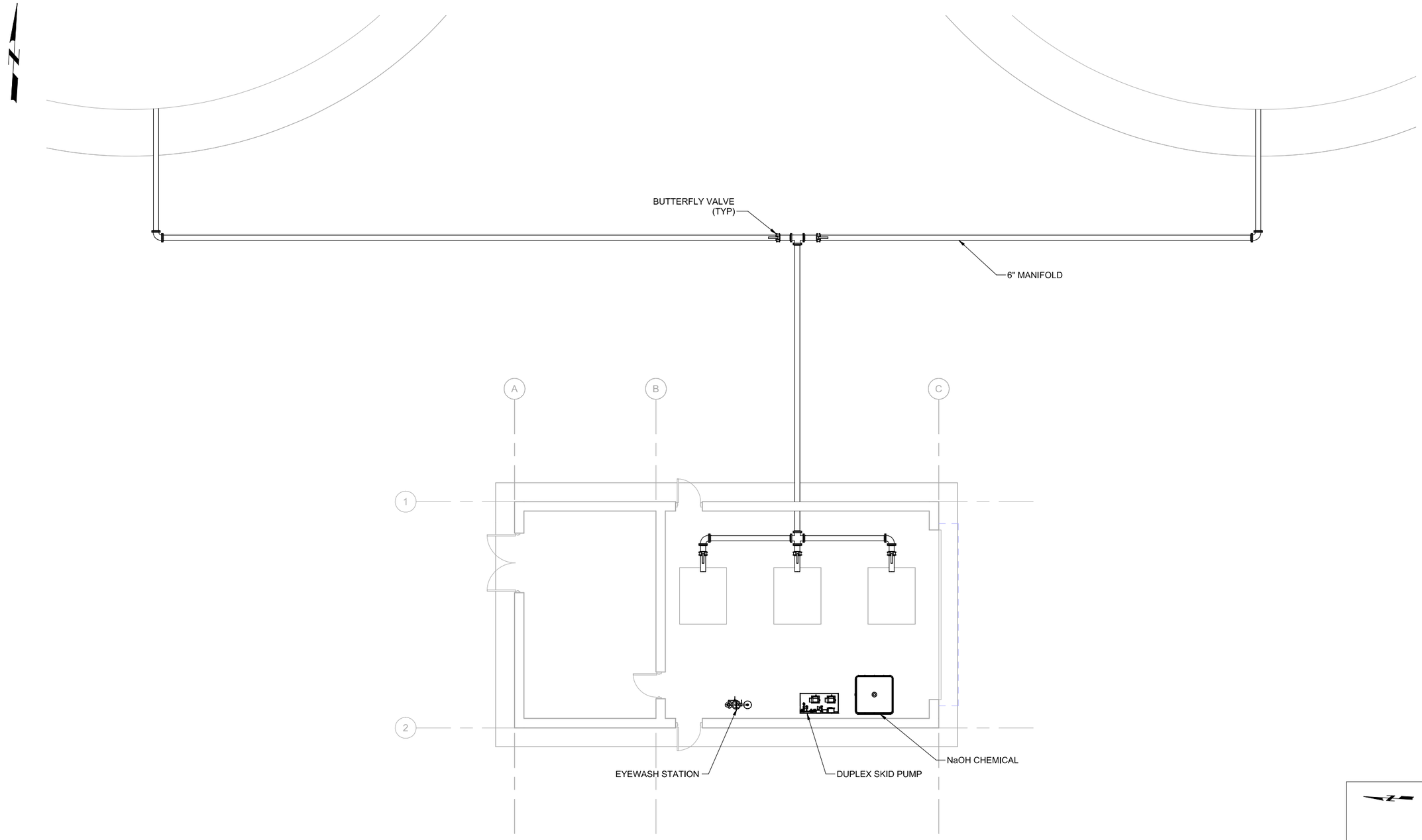
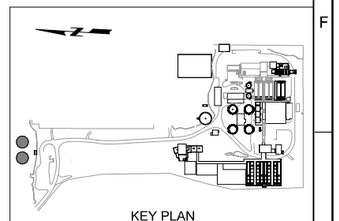
JOB NO. 203580
DRAWING NO. 90M02
SHEET NO. 14 OF 29

PLOT DATE: 8/13/2025 2:51:02 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/90-M-3D-101.rvt



1 **PLAN**
SCALE: 3/16" = 1'-0"



KEY PLAN

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CHECKED A. CONKLIN
DATE SEPTEMBER 2025

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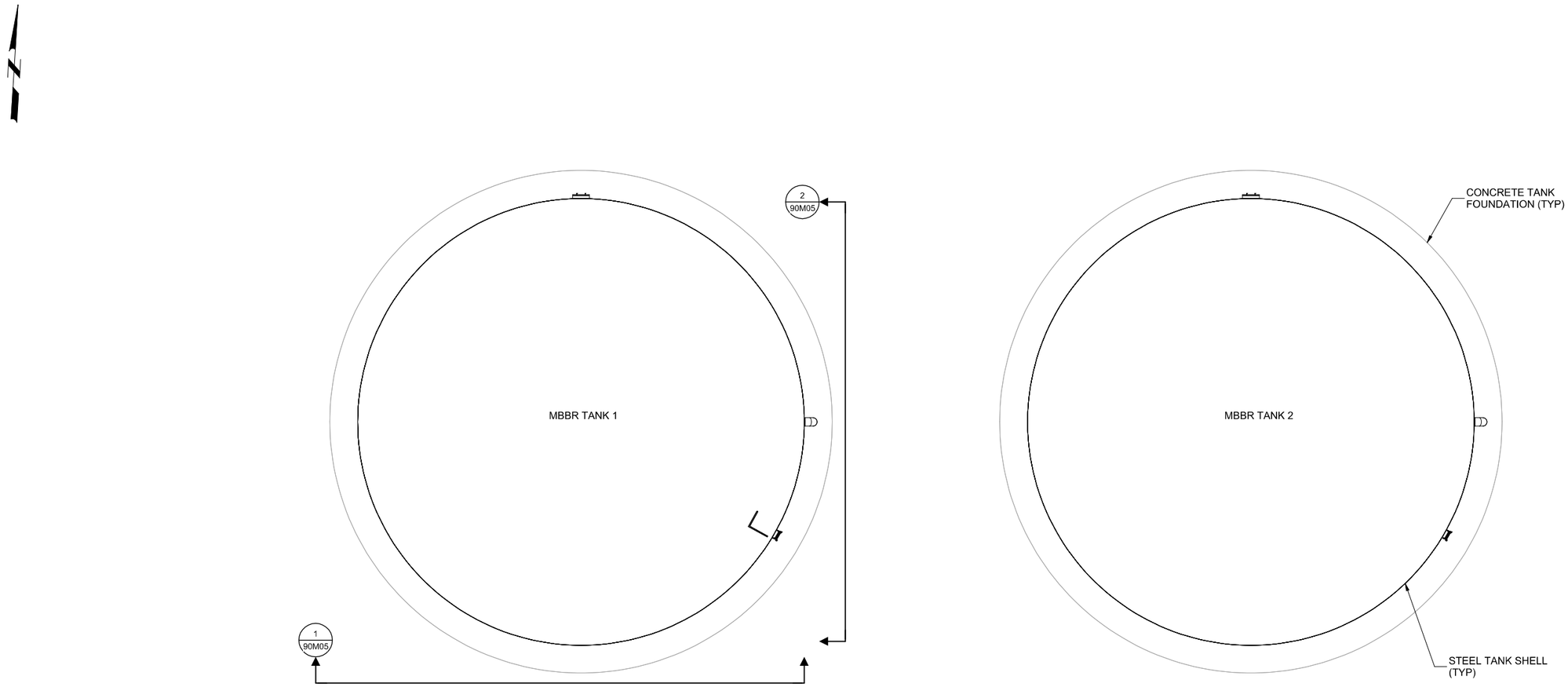
OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
MECHANICAL
BLOWER BUILDING - MECHANICAL PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

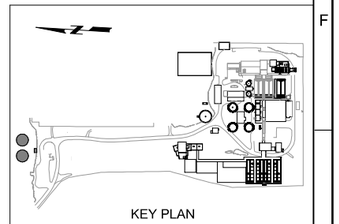
JOB NO. 203580
DRAWING NO. 90M03
SHEET NO. 15 OF 29

PLOT DATE: 8/14/2025 4:30:43 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/90-M-3D-101.rvt



1 **PLAN**
SCALE: 3/32" = 1'-0"


KEY PLAN

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
MECHANICAL
MBBR TANKS - PLAN AT EL. 392.50'

VERIFY SCALES
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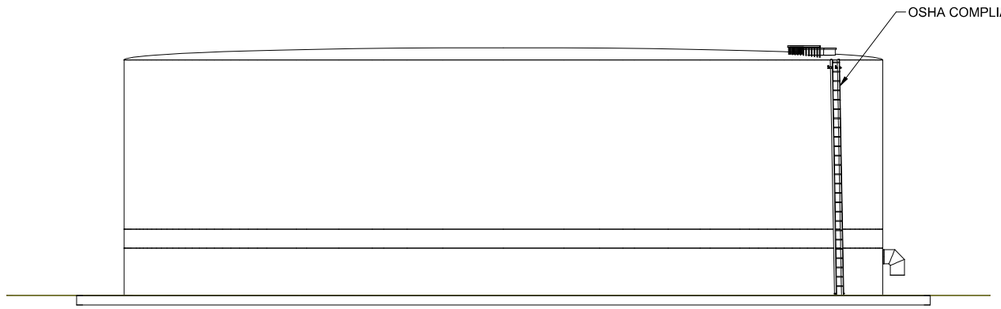
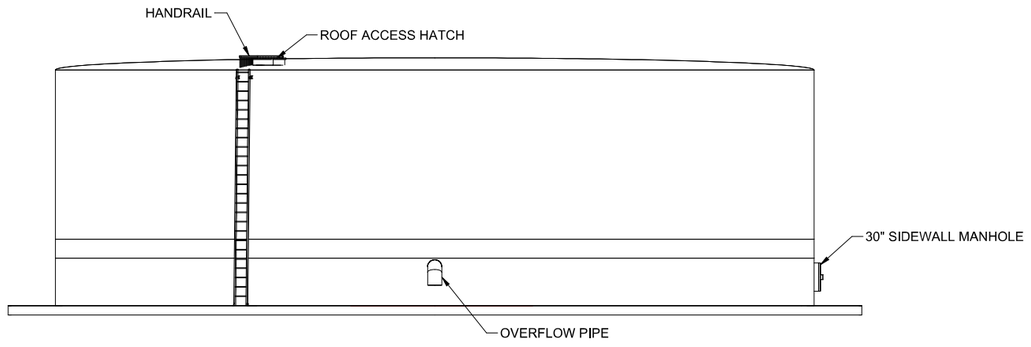
JOB NO. 203580
DRAWING NO. 90M04
SHEET NO. 16 OF 29

PLOT DATE: 8/14/2025 4:32:52 PM

FILE NAME: Autodesk Docs://OCDWEP 203580/90-M-3D-101.rvt



1 / 90M04 **SECTION**
SCALE: 1/8" = 1'-0"



2 / 90M04 **SECTION**
SCALE: 1/8" = 1'-0"

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
MECHANICAL
MBBR TANKS - SECTIONS

VERIFY SCALES
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JOB NO. 203580
DRAWING NO. 90M05
SHEET NO. 17 OF 29

PLOT DATE: 8/14/2025 4:33:47 PM
FILE NAME: Autodesk Docs://OCDWEP 203580/90-M-3D-101.rvt

ELECTRICAL PLAN SYMBOLS

IDENTIFICATION SYMBOLS

EQUIP # — EQUIPMENT AND INSTRUMENT IDENTIFICATION

EQUIPMENT/INSTRUMENT LOCATOR

LUMINAIRE IDENTIFICATION
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED FROM
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF FIXTURE
X = LUMINAIRE TYPE, REFER TO THE LUMINAIRE SCHEDULE

XXXX — CONDUIT IDENTIFICATION
XXXX = CONDUIT NUMBER, REFER TO CONDUIT SCHEDULE
UNLESS OTHERWISE NOTED, GROUPED CONDUITS ARE LABELED LEFT TO RIGHT OR TOP TO BOTTOM.

INDICATES KEYNOTE X
(PERTAINS ONLY TO SHEET WHERE NOTE IS FOUND)

DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

CAMERA

LUMINAIRES

LINEAR FIXTURE

2' X 2' LAY-IN TROFFER

2' X 4' LAY-IN TROFFER

LUMINAIRE POLE MOUNTED

LUMINAIRE, EMERGENCY BATTERY-POWERED

LUMINAIRE, EMERGENCY/EXIT BATTERY-POWERED

LUMINAIRE, EMERGENCY BATTERY-POWERED REMOTE

LUMINAIRE, SURFACE OR PENDANT MOUNTED

LUMINAIRE, WALL MOUNTED

LUMINAIRE, FLOOD/SPOT

LUMINAIRE, EXIT ONE OR TWO FACES AS INDICATED. ARROW POINTS IN DIRECTION OF EGRESS.

SWITCHES/RECEPTACLES

SINGLE POLE SWITCH
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATION
c = TYPE
2 = DOUBLE POLE SWITCH
3 = THREE-WAY SWITCH
3P = THREE POSITION SWITCH
4 = FOUR-WAY SWITCH
K = KEY OPERATED SWITCH
F = SWITCH AND FUSESTAT HOLDER
P = SWITCH AND PILOT LIGHT
T = THERMOSTAT
D = DIMMER SWITCH
L = LOW VOLTAGE LIGHT SWITCH
M = MANUAL MOTOR STARTER
N = NETWORKED SINGLE OR MULTIPLE SWITCH LOCATIONS
WP = WEATHER PROOF
REFER TO ABBREVIATIONS LEGEND FOR ALL OTHER DESIGNATIONS.

OCCUPANCY SENSOR
X = REFERENCE LIGHTING CONTROL COMPONENT SCHEDULE
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATION
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF SENSOR

PE — PHOTOCELL

SWITCH AND SINGLE RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

DUPLEX RECEPTACLE

QUADRUPLEX RECEPTACLE

IN FLOOR DUPLEX RECEPTACLE

IN FLOOR QUADRUPLEX RECEPTACLE

DUPLEX RECEPTACLE w/SPLIT WIRE

DEDICATED RECEPTACLE

SPECIAL PURPOSE RECEPTACLE

WELDING RECEPTACLE
a = CIRCUIT DESIGNATION
b = DISCONNECT TYPE

TWIST LOCK RECEPTACLE
a = AMP RATING

TELEPHONE OUTLET

DATA COMMUNICATIONS OUTLET
a = NETWORK SWITCH

FIRE ALARM

FACP — FIRE ALARM CONTROL PANEL

RACEWAY

EXPOSED CONDUIT

BREAK AND CONTINUATION IN CONDUIT RUN

EXPOSED CONDUIT HIDDEN BEHIND WALLS, FLOORS OR OTHER STRUCTURES

UNDERGROUND CONDUIT, DIRECT BURIED OR IN DUCT BANK

CONDUIT IN SLAB

CONDUIT VERTICAL CHANGE IN DIRECTION

CONDUIT CAP

J — JUNCTION BOX

CONDUIT SEAL

CONDUIT TEE

DUCT BANK
APPROXIMATE DIMENSIONS SHOWN ON DUCT BANK SECTIONS

CONDUIT SIZE AND CONDUCTORS

INDIVIDUAL CONDUCTORS

W"C-(3-X (Ø), 1-Y (N) & 1-Z (G))

W"C (WHERE INDICATED): W = CONDUIT TRADE SIZE

3-X (Ø):
3 = QUANTITY
X = SIZE OF CONDUCTORS
(Ø) = DESIGNATES PHASE CONDUCTORS

1-Y (N) (WHERE INDICATED):
1 = QUANTITY
Y = SIZE OF CONDUCTORS
(N) = DESIGNATES NEUTRAL CONDUCTORS

1-Z (G) (WHERE INDICATED):
1 = QUANTITY
Z = SIZE OF CONDUCTORS
(G) = DESIGNATES GROUND CONDUCTORS

U(3-X (Ø) & 1-X (G))
U = NUMBER OF PARALLEL RUNS

VFD CONDUCTORS

U{[N/C-X (Ø) & INTEGRAL (G)]:VFD}
U = NUMBER OF PARALLEL RUNS
N/C = NUMBER OF PHASE CONDUCTORS IN CABLE
X = SIZE OF CONDUCTORS
VFD = VFD CABLE

MULTI CONDUCTOR CABLES

K/2/C#16S
K (WHERE INDICATED) = NUMBER OF PAIRS
2/C#16S = TWO CONDUCTOR, 16 GAUGE, TWISTED SHIELDED PAIR

K/3/C#16S
K (WHERE INDICATED) = NUMBER OF TRIPLETS
3/C#16S = THREE CONDUCTOR, 16 GAUGE, TWISTED SHIELDED TRIPLETS

U{[N/C-X (Ø) & INTEGRAL (G)]:MC}
U = NUMBER OF PARALLEL RUNS
MC = MULTICONDUCTOR CABLE
N/C = NUMBER OF PHASE CONDUCTORS IN THE CABLE
X = SIZE OF CONDUCTORS

FIBER OPTIC CABLES

FO/N
N = NUMBER OF INDIVIDUAL FIBERS

GROUNDING

UNDERGROUND GROUND CABLE
#4/0 SDBC UNLESS OTHERWISE NOTED

GROUND ROD

GROUND ROD AND GROUND WELL

ELECTRICAL ONE-LINE SYMBOLS

MEDIUM VOLTAGE

CIRCUIT BREAKER, MEDIUM VOLTAGE
a = CIRCUIT BREAKER NUMBER
b = FRAME SIZE

ANSI RELAY DEVICE
a = ANSI DEVICE FUNCTION
b = QUANTITY

MEDIUM VOLTAGE DISCONNECT SWITCH NON-FUSED CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE SINGLE FUSE CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE DOUBLE FUSE CUT OUT

MEDIUM VOLTAGE SINGLE FUSE

MEDIUM VOLTAGE DOUBLE FUSE

MEDIUM VOLTAGE LIVE FRONT TERMINATOR

MEDIUM VOLTAGE ELBOW

MEDIUM VOLTAGE TEE

MEDIUM VOLTAGE CONTACTOR

MEDIUM VOLTAGE STARTER

MOV-ELBOW ARRESTER

LOW VOLTAGE

LOW VOLTAGE CIRCUIT BREAKER
a = TYPE
MCP = MOTOR CIRCUIT PROTECTOR
TM = THERMAL MAGNETIC
SS = SOLID STATE
b = FRAME SIZE (MANUFACTURER TO DETERMINE FRAME SIZE UNLESS INDICATED)
c = NUMBER OF POLES
d = TRIP SETTING (AT = AMP TRIP) (AC = MCP CONTINUOUS RATING)
e = DESIGNATION
f = INTERRUPTING RATING

LOW VOLTAGE CIRCUIT BREAKER AUXILIARY OPERATOR
* = S = SHUNT TRIP
= G = GROUND FAULT INTERRUPTER
= V = SOLENOID KEY RELEASE

DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

FUSED DISCONNECT SWITCH
B = TYPE, REFER TO DISCONNECT SCHEDULE
b = FUSE RATING

FUSE

COMBINATION STARTER WITH CONTROL POWER TRANSFORMER
a = CIRCUIT BREAKER DISCONNECT, TYPE AS NOTED
b = STARTER TYPE REFER TO THE SPECIFICATIONS FOR STARTER DEFINITIONS.
c = NEMA STARTER SIZE
d = OVERLOAD

MOTOR STARTER/DRIVES:
a = DEVICE TYPE
VFD-6 = 6-PULSE VFD
VFD-18 = 18-PULSE VFD
VFD-RH = REDUCED HARMONIC VFD (18-PULSE OR ACTIVE FRONT END AS DEFINED IN THE SPECIFICATIONS)
RVSS = REDUCED VOLTAGE SOLID STATE STARTER
RVAT = REDUCED VOLTAGE AUTO TRANSFORMER
a/B = DEVICE WITH BYPASS STARTER, REFER TO THE SPECIFICATIONS

b = INPUT OPTIONS
LL = LINE REACTOR
PHF = PASSIVE HARMONIC FILTER

c = OUTPUT OPTIONS
LR = LOAD REACTOR
DV/DT = Dv/dt FILTER
SWF = SINE WAVE FILTER

EQUIPMENT ENCLOSURE

MISCELLANEOUS

HP — MOTOR
HP = HORSEPOWER RATING
FULL LOAD AMPS AS NOTED

PACKAGED EQUIPMENT
LOAD RATING AS INDICATED
a = RATED LOAD
b = UNIT(HP, KW, KVA) AS INDICATED

TRANSFORMER
a = DEVICE I.D.
b = KVA RATING
c = NUMBER OF PHASES
d = PRIMARY VOLTAGE
e = SECONDARY VOLTAGE
f,g = CONNECTION TYPE SYMBOL
h = IMPEDANCE

GROUNDED WYE CONNECTION

DELTA CONNECTION

G — ENGINE-GENERATOR RATINGS AS INDICATED ON THE DRAWINGS
a = KVA/KW
b = VOLTAGE/CONNECTION
c = PHASE
d = WIRE
e = PF

CURRENT TRANSFORMER WITH SHORTING TERMINAL BLOCK
a = QUANTITY
b = RATIO

POTENTIAL TRANSFORMER
a = QUANTITY
b = RATIO
c,d = CONNECTION TYPE SYMBOL

SSM — SOLID STATE MULTIFUNCTION METER

ATP — AMPERE TEST POINT

VTP — VOLTAGE TEST POINT

UTILITY METER

LIGHTNING ARRESTER

SPD — SURGE PROTECTIVE DEVICE

DRAWOUT CONNECTION

GROUND

CAPACITOR

BATTERY

K — KIRK KEY INTERLOCK

LOAD BANK

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED M. SRINIVASAN
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

PDG POPLI DESIGN GROUP | carollo | Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
ELECTRICAL
GENERAL LEGEND AND SYMBOLS

VERIFY SCALES
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JOB NO. 203580-60000
DRAWING NO. 00GE01
SHEET NO. 18 OF 29

LAST SAVED BY:
PROJECT NO.
FILE NAME:

ABBREVIATIONS

A	AMP
ABS	ABSOLUTE
AC	ALTERNATING CURRENT
ACK	ACKNOWLEDGE
ACTR	ACTUATOR
AF	AMP FRAME
AFC	AUTOMATIC FREQUENCY CONTROL
AIC	AMP INTERRUPTING CAPACITY
AM	AMMETER
ANN	ANNUNCIATOR
ANT	ANTENNA
APU	AUXILIARY POWER UNIT
ARM	ARMORED CABLE
AS	AMMETER SWITCH
ASYM	ASYMMETRICAL
AT	AMP TRIP
ATO	AUTOMATIC THROW OVER
ATP	AMMETER TEST POINT
ATS	AUTOMATIC TRANSFER SWITCH
AUTO XFMR	AUTOMATIC TRANSFORMER
AUX	AUXILIARY
AWG	AMERICAN WIRE GAGE
B	BELL
BAT	BATTERY
BFG	BELOW FINISHED GRADE
BHP	BRAKE HORSEPOWER
BKR	BREAKER
BRF	BELOW RAISED FLOOR
C	CONDUIT / CONTINUOUS LOAD
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CCW	COUNTER CLOCKWISE
CKT	CIRCUIT
COAX	COAXIAL CABLE
COM	COMMON
COMM	COMMUNICATION
CPT	CONTROL POWER TRANSFORMER
CR	CONTROLLED RECEPTACLE
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
CV	CONTROL VALVE
CW	CLOCKWISE / COOL WHITE
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DCU - X	DISTRIBUTED CONTROL UNIT NO. X
DEMO	DEMOLITION
DISC	DISCONNECT SWITCH
DM	DEMAND METER
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DS	DOOR SWITCH
E/G	EMERGENCY GENERATOR
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSURE
ENG	ENGINE
ENT	ELECTRICAL NON-METALLIC TUBING
EP	EXPLOSION PROOF
ETM	ELAPSED TIME METER
F	SUB-FED
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FDR	FEEDER
FLA	FULL LOAD AMPS
FLX	FLEXIBLE CONDUIT
FO	FIBER OPTIC
FRC	FIBERGLASS RIGID CONDUIT
FREQ	FREQUENCY
FU	FUSE
FU SW	FUSED SWITCH
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
FWD	FORWARD
G	GROUND / EQUIPMENT GROUND / GROUND FAULT
GEN	GENERATOR
GRC	GALVANIZED STEEL RIGID CONDUIT
GFCI	GROUND FAULT CIRCUIT INTERRUPTER (RECEPTACLE)
GFI	GROUND FAULT INTERRUPTER (BREAKER)
GFR	GROUND FAULT RELAY
H	HOT-LEG
HF	HIGH FREQUENCY
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HSTAT	HUMIDISTAT
HV	HIGH VOLTAGE
HVAC	HEATING/VENTILATION/AIR CONDITIONING
HZ	HERTZ
I	INSTANTANEOUS / INTERMITTENT LOAD
IC	INTERRUPTING CAPACITY
IJB	INSTRUMENT JUNCTION BOX
IMC	INTERMEDIATE METAL CONDUIT
INST	INSTANTANEOUS
INT	INTERLOCK
INTERCOM	INTERCOMMUNICATION
J	JUNCTION BOX
K	KEY INTERLOCK
KA	KILOAMP
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAR	KILOVAR (REACTANCE)
KW	KILOWATT
KWD	KILOWATT DEMAND
KWH	KILOWATT HOUR
L	LONG-TIME
L-B	LINE-BUS
L-G	LINE-GROUND
LA	LIGHTNING ARRESTOR
LBL	LABEL
LC	LIGHTING CONTACTOR
LCP- X	LOCAL CONTROL PANEL NO. X
LL	LEAD-LAG LOAD REACTOR
LP	LIGHT POLE
LP - X	LIGHTING PANEL NO. X
LTG	LIGHTING
LV	LOW VOLTAGE
LVL	LEVEL
M-X	MOTOR CONTROLLER NO. X
MA	MILLIAMPERE
MCA	MOTOR CIRCUIT AMPS
MCC - X	MOTOR CONTROL CENTER NO. X
MCP	MOTOR CIRCUIT PROTECTOR
MH	MANHOLE / MOUNTING HEIGHT
MLO	MAIN LUGS ONLY
MOD	MOTOR OPERATED DAMPER
MOV	METAL OXIDE VARISTOR
MPR	MOTOR PROTECTION RELAY
MS-X	MOTOR STARTER NO. X
MSP	MOTOR STARTING PANEL
MTO	MANUAL THROW OVER
MTR-X	MOTOR NO. X
MTS	MANUAL TRANSFER SWITCH
MV	MEGAVOLT
MVA	MEGAVOLT-AMPERES
MVS	MEDIUM VOLTAGE SWITCH
MW	MEGAWATT
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NFC	NONMETALLIC FLEXIBLE CONDUIT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NP	NAMEPLATE
O	OPEN OR OPENED
OH	OVERHEAD
OL	OVERLOAD RELAY
P	POLE
PA	PUBLIC ADDRESS
PB	PUSHBUTTON / PULL BOX
PCS	PVC COATED GALVANIZED STEEL CONDUIT
PCM	PROCESS CONTROL MODULE
PE	PHOTOCELL
PF	POWER FACTOR
PFCC	POWER FACTOR CORRECTION CAPACITOR
PFR	PHASE FAILURE RELAY
PH	PHASE
PNL	PANEL
PPX	POWER PANEL NO. X
PRI	PRIMARY
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE RIGID PLASTIC CONDUIT
PWR	POWER
RAC	RIGID ALUMINUM CONDUIT
RECPT	RECEPTACLE
REV	REVERSE
RF	RADIO FREQUENCY
RMS	ROOT MEAN SQUARED
RVAT	REDUCED VOLTAGE AUTO TRANSFORMER
RVNR	REDUCED VOLTAGE NON-REVERSING
RVSS	REDUCED VOLTAGE SOLID STATE
S	SHIELD / SHORT-TIME
SA	SURGE ARRESTER
SC	SHORT CIRCUIT
SDBC	SOFT DRAWN BARE COPPER
SFL	SUB FEED LUGS
SLT	SEALTIGHT LIQUIDTIGHT FLEXIBLE CONDUIT
SM	SURFACE MOUNTED
SP	SINGLE POLE
SPD	SURGE PROTECTIVE DEVICE
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SPKR	SPEAKER
SS	SOLID STATE
STB	SHORTING TERMINAL BLOCK
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
TACH	TACHOMETER
TB - X	TERMINAL BLOCK - UNIT X
TC	THERMOCOUPLE / TIME CLOCK / TRAY CABLE
TD	TEMPERATURE DETECTOR RELAY
TE	TOTALLY ENCLOSED
TEFC	TOTALLY ENCLOSED FAN COOLED
TENV	TOTALLY ENCLOSED NON-VENTILATED
TERM	TERMINAL
TJB	TERMINAL JUNCTION BOX
TM	THERMAL MAGNETIC
TP	TWISTED PAIR
TS	TEMPERATURE SWITCH
TS1W	TWO SPEED CONSEQUENT POLE, ONE WINDING
TS2W	TWO SPEED SEPARATE WINDING
TSTAT	THERMOSTAT
UHF	ULTRA HIGH FREQUENCY
UNG	UNGROUNDED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UVR	UNDER VOLTAGE RELAY
V	VOLT
VA	VOLT AMPERE
VAR	VARMETER
VCP	VENDOR CONTROL PANEL
VFD	VARIABLE FREQUENCY DRIVE
VHF	VERY HIGH FREQUENCY
VM	VOLTMETER
VP	VAPORPROOF
VR	VOLTAGE REGULATOR
VS	VOLTAGE SWITCH
VT	VOLTAGE TRANSFORMER
VTP	VOLTAGE TEST POINT
W	WATT / WEST
WT	WATER TIGHT
WP	WEATHER PROOF
XFMR	TRANSFORMER

NOTES:

1. REFER TO SPECIFICATIONS AND OTHER DRAWINGS FOR ADDITIONAL ABBREVIATIONS.

POWER DEVICE FUNCTION NUMBERS

1	MASTER ELEMENT
2	TIME-DELAY STARTING OR CLOSING RELAY
3	CHECKING OR INTERLOCKING RELAY
4	MASTER CONTACTOR
5	STOPPING DEVICE
6	STARTING CIRCUIT BREAKER
7	ANODE CIRCUIT BREAKER
8	CONTROL POWER DISCONNECTING DEVICE
9	REVERSING DEVICE
10	UNIT SEQUENCE SWITCH
11	MULTIFUNCTION DEVICE
12	OVER-SPEED DEVICE
13	SYNCHRONOUS-SPEED DEVICE
14	UNDER-SPEED DEVICE
15	SPEED OR FREQUENCY MATCHING DEVICE
16	DATA COMMUNICATIONS DEVICE
17	SHUNTING OR DISCHARGE SWITCH
18	ACCELERATING OR DECELERATING DEVICE
19	STARTING-TO-RUNNING TRANSITION CONTACTOR
20	ELECTRICALLY OPERATED VALVE
21	DISTANCE RELAY
22	EQUALIZER CIRCUIT BREAKER
23	TEMPERATURE CONTROL DEVICE
24	VOLTS PER HERTZ RELAY
25	SYNCHRONIZING OR SYNCHRONISM-CHECK DEVICE
26	APPARATUS THERMAL DEVICE
27	UNDERVOLTAGE RELAY
27N	GROUND FAULT UNDERVOLTAGE RELAY
28	FLAME DETECTOR
29	ISOLATING CONTACTOR
30	ANNUNCIATOR RELAY
31	SEPARATE EXCITATION DEVICE
32	DIRECTIONAL POWER RELAY
33	POSITION SWITCH
34	MASTER SEQUENCE DEVICE
35	BRUSH-OPERATING OR SLIP-RING SHORT-CIRCUITING DEVICE
36	POLARITY DEVICE
37	UNDERCURRENT OR UNDERPOWER RELAY
38	BEARING PROTECTIVE DEVICE
39	MECHANICAL CONDITION MONITOR
40	FIELD RELAY
41	FIELD CIRCUIT BREAKER
42	RUNNING CIRCUIT BREAKER
43	MANUAL TRANSFER OR SELECTOR DEVICE
44	UNIT SEQUENCE STARTING RELAY
45	ABNORMAL ATMOSPHERIC CONDITION MONITOR
46	REVERSE-PHASE OR BALANCE CURRENT RELAY
47	PHASE-BALANCE OR PHASE-SEQUENCE VOLTAGE RELAY
48	INCOMPLETE SEQUENCE RELAY
49	MACHINE OR TRANSFORMER THERMAL RELAY
50	INSTANTANEOUS OVERCURRENT RELAY
51	AC TIME OVERCURRENT RELAY
52	AC CIRCUIT BREAKER
53	FIELD EXCITATION RELAY
54	TURNING GEAR ENGAGING DEVICE
55	POWER FACTOR RELAY
56	FIELD APPLICATION RELAY
57	SHORT-CIRCUITING OR GROUNDING DEVICE
58	RECTIFICATION FAILURE RELAY
59	OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT BALANCE RELAY
61	DENSITY SWITCH OR SENSOR
62	TIME-DELAY STOPPING OR OPENING RELAY
63	PRESSURE SWITCH
64	GROUND DETECTOR RELAY
65	GOVERNOR
66	NOTCHING OR JOGGING DEVICE
67	AC DIRECTIONAL OVERCURRENT RELAY
68	BLOCKING OR OUT OF STEP RELAY
69	PERMISSIVE CONTROL DEVICE
70	RHEOSTAT
71	LIQUID LEVEL SWITCH
72	DC CIRCUIT BREAKER
73	LOAD-RESISTOR CONTACTOR
74	ALARM RELAY
75	POSITION CHANGING MECHANISM
76	DC OVERCURRENT RELAY
77	TELEMETERING DEVICE
78	PHASE-ANGLE MEASURING RELAY
79	AC RECLOSING RELAY
80	FLOW SWITCH
81	FREQUENCY RELAY
82	DC LOAD MEASURING RECLOSING RELAY
83	AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY
84	OPERATING MECHANISM
85	PILOT COMMUNICATIONS, CARRIER OR PILOT-WIRE RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTIVE RELAY
88	AUXILIARY MOTOR OR MOTOR GENERATOR
89	LINE SWITCH
90	REGULATING DEVICE
91	VOLTAGE DIRECTIONAL RELAY
92	VOLTAGE AND POWER DIRECTIONAL RELAY
93	FIELD-CHANGING CONTACTOR
94	TRIPPING OR TRIP-FREE RELAY

COMMONLY USED SUFFIX LETTER APPLIED TO POWER DEVICE FUNCTION NUMBERS

A	ALARM ONLY
B	BUS PROTECTION
G	GROUND FAULT PROTECTION (RELAY CT IN A SYSTEM NEUTRAL CIRCUIT OR GENERATOR PROTECTION)
GS	GROUND FAULT PROTECTION (RELAY CT IN TOROIDAL OR GROUND SENSOR TYPE)
L	LINE PROTECTION
M	MOTOR PROTECTION
N	GROUND FAULT PROTECTION (RELAY COIL CONNECTED IN RESIDUAL CT CIRCUIT)
T	TRANSFORMER PROTECTION
V	VOLTAGE
P	PHASE PROTECTION

ABBREVIATIONS

AFD	ARC FLASH DETECTOR
CLK	CLOCK OR RIMING SOURCE
DDR	DYNAMIC DISTURBANCE RECORDER
DFR	DIGITAL FAULT RECORDER
ENV	ENVIRONMENTAL DATA
HIZ	HIGH IMPEDANCE FAULT DETECTOR
HMI	HUMAN MACHINE INTERFACE
HST	HISTORIAN
LGC	SCHEME LOGIC
MET	SUBSTATION METERING
PDC	PHASOR DATA CONCENTRATOR
PMU	PHASOR MEASUREMENT UNIT
PQM	POWER QUALITY MONITOR
RIO	REMOTE I/O DEVICE
RTU	REMOTE TELEMETRY UNIT/REMOTE TERMINAL UNIT
SER	SEQUENCE OF EVENTS RECORDER
TCM	TRIP CIRCUIT MONITOR

REV	DATE	BY	DESCRIPTION
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DESIGNED M. SRINIVASAN
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
ELECTRICAL
ABBREVIATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00GE02
SHEET NO. 19 OF 29

LAST SAVED BY:
PROJECT NO.
FILE NAME:

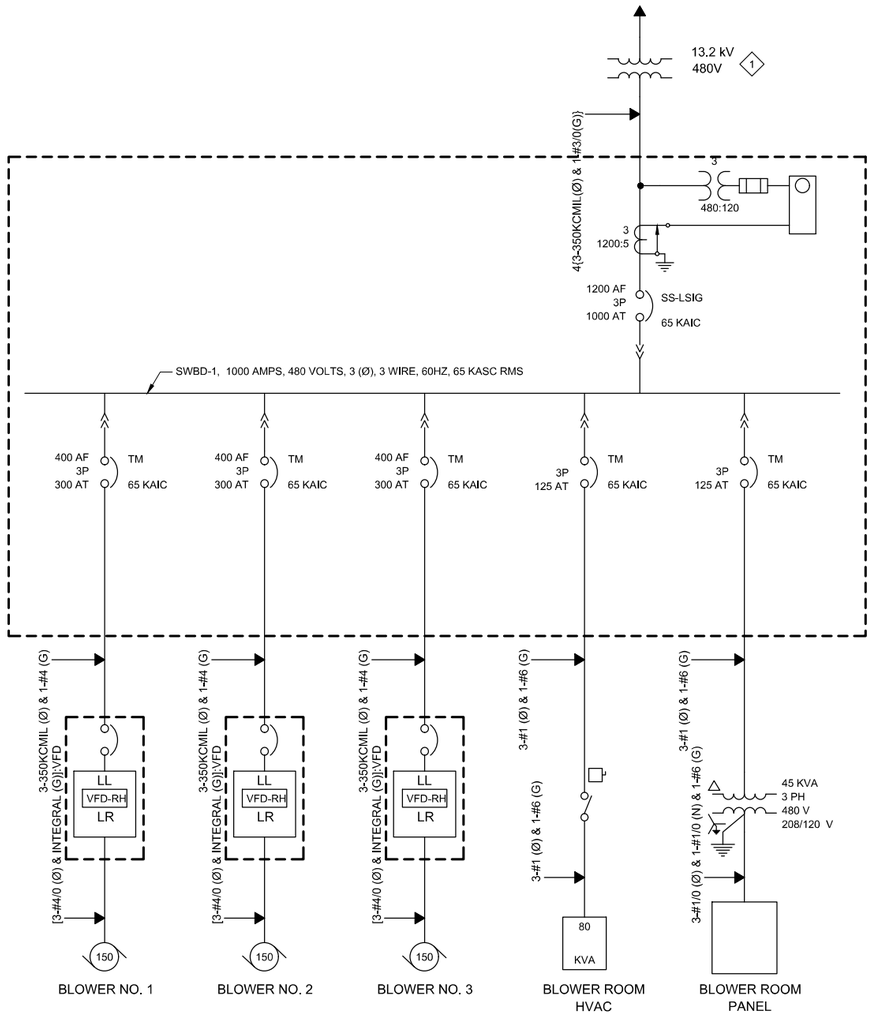
LEGEND:

LL: LINE REACTOR
LR: LOAD REACTOR
SWBD: SWITCHBOARD
VDF-RH: REDUCED HARMONIC VFD

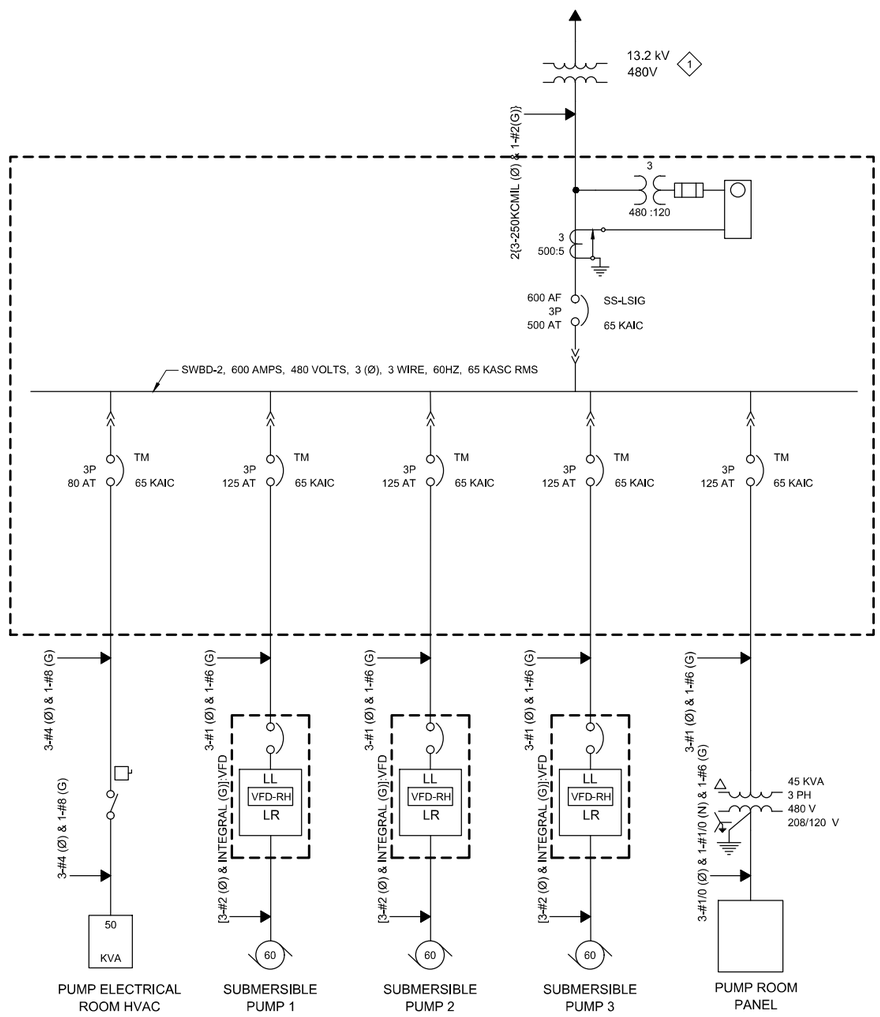
KEY NOTES:

1. UTILITY TRANSFORMER TO BE PROVIDED BY NATIONAL GRID.
2. NEW NATIONAL GRID SERVICE LOCATION 1
3. NEW NATIONAL GRID SERVICE LOCATION 2

NATIONAL GRID PRIMARY CONNECTION (2)



NATIONAL GRID PRIMARY CONNECTION (3)



REV	DATE	BY	DESCRIPTION
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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT
ELECTRICAL
MBBR SYSTEM - ONE-LINE DIAGRAM

VERIFY SCALES
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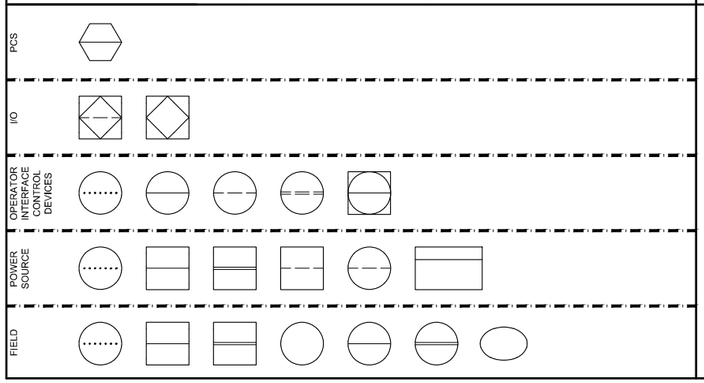
JOB NO. 203580-60000
DRAWING NO. 90E01
SHEET NO. 20 OF 29

LAST SAVED BY:
PROJECT NO.
FILE NAME:

SYMBOL	DRAWING VISIBLE FIELDS	FIELD - 1	FIELD - 2	FIELD - 3	FIELD - 4	FIELD - 5	FIELD - 6	FIELD - 7	FIELD - 8
HMI/SCADA SYSTEM OPERATOR INTERFACE TERMINAL	1 - TAG111 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - DESCRIPTION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	ACTION ALARM SP - NUMERIC STATUS - SET POINT TREND	DESCRIPTION 2 5	DESCRIPTION	E - EXISTING F - FUTURE		
HARDWIRED I/O POINT	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE 7 - IO TABLE	REFER 1 2 4	REFER 3	AI - ANALOG INPUT AO - ANALOG OUTPUT DI - DISCRETE INPUT DO - DISCRETE OUTPUT RTD - RTD INPUT	DESCRIPTION	PAC - PROGRAMMABLE AUTOMATION CONTROLLER NO. PLC - PROGRAMMABLE LOGIC CONTROLLER NO. RIO - REMOTE I/O VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
NETWORK / SOFT I/O	1 - TAG 2 - LOOP NUMBER 3 - PROTOCOL 4 - PANEL 5 - PLC 6 - EXISTING/FUTURE 7 - IO TABLE 8 - SWITCH/SEGMENT	REFER 1 2	REFER 3	COMMUNICATION PROTOCOL CNET - CONTROLNET DNET - DEVICENET EIP - ETHERNET/IP FF - FOUNDATION FIELDBUS HART-IP - HART OVER ETHERNET MANF - MFR. PROPRIETARY MBRTU - MODBUS RTU MB+ - MODBUS PLUS MBTCP - MODBUS TCP DP - PROFIBUS DP PA - PROFIBUS PA PNET - PROFINET SNMP - SNMPv3 HTTP - WEB SERVER (TCP/IP)	DESCRIPTION	PAC - PROGRAMMABLE AUTOMATION CONTROLLER NO. PLC - PROGRAMMABLE LOGIC CONTROLLER NO. RIO - REMOTE I/O VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
LOCAL OPERATOR INTERFACE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	ACTION ALARM SP - NUMERIC STATUS - SET POINT TREND	DESCRIPTION	LOI - LOCAL OPERATOR INTERFACE NO. LCP - LOCAL CONTROL PANEL NO. PCM - PROCESS CONTROL MODULE NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
PILOT DEVICE OPERATOR INTERFACE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - DESCRIPTION 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 2	REFER 3	AM - AUTO/MANUAL BYPASS - BY PASS ESD - EQUIPMENT SHUTDOWN HOA - HAND/OFF/AUTO LOR - LOCAL/OFF/REMOTE LOS - LOCK OUT STOP LS - LEAD/STANDBY LSR - LOCAL/STOP/REMOTE OC - OPEN/CLOSE OO - OFF/ON OSC - OPEN/STOP/CLOSE RST - RESET SEL - SELECT SPD - SPEED SS - START/STOP ST - STOP	DESCRIPTION 2 5	LCP - LOCAL CONTROL PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. RVSS - REDUCED VOLTAGE SOLID STARTER NO. VCP - VENDOR CONTROL PANEL NO. VFD - VARIABLE FREQUENCY DRIVE NO.	E - EXISTING F - FUTURE		
POWER DEVICE PRIMARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - VOLTAGE-POLE 5 - LOCATION 6 - EXISTING/FUTURE	CB - CIRCUIT BREAKER DISC - DISCONNECT FU - FUSE	REFER 3	TM - THERMAL MAGNETIC CIRCUIT BREAKER	24VDC - 1P 24VDC - 2P 24VAC - 1P 48VDC - 2P 120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	DP - DISTRIBUTION PANEL NO. LCP - LOCAL CONTROL PANEL NO. LP - LIGHTING PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. PP - POWER PANEL NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
POWER DEVICE AUXILIARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - DESCRIPTION 4 - DESCRIPTION 5 - DESCRIPTION 6 - EXISTING/FUTURE	DISC - DISCONNECT	REFER 3	DESCRIPTION	DESCRIPTION	DESCRIPTION	E - EXISTING F - FUTURE		
POWER DEVICE PRIMARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - VOLTAGE-POLE 5 - LOCATION 6 - EXISTING/FUTURE	CB - CIRCUIT BREAKER FU - FUSE	REFER 3	MCP - MOTOR CIRCUIT PROTECTOR SS - SOLID STATE CIRCUIT BREAKER TM - THERMAL MAGNETIC CIRCUIT BREAKER	24VDC - 1P 24VDC - 2P 24VAC - 1P 48VDC - 2P 120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	DP - DISTRIBUTION PANEL NO. LCP - LOCAL CONTROL PANEL NO. LP - LIGHTING PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. PP - POWER PANEL NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT STARTER / DRIVE CUBICLE / CABINET	1 - TAG 2 - LOOP NUMBER 3 - TYPE 4 - VOLTAGE-POLE 5 - POWER SOURCE 6 - EXISTING/FUTURE	MS - MOTOR STARTER RVAT - REDUCED VOLTAGE AUTO TRANSFORMER STARTER RVSS - REDUCED VOLTAGE SOLID STATE STARTER VFD - VARIABLE FREQUENCY DRIVE	REFER 3	FVNR - FULL VOLTAGE NON-REVERSING STARTER FVR - FULL VOLTAGE REVERSING STARTER PWS - PART-WINDING STARTER RVAT - REDUCED VOLTAGE AUTO RVSS - REDUCED VOLTAGE SOLID STATE STARTER TS1W - TWO SPEED SINGLE WINDING TS2W - TWO SPEED TWO WINDINGS VFD - VARIABLE FREQUENCY DRIVE	120VAC - 1P 208VAC - 2P 208VAC - 3P 240VAC - 2P 240VAC - 3P 480VAC - 3P 2400VAC - 3P 4160VAC - 3P	LCP - LOCAL CONTROL PANEL NO. MCC - MOTOR CONTROL CENTER NO. PCM - PROCESS CONTROL MODULE NO. VCP - VENDOR CONTROL PANEL NO.	E - EXISTING F - FUTURE		

SYMBOL	DRAWING VISIBLE FIELDS	FIELD - 1	FIELD - 2	FIELD - 3	FIELD - 4	FIELD - 5	FIELD - 6	FIELD - 7	FIELD - 8
INSTRUMENT PRIMARY ELEMENT	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION 5	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT PRIMARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - DESCRIPTION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION 5	DESCRIPTION 6 7	DESCRIPTION INT - INTEGRAL REM - REMOTE	E - EXISTING F - FUTURE		OUT - OUTDOOR
INSTRUMENT/ CONTROL ELEMENT AUXILIARY FUNCTION OPERATOR ACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT PRIMARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 3 XR - PROTECTION RELAY CR - CONTROL RELAY XR - INTERPOSING RELAY	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
INSTRUMENT/ CONTROL ELEMENT AUXILIARY FUNCTION OPERATOR INACCESSIBLE	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1 3 XR - PROTECTION RELAY CR - CONTROL RELAY XR - INTERPOSING RELAY	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		
FIELD EQUIPMENT NON-POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION/SIZE 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT PRIMARY FUNCTION POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	REFER 1	REFER 3	DESCRIPTION	DESCRIPTION 6 7	AREA NO. BUILDING NO. ROOM NO.	E - EXISTING F - FUTURE		
FIELD EQUIPMENT AUXILIARY FUNCTION POWERED	1 - TAG 2 - LOOP NUMBER 3 - FUNCTION 4 - FURNISHED BY 5 - LOCATION 6 - EXISTING/FUTURE	MWH - MOTOR WINDING HEATER TSH - TEMPERATURE SWITCH XSH - TORQUE SWITCH	REFER 3	DESCRIPTION	DESCRIPTION 6 7	DESCRIPTION	E - EXISTING F - FUTURE		

INSTRUMENT BUBBLE LOCATIONS



NOTES

1. INSTRUMENT TAG IDENTIFICATION LETTERS TABLE
2. OPERATOR PILOT DEVICE LEGEND
3. EQUIPMENT TAGGING TABLE
4. I/O TYPE DESIGNATIONS
5. INSTRUMENT TYPE DESIGNATIONS TABLE
6. FURNISHED BY:
   - FBO FURNISHED BY OWNER
   - FBV FURNISHED BY VENDOR
7. PROVIDED BY:
   - PBO PROVIDED BY OWNER
   - PBV PROVIDED BY VENDOR

LAST SAVED BY:

REV	DATE	BY	DESCRIPTION

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DESIGNED R. DEFREITAS
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

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ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

INSTRUMENTATION

SYMBOLS AND ABBREVIATIONS 1

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
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JOB NO. 203580-60000
DRAWING NO. 00GN01
SHEET NO. 21 OF 29

PROJECT NO.
FILE NAME:

INSTRUMENT TAG IDENTIFICATION LETTERS

MEASURED VARIABLE / INSTRUMENTATION FUNCTION		ELEMENT	TRANSMITTER	INDICATING TRANSMITTER	CONVERTER TRANSDUCER, RELAY SPECIAL DEVICES	INDICATOR	RECORDER	CONTROL/COMMAND	INDICATING CONTROLLER	RECORDING CONTROLLER	SWITCH	SWITCH LOW LOW	SWITCH LOW	SWITCH HIGH	SWITCH HIGH HIGH	SWITCH COMBINATION HIGH LOW	ACTION	ALARM LOW LOW	ALARM LOW	ALARM HIGH	ALARM HIGH HIGH	TOTALIZE INDICATOR TRANSMITTER	VALVE	GAUGE	LIGHT	SPEED SETTING
A	ANALYSIS	AE	AT	AIT	AY	AI	AR	AC	AIC	ARC	AS	ASLL	ASL	ASH	ASHH	ASHL		AALL	AAL	AAH	AAHH				AL	
C	CONDUCTIVITY	CE	CT	CIT	CY	CI	CR	CC	CIC	CRC	CS	CSLL	CSL	CSH	CSHH	CSHL		CALL	CAL	CAH	CAHH				CL	
D	DENSITY	DE	DT	DIT	DY	DI	DR	DC	DIC	DRC	DS	DSLL	DSL	DSH	DSHH	DSHL		DALL	DAL	DAH	DAHH				DL	
E	VOLTAGE												ESL													
F	FLOW	FE	FT	FIT	FY	FI	FR	FC	FIC	FRC	FS	FSLL	FSL	FSH	FSHH	FSHL		FALL	FAL	FAH	FAHH	FQI	FCV	FG	FL	
H	HAND (MANUAL)*							HC			HS*						HA*						HV		HL	HSS
I	CURRENT		IT	IIT	IY	II	IR	IC	IIC	IRC	IS	ISLL	ISL	ISH	ISHH			IALL	IAL	IAH	IAHH				IL	
J	POWER					JS																				
K	TIME				KY	KI	KR	KC	KIC	KRC	KS	KSLL	KSL	KSH	KSHH			KALL	KAL	KAH	KAHH		KV		KL	
L	LEVEL	LE	LT	LIT	LY	LI	LR	LC	LIC	LRC	LS	LSLL	LSL	LSH	LSHH	LSHL		LALL	LAL	LAH	LAHH		LCV	LG	LL	
M	MOISTURE OR HUMIDITY	ME	MT	MIT	MY	MI	MR	MC	MIC	MRC	MS	MSLL	MSL	MSH	MSHH			MALL	MAL	MAH	MAHH				ML	
N	USER'S CHOICE																									
P	PRESSURE OR VACUUM	PE	PT	PIT	PY	PI	PR	PC	PIC	PRC	PS	PSLL	PSL	PSH	PSHH	PSHL		PALL	PAL	PAH	PAHH		PCV		PL	
PD	DIFFERENTIAL PRESSURE		PDT	PDIT	PDY	PDI	PDR	PDC	PDIC	PDRC	PDS	PDSLL	PDSL	PDSH	PDSHH			PDALL	PDAL	PDAH	PDAHH		PDCV		PDL	
Q	QUANTITY	QE	QT	QIT	QY	QI	QR				QS	QSLL	QSL	QSH	QSHH			QALL	QAL	QAH	QAHH					
R	RADIATION																									
S	SPEED	SE	ST	SIT	SY	SI	SR	SC	SIC	SRC	SS	SSLL	SSL	SSH	SSHH			SALL	SAL	SAH	SAHH					
T	TEMPERATURE	TE	TT	TIT	TY	TI	TR	TC	TIC	TRC	TS	TSLL	TSL	TSH	TSHH	TSHL		TALL	TAL	TAH	TAHH		TCV		TL	
TD	DIFFERENTIAL TEMPERATURE		TDT	TDIT	TDY	TDI	TDR	TDC	TDIC	TDRC	TDS	TDSLL	TDSL	TDSH	TDSHH			TDALL	TDAL	TDAH	TDAHH		TDCV		TDL	
U	MULTIVARIABLE					UI	UR	UC	UIC	URC	US														UL	
V	VISCOSITY	VE	VT	VIT	VY	VI	VR	VC	VIC	VRC	VS	VSLL	VSL	VSH	VSHH			VALL	VAL	VAH	VAHH				VL	
W	WEIGHT	WE	WT	WIT	WY	WI	WR				WS	WSLL	WSL	WSH	WSHH			WALL	WAL	WAH	WAHH					
X	UNCLASSIFIED	XE	XT	XIT	XY	XI	XR	XC	XIC	XRC	XS	XSLL	XSL	XSH	XSHH			XALL	XAL	XAH	XAHH		XCV	XG	XL	
XV	VIBRATION	XVE	XVT		XVY	XVI	XVR				XVS			XVSH	XVSHH					XVAH	XVAHH				XVL	
Y	STATUS					YI																			YL	
Z	POSITION	ZE	ZT	ZIT	ZY	ZI		ZC**			ZS**												ZV		ZL**	

OPERATOR PILOT DEVICE LEGEND

DEVICE TYPE / PILOT DEVICE FUNCTION	LOCAL-OFF-REMOTE (LOR) OR LOCAL-STOP-REMOTE (LSR)	STOP(SP)	START (ST)	HAND-OFF-AUTO (HOA) HAND-OFF-REMOTE (HOR)	OFF-ON (OO)	SELECT (SEL)	OPEN-STOP-CLOSE (OSC)	JOG OPEN-HOLD-CLOSE (JOHC)	SEMIAUTO-AUTO-MANUAL (SAAM)	LEAD-LAG-STANDBY (LLGS)	AUTO-MANUAL (AM)	OPEN-CLOSE (OC)	LOW-HIGH (LH)	RESET (RST)	SPEED (SPD)	START-STOP (STSP)	EQUIPMENT SHUTDOWN (ESD)	BYPASS (BYP)			SILENCE	POSITION (POS)
PILOT DEVICE TAG (HAND SWITCHES)	HSA	HSB	HSC	HSD	HSE	HSF	HSG	HSH	HIS	HSJ	HSM	HSO	HSQ	HSR	HSS	HST	HSU	HSV	HSW	HSX	HSY	HSZ

I/O TYPE DESIGNATIONS

RNG	RUNNING	SPDC	SPEED COMMAND
FAIL	FAILED/FAULT	SPDF	SPEED FEEDBACK
FWD	RUNNING FORWARD	REM	LOR IN REMOTE
FAST	RUNNING HIGH	LOC	LOR IN LOCAL
SLOW	RUNNING LOW	AUTO	HOA IN AUTO
REV	RUNNING REVERSE	HAND	HOA IN HAND
SVC	SOLENOID VALVE CLOSE	RST	RESET
SVO	SOLENOID VALVE OPEN		
RUN	RUN		
SLWC	MOTOR START LOW		
REVC	MOTOR START REVERSE		

INSTRUMENT TYPE DESIGNATIONS

CGD	COMBUSTIBLE GAS DETECTOR	PTOF	PULSE TIME OF FLIGHT
COND	CONDUCTIVITY	RTD	RESISTANCE TEMP DETECTOR
DO	DISSOLVED OXYGEN	SB	SLUDGE BLANKET
FMCW	FREQ. MODULATED CONT. WAVE	SC	STREAMING CURRENT
ISB	INTRINSIC SAFETY BARRIER	SD	SLUDGE DEPTH
LEL	LOWER EXPLOSIVE LIMIT	TDR	TIME DOMAIN REFLECTOMETRY
MLSS	MIXED LIQUOR SUSPENDED SOLIDS	TOC	TOTAL ORGANIC CARBON
ORG	UV 504	TSS	TOTAL SUSPENDED SOLIDS
ORP	OXIDATION REDUCTION POTENTIAL	TURB	TURBIDITY
PSUB	PRESSURE SUBMERSIBLE	UVI	UV INTENSITY
PC	PARTICLE COUNTER	UVT	UV TRANSMITTANCE

SPECIFIC ABBREVIATIONS

HTR	HEATER
HTU	HEAT TRACE UNIT
MWH	MOTOR WINDING HEATER
SV	SOLENOID VALVE
SPD	SURGE PROTECTIVE DEVICE
UPS	UNINTERRUPTIBLE POWER SUPPLY
YLA	STATUS AUTO PILOT LIGHT
YLR	STATUS REMOTE PILOT LIGHT
YL1	STATUS RUNNING PILOT LIGHT
YL2	ALARM FAILED/FAULT PILOT LIGHT

P&ID LINE SYMBOLS

INSTRUMENT OR CONNECTION TO PROCESS

PNEUMATIC SIGNAL

ELECTRIC SIGNAL

HYDRAULIC SIGNAL

CAPILLARY TUBE

INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)

PROCESS LINE SYMBOLS

PRIMARY PROCESS FLOW IN PIPE

SECONDARY PROCESS FLOW IN PIPE

PRIMARY PROCESS FLOW IN CHANNEL

SECONDARY PROCESS FLOW IN CHANNEL

HEAT TRACE

DESIGNATIONS

EQUIPMENT ENCLOSURE

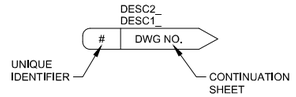
EXISTING

FUTURE

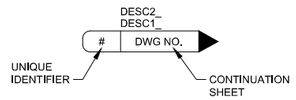
FUTURE

MISCELLANEOUS P&ID SYMBOLS

PROCESS CONTINUATION



SIGNAL CONTINUATION



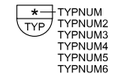
PIPE CALLOUT



SCHEMATIC DETAIL



TYPICAL DETAIL



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DESIGNED R. DEFREITAS
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

INSTRUMENTATION

SYMBOLS AND ABBREVIATIONS 2

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DRAWING NO. 00GN02
SHEET NO. 22 OF 29

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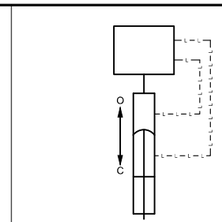
PROJECT NO.

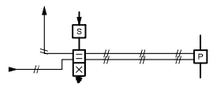
FILE NAME:

ACTUATORS

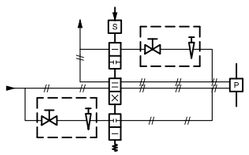
- DIAPHRAGM
- ELECTRIC HYDRAULIC
- ELECTRIC
- HAND
- HYDRAULIC
- MOTOR
- PNEUMATIC
- SOLENOID



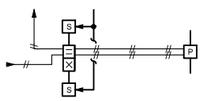
HYDRAULIC MODULATING



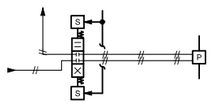
PNEUMATIC SINGLE SOLENOID OPEN/CLOSE



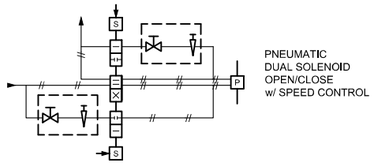
PNEUMATIC SINGLE SOLENOID w/ SPEED CONTROL



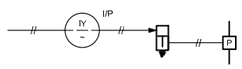
PNEUMATIC DUAL SOLENOID OPEN/CLOSE



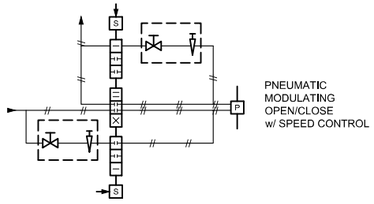
PNEUMATIC DUAL SOLENOID OPEN/HOLD/CLOSE



PNEUMATIC DUAL SOLENOID OPEN/CLOSE w/ SPEED CONTROL



PNEUMATIC MODULATING



PNEUMATIC MODULATING OPEN/CLOSE w/ SPEED CONTROL

PIPING

- AIR GAP
- BLIND FLANGE
- CAPPED OR PLUGGED
- CONCENTRIC INCREASER
- CONCENTRIC REDUCER
- DRAIN
- ECCENTRIC INCREASER
- FLANGED CONNECTION
- TEE
- UNION
- ECCENTRIC REDUCER
- EXPANSION COUPLING
- EXPANSION JOINT VIBRATION CENTER
- FLEXIBLE CONNECTION
- QUICK DISCONNECT

PUMPS

- AIR DRIVEN
- CENTRIFUGAL
- CHEMICAL FEED DIAPHRAGM
- DIAPHRAGM
- GEAR
- LOBE
- PERISTALTIC OR HOSE
- PISTON
- PROGRESSIVE CAVITY

OR SUBMERSIBLE

- VERTICAL TURBINE
- VERTICAL CHOPPER
- WATER CHAMP

BLOWERS/ COMPRESSORS/FANS

- CENTRIFUGAL SINGLE STAGE BLOWER/FAN
- CENTRIFUGAL MULTI STAGE BLOWER
- RECIPROCATING COMPRESSOR
- SCREW COMPRESSOR
- FAN
- LIQUID RING COMPRESSOR
- ROTARY LOBE BLOWER

CHECK VALVES

- BACK FLOW PREVENTER
- BALL
- DIAPHRAGM CHECK
- DOUBLE FLAP
- FLAPPER
- SLANTING CHECK VALVE
- SPRING LOADED GENERAL
- SPRING LOADED SWING
- SWING

PRESSURE VALVES

- BACKPRESSURE REGULATING SELF CONTAINED
- BACKPRESSURE REGULATING EXTERNAL TAP
- PRESSURE REDUCING SELF CONTAINED
- PRESSURE REDUCING EXTERNAL PRESSURE TAP
- REGULATING
- PRESSURE RELIEF
- VACUUM RELIEF

VALVES

- 3-WAY
- 3-WAY PLUG
- 4-WAY
- AIR-RELIEF
- ANGLE
- BALL
- BALL V-NOTCH
- BUTTERFLY
- BUTTERFLY-BURIED VALVE BOX
- CONE
- DIAPHRAGM
- FLOAT
- GATE
- GATE-BURIED VALVE BOX
- GLOBE
- HOSE
- MISCELLANEOUS
- MUD
- NEEDLE
- PINCH
- PLUG ECCENTRIC
- PLUG ECCENTRIC w-VALVE BOX
- PLUG ECCENTRIC LUBRICATED
- PLUG ECCENTRIC LUBRICATED BURIED VALVE BOX
- PLUG CONCENTRIC
- PLUG CONCENTRIC -BURIED VALVE BOX
- PLUG CONCENTRIC LUBRICATED
- PLUG CONCENTRIC LUBRICATED BURIED VALVE BOX
- PUMP DISCHARGE
- TELESCOPING

VALVE DESIGNATIONS	
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
FO	FAIL OPEN
FC	FAIL CLOSE
FLP	FAIL LAST POSITION

MISC

- AIR / CHEMICAL DIFFUSER
- BASKET STRAINER
- BLOW-OFF SILENCER
- CALIBRATION COLUMN
- COALESCER
- DESICCANT DRYER
- EDUCTOR/EJECTOR
- EQUIPMENT/ INSTRUMENT LOCATOR
- EYEWASH
- FILTER
- FILTER SEPARATOR
- FINE FILTER
- FIRE ALARM/SENSOR
- FLAME ARRESTER
- FLAME ARRESTER w/THERMALLY OPERATED VALVE
- FLOW CONDITIONER
- GAS CANNON
- GRINDER
- HEAT EXCHANGER
- HOIST
- HORIZONTAL MIXER
- HOSE CONNECTION
- INLET STRAINER
- INLINE STATIC MIXER
- INLINE DUCT BALANCING DAMPER
- LOUVER OR BACKDRAFT DAMPER
- MATERIAL CHANGE
- MIXER
- NOZZLE
- ORIFICE RESTRICTION
- PERISTALTIC COMPOSITE SAMPLER

OR PULSATION DAMPENER

- REFRIGERATED DRYER
- RUPTURE DISK
- SAMPLE PORT
- SIGHT TUBE
- SMOKE DETECTOR
- STRAINER - MECHANICALLY CLEANED
- STRAINER WITH BLOW OFF
- STRAINER WYE TYPE
- VAPOR HEATER
- VAPORIZER
- VENT
- VENT TO ATMOSPHERE

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DESIGNED R. DEFREITAS
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

carollo

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

INSTRUMENTATION

SYMBOLS AND ABBREVIATIONS 3

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DRAWING NO. 00GN03
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FILE NAME:

FLOW

- CORIOLIS
- MAGNETIC
- ORIFICE
- PADDLE WHEEL
- PISTON
- ANNUBAR
- PITOT TUBE
- POSITIVE-DISPLACEMENT
- PROPELLER-TURBINE
- ROTAMETER
- SHUTTLE
- THERMAL
- ULTRASONIC
- ULTRASONIC BIOGAS
- V-CONE
- VENTURI TUBE OR FLOW NOZZLE
- VORTEX

FLUMES

- LEOPOLD-LAGCO
- PALMER-BOWLUS
- PARSHALL
- REGULAR CUTTHROAT
- TRAPEZOIDAL

GATES

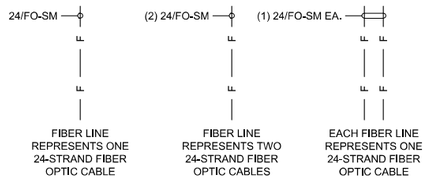
SIDE VIEW	PLAN VIEW
	FLAP
	KNIFE
SLIDE	SLIDE
SLUICE	SLUICE
STOP	STOP
	WEIR
	BUTTERFLY

LEVELS

- BUBBLER
- CAPACITANCE
- DIFFERENTIAL PRESSURE (TANK)
- DISPLACEMENT
- ELECTRODE
- BALL FLOAT
- INVERTED COLUMN
- PROBE
- RADAR PTOF
- RADAR (FREQUENCY MODULATED CONTINUOUS WAVE)
- RADAR TDR
- SUSPENDED/ SUBMERSIBLE
- TUNING FORK
- ULTRASONIC

NETWORKS

CABLE CALLOUTS AND ABBREVIATIONS



FIBER ABBREVIATIONS

###/FO-XX
- ## = STRAND COUNT
- FO = FIBER OPTIC

XX = MODE
- SM = SINGLE MODE
- MM = MULTIMODE

NETWORK ABBREVIATIONS

BMS	= BUILDING MANAGEMENT SYSTEM
BSN	= BUSINESS NETWORK
FCN	= FIELD CONTROL NETWORK
MIN	= MAINTENANCE INFORMATION NETWORK
PCN	= PROCESS CONTROL NETWORK
PLCN	= PLC NETWORK
SCN	= SECURITY CONTROL NETWORK
PCN-W	= WIRELESS PROCESS CONTROL NETWORK
NR	= NETWORK RACK
NP	= NETWORK PANEL
ES	= ETHERNET SWITCH
FPP	= FIBER PATCH PANEL

VLAN SYMBOLS

- = BUSINESS NETWORK
- = SECURITY CONTROL NETWORK
- = BUILDING MANAGEMENT SYSTEM
- = PROCESS CONTROL NETWORK
- = WIRELESS PROCESS CONTROL NETWORK
- = MAINTENANCE INFORMATION NETWORK
- = PLC NETWORK
- = FIELD CONTROL NETWORK

PRESSURE/VACUUM

PRESSURE

- PI — GAUGE
- PSH / PE — PRESSURE SWITCH
- PIT / PE — PRESSURE TRANSMITTER
- MANOMETER

DIFFERENTIAL PRESSURE

- PDI — GAUGE DIFFERENTIAL INDICATOR
- PDSL / PDE — DIFFERENTIAL PRESSURE SWITCH
- PDIT / PDE — DIFFERENTIAL PRESSURE TRANSMITTER

PRESSURE SEALS

- SEAL ANNULAR
- SEAL DIAPHRAGM
- SEAL SANITARY

EXAMPLE

PSH / PE — PRESSURE SWITCH

TEMPERATURE

- TEMPERATURE w/THERMOWELL
- TEMPERATURE GAUGE
- T — THERMOMETER

WEIGHT

- PLATFORM SCALE

WEIRS

SIDE VIEW	PLAN VIEW
RECTANGULAR w/o END CONTRACTIONS	RECTANGULAR w/o END CONTRACTIONS
RECTANGULAR w/ END CONTRACTIONS	RECTANGULAR w/ END CONTRACTIONS
V-NOTCH (TRIANGULAR)	V-NOTCH (TRIANGULAR)
TRAPEZOIDAL (CIPOLLETTI)	TRAPEZOIDAL (CIPOLLETTI)

NETWORK LINE SYMBOLS

COPPER ETHERNET	— C — C — C — C — C — C —
DUPLEX FIBER PATCH	— FP — FP — FP — FP — FP — FP —
FIBER OPTIC ETHERNET	— F — F — F — F — F — F —
WIRELESS	— W — W — W — W — W — W —
PROFIBUS DP	— PBD — PBD — PBD — PBD — PBD — PBD —
PROFIBUS PA	— PBA — PBA — PBA — PBA — PBA — PBA —
SERIAL DATA	— o — o — o — o — o — o — o — o — o — o — o — o —

MISCELLANEOUS NETWORK SYMBOLS

NETWORK CABLE CONTINUATIONS

TOP OF PAGE STYLE CONTINUATION

DESC 3
DESC 2
DESC 1 — CONTINUATION SHEET
DWG NO. — UNIQUE IDENTIFIER
(#)

BOTTOM/LEFT OF PAGE STYLE CONTINUATION

(#) — UNIQUE IDENTIFIER, CONTINUATION SHEET
DWG NO.
DESC 1
DESC 2
DESC 3

FIELD NETWORK DEVICE

PLC TAG / PANEL TAG — PROTOCOL / SEGMENT #
DEVICE SPECIFIC SYMBOL
TAG
DESC 1
DESC 2
DESC 3
P&ID DRAWING REFERENCE

NETWORK EQUIPMENT CALLOUT

TAG
DESC 1

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REV	DATE	BY	DESCRIPTION

DESIGNED R. DEFREITAS
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

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INSTRUMENTATION

SYMBOLS AND ABBREVIATIONS 4

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DRAWING NO. 00GN04
SHEET NO. 24 OF 29

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FILE NAME:

PROCESS SWITCHES

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION

- LEVEL SWITCH CLOSE ON RISING LEVEL
- LEVEL SWITCH OPEN ON RISING LEVEL
- PRESSURE SWITCH CLOSE ON RISING PRESSURE
- PRESSURE SWITCH OPEN ON RISING PRESSURE
- TEMPERATURE SWITCH CLOSE ON RISING TEMPERATURE
- TEMPERATURE SWITCH OPEN ON RISING TEMPERATURE
- FLOW SWITCH CLOSE ON INCREASE IN FLOW
- FLOW SWITCH OPEN ON INCREASE IN FLOW
- VIBRATION SWITCH OPEN ON RISING VIBRATION
- VIBRATION SWITCH CLOSE ON RISING VIBRATION
- TORQUE SWITCH OPEN ON HIGH TORQUE
- TORQUE SWITCH CLOSE ON HIGH TORQUE
- NORMALLY CLOSED LIMIT SWITCH
- NORMALLY CLOSED HELD OPEN LIMIT SWITCH
- NORMALLY OPEN LIMIT SWITCH
- NORMALLY OPEN HELD CLOSED LIMIT SWITCH

HAND SWITCHES

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a/b/c = POSITION
x = DENOTES POSITION CONTACTS CLOSED IN

- NORMALLY OPEN MOMENTARY PUSHBUTTON
- NORMALLY CLOSED MOMENTARY PUSHBUTTON
- MUSHROOM HEAD PUSHBUTTON NORMALLY OPEN
- MUSHROOM HEAD PUSHBUTTON NORMALLY CLOSED
- PUSH-PULL PUSHBUTTON MAINTAINED CONTACT
- PUSH-PULL PUSHBUTTON NORMALLY CLOSED
- PADLOCK SWITCH
- PULL CORD SWITCH
- STOP-LOCKOUT PUSHBUTTON
- THREE POSITION SELECTOR SWITCH
- TWO POSITION SELECTOR SWITCH NORMALLY OPEN
- TWO POSITION SELECTOR SWITCH NORMALLY CLOSED
- SPRING-RETURN

RELAYS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = TYPE
CR- CONTROL RELAY
TD- TIME DELAY RELAY
M - MOTOR STARTER COIL
L - MOTOR STARTER COIL - LOW SPEED
H - MOTOR STARTER COIL - HIGH SPEED
F - MOTOR STARTER COIL - FORWARD
R - MOTOR STARTER COIL - REVERSE

b = TIME DELAY STATE
TDON - TIME DELAY ON ENERGIZATION
TDOFF - TIME DELAY ON DEENERGIZATION

c = TIMING RANGE/SETTING

- RELAY COIL
- NORMALLY OPEN CONTROL CONTACT
- NORMALLY CLOSED CONTROL CONTACT
- TIME DELAY CONTACT NORMALLY OPEN TIMED CLOSING (NCTC)
- TIME DELAY CONTACT NORMALLY CLOSED TIMED OPENING (NCTO)
- TIME DELAY CONTACT NORMALLY OPEN TIMED OPENING (NOTO)
- TIME DELAY CONTACT NORMALLY CLOSED TIMED CLOSING (NOTC)

I/O

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = INPUT/OUTPUT
b = I/O VOLTAGE

- PLC DISCRETE
- PLC ANALOG
- DIGITAL BUS

MISC

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION

- SOLENOID
- CIRCUIT BREAKER
- DISCONNECT
- FUSE
- TRANSIENT SURGE PROTECTION
- MOTOR WINDING HEATER

MOTORS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = HORSEPOWER

- MOTOR - 1 PHASE
- MOTOR - 3 PHASE

INDICATORS

TAGGING IDENTIFICATION
1 = FUNCTION
2 = DESCRIPTION
3 = LOCATION
a = LENS COLOR
R - RED
G - GREEN
W - WHITE
A - AMBER
B - BLUE
Y - YELLOW
C - CLEAR

- PILOT LIGHT
- PUSH-TO-TEST LIGHT
- BEACON
- HORN

- VARISTOR
- CAPACITOR
- RESISTOR
- BATTERY
- DIODE
- MOTOR OVERLOAD HEATERS
- OVERLOAD CONTACT
- DRAWOUT CONNECTION
- GROUND
- LIGHTNING ARRESTOR
- CONTROL POWER TRANSFORMER (H1 H3 H2 H4 / X1 X2)

- ELAPSED TIME METER (ETM)
- RTD
- MISC PORT (a)
- ETHERNET PORT
- SURGE PROTECTION DEVICE (SPD)
- TRANSFORMER LINE/LOAD REACTOR
- SPEED SWITCH
- SPEED POTENTIOMETER
- SHIELDED WIRE
- LOOP

MOTORS

SCHEMATIC NUMBER — SCHEMATIC DESCRIPTION

DESCRIPTION

 # CONTROL SCHEMATIC

TAG: * = XXX — LOOP: XXX-
TAG NUMBER — PRIMARY EQUIPMENT LOOP

REFERENCE DWG.: DWG1 DWG2
DWG1 — P&ID REFERENCE
DWG2 — ADDITIONAL REFERENCES

LOCATION LEGEND: XXX = ABBREVIATION; IN/AT XXX = LOCATION DESCRIPTION

REV	DATE	BY	DESCRIPTION

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DRAWN A. FAKIROV
CHECKED S. BIGELOW
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SCHEMATIC SYMBOLS

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DRAWING NO. 00GN05
SHEET NO. 25 OF 29

LAST SAVED BY:

PROJECT NO.

FILE NAME:

EQUIPMENT DESCRIPTOR			
XXX		**XXX**	
AB	AERATION BASIN	GRI	GRINDER
AER	AERATOR	GRD	GRIT DEWATERING UNIT (CYCLONE)
AHU	AIR HANDLING UNIT	GRW	GRIT WASHER
ARC	AIR COMPRESSOR	GTW	GATEWAY
ARF	AIR FILTER	HPU	HYDRAULIC POWER UNIT
ARR	ARRESTOR	IC	ISOLATION CONTACTOR
ATS	AUTOMATIC TRANSFER SWITCH	INJ	INJECTOR
AUG	AUGER	LAG	LAGOON
AVR	AIR VACUUM RELIEF	INM	INDUCTION MIXER
BAR	BAR SCREEN	MAU	MAKE-UP AIR UNIT
BAS	BASIN	MIX	MIXER
BC	BYPASS CONTACTOR	MS	MOTOR STARTER
BFP	BELT FILTER PRESS	MPR	MOTOR PROTECTION RELAY
BIT	BIO TOWER	MTR	MOTOR
BLO	BLOWER	NP	NETWORK PANEL
BOI	BOILER	NR	NETWORK RACK
BUR	BURNER	OZG	OZONE GENERATOR
CAL	CALIBRATION COLUMN	PBU	POLYMER BLENDING UNIT
CB	CIRCUIT BREAKER	PCM	PROCESS CONTROL MODULE
CC	COMMUNICATIONS CABINET	PDC	POWER DISTRIBUTION CENTER
CEN	CENTRIFUGE	PLO	PLOW
CHI	CHILLER	PMP	PUMP
CHL	CHLORINATOR	PPR	PUMP PROTECTION RELAY
CLA	CLASSIFIER	PQM	POWER QUALITY METER
CLR	CLARIFIER	PRE	PRESS
CLU	CLUTCH	PUD	PULSATION DAMPENER
COA	COALESCER	REC	RECEIVER
COL	COLLECTOR	RVSS	REDUCED VOLTAGE STARTER
CON	CONVEYOR	RIO	REMOTE IO PANEL
COO	COOLER	RES	RESERVOIR
COS	COMPOSITE SAMPLER	RUD	ROLL UP DOOR
CPT	CONTROL POWER TRANSFORMER	SCB	SCRUBBER
CF	CARTRIDGE FILTER	SCR	SCREEN
CR	CONTROL RELAY	SCW	SCREW
CRN	BRIDGE CRANE/HOIST/MONORAIL	SEL	SEAL
CYC	CYCLONE CLASSIFER	SF	SUPPLY FAN
DAM	DAMPER	SHA	SHAKER
DCD	DC DRIVE	SLA	SLAKER
DEC	DECARBONATOR	SLC	SLUDGE COLLECTOR
DGC	DIGESTER GAS CONDITIONING	SPD	SURGE PROTECTION DEVICE
DIF	DIFFUSER	SRR	STIRRER
DIG	ANAEROBIC DIGESTER	STR	STRAINER
DIS	DISTRIBUTOR	SV	SOLENOID VALVE
DISC	DISCONNECT	SWC	SCREENING WASHER COMPACTOR
DRY	DRYER	THI	THICKENER
DSC	DUST COLLECTOR	TIP	TIPPING TROUGH
EDU	EDUCTOR	TNK	TANK
EF	EXHAUST FAN	TRA	TRAP
ES_	ETHERNET SWITCH	UPS	UNINTERRUPTIBLE POWER SUPPLY
ERD	ENERGY RECOVERY DEVICE	UVB	UV BANK
EUH	ELECTRIC UNIT HEATER	UVR	ULTRAVIOLET REACTOR
EVP	EVAPORATOR	VAL	VALVE
EXC	EXCHANGER	LCP	LOCAL CONTROL PANEL
FACP	FIRE ALARM CONTROL PANEL	VCP	VENDOR CONTROL PANEL
FAN	FAN	VFD	VARIABLE FREQUENCY DRIVE
FDR	FEEDER	WEL	WELL
FLA	FLARE	*CV	* CONTROL VALVE
FLC	FLOCCULATOR	*V	* VALVE
FLT	FILTER	*CG	* CONTROL GATE
FU	FUSE	*G	* GATE
GAT	GATE		* = A (ANALYTICAL), F (FLOW), L (LEVEL)
GEN	ENGINE GENERATOR		P (PRESSURE), T (TEMPERATURE)
GRC	GRIT CHAMBER		

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

carollo®

Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

INSTRUMENTATION

EQUIPMENT TAGGING

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 00GN06
SHEET NO. 26 OF 29

LAST SAVED BY:

PROJECT NO.

FILE NAME:

I/O

POWER SOURCE

VFD-

VFD-

480VAC-3P

VFD-

VFD-

480VAC-3P

FIELD

VCP FBBSS

MBBR
BLOWER MASTER CONTROL PANEL

TE3 RTD PH A

TE4 RTD PH B

TE5 RTD PH C

BLO FBBSS

PIT PE FBBSS

TIT TE FBBSS

VCP FBBSS

PDSH FBBSS

PE FBBSS

ZSOC

EAM FBBSS

PI FBBSS

VIB FBBSS

XIT

XEA FBBSS

XEB FBBSS

TI FBBSS

TIT

PDIT

TE FBBSS

PE FBBSS

E M

AIR INTAKE

PACKAGED SKID FURNISHED BY BLOWER SYSTEM SUPPLIER

MBBR BLOWER MASTER CONTROL PANEL

MBBR BLOWER NO.1

MBBR BLOWER NO.2

MBBR
BLOWER 3

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

INSTRUMENTATION

P&ID

MBBR BLOWERS TYPICAL

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

DRAWING NO. 90N01

SHEET NO. 27 OF 29

LAST SAVED BY:

PROJECT NO.

FILE NAME:

SCADA

RIC-1 PLC

MCC

PUMP 1 SPEED (SI)
PUMP 1 SPEED COMMAND (SC)
PUMP 1 HIGH RUNNING (YS) [2]
PUMP 1 RUN COMMAND (HC)
PUMP 1 IN REMOTE (HS)
PUMP 1 VFD FAULT (YA)
PUMP 1 HIGH TEMP ALARM (TAH) [3]
PUMP 1 HIGH PRESSURE ALARM (PAH)
PUMP 1 LOW FLOW ALARM (LAL)

IO TYPICAL OF PUMP 1 [2] [3]

IO TYPICAL OF PUMP 1 [2] [3]

41-VFD-??

41-VFD-??

41-VFD-??

KEYNOTES:

1. TRANSFER PUMPS AND EQUIPMENT WITHIN DOTTED LINE INCLUDED IN ROMS SCOPE.

FROM WETWELL

PUMP 1

PUMP 2

PUMP 3

CVK

CVK

CVK

D

TO CHLORINE CONTACT TANKS

REV	DATE	BY	DESCRIPTION

25% DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

INSTRUMENTATION

P&ID

MBBR PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000

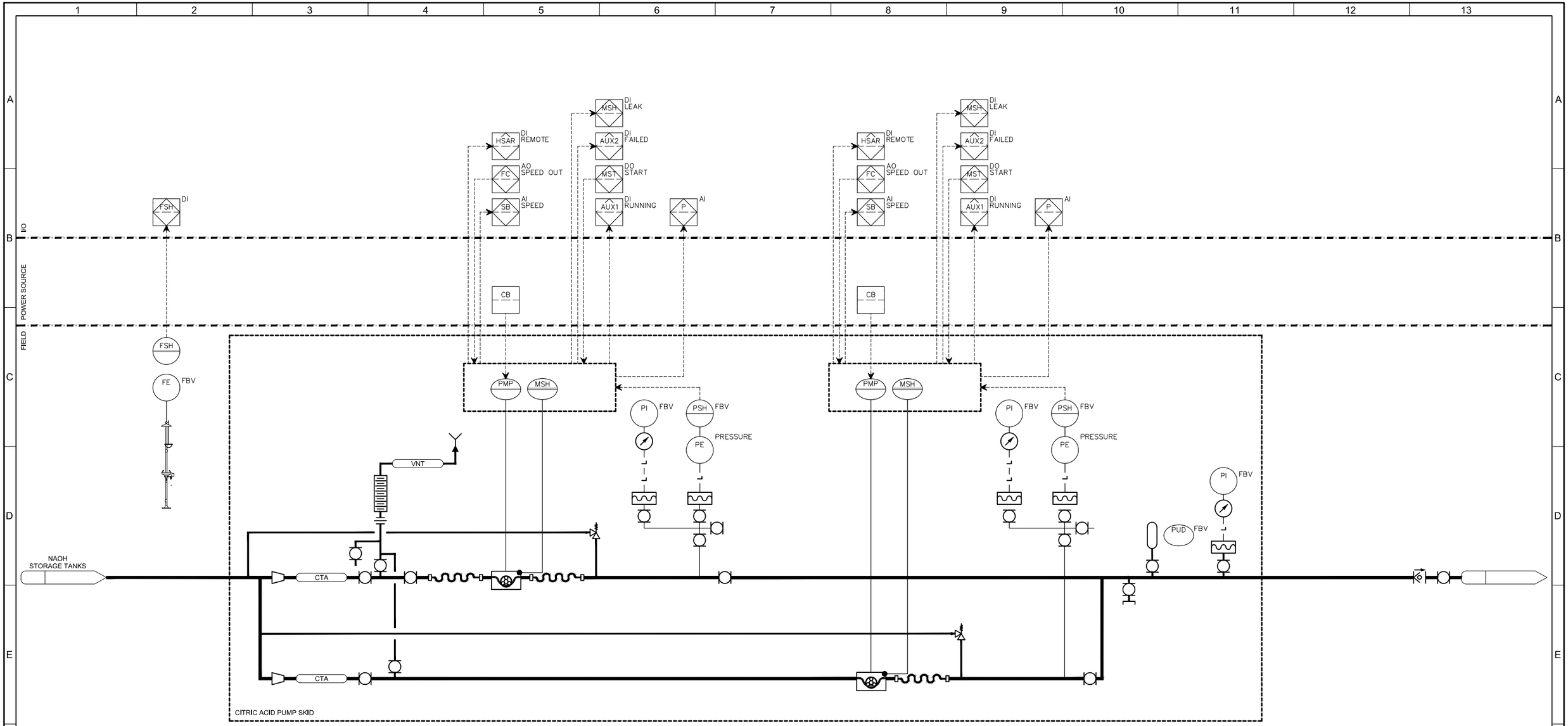
DRAWING NO. 90N02

SHEET NO. 28 OF 29

LAST SAVED BY:

PROJECT NO.

FILE NAME:



LAST SAVED BY:

REV	DATE	BY	DESCRIPTION
			25% DESIGN SUBMITTAL NOT FOR CONSTRUCTION

DESIGNED R. DEFREITAS
DRAWN A. FAKIROV
CHECKED S. BIGELOW
DATE SEPTEMBER 2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

INSTRUMENTATION

P&ID
NAOH FEED PUMPS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 203580-60000
DRAWING NO. 90N03
SHEET NO. 29 OF 29

PROJECT NO.
FILE NAME:

APPENDIX M

DOCUMENTED NON-COMPLIANCE EVENTS

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: Valarie Ellis, P.E. ***DEC Region:*** 7

Report Type: ___ *5 Day* X *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY-0030317 Facility: Oak Orchard WWTP

Date of noncompliance: 6/2020 Location (Outfall, Treatment Unit, or Pump Station): Outfall 001

Description of noncompliance(s) and cause(s): Please note that the above facility exceeded the effluent limits listed in the table below:

Laboratory analysis for an effluent CBOD sample collected on June 7, 2020, resulted in an analytical value of >41 mg/L. This result was due to an unexpectedly high CBOD concentration in the effluent sample, and a corresponding insufficient laboratory dilution. In accordance with the current NYSDEC reporting requirements, the greater than symbol ">" must be carried through to the final calculated values, for the month and week respectively. In the case of the % Removal value, the "<" symbol was applied.

Please find below Table 1 which list the Oak Orchard WWTP violations for June 2020:

Table 1

Parameter	Type	Limit	Reported Value
Biochemical Oxygen Demand($CBOD_5$), Effluent (mg/L)	7 DA ARME	40 mg/L	>26 mg/L
Biochemical Oxygen Demand($CBOD_5$), Effluent (lbs/day)	7 DA ARME	2336 lbs/day	>940 lbs/day
Biochemical Oxygen Demand($CBOD_5$), Effluent (mg/L)	30 DA ARME	25 mg/L	>10 mg/L
Biochemical Oxygen Demand($CBOD_5$), Effluent (lbs/day)	30 DA ARME	1460 lbs/day	>500 lbs/day
$CBOD_5$ % Removal	MO AV MIN	85%	< 94%

Due to the structure of the DMR and the current NYSDEC reporting requirements, the calculated results presented in the table below, though reflecting plant performance within permit limits must nevertheless be reported as an exceedence. This facility has returned to compliance.

Has Event Ceased? Yes **If so When** **Was Event due to plant upset?** No **SPDES limit violated?** Yes

Start date, time of event: _____, _____ **End date, time of event:** _____

Date, time oral notification made to DEC? _____, _____ **DEC Official contacted:** _____

Immediate corrective actions: Ensure proper effluent CBOD dilutions for analysis.

Preventive (long term) corrective actions: Review on a daily basis the trends from collected data.

SECTION 3

[redacted]

SECTION 4

Facility Representative: Joseph F. Pieklik Title: Head Operator Wastewater Treatment Plant Date: 07/22/2020

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

X

Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: Valarie Ellis, P.E. **DEC Region: 7**

Report Type: ___ *5 Day* X *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY-0030317 Facility: Oak Orchard WWTP

Date of noncompliance: 7/12/2020 Location (Outfall, Treatment Unit, or Pump Station): Outfall 001

Description of noncompliance(s) and cause(s):
Please be advised that the daily effluent Total Chlorine Residual Daily Maximum limit of 0.045 mg/L was exceeded on one (1) occasion, with a value of 1.80 mg/L, reported on 7/12/2020. Heavy rainfall that day caused high flows throughout the facility. A malfunction with the SCADA system controlling the new final effluent Parshall Flume resulted in a false sustained maximum flow rate of 32.5 MGD, between the hours of 0315-0620 hrs. Actual peak flow during that time was 14.0 MGD, as recorded by the secondary effluent flume. During that time, the flow paced chemical feed system was at maximum dosing for both Sodium Hypochlorite and Sodium Bisulfate. Although the ratio of chemical feed was adequate, the excessive dosing resulted in high chlorine residual. The system was placed into manual operation, feed rates were adjusted and one (1) additional chlorine residual sample was taken to verify compliance.

Our instrumentation section determined that excess foam in the flume may have caused a failsafe mode in the flume SCADA control system, which incorrectly defaulted to a sustained maximum flow rate of 32.5 MGD. The failsafe setting has since been changed to default to the most previous flow rate, in order to prevent this from occurring again. After the system was placed into manual operation, the facility quickly returned to compliance. Following the investigation, the system was placed back into flow paced operation.

Has Event Ceased? Yes **If so When** **Was Event due to plant upset?** No **SPDES limit violated?** Yes
Start date, time of event: **End date, time of event:**
Date, time oral notification made to DEC? , **DEC Official contacted:**

Immediate corrective actions: Flow paced chemical feed system was placed into manual control. Follow-up investigation was begun.

Preventive (long term) corrective actions: Programming for flume SCADA control system was adjusted, operation will monitor this closely, particularly during high flow periods to determine proper operation.

SECTION 3

Complete this section if event was a bypass:

Bypass amount: Was prior DEC authorization received for this event?

DEC Official contacted: Date of DEC approval:

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joseph F. Pieklik **Title:** Head Operator Wastewater Treatment Plant **Date:** 07/24/2020 08/24/20

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: *Valarie Ellis, P.E.* ***DEC Region:*** 7

Report Type: ___ *5 Day* X *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY-0030317 Facility: Oak Orchard WWTP

Date of noncompliance: 06/2021 Location (Outfall, Treatment Unit, or Pump Station): Outfall 001

Description of noncompliance(s) and cause(s): Please note that the above facility exceeded the effluent limits listed in the table below:

Please find below Table 1 which list the Oak Orchard WWTP violations for June 2021:

Table 1

Parameter	Type	Limit	Reported Value
Ammonia (NH_3), Effluent (lb/d)	30 DA ARME	307.0 lb/d	410.7 lb/d

Solids inventory and mean cell residence time (MCRT) were intentionally reduced by Operations to a level below that which nitrification is achievable in order to maintain adequate dissolved oxygen levels to prepare for the upcoming Energy Performance Contract (EPC) construction, which involves rehabbing the aeration tanks and replacing the mixers.

Has Event Ceased? No **If so When** **Was Event due to plant upset?** No **SPDES limit violated?** Yes

Start date, time of event: _____, _____ **End date, time of event:** _____

Date, time oral notification made to DEC? 07/02/2021 (E-Mail), **DEC Official contacted: Valarie Ellis**

Immediate corrective actions: N/A

Preventive (long term) corrective actions: Return aeration system to operation at the conclusion of the EPC construction tentatively October 2021.

Complete this section if event was a bypass:

Bypass amount: _____ Was prior DEC authorization received for this event? [ ]

DEC Official contacted: _____ Date of DEC approval: _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joseph F. Pieklik **Title:** Head Operator Wastewater Treatment Plant **Date:** 07/21/2021

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

X _____

Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: *Valarie Ellis, P.E.* ***DEC Region:*** 7

Report Type: ___ *5 Day* X *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY-0030317 **Facility:** Oak Orchard WWTP

Date of noncompliance: 06/2021 **Location (Outfall, Treatment Unit, or Pump Station):** Outfall 001

Description of noncompliance(s) and cause(s): Please note that the above facility exceeded the effluent limits listed in the table below:

Please find below Table 1 which list the Oak Orchard WWTP violations for June 2021:

Table 1

Parameter	Type	Limit	Reported Value
Ammonia (NH_3), Effluent (lb/d)	30 DA ARME	307.0 lb/d	410.7 lb/d

Solids inventory and mean cell residence time (MCRT) were intentionally reduced by Operations to a level below that which nitrification is achievable in order to maintain adequate dissolved oxygen levels to prepare for the upcoming Energy Performance Contract (EPC) construction, which involves rehabbing the aeration tanks and replacing the mixers.

Has Event Ceased? No **If so When** **Was Event due to plant upset?** No **SPDES limit violated?** Yes
Start date, time of event: ____, ____ **End date, time of event:** ____

Date, time oral notification made to DEC? 07/02/2021 (E-Mail), **DEC Official contacted:** Valarie Ellis

Immediate corrective actions: N/A

Preventive (long term) corrective actions: Return aeration system to operation at the conclusion of the EPC construction tentatively October 2021.

SECTION 3

Complete this section if event was a bypass:

Bypass amount: _____ Was prior DEC authorization received for this event? [ ]

DEC Official contacted: _____ Date of DEC approval: _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joseph F. Pieklik **Title:** Head Operator Wastewater Treatment Plant **Date:** 7-27-21

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

x _____

Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: Valarie Ellis, P.E. ***DEC Region:*** 7

Report Type: ___ *5 Day* ___ *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* X *Other*

SECTION 2

SPDES #: NY-0030317 **Facility:** Oak Orchard WWTP

Date of noncompliance: 12/21/2021 **Location (Outfall, Treatment Unit, or Pump Station):** Outfall 001

Description of noncompliance(s) and cause(s): Please note that an effluent TKN sample collected on December 21, 2021 at the above facility failed laboratory quality control criteria. After investigating, it was determined the sample was most likely improperly preserved. In accordance with the current NYSDEC reporting requirements, the sample must be categorized as an "invalid sample" and the analytical result may not be used in any calculations. Furthermore, this results in the use of the ">" symbol as defined by the NYSDEC manual for invalid samples. Please be advised that TKN analytical result associated with the above sample was excluded from the monthly data set. As a result the effluent Daily Maximum TKN for December is reported as > 9.1 mg/L. As this is a monitor only parameter, no permit limits were exceeded.

Has Event Ceased? Yes **If so When** **Was Event due to plant upset?** No **SPDES limit violated?** Yes

Start date, time of event: _____, _____ **End date, time of event:** _____

Date, time oral notification made to DEC? _____, _____ **DEC Official contacted:** _____

Immediate corrective actions: Laboratory investigation determined sample was most likely improperly preserved. Reviewed sample preservation procedures with sample technicians.

Preventive (long term) corrective actions: None.

SECTION 3

Complete this section if event was a bypass:

Bypass amount: _____ Was prior DEC authorization received for this event? _____

DEC Official contacted: _____ Date of DEC approval: _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

Facility Representative: Joe Pieklik **Title:** Wastewater Treatment Plant Head Operator **Date:** 11/22/2021

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

X

Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: Valarie Ellis, P.E. ***DEC Region:*** 7

Report Type: ___ *5 Day* X *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY-0030317 **Facility:** Oak Orchard WWTP

Date of noncompliance: 03/20/2022 **Location (Outfall, Treatment Unit, or Pump Station):** Outfall 001

Description of noncompliance(s) and cause(s): Please note that several Department SPDES samples, including an Oak Orchard influent sample and effluent sample, both collected on March 20, 2022, were associated with a laboratory error resulting in invalid results. Specifically, on that day, the new sample storage cooler holding these samples experienced a coolant valve blockage, resulting in the loss of temperature control in the cooler. Therefore, analytical results from these samples were given a data qualifier "Q" flag by the laboratory, due to the samples not being held to method specific temperature. The effluent parameters for this facility which were impacted are listed in the table below. In accordance with the current NYSDEC reporting requirements, this sample must be categorized as an "invalid sample" and the analytical results may not be used in any calculations. Furthermore, this results in the use of the ">" symbol as defined by the NYSDEC manual for invalid samples associated with permit limit averages or daily maximums. The greater than ">" symbol was carried over to the related calculated averages and daily maximum for the month.

Please find below Table 1 which list the Oak Orchard WWTP effluent invalid sample parameter summary:

Parameter	Type	Limit	Reported Value	SPDES Permit Limit Violation
Total Ammonia (as NH3), Effluent (lbs/day)	Monthly Average	2,026 lbs/day	>704 lbs/day	Yes
Total Ammonia (as NH3), Effluent (mg/L)	Monthly Average	Monitor	>12.9 mg/L	No
Total Kjeldahl Nitrogen (TKN as N), Effluent (mg/L)	Daily Maximum	Monitor	>14.3 mg/L	No

Due to the structure of the DMR form and current NYSDEC reporting requirements, the permit limit parameter (Total Ammonia lbs/d, as NH3), though reflecting plant performance within permit limits, must nevertheless be reported as an exceedance.

The equipment contractor responded quickly, identified the problem, and replaced a faulty component in the walk in cooler unit. This equipment is working properly and the facility has returned to compliance.

Has Event Ceased? Yes **If so When** **Was Event due to plant upset?** No **SPDES limit violated?** Yes

Start date, time of event: _____, _____ **End date, time of event:** _____

Date, time oral notification made to DEC? _____, _____ **DEC Official contacted:** _____

Immediate corrective actions: Repairs completed to component in the walk in cooler.

Preventive (long term) corrective actions: Follow-up evaluation by the contractor is recommended.

SECTION 3

Complete this section if event was a bypass:

Bypass amount: _____ Was prior DEC authorization received for this event? _____

DEC Official contacted: _____ Date of DEC approval: _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joe Pieklik Title: Head Operator Wastewater Treatment Plant Date: 04/25/2022

Phone #: (315) 652 5097 **Fax #:** (315) 652 5192

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

X _____

Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: Valarie Ellis, P.E. **DEC Region:** 7

Report Type: ___ 5 Day X Permit Violation ___ Order Violation ___ Anticipated Noncompliance ___ Bypass/Overflow ___ Other

SECTION 2

SPDES #: NY-0030317 **Facility:** Oak Orchard WPCP

Date of noncompliance: 06/23-28/2023 **Location (Outfall, Treatment Unit, or Pump Station):** Outfall 001

Description of noncompliance(s) and cause(s): Please be advised that the Department's main SCADA Server had a failure that began on Friday, June 23, 2023. The following facilities were impacted: Baldwinsville WWTP, Brewerton WPCP, Metropolitan Syracuse WWTP, and Oak Orchard WWTP. It was originally anticipated that the Server would be restored and the data would be retrievable. It became clear on June 26, 2023, that the system failure had resulted in the loss of all data logging capabilities at these facilities, including the permitted flow recordings. In response, the operations staff began manually recording flow readings from the flow meter displays until SCADA function was restored on July 28, 2023. For the duration of the SCADA outage this facility was staffed 24/7 and no abnormal flows were experienced. The Oak Orchard WWTP is currently in compliance.

Per discussions with NYSDEC (July 27, 2023), the loss of Continuous Flow Measurement (June 23-28, 2023) is considered a permit violation and must be characterized as an "invalid sample" for each effected day. The Department has assigned a ">" symbol to the monthly average flow to reflect measurement uncertainty. The ">" was also assigned to related loading calculations. The table below details the resulting violations:

Oak Orchard WWTP Outfall 001 June 2023 Monthly DMR Invalid Flow Data Impacted Permit Parameters			
Parameter	Type	Limit	DMR (Reportable Value)
Influent Ultimate Oxygen Demand	Daily Max	Monitor	>28000 lb/d
Effluent Ultimate Oxygen Demand	Daily Max	4289 lb/d	>2000 lb/d
Influent BOD_5	Monthly Average	Monitor	>12000 lb/d
Effluent Total Suspended Solids, TSS	Monthly Average	2500 lb/d	>200 lb/d
Influent Total Suspended Solids, TSS	Monthly Average	Monitor	>6500 lb/d
Effluent NH_3	Monthly Average Season 0	307 lb/d	>39 lb/day
Flow	Monthly Average	10 MGD	>4.772 MGD
Effluent $CBOD_5$	Monthly Average	2085 lb/d	>130 lb/d
Influent $CBOD_5$	Monthly Average	Monitor	>10000 lb/d

Please also note that an additional set of samples was collected on June 27, 2023, for NY2A parameters.

Has Event Ceased? Yes **If so When?** 6/28/2023 **Was Event due to plant upset?** No **SPDES limit violated?** Yes

Start date, time of event: 6/23/2023 11:21 **End date, time of event:** 6/28/2023 18:01

Date, time oral notification made to DEC? 6/27/2023 **DEC Official contacted:** Valarie Ellis

Immediate corrective actions: Upon discovery of loss of data logging, manual flow readings were taken every two hours until SCADA was restored. SCADA has been temporarily loaded on PCs to restore SCADA monitoring and logging while a permanent solution is put in place.

Preventive (long term) corrective actions: The Department is procuring equipment to fully replace the SCADA Server. This upgrade will include separate SCADA servers for each facility as well as Server redundancy. Procedures will be revised to require immediate manual recordings of flow values during any future SCADA outage.

SECTION 3

Complete this section if event was a bypass.

Bypass amount: _____ **Was prior DEC authorization received for this event?** [redacted]

DEC Official contacted: _____ **Date of DEC approval:** _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joseph Pieklik **Title:** Wastewater Treatment Plant Head Operator **Date:** 07/28/2023

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: Valarie Ellis, P.E. **DEC Region: 7**

Report Type: ___ *5 Day* X *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY-0030317 Facility: Oak Orchard WPCP

Date of noncompliance: 06/23-28/2023 **Location (Outfall, Treatment Unit, or Pump Station): Outfall 001**

Description of noncompliance(s) and cause(s): Please be advised that the Department's main SCADA Server had a failure that began on Friday, June 23, 2023. The following facilities were impacted: Baldwinsville WWTP, Brewerton WPCP, Metropolitan Syracuse WWTP, and Oak Orchard WWTP. It was originally anticipated that the Server would be restored and the data would be retrievable. It became clear on June 26, 2023, that the system failure had resulted in the loss of all data logging capabilities at these facilities, including the permitted flow recordings. In response, the operations staff began manually recording flow readings from the flow meter displays until SCADA function was restored on July 28, 2023. For the duration of the SCADA outage this facility was staffed 24/7 and no abnormal flows were experienced. The Oak Orchard WWTP is currently in compliance.

Per discussions with NYSDEC (July 27, 2023), the loss of Continuous Flow Measurement (June 23-28, 2023) is considered a permit violation and must be characterized as an "invalid sample" for each effected day. The Department has assigned a ">" symbol to the monthly average flow to reflect measurement uncertainty. The ">" was also assigned to related loading calculations. The table below details the resulting violations:

Oak Orchard WWTP Outfall 001 June 2023 Quarterly DMR Invalid Flow Data Impacted Permit Parameters			
Parameter	Type	Action Level	DMR (Reportable Value)
Arsenic, Total Recoverable	Daily Max	Monitor	>0.1 lb/d
Nickel, Total Recoverable	Daily Max	1.1 lb/d	>1.1 lb/d
Zinc, Total Recoverable	Daily Max	5.4 lb/d	>1.0 lb/d
Cadmium, Total Recoverable	Daily Max	0.4 lb/d	>0.06 lb/d
Chromium, Total Recoverable	Daily Max	1.9 lb/d	>0.6 lb/d
Copper, Total Recoverable	Daily Max	1.8 lb/d	>0.7 lb/d
Phenols	Daily Max	Monitor	>0.4 lb/d

Please also note that an additional set of samples was collected on June 27, 2023, for NY2A parameters.

Has Event Ceased? Yes **If so When? 6/28/2023** **Was Event due to plant upset? No** **SPDES limit violated? Yes**

Start date, time of event: 6/23/2023 11:21 **End date, time of event:** 6/28/2023 18:01

Date, time oral notification made to DEC? 6/27/2023 **DEC Official contacted: Valarie Ellis**

Immediate corrective actions: Upon discovery of loss of data logging, manual flow readings were taken every two hours until SCADA was restored. SCADA has been temporarily loaded on PCs to restore SCADA monitoring and logging while a permanent solution is put in place.

Preventive (long term) corrective actions: The Department is procuring equipment to fully replace the SCADA Server. This upgrade will include separate SCADA servers for each facility as well as Server redundancy. Procedures will be revised to require immediate manual recordings of flow values during any future SCADA outage.

Complete this section if event was a bypass:

Bypass amount: _____ **Was prior DEC authorization received for this event?** _____

DEC Official contacted: _____ **Date of DEC approval:** _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joseph Pieklik **Title:** Wastewater Treatment Plant Head Operator **Date:** 07/28/2023

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

X _____ for SH

Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: **Valarie Ellis, P.E.** ***DEC Region:*** **7**

Report Type: ___ *5 Day* ___ *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* X *Other*

SECTION 2

SPDES #: NY-0030317 **Facility: Oak Orchard WWTP**

Date of Noncompliance: 06/23-28/2023 **Location (Outfall, Treatment Unit, or Pump Station): Outfall 001**

Description of Noncompliance(s) and cause(s):

Please be advised that this is a follow up to the Report of Noncompliance submitted with the June DMR for technical exceedances of the action limits. That RNC was in relation to the previously reported main SCADA Server failure that occurred Friday, June 23, 2023. Per discussions with NYSDEC (July 27, 2023), the loss of Continuous Flow Measurement (June 23-28, 2023) was considered a permit violation and characterized as an "invalid sample" for each affected day.

In accordance with NYSDEC reporting requirements the second quarter action level limits were reported as exceedances on the June DMR due to invalid flow data. As a follow up, this Department scheduled a round of short-term, high intensity sampling to be conducted during August for these parameters. The results for action level loading limits show a return to compliance and are presented in the following tables. The short-term, high intensity sampling event results in August 2023 met compliance criteria, therefore this Department will return to our routine sampling schedule.

Oak Orchard WWTP Outfall 001 Effluent Total Arsenic Monitoring
Invalid Flow Impacted Monthly Action Level Parameter

Date	Flow (MGD)	Concentration (mg/L)	Loading (lbs/d)	Action Level Limit (lbs/d)	Action Level Exceedance
6/6/2023	4.484	<0.002	0.07	Monitor	None
6/27/2023	N/A	<0.002	N/A	Monitor	Yes
7/11/2023	6.334	<0.002	0.1	Monitor	None
8/1/2023	4.600	<0.002	0.08	Monitor	None
8/27/2023	4.718	<0.002	0.08	Monitor	None
8/28/2023	4.685	<0.002	0.08	Monitor	None
8/29/2023	4.312	<0.002	0.07	Monitor	None
9/7/2023	4.479	<0.002	0.07	Monitor	None
9/26/2023	4.133	<0.002	0.07	Monitor	None

Oak Orchard WWTP Outfall 001 Effluent Total Zinc Monitoring Invalid Flow Impacted Monthly Action Level Parameter					
Date	Flow (MGD)	Concentration (mg/L)	Loading (lbs/d)	Action Level Limit (lbs/d)	Action Level Exceedance
6/6/2023	4.484	0.024	0.9	5.4	None
6/27/2023	N/A	0.034	N/A	5.4	Yes
7/11/2023	6.334	0.034	1.8	5.4	None
8/1/2023	4.600	0.030	1.2	5.4	None
8/27/2023	4.718	0.028	1.1	5.4	None
8/28/2023	4.685	0.021	0.82	5.4	None
8/29/2023	4.312	0.025	0.90	5.4	None
9/7/2023	4.479	0.041	1.5	5.4	None
9/26/2023	4.133	0.027	0.93	5.4	None

Oak Orchard WWTP 001 Effluent Total Nickel Monitoring Invalid Flow Impacted Monthly Action Level Parameter					
Date	Flow (MGD)	Concentration (mg/L)	Loading (lbs/d)	Action Level Limit (lbs/d)	Action Level Exceedance
6/6/2023	4.484	<0.015	0.56	2.9	None
6/27/2023	N/A	<0.015	N/A	2.9	Yes
7/11/2023	6.334	<0.015	0.79	2.9	None
8/1/2023	4.600	<0.015	0.58	2.9	None
8/27/2023	4.718	<0.015	0.59	2.9	None
8/28/2023	4.685	<0.015	0.59	2.9	None
8/29/2023	4.312	<0.015	0.54	2.9	None
9/7/2023	4.479	<0.015	0.56	2.9	None
9/26/2023	4.133	<0.015	0.52	2.9	None

Oak Orchard WWTP Outfall 001 Effluent Total Cadmium Monitoring Invalid Flow Impacted Monthly Action Level Parameter					
Date	Flow (MGD)	Concentration (mg/L)	Loading (lbs/d)	Action Level Limit (lbs/d)	Action Level Exceedance
6/6/2023	4.484	<0.0008	0.03	0.4	None
6/27/2023	N/A	<0.0008	N/A	0.4	Yes
7/11/2023	6.334	<0.0008	0.04	0.4	None
8/1/2023	4.600	<0.0008	0.03	0.4	None
8/27/2023	4.718	<0.0008	0.03	0.4	None
8/28/2023	4.685	<0.0008	0.03	0.4	None
8/29/2023	4.312	<0.0008	0.03	0.4	None
9/7/2023	4.479	<0.0008	0.03	0.4	None
9/26/2023	4.133	<0.0008	0.03	0.4	None

Oak Orchard WWTP Outfall 001 Effluent Total Chromium Monitoring Invalid Flow Impacted Monthly Action Level Parameter					
Date	Flow (MGD)	Concentration (mg/L)	Loading (lbs/d)	Action Level Limit (lbs/d)	Action Level Exceedance
6/6/2023	4.484	<0.008	0.3	1.9	None
6/27/2023	N/A	<0.008	N/A	1.9	Yes
7/11/2023	6.334	<0.008	0.4	1.9	None
8/1/2023	4.600	<0.008	0.3	1.9	None
8/27/2023	4.718	<0.008	0.3	1.9	None
8/28/2023	4.685	<0.008	0.3	1.9	None
8/29/2023	4.312	<0.008	0.3	1.9	None
9/7/2023	4.479	<0.008	0.3	1.9	None
9/26/2023	4.133	<0.008	0.3	1.9	None

Oak Orchard WWTP Outfall 001 Effluent Total Copper Monitoring Invalid Flow Impacted Monthly Action Level Parameter					
Date	Flow (MGD)	Concentration (mg/L)	Loading (lbs/d)	Action Level Limit (lbs/d)	Action Level Exceedance
6/6/2023	4.484	<0.010	0.37	1.8	None
6/27/2023	N/A	<0.010	N/A	1.8	Yes
7/11/2023	6.334	<0.010	0.53	1.8	None
8/1/2023	4.600	<0.010	0.38	1.8	None
8/27/2023	4.718	<0.010	0.39	1.8	None
8/28/2023	4.685	<0.010	0.39	1.8	None
8/29/2023	4.312	<0.010	0.36	1.8	None
9/7/2023	4.479	<0.010	0.37	1.8	None
9/26/2023	4.133	<0.010	0.34	1.8	None

Oak Orchard WWTP Outfall 001 Effluent Total Phenols Monitoring Invalid Flow Impacted Monthly Action Level Parameter					
Date	Flow (MGD)	Concentration (mg/L)	Loading (lbs/d)	Action Level Limit (lbs/d)	Action Level Exceedance
6/27/2023	N/A	<0.005	N/A	Monitor	Yes
8/1/2023	4.600	<0.005	0.2	Monitor	None
8/27/2023	4.718	<0.005	0.2	Monitor	None
8/28/2023	4.685	<0.005	0.2	Monitor	None
8/29/2023	4.312	<0.005	0.2	Monitor	None
9/26/2023	4.133	0.006	0.2	Monitor	None

Has Event Ceased?: _Yes_ **If so When?: _6/28/2023_**

Start date, time of event: _6/23/2023 11:21_ **End date, time of event: _6/28/2023 18:01_**

Was Event due to plant upset?: _No_ **SPDES limit violated?: _Yes_**

Date, time oral notification made to DEC? : _6/27/2023_ **DEC Official contacted: _Valarie Ellis_**

Immediate corrective actions:

The Department is running SCADA on temporary PC's and has established protocols for flow recording during any outages until a new SCADA server can be installed.

Preventive (long term) corrective actions:

The Department is procuring equipment to fully replace the SCADA Server. This upgrade will include separate SCADA servers for each facility as well as Server redundancy.

SECTION 3

Complete this section if event was a bypass:

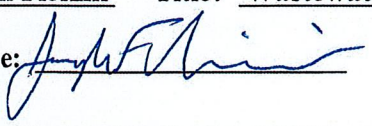
Bypass amount: _____ **Was prior DEC authorization received for this event?** [redacted]

DEC Official contacted: _____ **Date of DEC approval:** _____

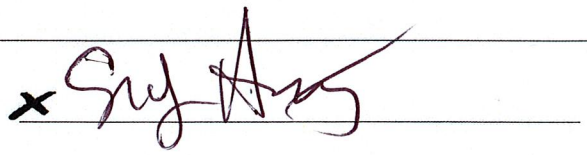
Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joseph Pieklik **Title:** Wastewater Treatment Plant Head Operator **Date:** 10/23/2023

Facility Representative Signature:  **Phone #:** (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: *Valarie Ellis, P.E.* ***DEC Region:*** 7

Report Type: ___ *5 Day* X *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY-0030317 **Facility:** Oak Orchard WWTP

Date of noncompliance: 06/23-28/2023 **Location (Outfall, Treatment Unit, or Pump Station):** Outfall 001

Description of noncompliance(s) and cause(s): Please be advised that the Department's main SCADA Server had a failure that began on Friday, June 23, 2023. The following facilities were impacted: Baldwinsville WWTP, Brewerton WPCP, Metropolitan Syracuse WWTP, and Oak Orchard WWTP. It was originally anticipated that the Server would be restored and the data would be retrievable. It became clear on June 26, 2023, that the system failure had resulted in the loss of all data logging capabilities at these facilities, including the permitted flow recordings. In response, the operations staff began manually recording flow readings from the flow meter displays until SCADA function was restored on June 28, 2023. For the duration of the SCADA outage this facility was staffed 24/7 and no abnormal flows were experienced. The Oak Orchard WWTP is currently in compliance.

Per discussions with NYSDEC (July 27, 2023), the loss of Continuous Flow Measurement (June 23-28, 2023) is considered a permit violation and must be characterized as an "invalid sample" for each effected day. The Department has assigned a ">" symbol to the monthly average flow to reflect measurement uncertainty. The ">" was also assigned to related loading calculations, including the 7-day averages that carried into July reporting. This impacted the first week of July 2023 (June 25-July1). The table below details the resulting violations:

Oak Orchard WWTP Outfall 001 July 2023 Monthly DMR Invalid Flow Data Impacted Permit Parameters			
Parameter	Type	Limit	DMR (Reportable Value)
Effluent Total Suspended Solids, TSS	7-Day Average	3750 lb/d	>300 lb/d
Influent Total Suspended Solids, TSS	7-Day Average	Monitor	>6600 lb/d
Effluent $CBOD_5$	7-Day Average	3336 lb/d	>200 lb/d
Influent $CBOD_5$	7-Day Average	Monitor	>10000 lb/d

Has Event Ceased? Yes **If so When?** 6/28/2023 **Was Event due to plant upset?** No **SPDES limit violated?** Yes

Start date, time of event: 6/23/2023 11:21 **End date, time of event:** 6/28/2023 18:01

Date, time oral notification made to DEC? 6/27/2023 **DEC Official contacted:** Valarie Ellis

Immediate corrective actions: Upon discovery of loss of data logging, manual flow readings were taken every two hours until SCADA was restored. SCADA has been temporarily loaded on PCs to restore SCADA monitoring and logging while a permanent solution is put in place.

Preventive (long term) corrective actions: The Department is procuring equipment to fully replace the SCADA Server. This upgrade will include separate SCADA servers for each facility as well as Server redundancy. Procedures will be revised to require immediate manual recordings of flow values during any future SCADA outage.

Complete this section if event was a bypass:

Bypass amount: _____ **Was prior DEC authorization received for this event?** _____

DEC Official contacted: _____ **Date of DEC approval:** _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joseph Pieklik **Title:** Wastewater Treatment Plant Head Operator **Date:** 08/28/2023

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

x _____

Signature of Principal Executive Officer or Authorized Agent

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact: Valarie Ellis, P.E. ***DEC Region:*** 7

Report Type: ___ *5 Day* X *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY-0030317 **Facility:** Oak Orchard WWTP

Date of noncompliance: 07/10/2023 **Location (Outfall, Treatment Unit, or Pump Station):** Outfall 001

Description of noncompliance(s) and cause(s):

Please be advised that the Oak Orchard WWTP had an effluent pH violation on July 10, 2023. Per the SPDES permit the pH must be within the range of 6-9 SU. On July 10, 2023, a minimum pH value of 5.9 SU was observed. The loss of alkalinity due to seasonal nitrification at this facility often results in lower effluent pH values. Typically, the use of mechanical aeration and flow through the lagoons buffer the pH during seasonal nitrification. On July 10, 2023, the flow was bypassing the lagoons to allow for mechanical harvesting of vegetation. This is believed to be the cause of the pH violation. Samples taken on July 11, 2023, showed a return to compliance.

Has Event Ceased? Yes **If so When?** 7/11/2023 **Was Event due to plant upset?** No **SPDES limit violated?** Yes

Start date, time of event: 7/10/2023 **End date, time of event:** 7/11/2023

Date, time oral notification made to DEC?_____ **DEC Official contacted:** _____

Immediate corrective actions: Increased WAS rates and reduced aluminum sulfate feed to reduce consumption of alkalinity.

Preventive (long term) corrective actions: Evaluate pH trends and make process adjustments ahead of planned lagoon bypasses.

SECTION 3

Complete this section if event was a bypass:

Bypass amount: _____ Was prior DEC authorization received for this event? _____

DEC Official contacted: _____ Date of DEC approval: _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Joseph Pieklik **Title:** Wastewater Treatment Plant Head Operator **Date:** 08/28/2023

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

x _____

Signature of Principal Executive Officer or Authorized Agent

Docusign Envelope ID: A8142109-4B40-41A3-AA26-C74E703E2FCC

Appendix B

SECTION 1

New York State Department of Environmental Conservation
Division of Water

Report of Noncompliance Event

To: DEC Water Contact Valarie Ellis ***DEC Region:*** 7

Report Type: ✔ *5 Day* ___ *Permit Violation* ___ *Order Violation* ___ *Anticipated Noncompliance* ___ *Bypass/Overflow* ___ *Other*

SECTION 2

SPDES #: NY- 0030317 **Facility:** Oak Orchard WWTP

Date of noncompliance: 05/12/2025 **Location (Outfall, Treatment Unit, or Pump Station):** Outfall 001

Description of noncompliance(s) and cause(s): A third party contractor working on-site at the Oak Orchard WWTP snagged the primary electric feed resulting in a facility-wide power outage. Due to the outage, essential treatment processes could not be maintained and the 2.96 million gallons of effluent discharged through the permitted outfall over the duration of the outage is assumed to be partially treated.

Has event ceased? Yes **If so, when?** 11:27 PM **Was event due to plant upset?** No **SPDES limits violated?** No

Start date, time of event: 05/12/2025, 1:15 pm **End date, time of event:** 05/12/2025 11:27 pm

Date, time oral notification made to DEC? 05/12/2025, 3:45 pm **DEC Official contacted:** Tom Vigneault

Immediate corrective actions: See attachment.

Preventive (long term) corrective actions: See attachment.

SECTION 3

Complete this section if event was a bypass:

Bypass amount: _____ Was prior DEC authorization received for this event? No

DEC Official contacted: _____ Date of DEC approval: _____

Describe event in "Description of noncompliance and cause" area in Section 2. Detail the start and end dates and times in Section 2 also.

SECTION 4

Facility Representative: Shannon L. Harty **Title:** Commissioner **Date:** 5/16/2025

Phone #: (315) 435-2260 **Fax #:** (315) 435-5023

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed by: Shannon Harty
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Signature of Principal Executive Officer or Authorized Agent

Docusign Envelope ID: A8142109-4B40-41A3-AA26-C74E703E2FCC

INSTRUCTIONS

The Division of Water developed this standardized form to simplify the reporting of noncompliance events. The SPDES Permit General Conditions, require that certain discharges of untreated or partially treated sewage must be reported orally within either 2 hours[1] or 24 hours and also in writing within five (5) days as required by the appropriate regulation. All other permit noncompliance shall be reported as attachments to the Discharge Monitoring Report (DMR). This form should be used for these events as well as to report noncompliance relating to consent orders, scheduled events and bypass events.

All necessary information can readily be reported to DEC on this form. Additional information required to describe the event can be attached. **Please make additional copies of this form and use as needed**. Instructions are provided below. For questions on form use please contact the appropriate office listed below for the county where your permitted facility is located. Thank you for your cooperation.

Instructions to complete and submit Noncompliance Report

1. Provide facility information and all applicable event details in Sections 1 through 3. Dates should be completed in month/day/year format.

2. Provide your name, title, business phone number, and date report was completed in Section 4. Use additional sheets as needed to provide full detail of the event in Section 2.

3. For 5-day written reports, mail or fax the completed form to the appropriate DEC Regional Office listed below. Attach all other noncompliance reports to the DMR submittal (be sure to attach to each set of DMR copies) or mail separately if related to consent order/scheduled event noncompliance. After hours and weekend reporting of unusual discharge events of other noncompliance must be reported through the DEC Telephone Hotline, which is 1-800-457-7362.

DEC Regional Offices:

REGION 1 Regional Water Engineer NYS SUNY , Bldg. 40 Loop Road Stony Brook, NY 11790-2356 Phone: 631-444-0405 Fax: 631-444-0373 **Counties:** Nassau Suffolk	**REGION 2** Regional Water Engineer One Hunters Point Plaza 47-40 21st St. Long Island City, NY 11101-5407 Phone: 718-482-4900 Fax: 718-482-6516 **Counties:** Queens Bronx New York Richmond Kings	**REGION 3** ** Regional Water Engineer 21 So. Putt Corners Rd New Paltz, NY 12561-1696 Phone: 845-256-3000 Fax: 845-255-0714 **Counties:** Rockland Dutchess Sullivan Orange Ulster Putnam Westchester
REGION 4 Regional Water Engineer 1150 North Westcott Rd. Schenectady, NY 12306-2014 Phone: 518-357-2045 Fax: 518-357-2398 **Counties:** Montgomery Albany Otsego Rensselaer Columbia Delaware Schoharie Greene Schenectady	**REGION 5** ** Regional Water Engineer Route 86, P.O. Box 296 Ray Brook N.Y. 12977-0296 Phone: 518-897-1241 Fax: 518-897-1245 **Counties:** Clinton Hamilton Franklin Essex Saratoga Warren Fulton Washington	**REGION 6** ** Regional Water Engineer Region 6 Suboffice State Office Bldg. 207 Genesee St. Utica, NY 13500 Phone: 315-793-2554 Fax: 315-793-2748 **Counties:** Lewis Jefferson Herkimer Oneida St. Lawrence
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[1] This requirement reflects proposed pending regulations.

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Oak Orchard WWTP: NY-0030317
Attachment to RNC: Summary of immediate and long-term corrective actions
Date of noncompliance: May 12, 2025

Immediate Corrective Action

WEP staff contacted National Grid at 1:24 PM to report the event. While awaiting restoration of electrical service, the following actions were taken:

- Plant staff immediately opened the screen rake bypass gate and deployed a trash pump to maintain the level in the plant waste station.
- Operations returned a primary clarifier to service to reduce discharge volume.
- Automated samplers were set up by 2:30 PM to monitor influent and effluent water quality.
- A battery-powered flow meter was installed at 2:40 PM to monitor discharge flow.
- A small generator was connected by 3:15 PM to power and operate the chlorination and dechlorination systems.
- Attempts to notify WEP's primary DEC contact were made at 1:37 PM, 1:58 PM, and 3:15 PM
- Tom Vigneault was successfully notified by phone at 3:45 PM.
- A SPRTK alert was issued at 4:03 PM.
- Plant staff monitored the facility and operated trash pumps and generator until power was restored at 11:27 PM.
- All plant equipment was restarted by 12:15 AM on May 13, 2025. Operations personnel remained onsite to make significant process control adjustments to ensure recovery of the biological process.
- In the days following power restoration, Operations staff observed a rapid recovery of all treatment processes.

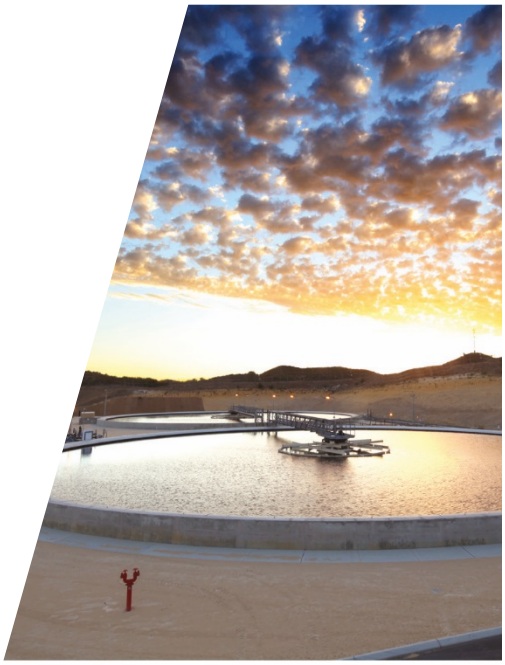
Preventative (Long Term) Corrective Action

Power was restored to the facility at 11:27 PM. To assess any lasting impacts from the outage, continuous monitoring of influent and effluent will continue through May 19th, in addition to permit required sampling. Daily composite samples will be collected and analyzed for BOD_5, $CBOD_5$, UOD, TSS, TKN, NH3-N, and TP. Daily grab samples will be analyzed for fecal coliform and dissolved oxygen. Updates will be provided to the DEC daily for the duration of the monitoring effort.

Long term solutions, including upgrades for backup power systems or dual electrical feeds, are currently under discussion as part of the Oak Orchard WWTP expansion design. The final schedule for these upgrades is still to be determined. WEP will also develop an Emergency Response Plan for power loss events at each wastewater treatment facility.

APPENDIX N

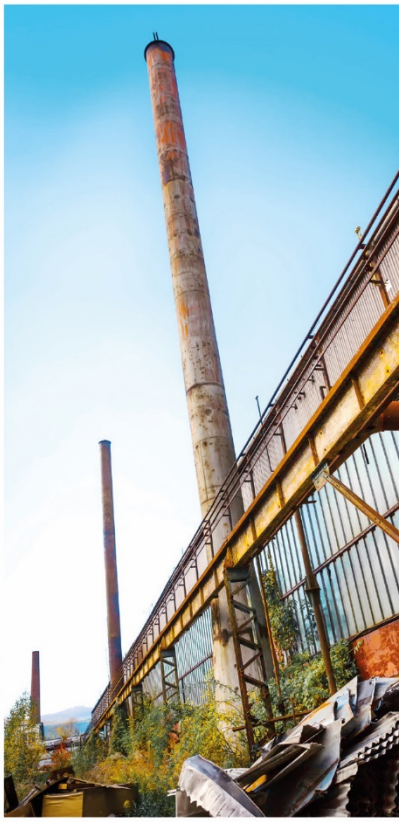
FEBRUARY 2021 OAK ORCHARD WASTEWATER TREATMENT PLANT FACILITIES PLAN AND FEASIBILITY STUDY



Oak Orchard Wastewater Treatment Plant Facilities Plan and Feasibility Study

Onondaga County, New York









OAK ORCHARD WASTEWATER TREATMENT PLANT

FACILITIES PLAN AND FEASIBILITY STUDY

Prepared for

ONONDAGA COUNTY, NEW YORK



Prepared by

GHD CONSULTING SERVICES INC.
5788 Widewaters Pkwy
Syracuse, New York 13214

February 2021

Project No. 11214118

Executive Summary

The Onondaga County Department of Water and Environment Protection (OCDWEP), Onondaga County Industrial Development Agency (OCIDA), and Syracuse Onondaga County Planning Agency (SOCPA) are working together to promote industrial development at the White Pine Commerce Park (White Pine), targeting high technology such as semiconductor manufacturing. In addition, these agencies are promoting development of the surrounding lands with development potential and uses that could complement associated supply chain facilities, other industrial users, commercial establishments (restaurants, hotels, retail), and workforce-related residential growth. An industrial tenant at White Pine would require connection to the local sewer with ultimate treatment and discharge at OCDWEP's Oak Orchard Wastewater Treatment Plant (WWTP) in Clay, NY.

The OCDWEP commissioned this Facilities Plan and Feasibility Study to review current treatment operations at the Oak Orchard WWTP from two perspectives: first, to support the anticipated 20-year residential and commercial growth in this area; and second, to evaluate the additional treatment and life cycle costs associated with accepting industrial process wastewater generated from a potential new high technology manufacturer and supporting supply chain or other industrial facilities at the White Pine site and surrounding lands within the Oak Orchard Service Area.

The Oak Orchard WWTP has been in service since 1981 and is permitted to treat a maximum monthly average flow of 10 million gallons per day (mgd) and a peak hourly flow of 24 mgd. Although influent flows to the plant average 5.9 mgd, maximum monthly flows have reached 9.3 mgd. Further, the Oak Orchard WWTP is approaching its capacity to treat biochemical oxygen demand (BOD) and ammonia loads and has previously been rerated to provide short-term relief. Therefore, continued growth in the service area will trigger the need for WWTP upgrades. Three growth scenarios were considered: complement

1. Flow and Load Scenario 1 – Represents a 20-year projection of anticipated growth, excluding any major development at the White Pine site (also known as the Baseline Condition). Under this scenario, the existing maximum monthly and peak hourly flow capacities would remain at 10 mgd and 24 mgd, respectively. However, plant upgrades would be necessary to treat additional BOD and ammonia loading, along with significant rehabilitation of existing facilities due to the age and condition of the plant.
2. Flow and Load Scenario 2 – Represents the Baseline Condition plus 7 mgd of industrial flow from the White Pine site, and corresponding development within the community. The Oak Orchard WWTP maximum monthly and peak hourly flow capacities would need to be increased to 17.3 mgd and 32.5 mgd, respectively.
3. Flow and Load Scenario 3 – Represents the Baseline Condition plus 10 mgd of industrial flow from White Pine, and corresponding development within the community (supply chain, other industrial, commercial, and residential growth). The Oak Orchard WWTP maximum monthly and peak hourly flow capacities would need to be increased to 21.1 mgd and 37.7 mgd, respectively. This plant capacity provides the County with the flexibility to accommodate flows and loads for further residential, commercial, and supply chain growth while establishing the

necessary capability to treat high-technology industry wastewater flows. This is based on the anticipated assimilative capacity of the plant's receiving stream and associated New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) permit limitations.

In addition to the flow capacity increases under Scenarios 2 and 3, the plant upgrades must be designed to effectively treat the industrial process wastewater and resist potential process upsets. For example, semiconductor facility wastewater can commonly contain contaminants such as ammonia, solvents, arsenic, antimony, acids, alkalis, salts, fine oxide particles, and other pure organic and inorganic compounds. Advance knowledge of the type and quantity of these constituents is critical for design of the Oak Orchard WWTP upgrades and development of a protective pretreatment permit.

Several technologies were evaluated through a two-step evaluation process. Each step included a numerical matrix analysis where the evaluation criteria were weighted based on importance to the OCDWEP. Evaluation criteria included capital cost, operations and maintenance cost, implementation schedule, construction impact, reliability of effluent performance, resiliency to process upsets and inhibition, and ability to adapt the process to potentially more stringent future discharge limits. Five alternatives were evaluated in detail for each Flow and Load Scenario:

- Alternative 1 – Membrane Bioreactor (MBR)
- Alternative 2 – Conventional Activated Sludge (CAS) followed by Biologically Aerated Filter (BAF) and Cloth Media Filtration
- Alternative 3 – High Purity Oxygen Activated Sludge (HPO) followed by Moving Bed Biofilm Reactor (MBBR) and Cloth Media Filtration
- Alternative 4 – CAS followed by MBBR and Cloth Media Filtration
- Alternative 5 – HPO followed by BAF and Cloth Media Filtration

Each alternative also included the addition of sludge handling facilities using thickening, anaerobic digestion, beneficial biogas cogeneration, solids dewatering, and disposal at a landfill.

Conceptual capital and O&M cost estimates were developed for each alternative under the three flow and load scenarios to determine a 20-year present worth. The capital costs developed represent AACE Class 4 estimates. Class 4 estimates are considered preliminary and are prepared based on the project being between 1 and 15 percent developed. The estimates use factored costs obtained for larger equipment, unit costs, and other parametric methods. Class 4 estimates have an accuracy of -15 to -30 percent on the low range and +20 to +50 percent on the high range. These estimates include 25 percent contingency and 20 percent engineering/administration factors. For those major capital cost components where an equipment quotation was not obtained, costs were based on previous project experience and best engineering judgement. O&M costs were developed for the estimated additional labor, maintenance, chemical, power, and solids disposal for each alternative. The O&M costs developed are not all inclusive for the entire Oak Orchard WWTP, but are focused on major items and other differentiating system components among the treatment alternatives to allow for comparison and identification of the least cost alternative. Unit costs for utilities and consumables were based on information provided by OCDWEP.

Flow/Load Scenario 1 Recommendation

Under Scenario 1, there is modest growth projected for the organic loading to the Oak Orchard WWTP and a small projected increase in flows. All new flows and loads are projected to originate from a mix of residential, commercial, and light industrial sources. Although plant flows and loading capacity would both increase, the plant hydraulic capacity would remain unchanged. To accommodate this scenario, all five alternatives would provide effective treatment to meet the needs of the facility. However, Alternative 3, HPO and MBBR with Cloth Media Filtration, is recommended for Scenario 1. This alternative is cost effective as it utilizes existing infrastructure and minimizes space and capital in comparison to the other alternatives. MBBR technology is relatively simple to operate and would increase the current treatment capacity and ability to remove ammonia. The estimated conceptual capital cost for implementing the recommended alternative is $119 million and the 20-year present worth is $149 million.

Flow/Load Scenarios 2 and 3 Recommendations

For Flow/Load Scenarios 2 and 3, which include accommodations for a major contribution from a high technology industrial wastewater associated supply chain facilities, other industrial users, commercial establishments, and residential growth, the Oak Orchard WWTP would require a more significant upgrade to meet projected effluent limits. As a result, the outcome of the final scoring matrix and treatment process selection identified Alternative 1, MBR, as the best option for accommodating these higher flow/load scenarios. MBR technology would provide the highest quality effluent and the most flexibility and adaptability to handle potential changes in plant loading due to the high technology industrial wastewater. The membrane barrier allows for a much higher mixed liquor content and sludge age, resulting in a smaller footprint and more stable sludge that could absorb shock loading and upset conditions that would otherwise result in loss of a non-settling sludge in a conventional clarification process. Alternative 1 also has the lowest estimated conceptual capital cost ($154 million for Scenario 2,$163 million for Scenario 3) and 20-year present worth ($226 million for Scenario 2, $250 million for Scenario 3).

The MBR technology provides a consistent high-quality effluent that would put Oak Orchard ahead of the future regulations and potential limits that may be imposed for emerging contaminants. The MBR technology also has an advantage of operational flexibility and can meet the demands that a significant industrial wastewater contributor can have on a municipal wastewater treatment plant from a flow and loading perspective. Furthermore, this technology is widely used in the semiconductor industry and is regarded favorably from a regulatory permitting perspective.

Key modifications for implementation of Alternative 1 include the following:

1. Major Treatment Modifications
    a. Construct new headworks facility, complete with screenings and grit removal systems, housed in a new building.
    b. Construct new primary clarifier adjacent to existing four clarifiers.
    c. Construct intermediate lift pump station, using vertical turbine pumping equipment.

d. Construct new fine screen facility in new building to protect new MBR treatment process

e. Construct new activated sludge aeration tanks.

f. Modify existing HPO aeration tanks for conversion to air activated sludge, including new mechanical aerator/mixer units located where existing HPO mixer units are located.

g. Provide new membrane bioreactor process, constructed in new membrane tanks with a dedicated Process Equipment Building to house supporting equipment such as pumps, blowers, and chemical cleaning system.

h. Convert existing HPO Generation Building to Process Aeration Blower Building with new conventional aeration blowers to support MBR treatment process.

i. Decommission and demolish existing secondary clarifiers.

j. Expand existing disinfection and dechlorination facilities to accommodate new peak flow.

2. Solids Handling Modifications

a. Rehabilitate the existing gravity thickeners.

b. Close, drain, clean, and fill Lagoon 1 to enable construction of new digesters and dewatering facilities.

c. Construct two new sludge blending tanks with mixing.

d. Construct new insulated primary and secondary anaerobic digester tanks, complete with pumped mixing systems.

e. Construct a new digester complex, including digester mixing equipment, sludge heating equipment, and gas handling equipment.

f. Construct a new solids processing facility, including mechanical dewatering and polymer storage and feed system.

g. Construct a new biogas conditioning and cogeneration facility complete with biogas conditioning equipment and power cogeneration equipment for on-site electricity generation.

In addition to the major process modifications, the following plant infrastructure modifications are recommended to be completed as part of the Oak Orchard WWTP upgrade:

1. Upgrade the plant electrical service to meet the increased electrical load requirements of the upgraded plant, including main switchgear, unit substations, and associated service entrance equipment.

2. Replace MCCs, conduit, and cable of existing facilities impacted by the upgrades.

3. Install a standby power generation system to provide full backup power for the facility

4. Replace the existing plant control and SCADA system and associated instrumentation.

5. Conduct a structural and architectural assessment of existing facilities and implement recommendations.
6. Reconfigure the plant exterior lighting system.
7. Provide fire detection and fire suppression systems for new facilities in accordance with applicable codes.
8. Expand the plant surveillance, security, internet, and PA systems to accommodate the new facilities.
9. Expand the plant effluent water and potable water pipe loops.
10. Modify the plant site plan, including grading, access roads, and stormwater drainage to accommodate the plant upgrade.
11. Prepare a Stormwater Pollution Prevention Plan (SWPPP) to address the loss of pervious surfaces as a result of the upgrade. Perform a green technology evaluation as part of the SWPPP effort.

Summary of Next Steps to Implement Recommendations

The first step for further development of the recommended alternative would be to establish the potential timing to start development and begin discharging wastewater. This will allow the County to develop both a timeline to encumber funding for infrastructure needs as well as requests for proposals for engineering and other services.

In addition to the timing of the development, knowledge of the quantity and characteristics of the wastewater flow, as well as the pretreatment being used by the industry, is critical to the proper design of the Oak Orchard WWTP upgrades. This information can be supplemented by supporting data provided by the industry for other similar operating facilities. Discussions with other municipal WWTPs that accept wastewater from similar industries should be initiated to identify operational challenges and successes. This additional information would be used to confirm the design criteria and performance of the recommended alternative. Design criteria confirmation also would include verifying materials of construction for the plant upgrade to resist the anticipated level of constituents, such as chlorides.

Once more site-specific information is known about the actual industrial wastewater to be treated, OCDWEP should establish a draft of the pretreatment permit with upstream limits that protect Oak Orchard WWTP processes and the receiving water. This analysis will also be used to estimate contaminants in the resultant sludge and verify the solids can be accepted at a municipal landfill and not be treated as a hazardous material.

Discussions will need to be initiated with the NYSDEC early in the development process to verify assumptions and identify potential implications to the SPDES Permit. Using the estimated industrial wastewater flow and loading characteristics, potential discharge limits should be established with the NYSDEC, as the addition of the industrial wastewater would most likely affect the current discharge permit limits and overall design requirements.

Additional steps that should be considered as part of implementing the recommended alternative include the following:

1. Perform an evaluation of the bridge at the plant entrance and Oak Orchard Road to confirm its ability to handle large and extensive construction traffic for three to four years. Determine if bridge rehabilitation or an upgrade would be required.
2. Determine whether the upgrade project would be completed as a single project or as multiple projects.
3. Evaluate procurement of the contractor via design, bid, build, or using an alternative delivery method.
4. Complete the SEQR process elements including a Wetland Delineation Study and State Historic Lands Survey.
5. Complete a headworks analysis to determine whether industrial flow contributions could be phased. This may allow more time to design and construct the plant upgrades.

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1. Introduction

1.1 Project Background

The Oak Orchard Wastewater Treatment Plant (WWTP) has been in service since 1981, is permitted to treat a maximum monthly average design flow up to 10 million gallons per day (mgd) and is designed for a peak flow of 24 mgd. The wastewater influent sources are primarily residential and commercial with a few industrial users. An aerial view of the plant is shown on Figure 1.1.

The Onondaga County Department of Water and Environment Protection (OCDWEP), Onondaga County Industrial Development Agency (OCIDA), and Syracuse Onondaga County Planning Agency (SOCPA) are working together to promote industrial development at the White Pine Commerce Park. In addition, these agencies are promoting development of the surrounding lands with development potential and uses that could complement associated supply chain facilities, other industrial users, commercial establishments (restaurants, hotels, retail, etc.), and workforce-related residential growth. Industrial process wastewater resulting from this development would require discharge to the local sewer with ultimate treatment and discharge at the OCDWEP's Oak Orchard WWTP. For preparation of this report, it has been assumed that a high-tech manufacturer of semiconductors could occupy the White Pine Commerce Park.

The purpose of this Facilities Plan and Feasibility Study is to identify improvements needed for continuing service, and to assess the Oak Orchard WWTP's ability to treat flows and loadings to support anticipated residential and commercial growth for the next 20 years as well as from a prospective industrial user at the White Pine Commerce Park. This report includes an assessment of treatment capability and improvements needed to maintain service for the next 20 years. It presents various growth scenarios and the addition of a major industrial user, including additional treatment processes needed to maintain compliance with the facility's existing State Pollutant Discharge Elimination System (SPDES) Permit.

1.2 Project Goals

The goals for the Oak Orchard WWTP Facilities Plan and Feasibility Study are as follows:

1. Assess current flows and loadings to the Oak Orchard WWTP from residential, commercial, and industrial sources.
2. Project 20-year growth within the existing Oak Orchard WWTP service area and the ability of current WWTP processes to meet the potential growth in accordance with the SPDES Permit.
3. Complete preliminary research and characterization on wastewater produced by a semiconductor industry. Identify areas of concern for toxicity and/or challenges with treating this wastewater. Assess the potential impact on residential and commercial growth within the service area should a large development occur at the White Pine Commerce Park.

4. Develop three flow/loading scenarios for the Oak Orchard WWTP to handle projected 20-year residential/commercial growth and industrial development at the White Pine Commerce Park.
5. Identify potential SPDES Permit impacts associated with the addition of a major industrial user and increased capacity of the Oak Orchard WWTP.
6. Evaluate upgrades required at the Oak Orchard WWTP to support treatment of the three flow/loading scenarios.
7. Evaluate pretreatment requirements and/or limitations of discharge from development at the Commerce Park, assuming a semiconductor facility is constructed.
8. Identify preliminary life cycle costs and logistics of the required upgrades under the three flow/loading scenarios.
9. Perform computer-aided modeling to support work identified above, with ultimate turnover of a tool with training that can be utilized by OCDWEP for future planning and optimization of operations.

1.3 Project Scope

This project report was completed based on the following major tasks:

1. Identification of potential growth for 20-year planning based on available land use for residential, commercial, and industrial growth within the Oak Orchard WWTP Service Area.
2. Coordination with and utilization of OCIDA and SOCPA for available data to support facility planning efforts.
3. Review of current loading conditions, operations, and ability of the Oak Orchard WWTP to meet existing permit limits.
4. Identification of the potential future impact an high-technology industrial manufacturer could have on current operations, as well as development of the surrounding service area from a residential and commercial growth perspective.
5. Development of three flow and loading scenarios estimating projected 20-year growth, and potential for adding flows from a high-technology industry at the White Pine Commerce Park.
6. Identification of potential upgrades to existing treatment operations that can support growth and industrial development. Evaluation of options and identification of alternatives that can support the potential growth and maintain compliance with current and potential future discharge requirements.
7. Preparation of conceptual design calculations for each alternative including design criteria from the Ten-States Standards, published by the Great Lakes-Upper Mississippi River Board (2014); Guides for the Design of Wastewater Treatment Works (TR-16), published by the New England Interstate Water Pollution Control Commission (2011); and other technical guidance documents.

8. Performing BioWin modeling of each technology at the various loading scenarios from the anticipated residential/commercial growth and high-technology industrial wastewater loadings identified in the initial scoping of the project. .
9. Evaluation of the advantages and disadvantages of each alternative, including flexibility to handle the challenges and variability of industrial wastewater, ease of operations, commonality with other OCDWEP treatment processes, energy efficiency, future expandability to support incremental growth, land requirements, odor concerns, regulatory impacts, environmental impacts, and cost and implementation schedule.
10. Identification of improvements outside of the evaluation that would be needed, such as on-site sludge digestion and dewatering processes, odor control, headworks and disinfection systems, supporting infrastructure, etc.
11. Completion of a conceptual life cycle cost evaluation (capital and O&M) based on a 20-year planning horizon.
12. Preparation of an implementation schedule for the recommended alternative including planning and approval process, as well as potential phasing of recommended improvements.

1.4 Organization of the Report

This report is divided into nine sections. Section 1 presents background information on the project, including purpose, goals, scope, organization of the report, and related studies. A description of the existing Oak Orchard WWTP and associated collections systems is provided in Section 2. Section 3 summarizes existing wastewater flows and loads and the development of future projections, including the potential industrial wastewater contribution.

Section 4 includes a review of current SPDES effluent permit limits and a discussion of probable future limits due to increased flow and new industrial contribution. Section 5 provides a summary and screening of the potential alternatives for further consideration. Section 6 includes the conceptual development and design criteria establishment, modeling results, and conceptual cost estimates and evaluation of the alternatives selected for further consideration.

Sections 7, 8, and 9 include the further development of supporting designs and improvements necessary to support the selected alternative as well as identification of life cycle costs, implementation, scheduling, and phasing. Also provided in Section 9 is an outline of further work to be completed to finalize the preliminary design and scoping for the recommended alternative.

1.5 Related Studies

The following is a list of past studies related to the Oak Orchard WWTP that were considered as part of this project:

1. Oak Orchard Wastewater Treatment Plant, Comprehensive Performance Evaluation, August 2014
2. Oak Orchard Wastewater Treatment Plant Capacity Evaluation, GHD, July 2013

3. Oak Orchard Wastewater Treatment Plant Facilities Plan Addendum, Stearns & Wheler, LLC, June 2010

4. Oak Orchard Wastewater Treatment Plant Facilities Plan, Stearns & Wheler, LLC, April 2009

2. Description of Existing Facilities

2.1 Oak Orchard Wastewater Treatment Plant

2.1.1 Background

The Oak Orchard WWTP is located on Oak Orchard Road in Clay, NY. The original facilities at this site consisted of two wastewater treatment lagoons and a chlorination system. These systems were used to provide aerobic treatment and disinfection to the primary effluent coming from the Davis Road Pump Station (DRPS), which was a primary treatment plant at that time.

In the late 1970s, the Oak Orchard facilities were upgraded to provide primary and secondary treatment as well as ammonia removal. This facility is an aerobic activated sludge treatment plant with a plant design capacity of 10 mgd. In conjunction with the upgrade, the treatment facilities at the Davis Road Pump Station were abandoned.

The upgraded Oak Orchard WWTP consisted of screenings and grit removal, primary clarification, activated sludge aerobic treatment followed by secondary clarification, aerated lagoon nitrification, and disinfection. Several plant modifications were performed at the WWTP in the late 1990s and early 2000s, as follows:

1. Plant access road improvements.
2. Addition of a lagoon bypass pipeline.
3. Upgrade and conversion of the disinfection system to sodium hypochlorite.
4. Miscellaneous sludge handling improvements to enable transfer of thickened solids to the Metropolitan Syracuse WWTP for treatment and disposal.

A significant plant rehabilitation was completed in 2017 which included the following efforts:

1. Installation of divider walls in the existing primary clarifiers to facilitate conversion from two larger tanks to four smaller tanks. This included replacing the traveling bridge skimmer/scraper with a chain-and-flight system, replacing the primary sludge pumps, installing flow balancing gates, and replacing the programmable logic controller (PLC) system.
2. Replacement of the plant steam boilers, air handling systems, unit heaters, ventilation fans, and condensate piping and pumping systems.
3. Removal of mechanical equipment from the primary and secondary flocculation tanks.
4. Removal of burning sludge system equipment on the B Building Mezzanine.
5. Replacement of the grit blowers and air piping.
6. Administrative Building rehabilitation.
7. Replacement of the influent mechanical bar screen.
8. Replacement of lagoon aerator.

9. Rehabilitation of the odor control system.
10. Replacement of the tanker truck sludge loading system.
11. Structural repairs.
12. Replacement of exterior lighting.

A subsequent project involved cleaning the lagoons and adding sodium bisulfite feed capability to dechlorinate disinfected wastewater.

Raw wastewater is conveyed to the Oak Orchard WWTP via an influent force main fed by several pump stations located within the treatment plant collection system, the primary pump station being the DRPS. Upon reaching the Oak Orchard plant, the raw wastewater flows by gravity through the various treatment processes before being discharged via the plant outfall to the Oneida River. A site plan of the existing treatment plant is included as Figure 2.1.

2.1.2 Preliminary Treatment

The raw wastewater entering the treatment plant is first treated at the Influent Building, which houses the screening and grit removal facilities. The wastewater first passes through a manually cleaned coarse bar screen that removes the larger debris. Downstream of this screen, wastewater flows into two aerated grit chambers where sand, gravel, and other heavy particles are removed. Aeration for the grit chambers is provided by two positive displacement blowers located in the gallery area adjacent to the grit chambers. Key design criteria for the grit removal system is summarized in Table 2.1.

Table 2.1 Grit Removal

Parameter	Value
Type	Aerated grit channels
Number of channels	2
Channel width	16 feet
Channel length	34 feet
Channel side water depth	12 feet
Total working volume	98,000 gallons
Number of blowers	2
Capacity of blowers	365 scfm each

After the grit chambers, there are two mechanically cleaned climber-type bar screens. Key criteria for the influent screens are presented in Table 2.2. Another manually cleaned bar screen is located between the two mechanical screens to provide bypass screening in the event the mechanical screens are out of service.

Table 2.2 Influent Screens

Parameter	Value
Type	Mechanical bar screen
Number of units	2
Channel width	4 feet
Channel depth	1.5 feet
Bar spacing	1/2 inch
Estimated capacity	15 mgd per screen

2.1.3 Primary Treatment

Screened and degritted wastewater flows to four primary clarifiers. The two existing primary flocculators have been removed from service. A metal salt coagulant (aluminum sulfate [alum]) is added to the wastewater to provide enhanced settling in the primary clarifiers. The alum coagulant is delivered to the treatment process by two diaphragm pumps that draw from two 5,800-gallon chemical bulk storage tanks located in the adjacent Sludge Processing Building.

After the coagulant addition, wastewater flows to the primary clarifiers; key design criteria are summarized in Table 2.3. Two adjustable overshot weir gates are used to promote flow balancing between the four rectangular clarifiers, which are each equipped with a chain-and-flight collector mechanism for collecting sludge and scum. Each clarifier is also equipped with a cross collector to the sludge hopper. Four rotary lobe-type sludge pumps are used to draw off the primary sludge from the clarifiers and send it to the gravity sludge thickeners. The scum skimmed from the surface of the clarifiers is collected in two separate primary scum pump stations which are periodically pumped out and hauled away for disposal.

Table 2.3 Primary Clarification

Parameter	Value
Type	Rectangular, chain-and-flight
Number of units operating	4
Total number of units	4
Width (each)	28 feet
Length (each)	120 feet
Side water depth (each)	11 feet
Total surface settling area (4 operating)	13,440 ft^2
Total weir length (4 operating)	648 feet

2.1.4 Secondary Treatment

The Oak Orchard WWTP employs a high purity oxygen (HPO) aeration treatment process. Primary effluent flows into two HPO aeration tanks for biological treatment. Each tank is partitioned into three

stages configured in series, with each stage separated by a concrete dividing wall. Openings at the end of each dividing wall allow the mixed liquor to pass from one stage to the next; the openings are located to maximize plug flow through the aeration tanks. Each stage of the aeration tanks contains two mechanical aerators for imparting HPO to the mixed liquor. The Oxygen Generation Building, located south of the aeration tanks, contains a pressure swing adsorption system for generating the HPO used for the biological treatment process. Three reciprocating compressors are used to deliver the HPO to the mechanical aerators. In addition to the oxygen generation equipment, a liquid oxygen storage tank is located outside of the Oxygen Generation Building which serves as a standby oxygen supply should the generation system be out of service or if additional oxygen is required.

Key design criteria for the secondary treatment system are summarized in Table 2.4.

Table 2.4 Secondary Treatment

Parameter	Value
Type	HPO activated sludge
Number of tanks	2
Stages per tank	3
Width (each stage)	72 feet
Length (each stage)	36 feet
Side water depth (each stage)	9 feet
Total volume	1,050,000 gallons
Number of HPO compressors	3
Total oxygen generation capacity (2 operating, 1 standby)	20,000 lbs/day O_2

The existing HPO aeration tanks have a maximum organic capacity of 17,100 lbs. of biochemical oxygen demand per day (lbs BOD_5/day) based on a loading rate of 100 lbs BOD_5/day/1,000 ft^3.

Downstream of the biological treatment process, the mixed liquor flows through channels to the secondary clarifiers, bypassing the two secondary flocculation tanks that are no longer in service. A polymer solution is added to the mixed liquor upstream of the secondary clarifiers to aid in settling. There are six rectangular secondary clarifiers at the plant, each with chain-and-flight-type mechanisms for sludge and scum collection; key design criteria are included in Table 2.5. The six clarifiers are separated into two trains of three units each. Flow distribution to the six units is achieved through the use of channels and adjustable slide gates located at the inlet of each clarifier.

Once the sludge has settled to the bottom of the clarifiers, the main chain-and-flight collectors transport the sludge to the influent end of the tank where a cross collector mechanism moves the sludge to the sludge hopper. There are two sludge recycle pits, one for each train. Sludge from the six sludge hoppers drains to these two recycle pits, from where sludge is returned to the aeration tanks. Four return activated sludge (RAS) pumps are set up on two common headers to provide return sludge pumping back to the aeration tanks. In addition, two waste activated sludge (WAS) pumps remove sludge from the biological system. These pumps draw WAS from the aeration tanks

and pump it to the gravity sludge thickeners. Scum that is skimmed from the secondary clarifiers is sent to one of two secondary scum pump stations, and periodically pumped out and hauled away for disposal.

An effluent water pump and two oxidative liquor pumps are located in the gallery area between the two trains of secondary clarifiers. Each of these pumps is configured to pump secondary effluent from a common effluent box at the end of the clarifiers. The effluent water pump is used to provide carrier water for the polymer solution that is added to the secondary clarifiers, while the oxidative liquor pumps provide dilution water to the gravity sludge thickeners.

Table 2.5 Secondary Clarification

Parameter	Value
Type	Rectangular, chain-and-flight
Number of units operating	6
Total number of units	6
Width (each)	20 feet
Length (each)	140 feet
Side water depth (each)	10 feet
Total surface settling area (6 operating)	16,800 ft^2
Total weir length (6 operating)	648 feet

It should be noted that the existing secondary clarifiers have a side water depth of 10 feet. Both the Ten-State Standards and TR-16 recommend a minimum of 12 feet side water depth. To account for the insufficient side water depth, the clarifiers may be derated by 10 percent, resulting in a hydraulic capacity of approximately 15 mgd based on a loading rate of 900 gpd/ft^2. Based on the available weir length in the clarifiers, the peak hour hydraulic capacity is 19.4 mgd. On a solids loading basis, the existing clarifiers have a peak capacity of 590,000 lbs/day.

2.1.5 Treatment Lagoons

There are two treatment lagoons at the Oak Orchard WWTP. These lagoons were modified as part of the major plant upgrade in the 1970s. While originally intended to provide nitrification, operating experience showed that sufficient ammonia removal was not being provided. Therefore, operation of the HPO processes was modified to provide carbonaceous and ammonia treatment. The lagoons now serve to polish the secondary effluent, particularly during higher flows, provide pH adjustment (through aeration); and add dissolved oxygen prior to discharge. There are two aerators located lagoon closest to the secondary clarifiers, along with two blowers in a room adjacent to the Chlorination Building at the northern end of the treatment plant.

Effluent from the secondary clarifiers passes through a Parshall flume for secondary effluent flow measurement prior to entering the first of the two treatment lagoons. The lagoons are configured in series. A lagoon bypass is in place to allow secondary effluent to be diverted around all or part of the lagoon system, if desired

Under normal conditions, the capacity of Lagoon No. 1 is approximately 8.4 MG, while Lagoon No. 2 is 5.9 MG, and when filled to the top of rip-rap, the lagoons have a capacity of 10.4 MG and 7.3 MG for Lagoon No. 1 and 2, respectively. There are no design criteria on which to determine the capacity of these lagoons and therefore they are not a rated treatment process.

2.1.6 Disinfection/Dechlorination

Plant effluent is treated at a disinfection system at the northern end of the treatment plant prior to being discharged from the facility. The disinfection system consists of two chlorine contact tanks and an adjacent Chlorination Building which houses the liquid sodium hypochlorite used and associated chemical feed systems. The original chlorine addition point to the chlorine contact tanks was relocated by OCDWEP to the lagoon diversion structure located upstream. The chlorine contact tanks have a capacity to treat up to 15 to 30 mgd based on a minimum contact time of 15 minutes as recommended in Ten-State Standards. Key design criteria for the disinfection system are summarized in Table 2.6.

Table 2.6 Effluent Disinfection

Parameter	Value
Type	Chlorine contact tanks
Chemical type	Liquid sodium hypochlorite
Total number of units	2
Width (each)	25 feet
Length (each)	83 feet
Side water depth (each)	10 feet
Total volume	300,000 gallons

Dechlorination facilities using sodium bisulfite were added to the Oak Orchard WWTP in 2019. The dechlorination tanks reportedly have a capacity to treat up to 38 mgd based on a minimum contact time of 0.5 minutes as recommended in Ten-State Standards. Key design criteria are summarized in Table 2.7.

Table 2.7 Dechlorination

Parameter	Value
Type	Chlorine contact tanks
Chemical type	Sodium bisulfite
Total number of units	2
Width (each)	5.2 feet
Length (each)	34.5 feet
Side water depth (each)	10 feet
Total volume	13,334 gallons

2.1.7 Sludge Treatment Processes

The Oak Orchard WWTP was originally designed and constructed to treat raw sludge using a sludge oxidation process for volatile solids destruction and solids stabilization prior to dewatering and disposal. Under the original installed sludge treatment process, WAS and primary sludge was co-settled and thickened in two raw sludge gravity thickeners located south of the primary clarifiers with a sludge holding tank for thickened raw sludge storage. The thickened raw sludge was then processed in the oxidized sludge reactors for volatile solids destruction and solids stabilization. The oxidized sludge from the reactors was thickened using two oxidized sludge thickeners located on the north side of the primary clarifiers. A filtrate storage tank was located adjacent to the oxidized sludge thickeners to store the supernatant from these thickeners. For dewatering, the thickened oxidized sludge was processed using two vacuum filters, and the dewatered sludge cake was hauled to a landfill for disposal. This sludge oxidation treatment process never operated as originally intended due to operational problems during system start-up. The equipment associated with sludge oxidation and dewatering has since been removed or abandoned.

Currently, only the two raw sludge thickeners are utilized. The WAS and primary sludge are co-settled in the two raw sludge gravity thickeners. Dilution water is provided to the thickeners by two oxidative liquor pumps drawing effluent from the secondary clarifiers. This water is added to the gravity thickeners to maintain the proper hydraulic loading rate and prevent the sludge from becoming septic, which can cause floating sludge and odors.

The thickened sludge is pumped from the two gravity thickeners into trucks and hauled to the Syracuse Metro WWTP for disposal several times per day. At the Metro WWTP, the hauled thickened sludge is added to the anaerobic digesters where it is digested, dewatered, and disposed to landfill. See Table 2.8 for key design criteria.

Table 2.8 Gravity Sludge Thickening

Parameter	Value
Type	Circular, circular scraper
Total number of units	2
Diameter (each)	40 feet
Side water depth (each)	10 feet
Total surface settling area (2 operating)	2,510 ft^2
Total volume (2 operating)	150,000 gallons

2.2 Collection Systems

2.2.1 General Description of Collection System Tributary to Plant

The Oak Orchard Sewer Service Area consists of the Village of North Syracuse and portions of the Towns of Clay and Cicero. The topography of much of the service area is relatively flat and includes state-owned marshland. The majority of the wastewater from the service area is from residential

sources; however, there are also commercial and industrial contributors. A significant industrial contributor is Clinton's Ditch Co-Op, Inc., a beverage production company located in the Town of Cicero. A map of the Oak Orchard Sewer Service Area is provided in Figure 2.2.

Throughout the service area, a system of gravity sewers and smaller pumping stations convey sewage from a large portion of the service area through trunk sewers to the DRPS. Flow from this pump station is pumped over 6 miles through two interconnected force mains (Clay-Cicero [24-inch] and Davis Road [36-inch]) that combine to form a single 30-inch force main at Euclid in the Town of Clay, which then conveys the sewage to the Oak Orchard WWTP grit chamber. The parallel force mains are provided with five cross connections, including connections to each of three intermediate pump stations (Henry Clay, Caughdenoy Road, and Gatewood) that also pump flow to the Oak Orchard WWTP. An additional source of flow is generated from the Horseshoe Island force mains, which are owned by the Town of Clay. Approximately 100 households are on this system, which enters the plant just prior to the Oak Orchard WWTP grit chamber.

Historically, infiltration and inflow to sanitary sewers in the service area contributes to high flows experienced at the Oak Orchard WWTP during moderate to heavy storm events. High flow impacts the nitrification process and contributes to loss of solids from the secondary clarifiers.

2.2.2 Current White Pine Development (Commerce Park) Pump Station and Force Main

Onondaga County owns a large industrial park which it has been developing since 1991 to attract new tenants, specifically targeting the high-tech industry. The property is approximately 650 acres (and is located at the northeast corner of Route 31 and Caughdenoy Road, strategically close to the railroad line, electrical substation, and halfway between Interstates 81 and 481. The County is currently designing a new pump station and 4-mile force main from this area to the Oak Orchard WWTP to establish a "build ready" industrial park.

3. Wastewater Flow and Loading Projections

3.1 Existing Wastewater Flows and Loadings

Existing influent plant data has been reviewed to determine the current flow and loading conditions for the Oak Orchard WWTP. The primary parameters of interest at this treatment plant are flow, 5-day carbonaceous biochemical oxygen demand ($cBOD_5$), ultimate oxygen demand (UOD), total suspended solids (TSS), total Kjeldahl nitrogen (TKN), ammonia (NH_3), and phosphorus. The data were summarized from 2009 to 2014 and from 2017 to 2019 (Table 3.1). Figures 3.1 and 3.2 illustrate the historical plant flows and loadings. It is noteworthy that Oak Orchard WWTP influent flows have reached 24 mgd during extreme wet weather events.

Table 3.1 Current Flows and Loading Conditions

Parameter	2009-2014 Average	2009-2014 Maximum Month	2017-2019 Average	2017-2019 Maximum Month
Daily average flow (mgd)	5.9	9.3	5.9	8.3
$CBOD_5$ load (lb/d)	11,010	14,790	9,000	11,710
TSS load (lb/d)	7,110	10,210	6,700	9,330
Total phosphorus load (lb/d)	190	240	171	210
NH_3 load (lb/d)	1,160	1,530	1,170	1,480
TKN load (lb/d)	1,410	1,776	1,370	1,680
UOD load (lb/d)	22,860	29,040	19,650	24,010

3.2 Residential/Commercial Wastewater Flows and Loading Projections

Overall, residential flows and loading have been consistent and steady since the last Facilities Plan was prepared in 2010. Commercial contribution from Clinton's Ditch has decreased, believed to be a result of waste reduction measures implemented at this facility. GHD worked with OCDWEP and SOCPA to estimate future flows and loading from residential and commercial sources based on the amount of available land and additional housing units that could be constructed in this area. It is assumed that Clinton's Ditch would continue to operate at or below the current established pretreatment permit limits. Estimated future flows and loadings are summarized in Section 3.4.

A major industrial development located at the White Pine Commerce Park would have an impact on the projected growth within the Oak Orchard Sewer Service Area. However, when considering the prospect of additional residential/commercial growth in the service area due to a major industrial development more closely, the potential for added growth is mitigated by other factors. For example, the current available housing inventory within the Oak Orchard Service Area is limited; while there are opportunities for some additional housing development within the Oak Orchard Service Area,

adjacent communities within reasonable commuting distance from the commerce park location will provide additional opportunities for residential growth. Figure 3.3 illustrates the Oak Orchard Service Area, White Pine Commerce Park, and a 15-mile commuting radius from the park. This indicates the potential for industrial development-related housing across approximately 50 percent of Onondaga County, as well as a large area of Oswego County and a small portion of Madison County. Therefore, although a major industrial development within the Oak Orchard Service Area would increase the residential/commercial growth opportunities within the immediate area, much of the growth would be expected to be spread out across a larger area.

3.3 New Major Industrial Source Characteristics

OCDWEP, OCIDA, and SOCPA are working together to attract industrial development to the White Pine Commerce Park. To be conservative in terms of wastewater flow and characterization, it has been assumed that a high-tech manufacturer of semiconductors would occupy the Commerce Park.

Semiconductor facility wastewater typically contains contaminants such as solvents, arsenic, antimony, acids, alkalis, salts, fine oxide particles, and other pure organic and inorganic compounds. The amount and type of upstream recovery and/or treatment is specific to each manufacturer and the economics of recovery versus downstream treatment cost. Developing pretreatment requirements for such an industry must balance upstream recovery and pretreatment with the Oak Orchard WWTP's ability to treat this specific wastewater and achieve future established permitted discharge compliance.

Specific wastewater flows and characteristics will be unknown until a potential manufacturer provides such information; however, some generalized considerations for treatment of this wastewater obtained from research are listed as follows:

1. Contains tetramethylammonium hydroxide (TMAH), which can have toxicity issues impacting initial start-up and acclimations.
2. TMAH also contributes to the formation of additional ammonia loading to a system after the initial degradation of this chemical. This can add an additional load of ammonia upon breakdown that must be considered in the nitrification process.
3. Can have other toxicity issues, caused by fluoride or other cleaning chemicals used upstream.
4. Can contain fine inert solids that are comprised of oxide particles. These particles can pass through the treatment system and could cause opacity issues in the discharge.
5. Wastewater can be low in alkalinity and require supplemental alkalinity for nitrification.
6. Wastewater can contain chlorides with concentrations greater than 500 mg/L, which can cause corrosion on equipment and piping.
7. Wastewater can have an affinity for scaling due to increased calcium and associated hardness concentrations, as well as the presence of sulfates.

8. Wastewater can contain metals that concentrate in sludge in amounts that make disposal more difficult. Potential impacts to sludge disposal, such as Class A biosolids, can be mitigated through industrial pretreatment to establish acceptable discharge limitations.

An overall summary of research and further detail into the potential characteristics of semi-conductor wastewater, as well as recovery and pretreatment methods is provided as Appendix A. Estimated future flows and loadings are summarized in Section 3.4.

3.4 Projected Oak Orchard WWTP Flow and Loading Scenarios

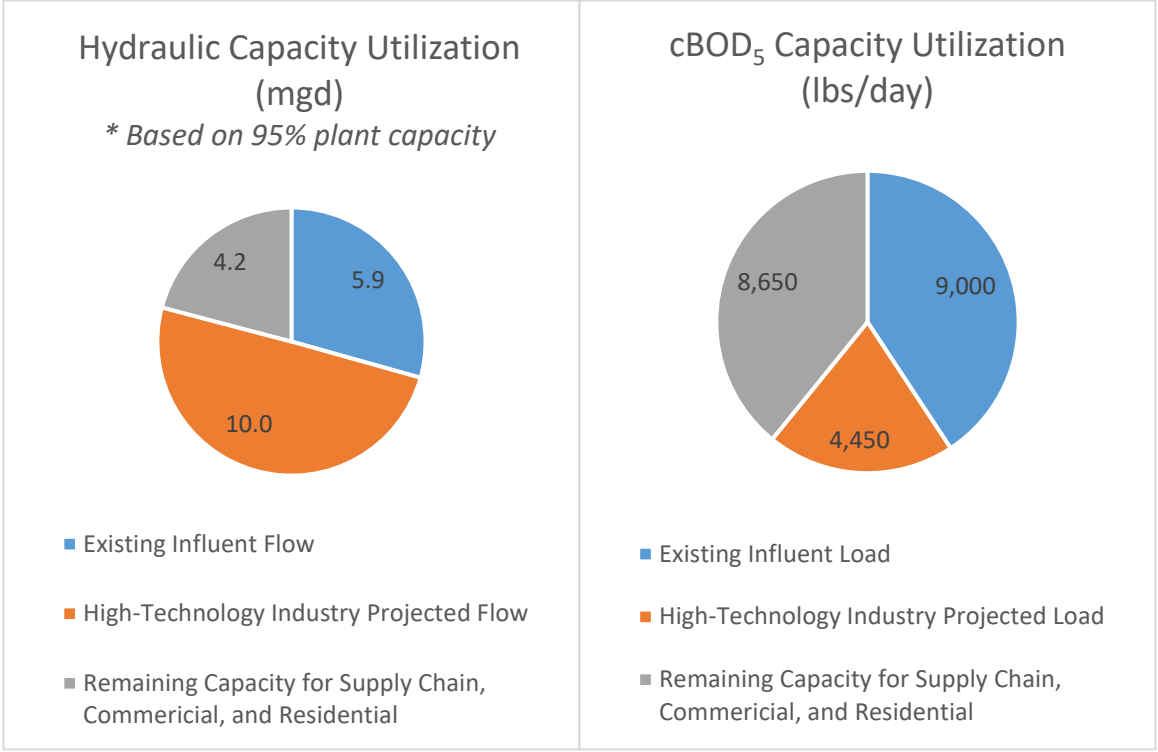
The influent wastewater flows and loadings for the Oak Orchard WWTP were projected based on a 20-year planning period. Three flow and loading scenarios were developed using existing plant data and based on discussions and information provided by the County. The projected wastewater flow and loading values are summarized in Table 3.2. A detailed summary of the flow and load projections is summarized in Appendix B.

1. Flow and Load Scenario 1 – Represents a 20-year projection of anticipated growth not including development of the White Pine Commerce Park (also known as the Baseline Condition).
2. Flow and Load Scenario 2 – Represents the Baseline Condition plus 7 mgd of industrial flow from the Commerce Park.
3. Flow and Load Scenario 3 – Represents the Baseline Condition plus 10 mgd of industrial flow from the Commerce Park.

Table 3.2 Potential Flows and Loading Scenarios

	Units	Scenario 1	Scenario 2	Scenario 3
Flow				
Maximum month flow	mgd	10.0	17.3	21.1
Peak hour flow	mgd	24.0	31.5	37.7
cBOD				
Maximum month concentration	mg/L	194	123	125
Maximum month load	lb/day	15,100	17,700	22,100
TSS				
Maximum month concentration	mg/L	140	109	104
Maximum month load	lb/day	10,900	15,700	18,300
TKN				
Maximum month concentration	mg/L	26	28	29
Maximum month load	lb/day	2,000	4,100	5,100
UOD				
Maximum month load	lb/day	30,400	44,000	54,900

The following charts provide an illustration of the anticipated allocations (flow, $CBOD_5$, TSS, and TKN) for existing wastewater flows, projected high-technology development, and remaining capacity for other growth opportunities under Scenario 3.



The values presented in the charts represent average flows and loads from the various sources compared with the design maximum month capacities for the Oak Orchard WWTP.

4. Effluent Limits and Performance Requirements

4.1 Current SPDES Limits

Onondaga County is currently authorized to discharge treated wastewater effluent from the Oak Orchard WWTP to the Oneida River in accordance with the conditions of SPDES Discharge Permit No. NY0030317 administered by the New York State Department of Environmental Conservation (NYSDEC). The plant has a rated capacity of 10 mgd based on a 30-day average effluent flow. Key effluent limits and performance requirements contained in the SPDES Permit are summarized in Table 4.1. The Oak Orchard WWTP's current SPDES Permit is included as Appendix C.

Table 4.1 Current Key SPDES Permit Limits

Parameter	Averaging Period	Current Permit Limits			
		June 16 – October 31		November 1 - June 15	
		Concentration	Loading	Concentration	Loading
$CBOD_5$	30-day average			25 mg/L	2,085 lb/day
UOD	30-day average		4,289 lb/day		
Ammonia (as NH_3)	30-day average		307 lb/day		
Total phosphorus	30-day average	1 mg/L		1 mg/L	
Total residual chlorine	Daily maximum	0.045 mg/L		0.045 mg/L	

4.2 Projected Future SPDES Limits

Under Flow and Load Scenario 1, effluent limits are not expected to change because the influent wastewater characteristics will be similar. As a result of the increases under Flow and Load Scenarios 2 and 3 (including industrial flow from the White Pine Commerce Park), it is anticipated that more stringent UOD, ammonia, and TKN concentrations would need to be met. These three parameters are regulated based on allowable loading to the receiving stream, and it has been conservatively assumed that the NYSDEC would not authorize an increase in loadings. Therefore, the necessary plant effluent concentrations for UOD, ammonia, and TKN become lower as plant capacity increases. Table 4.2 provides a summary of the projected future SPDES permit effluent discharge limits for key parameters.

Table 4.2 Projected Permit Effluent Limits (Assuming Effluent cBOD of 10 mg/L)

Flow and Load Scenario	Design Maximum Month Flow	Projected Effluent Limits				
		UOD		Ammonia (as NH_3)		TKN (Calculated)
1	10 mgd	4,289 lb/day	51.4 mg/L	307 lb/day	3.7 mg/L	8.1 (mg/L)
2	17.3 mgd		29.7 mg/L		2.1 mg/L	3.3 (mg/L)
3	21.1 mgd		24.3 mg/L		1.7 mg/L	2.1 (mg/L)

Note: Assumed cBOD concentration of 10 mg/L used to calculate TKN.

Based on the anticipated SPDES permit limitations and the assimilative capacity of the receiving stream, the 21.1 mgd design capacity established under Flow and Load Scenario 3 is approaching the maximum anticipated buildout capacity for the Oak Orchard WWTP. Minimal additional flow capacity can be accommodated at the facility, as it is approaching the limit of technology to maintain compliance with effluent requirements.

4.3 Potential New Limits Associated With Specialized Industrial Wastewater

Semiconductor wastewater is regulated by the United States Department of Environmental Protection (USEPA) Code of Federal Regulations, 40 CFR Part 469. This section of the code establishes the Electrical and Electronic Components Point Source Category Effluent Limitations Guidelines. Subpart A of 40 CFR Part 469 presents potential categorical limits for semiconductor wastewater. The potential limits that could be added to the existing Oak Orchard permit are as follows:

1. Total Toxic Organics (TTO) effluent concentration of 1.73 mg/L. TTO is defined as the sum of concentrations for each of the identified toxic organic compounds under CFR 469.12 that are measured in the discharge at a concentration greater than 10 micrograms per liter (µg/L), such as:
    - 1,2,4 Trichlorobenzene Chloroform
    - 1,2 Dichlorobenzene
    - 1,3 Dichlorobenzene
    - 1,4 Dichlorobenzene ethylbenzene
    - 1,1,1 Trichloroethane methylene chloride napthalene
    - 2 Nitrophenol phenol bis (2-ethylhexyl) phthalate tetrachloroethylene toluene trichloroethylene
    - 2 chlorophenol
    - 2,4 dichlorophenol
    - 4 nitrophenol penta chlorophenol di-n-butyl benzyl pthalate

- 1,2 diphenylhydrazine isophorone butyl benzyl phalate
- 1,1 dichloroethane
- 1,2 dichloroethane
- 2,4,6 trichlorophenol carbon tetrachloride
- 1,1 trichloroethane dichlorobromomethane

New source discharge limits are also listed for fluoride (32 mg/L) and pH (6-9 S.U.).

Acceptable end-of-pipe treatment methods listed within 40 CFR Part 469 include neutralization, precipitation and clarification, filtration, activated sludge, advanced oxidation and carbon adsorption.

Review of existing permitted municipal treatment systems that accept semiconductor wastewater, as well as review of applicable USEPA inhibitory guidelines, were used as sources to identify other potential permitted parameters in addition to current allowable local limits, as listed below:

- Arsenic
- Cyanide, free and total
- Oil and grease
- Lead
- Selenium
- Silver, total
- Zinc
- Trichloroethylene

A more detail review and analysis of semiconductor wastewater including further design and permitting efforts required can be found in Appendix A.

5. Identification and Screening of Wastewater Treatment Alternatives

Candidate wastewater treatment alternatives to address the three flow and load scenarios for the Oak Orchard WWTP were identified and screened. The candidates were selected based on their potential to provide complete nitrification in addition to sufficient cBOD and TSS removals to treat projected flows and loads while complying with projected effluent limitations. The following wastewater treatment alternatives were considered:

1. Combined Carbonaceous and Ammonia Treatment Processes
    a. Conventional activated sludge (CAS)
    b. Integrated fixed-film activated sludge (IFAS)
    c. Membrane bioreactor (MBR)
    d. Sequencing batch reactor (SBR)
    e. Granular activated sludge (AquaNereda®)
    f. Oxidation ditch
2. Two-Stage Carbonaceous and Ammonia Treatment Processes
    a. Conventional activated sludge followed by biologically active filter (BAF)
    b. Conventional activated sludge followed by conventional activated sludge
    c. Conventional activated sludge followed by moving bed bioreactor (MBBR)
    d. High purity oxygen (HPO) followed by BAF
    e. HPO followed by MBBR
    f. BAF followed by BAF

Figures 5.1 through 5.12 schematically illustrate how these alternatives would be integrated into the existing Oak Orchard WWTP.

5.1 Candidate Wastewater Treatment Process Alternatives

The following is an overview and description of each candidate process alternative, as well as the advantages and disadvantages of each technology.

5.1.1 Conventional Activated Sludge

Single-stage activated sludge systems ($cBOD_5$ and ammonia removal in a single aerobic reactor) are commonly used in municipal wastewater treatment to achieve nitrification. The process consists of a CAS system (suspended growth) optimized for nitrification by providing long detention times and sufficient aeration capacity to meet the oxygen requirements for $cBOD_5$ and ammonia removal (nitrification). Aeration is typically provided with diffused aeration and blowers or mechanical surface

aerators. Clarifiers are provided to settle the MLSS and return sludge pumps recycle mixed liquor to maintain an active biomass in the aeration tanks. Sludge is traditionally wasted from the system from the bottom of secondary clarifiers or recycled activated sludge line.

Advantages and disadvantages of this treatment technology include the following:

Advantages:

- Proven technology.
- County experience with technology.

Disadvantages:

- Large process tankage required; increased space requirements.
- Process performance dependent on ability to settle sludge.
- Slower to respond to changing process conditions.

5.1.2 Integrated Fixed-Film Activated Sludge

IFAS is a treatment process that combines activated sludge and fixed-film biological treatment. An IFAS treatment system is configured as a CAS process with the addition of media to the aeration tanks to a support fixed-film biomass. The additional biomass provided by the IFAS media increases the biological treatment capability of the treatment process, which reduces the overall reactor volume required. This makes IFAS a good alternative for retrofitting existing activated sludge treatment processes requiring increased treatment capacity.

There are several types of IFAS media systems available, including sponge media, rope media, and plastic media. Coarse or medium bubble diffused aeration equipment is required for this treatment process due to the media contained in the aeration tanks. Screens, or sieves, are required to keep the media in the aeration tanks. The IFAS treatment process is essentially a combination of a CAS process and an MBBR process providing the advantage of both technologies in one package.

Advantages and disadvantages of this treatment technology include the following:

Advantages:

- Low capital cost.
- Relatively low O&M costs.
- Reduced space requirements.
- Ability to retrofit into existing activated sludge treatment process.
- Fixed-film biomass on the IFAS media is resistant to washout during high flow events.
- Improved settleability compared to other fixed film technologies.
- Reduced solids loading to the secondary clarification process.

Disadvantages:

- No County experience with technology.
- Existing tanks are considered shallow for use of this technology.
- Increase maintenance in comparison to activated sludge associated with media replacement and cleaning of screening devices.
- Susceptible to upsets due to poor settling sludge.
- Need upfront screening.
- Slow to react to process change.

5.1.3 Membrane Bioreactor

The MBR process is an activated sludge treatment process where that uses membrane filtration to perform solids separation. Membrane filtration can provide better solids separation (absolute barrier, 0.2-0.45 µm) in comparison to settling combined with tertiary sand filters. As a result of the improved solids separation process, the mixed liquor concentration that can be maintained in the aeration tanks is much greater than a typical activated sludge process followed by settling. An MBR typically operates with MLSS concentrations of 8,000 to 15,000 mg/L. In comparison, a CAS MLSS concentration typically ranges from 2,500 to 4,000 mg/L. This allows for more treatment in a smaller footprint with less risk of process upsets. The higher MLSS concentrations also make the MBR process a good retrofit option for existing wastewater treatment plants by providing increased treatment capacity within the existing process tankage on site.

The membranes are arranged in cassettes, or racks, that house tubular or plate membranes submerged directly in the mixed liquor. Treated effluent is filtered through the membranes using permeate pumps, and sludge is periodically wasted directly from the aeration tank. MBR systems are equipment-intensive due to the various pumps, blowers, actuated valves, and chemical membrane cleaning systems required to operated and maintain the systems. Advantages and disadvantages with this treatment technology include the following:

Advantages:

- High quality effluent without use of a separate filtration process. May reduce opacity in effluent (semiconductor wastewater) in comparison to other treatment technologies.
- Elimination of clarifiers.
- Low space requirements.
- Less susceptible to upsets.
- Can achieve a longer SRT and more stable sludge for dewatering.
- Ability to retrofit into existing activated sludge treatment process.
- Modular design.
- Can handle peak wet weather flow by increasing surface area.

Disadvantages:

- Higher capital cost.
- High operation and maintenance costs.
- Need upfront fine screening (less than 2 mm).
- Complex to operate and maintain.

5.1.4 Sequencing Batch Reactor

The SBR treatment process is an activated sludge, or suspended growth, process in which the biological treatment (including nitrification) and the secondary clarification are performed within the same tank. A fill-and-draw process is utilized in the SBR tanks to provide batch treatment of the wastewater. The untreated wastewater is added to the SBR tank where it is mixed and aerated to provide biological treatment. The mixing and aeration are then stopped to allow the mixed liquor to settle prior to the decant process, where the clarified effluent is removed from the tank. This cycle of fill-and-draw is then repeated. The SBR treatment process does not use a return sludge system because the biomass is maintained within the SBR tanks. Sludge wasting in the SBR process is usually performed during the reaction phase.

Advantages and disadvantages of this treatment technology include the following:

Advantages:

- Simple to operate, automated control systems with easy operator interface.
- No recycle flow streams and associated pumps.
- Relatively low equipment costs.
- Can add a chemical addition step to achieve precipitation of phosphorus and/or enhanced settling.
- Relatively low operation and maintenance costs (lower power associated with cycling of aeration and elimination of return sludge).
- Modular system.

Disadvantages:

- Large process tankage required for batch processing in comparison to continuous flow technology, increasing space requirements Not feasible for larger flow systems.
- May need pre- and post-equalization tanks, depending on sequencing and ability to control incoming and/or outgoing flow.
- Susceptible to process upsets associated with poor settling or FOG accumulation.
- Limited County experience with process.

5.1.5 Granular Activated Sludge (AquaNereda®)

Granular activated sludge is a process developed in the Netherlands that utilizes granular activated sludge in lieu of typical flocculant sludge. The proprietary process that forms the granules uses a batch fill/draw, react, settle cyclic process, similar to the SBR. However, the advantage with granular activated sludge is that it settles well (Sludge Volume Index [SVI] 30-50 milliliters per gram [mL/g]), allowing mixed liquor to run at a much higher concentration in comparison to the SBR (>8,000 mg/L).

The granular material contains a consortium of bacteria that can achieve nitrification, denitrification, and anaerobic conditions within the layers of the granule that allow for enhanced nutrient removal (ENR) in a single process vessel. The robust structure of the granule reportedly is less susceptible to chemical spikes, load, salt, pH, and toxic shocks. Advantages and disadvantages of this treatment technology include the following:

Advantages:

- Simple to operate, automated control systems with easy operator interface.
- No recycle flow streams and associated pumps.
- Longer solids retention time (SRT) within a smaller footprint to achieve both nitrification and denitrification, if required.
- Lower chemical addition required.
- Relatively low O&M costs (lower power associated with cycling of aeration and elimination of return sludge).

Disadvantages:

- Relatively unknown process; difficult to obtain approval and permit from regulatory agencies without extensive pilot testing.
- Proprietary process eliminating competitive advantage, including seed sludge.
- Reliant upon the formation of granules.
- May need pre- and post-equalization tanks, depending on sequencing and ability to control incoming and/or outgoing flow.
- Limited County experience with process.

5.1.6 Oxidation Ditch

The oxidation ditch is an activated sludge treatment system comprising a series of plug flow and completely mixed reactors within a continuous flow “track.” Various sections are separated by baffles and gates within the oxidation ditch that use differential head, mechanical aeration, and/or diffused aeration to achieve a flow pattern and various dissolved oxygen levels and mixing within each zone. These zones allow for aerobic, anoxic, and anaerobic conditions all within one continuous flow process unit to achieve the desired nutrient removal.

The oxidation ditch requires secondary clarification to settle and return solids to the process. Chemical addition can be used to precipitate phosphorus prior to secondary clarification. Influent can be introduced into any of the zones as a carbon source to facilitate operation. Adjustments are usually made manually by adjusting gates and/or weirs and the speed of aerators to achieve target process changes. Advantages and disadvantages of this treatment technology include the following:

Advantages:

- Simple operation, although more manual than other technologies.
- Can achieve ENR in one process tank.
- No recycle flow streams and associated pumps.
- Longer SRT, potential for less sludge.
- Stable, less susceptible associated with variable influent.
- Relatively low O&M costs (lower power associated with use of mechanical aeration and elimination of return sludge).

Disadvantages:

- Large process tankage required; redundancy difficult to achieve.
- Difficult to cover tankage, if required.
- Limited County experience with process.

5.1.7 Biological Aerated Filters

The BAF is a submerged fixed-media biological reactor that does not employ a recycle or return sludge flow. The media, which can be dense or floating, provides surface area supporting the growth of biological microorganisms responsible for $cBOD_5$ and ammonia removal. The media also acts as a filter, eliminating the need for separate clarification under many situations. The BAF units are upflow filters that use fixed media (typically 2 to 4 mm in size) to provide surface area for microorganisms to attach and grow upon.

Influent wastewater is introduced at the bottom of the filter and flows upward through the media. Process air is introduced at the bottom of the filter at a rate that keeps the entire bed aerobic and provides the oxygen necessary for biological ammonia removal (nitrification) to occur. Solids are retained on and within the media as flow travels up through the filter. Automated backwashing normally occurs once every 24 to 48 hours and can be controlled based on elapsed time and/or accumulated headloss across the filter bed. Media depth generally ranges from 10 to 13 feet.

In the application of the Oak Orchard WWTP, a two-stage BAF system would be required, operating in series. In the first stage, cBOD removal would be accomplished while the second stage would be operated as a nitrification stage to convert ammonia to nitrate. Advantages and disadvantages of this treatment technology include the following:

Advantages:

- Reduced space requirements.
- Elimination of secondary clarification.
- Fully automated operation.
- Elimination of MLSS operational requirements.
- County familiar with technology.

Disadvantages:

- High O&M costs.
- Operational complexity.
- Significant headloss requires intermediate pump station.

5.1.8 Moving Bed Biofilm Reactor

The MBBR is a fixed-film treatment process that uses specifically designed plastic media, or biofilm carriers, to support the required biomass for biological treatment. Aeration diffusers are used to provide the necessary oxygen for the fixed-film biomass on the media. Screens, or sieves, are required to keep the media contained within the process tanks while allowing the biologically treated wastewater to leave the tanks. Wastewater enters the MBBR process treatment tanks where the fixed-film biomass, growing within the internal structures of the plastic media, provides biological treatment such as cBOD and ammonia removal. Solids are generated by this process when excess biofilm sloughs off of the plastic media. Secondary clarification is required downstream of the MBBR tanks to settle these solids. There is no RAS required for this process. All of the solids collected in the secondary clarification process are wasted, as there is no RAS flow for the MBBR process. Since there is no RAS for this process, the complexity associated with return rates and the maintenance associated with the return sludge piping, pumps, and controls is eliminated. Advantages and disadvantages of this treatment technology include the following:

Advantages:

- Fixed-film biomass is resistant to washout during high flow events.
- Low solids loading to the secondary clarification process.
- Elimination of mixed liquor suspended solids operational requirement.
- Relatively simple process to operate.
- Modular – easy to expand.

Disadvantages:

- Large process tankage required.
- Need upfront screening (6mm).

- Relatively high capital cost.
- Lack of County experience with this treatment technology.

5.1.9 High Purity Oxygen Activated Sludge

This single-stage activated sludge treatment process uses HPO for the aeration process in lieu of conventional aeration. These systems traditionally operate with multiple stages (three or four) configured in series, where the influent wastewater, RAS, and HPO are added to the first stage. Because this system uses HPO for aeration, the system is capable of operating at higher mixed liquor (MLSS) concentrations and shorter detention times due to increased oxygen transfer rates. To contain the HPO within the process, the aeration tanks are typically covered. The HPO is maintained within the headspace of the tanks, and mechanical aerators are used to draw the HPO down into the mixed liquor. One drawback to this process is that carbon dioxide can build up in the headspace of the aeration tanks, depressing the pH of the mixed liquor. This condition can limit the nitrification ability of the HPO system, as well as depress the pH of the wastewater.

The HPO for the process is provided by on-site generation or commercially hauled liquid oxygen with on-site storage at the treatment facility. On-site generation is typically provided by pressure swing adsorption or cryogenic technology. The oxygen demand at the treatment facility would be used to determine the most cost-effective alternative for obtaining the required HPO. Hauled liquid oxygen is often cost effective for smaller treatment plants, while the pressure swing adsorption system is used for intermediate to large treatment plants, and cryogenic oxygen generation is reserved used at the largest facilities.

Clarification is provided downstream of the aeration tanks to settle the MLSS and recycle sludge to maintain an active biomass in the aeration tanks. Sludge is traditionally wasted from the system from the secondary clarifiers. Advantages and disadvantages of this treatment technology include the following:

Advantages:

- Higher loading capability than conventional activated sludge process.
- Smaller aeration tank volume required.
- County experience with technology.
- Improved odor control.
- High oxygen transfer efficiency.
- Allows reuse of existing tankage.

Disadvantages:

- Operational complexity; HPO equipment.
- Higher capital cost than conventional activated sludge.
- Higher operation and maintenance costs than conventional activated sludge .

A summary of two-stage alternatives is presented in the following sections. A key advantage of two-stage processes is the separation of the autotrophs and heterotrophs to provide more efficient treatment in each stage, as well as protect autotrophic (nitrification) bacteria that can be more susceptible to changes in water temperature and chemistry (pH, shock loading, inhibitions, etc.). Typically, two-stage systems allow for tighter process control in each process to achieve more stringent limits. However, two-stage systems often have higher capital and operating costs because multiple redundant trains requires more tankage, process equipment, control, and redundancy.

5.1.10 Conventional Activated Sludge – BAF

This alternative uses technologies with which OCDWEP has extensive experience operating, including the Metro Syracuse WWTP. The existing HPO tanks can be converted to activated sludge for more efficient and cost-effective $cBOD_5$ removal with the BAF added after for ammonia removal.

5.1.11 Conventional Activated Sludge (Two-Stage)

This alternative provides a simple and proven method for treatment of wastewater. The two-stage activated sludge systems can be used to optimize SRT in each stage to provide efficient $cBOD_5$ removal and ammonia removal, as well as protect the nitrifiers in the second-stage process. This alternative represents the largest footprint of all alternatives and the need to provide intermediate pumping to return multiple return streams back to the activated sludge process.

5.1.12 Conventional Activated Sludge – MBBR

Similar to the process described in Section 5.1.10, this alternative has the advantage of activated sludge followed by a fixed-film system to provide nitrification in a smaller footprint. The difference is that the MBBR uses a cross flow as opposed to an upflow pattern in a BAF and therefore uses less energy in comparison to the BAF. However, the MBBR typically requires clarification after treatment; BAF effluent typically does not require clarification. In addition, OCDWEP does not have familiarity with operation of a MBBR system.

5.1.13 HPO – BAF

OCDWEP is familiar with using the HPO activated sludge at the Oak Orchard WWTP and other plants. The BAF process is used at the Metro Syracuse WWTP. The existing HPO tanks would be reused for $cBOD_5$ removal and the BAF added for ammonia removal, representing a lower capital cost alternative.

5.1.14 HPO – MBBR

This process item is similar to that described in Section 5.1.13 and would allow reuse of the existing HPO tanks to reduce capital cost.. However, the use of MBBR instead of a BAF would require clarification after treatment and therefore a larger footprint. As mentioned above, OCDWEP does not have familiarity with operating an MBBR system.

5.1.15 BAF - BAF

Two-stage BAFs can provide a reliable two-stage fixed-film process for $cBOD_5$ and ammonia removal. Because treatment is provided with fixed-film in lieu of activated sludge, this alternative will have an overall smaller footprint than other alternatives. OCDWEP is also familiar with operating this technology. However, operators would not have the ability to control sludge age, and fixed-film systems do not have the ability to adapt as quickly to changing conditions. Because this system will have a large industrial contribution, both attributes are needed to be able to effectively treat the anticipated variable and inhibitive conditions.

5.2 Screening Matrix and Evaluation of Process Alternatives

Each of the 12 candidate alternatives was added to an evaluation matrix and ranked for various criteria critical to the success of the Oak Orchard WWTP to treat wastewater under Flow and Load Scenarios 2 and 3, recognizing a significant industrial contribution from the semiconductor manufacturer. The following criteria were used for screening candidate alternatives:

1. Capital Cost – Total cost to implement project, including design and construction.
2. Operating Cost – Continuing cost of labor, maintenance, utilities, media, and chemicals necessary to operate the system.
3. Operational Complexity – How much daily interaction is required for the operator to monitor and modify operations to meet treatment goals and expectations.
4. Maintenance Complexity – Amount of interaction required to perform routine facility maintenance.
5. Generation and Control of Odors – Propensity to generate and ability to control odors.
6. Constructability/Maintenance of Plant Operations – Complexity of the sequencing of construction and ability to maintain plant operations and permit compliance during construction.
7. Implementation Schedule – Amount of time required to construct new processes to accept increased flows and loads.
8. Regulatory Approval – Ability to obtain process approval by regulatory agencies.
9. Siting Requirements – Ability to fit on the existing site while maintaining treatment during construction, minimizing clearing and development of new areas for construction.
10. Performance Expectation – Ability to perform consistent treatment at or below permitted treatment limits.
11. Similar Experience – Amount of experience with similar treatment processes, familiarity with operations.
12. Process Flexibility – Ability of the process to be modified (hydraulic and sludge retention time, oxygen delivery, recycle flows, etc.) to adapt to changing conditions while maintaining

consistent treatment at or below permitted treatment limits. Also the rate at which process changes can be implemented.

13. Resistance to Toxicity and Inhibition – Since there could be a significant industrial contribution to the Oak Orchard plant, the process will need to be able to resist potential shock loading and/or inhibitory conditions caused by pollutants in the wastewater. The ability to use process controls to acclimate microorganisms to such conditions, to the extent possible, will be needed.

14. Sustainable (Green) Energy Efficiency – Treatment process requiring the lowest energy and most efficient use of energy for treatment, including the ability to turn the process down under low flow and loading conditions.

The evaluation matrix and weighted ratings for each of the above criteria for the 12 alternatives is presented as Appendix D.

5.3 Selection of Process Alternatives for Detailed Evaluation

Using the weighted ranking system, the following alternatives were selected for further conceptual design and modeling:

- Alternative 1 - MBR
- Alternative 2 - Conventional activated sludge followed by BAF
- Alternative 3 - HPO followed by MBBR
- Alternative 4 – Conventional activated sludge followed by MBBR
- Alternative 5 – HPO flowed by BAF

5.3.1 Single-Stage Selection

MBR was selected as the only recommended single-stage activated sludge alternative for further consideration. Although this alternative did not score as well in comparison for initial capital cost, O&M costs, or similar experience, the MBR ranked most favorable because this technology is anticipated to provide the highest quality effluent with the most flexibility and adaptability for process changes and upset conditions associated with treatment of a significant contribution of industrial wastewater.

The absolute membrane barrier allows for a much higher mixed liquor content and sludge age, resulting in the need for a smaller footprint and more stable sludge that can adsorb shock loading and upset conditions that would otherwise result in loss of a non-settling sludge in the clarification process.

MBR is also utilized at other semiconductor manufacturing facilities for wastewater treatment, and it is anticipated that this technology would be easier to obtain approval for from NYSDEC for difficult wastewater treatment scenarios with a high industrial contribution, in comparison to the other technologies that rely on settling and/or further filtration for performance.

Although the chemical cleaning and energy costs are somewhat higher, the clear supernatant is typically easier to disinfect, requiring less chemical usage downstream.

The single-stage fixed-film systems did not score as favorably for treatment of industrial wastewater as this technology is not as easily and readily adaptable to changing loading conditions, which can result in less favorable results and/or the potential for odors during upset conditions. Fixed-film systems also rely on growth of fixed-film bacteria and adherence to media which can be difficult under inhibitory start-up conditions.

5.3.2 Two-Stage Treatment

The remaining alternatives selected for further evaluation for combined treatment were two-stage systems - typically an activated sludge system followed by a fixed-film system for nitrification. As the first stage, the activated sludge system provides process control and the ability to adapt to changing conditions. Using fixed-film processes for nitrification in the second stage provides a smaller overall footprint that can fit on site in the available space at the plant site. The activated sludge as the first stage also protects the downstream fixed-film system from some of the limitations listed above for this treatment technology as a single-stage system.

The HPO alternative for the first-stage activated sludge offers a lower capital cost option utilizing infrastructure that is currently in place and operating, as well as operator familiarity. Conventional activated sludge provides a lower operational and maintenance-intensive option for OCDWEP, as it does not require use of the oxygen generation and storage equipment.

Utilizing BAF for nitrification provides a familiar process currently operated by OCDWEP at the Metro WWTP. It is anticipated it will be easier to gain regulatory approval for this technology for nitrification, as NYSDEC is familiar with it and it has a proven track record at the Metro WWTP to achieve low effluent ammonia concentrations.

The MBBR option is provided as an alternative fixed-film system to the BAF although not ranked as high as the BAF due to operator unfamiliarity, performance expectations, and ability to gain regulatory approval as this technology is not currently widely used at municipal plants.

Further development and evaluation of these alternatives is provided in Section 6.

6. Detailed Evaluation of Selected Wastewater Treatment Alternatives

In this section, further technical evaluation of the five screened alternatives will be outlined including conceptual design development and design criteria. Estimated process sizing was developed and further technical comparison was performed for each alternative based on actual site conditions and project requirements. This sizing was then calibrated using modeling, as well as obtaining vendor quotations for major equipment packages. Also outlined in this section are the requirements for ancillary systems common to all the alternatives, such as biosolids treatment and disposal. Miscellaneous infrastructure improvements common to all alternatives are outlined in Section 7 and overall life cycle costs, including complete costs for each alternative, are provided in Section 8.

6.1 Design Criteria and Considerations

The applicable design guidance documents used for the evaluation were as follows:

- *The Recommended Standards for Wastewater Facilities*, 2014 Edition, also known as "Ten-States Standards."
- *Guides for the Design of Wastewater Treatment Works.* New England Water Interstate Water Pollution Control Commission TR-16, 2011 Edition.
- *Design of Water Resource Recovery Facilities*, Water Environment Foundation (WEF) Manual of Practice (MOP-8), 2018 Edition.

The following sections summarize the anticipated design requirements for each key treatment process. Summary tables of the conceptual basis of design for each alternative are provided in Appendix E with supporting calculations presented in Appendix H.

6.1.1 Preliminary and Primary Treatment

Preliminary and primary treatment will continue to involve the use of grit removal and screening of the plant influent, followed by primary clarification. Flow and Load Scenario 1 is based on reusing existing screens, grit removal system, and clarifiers. The majority of these processes were rehabilitated in 2016. Therefore, it is anticipated that only the grit tanks and grit removal system will require rehabilitation.

Flow and Load Scenarios 2 and 3 are based on replacing the plant headworks and adding process tankage to supplement the existing primary clarifiers in order to meet the higher hydraulic and loading requirements. A new headworks building would be located in the vicinity of the DRPS force main as it enters the treatment plant property. The headworks building would include new mechanical screens with bypass located upstream of two vortex-type grit removal tanks. Grit pumping and classifiers would be included, as well as a separate odor control system. A new primary clarifier would be constructed adjacent to the existing primary clarifiers.

6.1.1.1 Membrane Bioreactor

Major components of the MBR system under all flow and loading scenarios include aeration tanks, air supply and distribution, membrane bioreactors, and fine screens to pre-treat primary clarifier effluent prior to entering the MBR process. An intermediate pumping station also would be required to offset hydraulic losses through the process. The existing HPO tanks would be converted for use as aeration tanks; additional aeration tankage would be required, the volume driven by the flow and load scenario. The existing HPO generation system would be removed and replaced with blowers.

Table 6.1 presents a summary of key conceptual design criteria for an MBR process for the three flow and load scenarios. These criteria were based on the following guidelines:

1. Recommended MLSS: 5,000 - 15,000 mg/L
2. SRT: 10 - 25 days
3. Food to Mass Ratio (F:M): 0.1 - 0.4
4. Dissolved oxygen in aerobic zone: 1.0 - 3.0 mg/L
5. Dissolved oxygen content in the membrane zone: 2.0 - 6.0 mg/L
6. Need upfront screening: <2 mm
7. Membranes should be sized to pass peak hourly flow and at the coldest temperatures for wastewater anticipated
8. Recommended membrane materials; polyethersulfone, polyvinylidene fluoride, polypropylene, polyethylene, polyvinylpyrrolidone, or chlorinated polyethylene. Industrial wastewater characteristics or chemicals used should be checked for material compatibility.
9. Microfiltration Pore Size Ranges: 0.01 - 0.4 microns (µm)
10. Ultrafiltration Pore Size Ranges : 0.008 - 0.1 µm
11. Flux Rate: 600 - 1,100 L/m^2-d, set by manufacturer for peak flows
12. Air scour rates: 0.1 - 0.3 scfm/ft^2 or 3 - 12 L air/min-m^2 of membrane surface area
13. Recycle rates of 4 – 6 times plant flow
14. Influent oil and grease: <150 mg/L
15. Provide one redundant membrane cartridge or unit per three installed.
16. Pumping systems shall be able handle peak conditions with one unit out of service.

Table 6.1 MBR Design Summary

Parameter	Scenario 1	Scenario 2	Scenario 3
Additional Aeration Tankage			
Number of units	1	1	1
Dimensions (feet)	77L x 61W x 10H	135L x 55W x 18H	200L x 55W x 18H
Total volume (gallons)	350,000	1,200,000	1,480,000
Aeration system type	Diffused fine bubble	Diffused fine bubble	Diffused fine bubble
Convert Existing HPO to Aeration Tanks (Modified Existing)			
Number of units	2	2	2
Dimensions (feet)	108L x 72W x 9H	108L x 72W x 9H	108L x 72W x 9H
Total volume (gallons)	1,050,000	1,050,000	1,050,000
Total aeration volume including additional tankage (gallons)	1,400,000	2,250,000	2,530,000
HRT @ maximum month flow (hours)	3.4	3.1	2.9
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	100	73	81
Design MLSS (mg/L)	<8,000	<8,000	<8,000
Design SRT (days)	12	12	12
Aeration system type	Diffused fine bubble	Diffused fine bubble	Diffused fine bubble
Process Air Blowers			
Number of units	3	3	3
Blower type	Turbo blower	Turbo blower	Turbo blower
Blower capacity (scfm)	16,000	20,000	22,000
Membrane Bioreactor			
Number of units	6	8	8
Dimensions (feet)	75L x 9W x 13H	75L x 9W x 13H	82L x 9W x 13H
Total volume (gallons)	390,000	500,000	580,000
Number of cassettes per train	10	12	12
Aeration system type	Diffused fine bubble	Diffused fine bubble	Diffused fine bubble
Process Air Blowers			
Number of units	7	9	9
Blower type	Turbo blower	Turbo blower	Turbo blower
Blower capacity (scfm)	13,500	17,000	17,000
Fine Screening			
Number of units	3	3	3

Parameter	Scenario 1	Scenario 2	Scenario 3
Type	Rotating drum	Rotating drum	Rotating drum
Screening spacing	2 mm	2 mm	2 mm
Channel dimensions (feet)	4W x 5H	6W x 5H	6W x 5H
Influent screen capacity (mgd)	12	20	20
Screen press capacity	70 ft^3/hr	177 ft^3/hr	177 ft^3/hr

6.1.1.2 CAS - BAF

Major components of the CAS-BAF process include aeration tanks, air supply and distribution, secondary clarification, and the BAF process. An intermediate pumping station would be required to lift secondary clarifier effluent into the BAF. The existing HPO tanks would be converted for use as aeration tanks; additional aeration tankage would be required, the volume driven by the flow and load scenario. The existing HPO generation system would be removed and replaced with blowers.

Table 6.2 presents a summary of key conceptual design criteria for an CAS-BAF process for the three flow and load scenarios. These criteria were based on the following guidelines:

1. CAS
    - For activated sludge systems for BOD_5 removal only, loading rate, 75 - 150 lb. BOD_5/1,000 ft^3 at peak loading conditions, 0.2 - 0.5 F:M, 1,000 - 3,000 MLSS.
    - Reactor >10 feet in depth up to 30-feet maximum.
    - For aeration mixing 20 - 30 scfm/ft^2 of reactor for coarse bubble, 0.12 scfm/ft^2 of reactor fine bubble, 0.5 HP/1,000 ft^3 of tank volume for mechanical mixing.
    - 1.1 - 1.5 lbs. O_2/lb. of $cBOD_5$ removed for peak loading conditions, 4.6 lbs, of O_2/lb. of ammonia removed.
    - Reactors sized to meet peak demand with largest unit out of service.
    - RAS 15 - 100 percent of forward flow.
    - Oxygen demands considering coldest winter and hottest summer conditions.
2. BAF
    - Loading rate shall be no greater than 5.0 gpm/ft^2.
    - Provide full capacity at peak flow with one unit out of service and one unit backwashing.
    - Media to provide a minimum bulk surface area of 70 - 500 ft^2/ft^3.
    - Fine screening recommended.
    - For nitrification, influent $cBOD_5$ less than 62 - 125 lbs. of $cBOD_5$/1,000 ft^3/day of media; ammonia loading rates of 62 - 100 lbs. ammonia/1,000 ft^3/day; TSS <100 lbs. TSS/1,000 ft^3/day of media.

Table 6.2 CAS – BAF Design Summary

Parameter	Scenario 1	Scenario 2	Scenario 3
Additional Aeration Tankage			
Number of units	1	2	2
Dimensions (feet)	108L x 72W x 9H	108L x 72W x 9H	108L x 72W x 9H
Total volume (gallons)	520,000	1,050,000	1,050,000
Aeration system type	Diffused fine bubble	Diffused fine bubble	Diffused fine bubble
Convert Existing HPO to Aeration Tanks (Modified Existing)			
Number of units	2	2	2
Dimensions (feet)	108L x 72W x 9H	108L x 72W x 9H	108L x 72W x 9H
Total volume (gallons)	1,050,000	1,050,000	1,050,000
Total aeration volume (gallons)	1,570,000	2,100,000	2,100,000
HRT @ maximum month flow (hours)	3.8	2.9	2.1
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	72	63	79
Design MLSS (mg/l)	<2500	<2500	<2500
Design SRT (days)	2	2	2
Aeration system type	Diffused fine bubble	Diffused fine bubble	Diffused fine bubble
Process Air Blowers			
Number of units	4	4	4
Blower type	Turbo blower	Turbo blower	Turbo blower
Blower capacity (scfm)	7,500	11,000	12,000
Secondary Clarification			
Number of units	3	4	4
Type	Circular	Circular	Circular
Mechanism	Center feed – peripheral draw – spiral collector	Center feed – peripheral draw – spiral collector	Center feed – peripheral draw – spiral collector
Diameter (feet)	102	102	110
Side water depth (feet)	14	14	14
Total surface area	24,500	32,700	38,000
Total peak surface overflow rate (gpd/ft^2)	950	1,000	990
Biological Aerated Filter			
Number of cells	6	8	10
Cell size (ft^2)	940	940	940

Parameter	Scenario 1	Scenario 2	Scenario 3
Total filter area (ft^2)	5,640	9,400	9,400
Media size (mm)	3.6	3.6	3.6
Media depth (ft)	9.8	11.5	11.5
Total media volume (ft^3)	55,300	86,500	108,100
Hydraulic Loading			
Design month (N-1_ (gpm/ft^2)	1.4	1.8	1.9
Peak (N-1_ (gpm/ft^2)	3.4	3.4	3.1
Daily backwash volume (mgd)	1.03	1.7	2.02
Peak air demand (scfm)	3,200	4,400	5,300

6.1.1.3 HPO - MBBR

The HPO-MBBR process includes aeration tanks, air supply and distribution, secondary clarification, and the MBBR process. The existing HPO tanks would remain in service for $cBOD_5$ removal. No additional HPO process tankage would be required under Flow and Load Scenario 1. Additional HPO process tankage would be required under Flow and Load Scenarios 2 and 3. The existing HPO generation system would be replaced.

Table 6.3 presents a summary of key conceptual design criteria for an HPO-MBBR process for the three flow and load scenarios. These criteria were based on the following guidelines:

1. HPO
    - For activated sludge systems for carbonaceous BOD_5 removal only, loading rate, 80 - 200 lb. BOD_5/1,000 ft^3 at peak loading conditions, 0.2 - 0.5 F:M, 1,000 - 3,000 MLSS
    - Reactor >10 feet in depth up to 30-feet maximum.
    - Mechanical aeration provide a minimum of 2.0 lbs O_2/HP/hr.
    - For aeration mixing 0.5 HP/1,000 ft^3 of tank volume for mechanical mixing.
    - 1.1 - 1.5 lbs. O_2/lb. of $cBOD_5$ removed for peak loading conditions, 4.6 lbs, of O_2/lb. of ammonia removed.
    - Reactors sized to meet peak demand with largest unit out of service.
    - RAS 15 - 100 percent of forward flow.
    - Oxygen demands considering coldest winter and hottest summer conditions.
2. MBBR
    - 1.7 - 6.0 kg $cBOD_5/m^3$-day based upon 60 percent fill fraction
    - 25 - 67 percent fill recommended.
    - Coarse bubble aeration recommended.
    - Removal flux 5 - 20 g/m^2-d.

- For nitrification, loading rates <0.2 - 0.6 lb. $cBOD_5$/1000 ft^2 of media/day, ammonia loading 0.06 - 0.24 lbs. ammonia per 1,000 ft^2 of media.
- DO > 2.0 - 6.0 mg/L.
- Screening <12 mm, scum removal.
- Approach velocity to sieves <1.9 ft/sec based on peak conditions; 1.1 ft/sec recommended.
- Make sure defoamer, if necessary, is compatible with the membrane material, as these chemicals can sometimes act as foulants if incorrectly selected.
- Media bulk surface area typically 137 - 365 ft^2/ft^3.

Table 6.3 HPO - MBBR Design Summary

Parameter	Scenario 1	Scenario 2	Scenario 3
Additional HPO Process Tankage			
Number of units	NA	1	1
Dimensions (feet)	NA	108L x 72W x 9H	108L x 72W x 9H
Total volume (gallons)	NA	520,000	520,000
Aeration system type	NA	HPO-surface aeration	HPO-surface aeration
Re-use HPO Process Tanks (Modified Existing)			
Number of units	2	2	2
Dimensions (feet)	108L x 72W x 9H	108L x 72W x 9H	108L x 72W x 9H
Total volume (gallons)	1,050,000	1,050,000	1,050,000
Total aeration volume (gallons)	1,050,000	1,570,000	1,570,000
HRT @ maximum month flow (hours)	2.5	2.2	1.8
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	110	85	105
Design MLSS (mg/l)	<2,500	<2,500	<2,500
Aeration system type	HPO-surface aeration	HPO-surface aeration	HPO-surface aeration
High Purity Oxygen System			
Number of units	2 (minimum)	2 (minimum)	2 (minimum)
Type	Vacuum-pressure swing adsorption	Vacuum-pressure swing adsorption	Vacuum-pressure swing adsorption
Capacity (tpd)	7.5	10	10
Liquid storage capacity (gallons)	11,000	11,000	11,000

Parameter	Scenario 1	Scenario 2	Scenario 3
Secondary Clarification			
Number of units	3	4	4
Type	Circular	Circular	Circular
Mechanism	Center feed – peripheral draw – spiral collector	Center feed – peripheral draw – spiral collector	Center feed – peripheral draw – spiral collector
Diameter (feet)	102	102	110
Side water depth (feet)	14	14	14
Total surface area	24,500	32,700	38,000
Total peak surface overflow rate (gpd/ft^2)	950	1,000	990
MBBR			
Number of units	4	8	10
Dimensions	46L x 25W x 18H	46L x 25W x 18H	46L x 25W x 18H
Total filter area (ft^2)	4,600	9,200	11,500
Media depth (ft)	18	18	18
Total media volume (gallons)	620,000	1,245,000	1,550,000
Hydraulic Loading			
Design month (N-1_ (gpm/ft^2)	2.0	1.5	1,4
Peak (N-1_ (gpm/ft^2)	4.7	2.8	2.5
Process air requirement (scfm)	3,300	6,200	7,500

6.1.1.4 CAS - MBBR

Major components of the CAS-MBBR process include aeration tanks, air supply and distribution, secondary clarification, and the MBBR process. The existing HPO tanks would be converted for use as aeration tanks; additional aeration tankage would be required, the volume driven by the flow and load scenario. The existing HPO generation system would be removed and replaced with blowers.

Table 6.4 presents a summary of key conceptual design criteria for an CAS-MBBR process for the three flow and load scenarios. These criteria were based on the following guidelines:

1. CAS
    - For activated sludge systems for carbonaceous BOD_5 removal only, loading rate, 75 to 150 lb. $cBOD_5$/1,000 ft^3 at peak loading conditions, 0.2 - 0.5 F:M, 1,000 - 3,000 MLSS.
    - Reactor >10 feet in depth up to 30-feet maximum.
    - Mechanical aeration provides a minimum of 2.0 lbs O_2/HP/hr.
    - For aeration mixing 0.5 HP/1,000 ft^3 of tank volume for mechanical mixing.

- 1.1 - 1.5 lbs. O_2/lb. of $cBOD_5$ removed for peak loading conditions, 4.6 lbs. of O_2/lb. of ammonia removed.
- Reactors sized to meet peak demand with largest unit out of service.
- RAS 15 - 100 percent of forward flow.
- Oxygen demands considering coldest winter and hottest summer conditions.

2. MBBR

- 1.7 - 6.0 kg $cBOD_5/m^3$-day based upon 60 percent fill fraction.
- 25 - 67 percent fill recommended.
- Course bubble aeration recommended.
- Removal flux 5 - 20 g/m^2-d
- For nitrification, loading rates <0.2 - 0.6 lb.$cBOD_5$/1000 ft^2 of media/day, ammonia loading 0.06 - 0.24 lbs. ammonia per 1,000 ft^2 of media.
- DO >2.0 - 6.0 mg/L.
- Screening <12 mm, scum removal.
- Approach velocity to sieves <1.9 ft/sec based on peak conditions; 1.1 ft/sec recommended.
- Confirm defoamer is compatible with media.
- Media bulk surface area typically 137 - 365 ft^2/ft^3.

Table 6.4 CAS – MBBR Design Summary

Parameter	Scenario 1	eScenario 2	Scenario 3
Additional Aeration Tankage			
Number of units	1	2	2
Dimensions (feet)	108L x 72W x 9H	108L x 72W x 9H	108L x 72W x 9H
Total volume (gallons)	520,000	1,050,000	1,050,000
Aeration system type	Diffused fine bubble	Diffused fine bubble	Diffused fine bubble
Convert Existing HPO to Aeration Tanks (Modified Existing)			
Number of units	2	2	2
Dimensions (feet)	108L x 72W x 9H	108L x 72W x 9H	108L x 72W x 9H
Total volume (gallons)	1,050,000	1,050,000	1,050,000
Total aeration volume (gallons)	1,570,000	2,100,000	2,100,000
HRT @ maximum month flow (hours)	3.8	2.9	2.1

Parameter	Scenario 1	eScenario 2	Scenario 3
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	89	78	98d
Design MLSS (mg/l)	<2500	<2500	<2500
Design SRT (days)	2	2	2
Aeration system type	Diffused fine bubble	Diffused fine bubble	Diffused fine bubble
Process Air Blowers			
Number of units	4	4	4
Blower type	Turbo blower	Turbo blower	Turbo blower
Blower capacity (scfm)	7,500	11,000	12,000
Secondary Clarification			
Number of units	3	4	4
Type	Circular	Circular	Circular
Mechanism	Center feed – peripheral draw – spiral collector	Center feed – peripheral draw – spiral collector	Center feed – peripheral draw – spiral collector
Diameter (feet)	102	102	110
Side water depth (feet)	14	14	14
Total surface area	24,500	32,700	38,000
Total peak surface overflow rate (gpd/ft^2)	950	1,000	990
MBBR			
Number of units	4	8	10
Dimensions	46L x 25W x 18H	46L x 25W x 18H	46L x 25W x 18H
Total filter area (ft^2)	4,600	9,200	11,500
Media depth (ft)	18	18	18
Total media volume (gallons)	620,000	1,245,000	1,550,000
Hydraulic Loading			
Design month (N-1_ (gpm/ft^2)	2.0	1.5	1.4
Peak (N-1_ (gpm/ft^2)	4.7	2.8	2.5
Process Air Requirement (scfm)	3,300	6,200	7,500

6.1.1.5 HPO – BAF

The HPO-BAF process includes aeration tanks, air supply and distribution, secondary clarification, and the BAF process. The existing HPO tanks would remain in service for $cBOD_5$ removal. No additional HPO process tankage would be required under Flow and Load Scenario 1. Additional HPO process tankage would be required under Flow and Load Scenarios 2 and 3. The existing HPO

generation system would be replaced. An intermediate pumping station would also be required to lift secondary clarifier effluent into the BAF.

Table 6.5 presents a summary of key conceptual design criteria for an HPO-BAF process for the three flow and load scenarios. These criteria were based on the following guidelines:

1. HPO
    - For activated sludge systems for carbonaceous BOD_5 removal only, loading rate, 80 – 200 lb. $cBOD_5$/1,000 ft^3 at peak loading conditions, 0.2 - 0.5 F:M, 1,000 - 3,000 MLSS.
    - Reactor >10 feet in depth up to 30-feet maximum.
    - For aeration mixing 20 - 30 scfm/ft^2 of reactor for coarse bubble, 0.12 scfm/ft^2 of reactor fine bubble, 0.5 HP/1,000 ft^3 of tank volume for mechanical mixing.
    - 1.1 - 1.5 lbs. O_2/lb. of BOD_5 removed for peak loading conditions, 4.6 lbs, of O_2/lb. of ammonia removed.
    - Reactors sized to meet peak demand with largest unit out of service.
    - RAS 15 - 100 percent of forward flow.
    - Oxygen demands considering coldest winter and hottest summer conditions.
2. BAF
    - Loading rate shall be no greater than 5.0 gpm/ft^2.d
    - Provide full capacity at peak flow with one unit out of service and one unit backwashing.
    - Media provides a minimum bulk surface area of 70 – 500 ft^2/ft^3.
    - Fine screening recommended.
    - For nitrification influent $cBOD_5$ less than 62 - 125 lbs. of $cBOD_5$/1,000 ft^3/day of media, ammonia loading rates of 62 - 100 lbs. ammonia/1,000 ft^3/day, TSS <100 lbs. TSS/1,000 ft^3/day of media.

Table 6.5 HPO - BAF Design Summary

Parameter	Scenario 1	Scenario 2	Scenario 3
Additional HPO Process Tankage			
Number of units	NA	1	1
Dimensions (feet)	NA	108L X 72W X 9H	108L X 72W X 9H
Total volume (gallons)	NA	520,000	520,000
Aeration system type	NA	HPO-surface aeration	HPO-surface aeration

Parameter	Scenario 1	Scenario 2	Scenario 3
Re-use HPO Process Tanks (Modified Existing)			
Number of units	2	2	2
Dimensions (feet)	108L x 72W x 9H	108L x 72W x 9H	108L x 72W x 9H
Total volume (gallons)	1,050,000	1,050,000	1,050,000
Total aeration volume (gallons)	1,050,000	1,570,000	1,570,000
HRT @ maximum month flow (hours)	2.5	2.2	1.8
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	110	85	105
Design MLSS (mg/l)	<2,500	<2,500	<2,500
Aeration system type	HPO-surface aeration	HPO-surface aeration	HPO-surface aeration
High Purity Oxygen System			
Number of units	2 (minimum)	2 (minimum)	2 (minimum)
Type	Vacuum-pressure swing adsorption	Vacuum-pressure swing adsorption	Vacuum-pressure swing adsorption
Capacity (tpd)	7.5	10	10
Liquid storage capacity (gallons)	11,000	11,000	11,000
Secondary Clarification			
Number of units	3	4	4
Type	Circular	Circular	Circular
Mechanism	Center feed – peripheral draw – spiral collector	Center feed – peripheral draw – spiral collector	Center feed – peripheral draw – spiral collector
Diameter (feet)	102	102	110
Side water depth (feet)	14	14	14
Total surface area	24,500	32,700	38,000
Total peak surface overflow rate (gpd/ft^2)	950	1,000	990
Biological Aerated Filter			
Number of cells	6	8	10
Cell size (ft^2)	940	940	940
Total filter area (ft^2)	5,640	9,400	9,400
Media size (mm)	3.6	3.6	3.6
Media depth (ft)	9.8	11.5	11.5
Total media volume (ft^3)	55,300	86,500	108,100
Hydraulic Loading			
Design month (N-1_ (gpm/ft^2)	1.4	1.8	1.9

Parameter	Scenario 1	Scenario 2	Scenario 3
Peak (N-1_ (gpm/ft^2)	3.4	3.4	3.1
Mudwell working volume (gallons)	1.03	1.7	2.02
Daily backwash volume (mgd)	3,200	4,400	5,300
Peak air demand (scfm)	1.4	1.8	1.9

6.1.1.6 Filtration and Disinfection

Effluent filtration would be required under Flow/Load Scenarios 2 and 3 following the two-stage treatment processes due to the very low $cBOD_5$ and TKN effluent concentrations projected at the higher flow rates. Additional filtration would not be required for the MBR alternative, as the membranes serve as filters. Disc filters were selected for this application because they are generally cost effective, easy to operate, relatively compact, and have a proven track record of performance in polishing applications. Table 6.6 presents a summary of key conceptual design criteria for the disc filters; these criteria were based on the following guidelines:

1. <6.5 gpm/ft^2 loading rate on filter surface area.
2. In cold climates, provide a heated enclosure around units.
3. Provide full capacity at peak flow with one unit out of service and one backwashing.

Table 6.6 Effluent FIltration

Parameter	Scenario 1	Scenario 2	Scenario 3
Disc Filtration			
Number of units	NA	4	5
Disc diameter (m)	NA	2.2	2.2
Filter area (ft^3)	NA	2,388	2,786
Peak hydraulic loading rate (gpm/ft^2)	NA	3.58	3.61

Under Flow/Load Scenario 1, the existing WWTP chlorination process has sufficient capacity to meet design requirements. Under Flow/Load Scenarios 2 and 3, the existing chlorine would need to be extended to provide a 15-minute chlorine contact time at peak flow. A summary of chlorine contact tank sizing is provided in Table 6.7. The existing dechlorination facilities would have sufficient capacity under all three flow/load scenarios.

Table 6.7 Effluent Disinfection

Parameter	Scenario 1	Scenario 2	Scenario 3
Type	Chlorine contact tanks	Chlorine contact tanks	Chlorine contact tanks
Chemical type	Liquid sodium hypochlorite	Liquid sodium hypochlorite	Liquid sodium hypochlorite
Total number of units	2	2	2
Width (each)	25 feet	25 feet	25 feet
Length (each)	83 feet	100 feet	125 feet
Side water depth (each)	10 feet	10 feet	10 feet
Total volume	310,000 gallons	375,000 gallons	475,000 gallons

6.2 Wastewater Treatment Process Alternatives Modeling

Process models were developed using BioWin® Version 6.1 (Envirosim) to evaluate and compare the selected alternatives under the three projected flow and loading scenarios. BioWin is a wastewater treatment process simulator that ties together biological, chemical, and physical process models and serves as a tool for designing, upgrading, and optimizing wastewater treatment plants. The model is a well-established, kinetic model based on International Water Association activated sludge models. It is capable of modeling the processes responsible for biological carbon, phosphorus, and nitrogen removal, including activated sludge and fixed-film processes. It also has the ability to simulate the chemical reactions associated with phosphorus removal by precipitation with aluminum or iron salts.

Developing a process-specific model requires an understanding of the various carbon, nitrogen, and phosphorus fractions in the influent wastewater, typically gained by a specialized sampling program. No special sampling program was conducted for this project. Instead, historical plant data were used in conjunction with information provided by the plant operations staff. For the purposes of this report, all modeling was performed using the steady-state conditions.

The key process alternatives evaluated using BioWin modeling are summarized in Table 6.8.

Table 6.8 BioWin Model Runs

Flow and Load Scenario	Number of Model Runs			
		Alternative 1	Alternatives 2/4	Alternatives 3/5
	Existing HPO	MBR	CAS -BAF/MBBR	MBR
1	1	1	1	1
2		1	1	1
3		1	1	1
Total Runs	**10**			

Key assumptions used for developing and running the simulations included the following:

1. A model was developed for the existing plant and each flow and load scenario.
2. Secondary and tertiary reactor sizing was selected based on manufacturer proposals and typical loading rates from industry practice, Ten-States Standards, and TR-16.
    - Proposals were provided for Flow/Load Scenarios 1 and 3 for MBR, BAF, MBBR, and those reactor sizes and depths were input into the model.
    - Flow/Load Scenario 1 – Used existing HPO tank size. Conventional tanks increased by 50 percent from existing HPO volume.
    - Flow/Load Scenario 3 – HPO tanks increased by 50 percent. Conventional tanks increased by 100 percent from existing HPO volume.
    - Flow/Load Scenario 2 – All tank sizes estimated based on reduction in load compared to Scenario 3.
3. Ideal clarifier used to model secondary clarification.
4. Point clarifier used to model tertiary filters.
5. Submerged aerated filter unit followed by point clarifier used to model BAF.
6. Media bioreactor unit used to model MBBR.
7. Membrane bioreactor unit used to model MBR.
8. Influent load inputs summarized in Table 6.9, from developmental analysis (Appendix B) for each of the three scenarios. Default wastewater fractions used unless available influent data indicated a different value should be used (per built in specifier).
9. Alum added for phosphorus removal

Model simulations were completed for all five alternatives under Flow/Load Scenarios 1, 2 and 3. The objective of the modeling was to determine the design criteria (e.g., process tank volumes, SRT, MLSS, etc.) that will meet the treatment objectives for compliant WWTP operation. These treatment objectives included the following:

1. Meet the projected effluent limits for each respective flow/load scenario. Key target concentrations were:
    - TP = 0.75 mg/L under all scenarios
    - Effluent TKN
        - Flow/Load Scenario 1 <3.5 mg/L
        - Flow/Load Scenario 2 <2.5 mg/L
        - Flow/Load Scenario 3 <2.0 mg/L
    - Effluent $cBOD_5$
        - Flow/Load Scenario 1 <25 mg/L

- Flow/Load Scenario 2 <15 mg/L
- Flow/Load Scenario 3 <10 mg/L

- Effluent TSS <15 mg/L

2. Recycle ratios selected based on typical ranges from industry practice.
3. SRT in conventional and HPO secondary treatment kept at two days to limit nitrification in this stage.
4. Thickened (gravity thickener for primary and mechanical thickener for secondary) and dewatering (using a belt filter press) solids concentration targets were chosen based on typical ranges based on industry practice:
   - Primary thickened concentration targeted at 6 percent dry solids
   - Secondary thickened concentration targeted at 4 percent dry solids
   - Dewatered sludge concentration targeted at 22 to 23 percent dry solids
5. Primary digesters sized based on minimum HRT of 15 days and maximum VSS loading of approximately 120 lbs VSS/103 ft^3 day. There will be two primary digesters and one secondary digester (all equally sized). Primary digester is mesophilic (35°C). The secondary digester is unheated.

Process models were developed using BioWin® Version 6.1 (Envirosim) to evaluate and compare the selected alternatives under the three projected flow and load scenarios. Resulting design criteria from the BioWin simulations that met the target objectives are summarized in Table 6.9. These results include total aeration volume, SRT, and MLSS are shown in the table for each alternative and flow and load scenario. Estimated total digester volumes, primary digester volatile suspended solids (VSS) loading (lb VSS/10^3 ft^3-day), and HRT are also summarized. A detailed BioWin results summary is attached as Appendix F. Model results are presented in Appendix G.

6.3 Oak Orchard WWTP Wastewater Treatment Process Conceptual Design Summaries

As shown in Table 6.8, the exiting WWTP configuration was simulated under Flow/Load Scenario 1 to evaluate anticipated plant performance under the 20-year projected residential and commercial development. The model was run at four days SRT with a target MLSS of less than 4,000 mg/L. The model indicated that under Flow/Load Scenario 1, the existing plant is not capable of achieving significant nitrification. Model effluent TKN and ammonia concentrations were 17 and 14 mg N/L, respectively, under maximum month conditions. The effluent $cBOD_5$ concentration was approximately 9 mg/L. Further, the secondary clarifiers operate at reduced effectiveness at higher plant flows, resulting in solids washout; this effectiveness will continue to decline as plant flows increase. Therefore, the existing plant will require upgrades to meet projected residential and commercial growth over the next 20 years.

The modeling results were incorporated into the review of existing processes to develop conceptual design layouts and design criteria for the five alternatives under Flow/Load Scenarios 1, 2, and 3.

Table 6.9 BioWin Simulation Summary Table

Parameter		Units	Flow and Load Scenario 1			Flow and Load Scenario 2			Flow and Load Scenario 3		
			Alternatives 3/5	Alternatives 2/4	Alternative 1	Alternatives 3/5	Alternatives 2/4	Alternative 1	Alternatives 3/5	Alternatives 2/4	Alternative 1
			HPO-MBBR/BAF	CAS I-BAF/MBBR	MBR	HPO-MBBR/BAF	CAS -BAF/MBBR	MBR	HPO-MBBR/BAF	CAS -BAF/MBBR	MBR
Maximum month flow	Raw influent	mgd	10			10.3			11.1		
	Semiconductor	mgd	0			7			10		
Maximum month load	cBOD	lb/day	15,100			17,700			22,100		
	TKN	lb/day	2,000			4,100			5,100		
	TSS	lb/day	10,900			15,700			18,300		
Total aerobic volume		gallons	1,050,000	1,570,000	1,500,000	1,415,000	1,800,000	2,050,000	1,570,000	2,100,000	2,530,000
Target SRT		days	2	2	12	2	2	12	2	2	12
MLSS		mg/L	1,677	1,157	7,419	1,512	1,240	6,466	1,650	1,264	6,250
Aerobic HRT		hours	1.8	2.4	0.9	1.2	1.5	0.7	1.2	1.5	0.6
Primary digester volume		gallons	950,000	950,000	675,000	1,100,000	1,100,000	800,000	1,350,000	1,350,000	1,000,000
Secondary digester volume		gallons	475,000	475,000	337,500	550,000	550,000	400,000	675,000	675,000	500,000
Primary digester HRT		days	21.5	20	20.2	21	21.4	20.2	21.1	21.5	20.7
Primary digester VSS loading		lbs VSS/10^3 ft^3-day	119	119	121	118	117	122	119	117	121

These alternatives are summarized in the following sections. Section 6.4 summarizes the conceptual biosolids handling upgrades associated with the alternatives.

6.3.1 Alternative 1 - Membrane Bioreactor

An MBR process is an integrated activated sludge treatment process where the solids separation step, typically performed by settling in the secondary clarifiers, is replaced with membrane filtration. Figure 6.1 presents the BioWin modeling schematic of Alternative 1. Figures 6.2 and 6.3 present the site plan of this alternative under Flow/Load Scenario 1 and Flow/Load Scenarios 2 and 3, respectively. The basis of design for Alternative 1 is included as Appendix E.

For this alternative, the existing HPO aeration tanks would be converted into conventional aeration tanks, achieved by replacing the existing surface aerators with new hyperbolic mixers that include integrated aeration diffuser rings, and removing sections of the existing concrete tank covers. Hyperbolic mixers were selected for further consideration as they are an energy efficient option that works well in shallow tanks to decouple aeration from mixing when using air to promote mixing is expected to be inefficient.

New, deeper bioreactors would be constructed upstream of the converted HPO tanks to provide the additional aeration tank volume needed for the MBR process. New membrane tanks would be constructed downstream of the existing HPO process.

A new MBR Building would be constructed to house the membrane tank blowers, permeate pumps, RAS pumps, chemical storage tanks, and electrical and process control components. A fine screen building would be constructed upstream of the aeration tanks to provide the pretreatment necessary to protect the membranes. The existing HPO generation equipment in the Oxygen Generation Building would be replaced with new blowers to provide process air for the fine bubble diffusers in the aeration tanks.

Some of the advantages and disadvantages of Alternative 1 include:

Advantages:

- Superior effluent quality compared to other technologies; does not need effluent filtration and is easier to disinfect
- Elimination of secondary clarifiers and challenges with poor solids settleability
- Compact process with low footprint requirements
- Simple, automated process operation
- Long solids retention time provides better ability to remove slowly biodegradable industrial compounds, such as TMAH, and produces a more stable sludge that is easier to dewater.

Disadvantages:

- More instrumentation to calibrate and maintain
- Fine screening required upstream of the membranes

- Membranes require periodic recovery cleaning two to four times per year
- Membranes require replacement every 10 to 12 years
- Greater electricity use than other alternatives
- Operator unfamiliarity

6.3.2 Alternative 2 - Conventional Activated Sludge and Biologically Aerated Filter, and Filtration

CAS (for $cBOD_5$ removal) followed by BAF (for ammonia removal) would be configured in series. For the $cBOD_5$ removal stage, conventional activated sludge aeration tanks would be followed by secondary clarification. Effluent from the secondary clarification process would be treated by the BAF system to provide ammonia removal, as well as additional solids reduction. Figure 6.4 presents the BioWin modeling schematic of Alternative 2. Figures 6.5 and 6.6 present the site plan of this alternative under Flow/Load Scenario 1 and Flow/Load Scenarios 2 and 3, respectively. The basis of design for Alternative 2 is included as Appendix E.

The biological treatment process for the existing plant would be converted from HPO to a fine bubble diffused aeration process. The concrete tank covers over the HPO aeration tanks would be removed along with the mechanical aerators and new fine bubble diffusers would be installed. New turbo blowers would be installed in the Oxygen Generation Building to replace the existing HPO generation equipment. New process air piping would be required to transport air to the modified aeration tanks.

Under all three flow and load scenarios, new conventional treatment trains would be constructed in addition to the existing aeration volume to accommodate the increased flow and loads. Secondary clarifier effluent would flow into a pump station, which would lift the wastewater up into the BAF system for ammonia removal. Under Flow/Load Scenarios 2 and 3, disc filters would be installed following the BAF for additional TSS removal to achieve the required level of treatment anticipated from the projected future effluent limits.

Some of the advantages and disadvantages of Alternative 2 include:

Advantages:

- OCDWEP's experience with conventional treatment and BAF
- Two-stage biological treatment system may help protect nitrifier population in the BAF from inhibitory compounds in the primary effluent
- BAF has relatively small space requirements
- BAF operation is fully automated

Disadvantages:

- Operational complexity – two separate biological treatment systems plus effluent filters
- Conventional activated sludge process and secondary clarifiers have high footprint requirements

- Potential for TMAH pass through of treatment plant
- May be challenging to operate conventional activated sludge process to avoid nitrification in the summer
- More instrumentation to calibrate and maintain

6.3.3 Alternative 3 - High Purity Oxygen Activated Sludge, Moving Bed Biofilm Reactor, and Filtration

Under Alternative 3, HPO would be used for $cBOD_5$ removal and MBBR would treat ammonia. Figure 6.7 presents the BioWin modeling schematic of Alternative 3. Figures 6.8 and 6.9 present the site plan of this alternative under Flow/Load Scenario 1 and Flow/Load Scenarios 2 and 3, respectively. The basis of design for Alternative 3 is included as Appendix E.

The existing HPO facilities would be rehabilitated under this alternative, including replacing the existing mechanical aerators, completing concrete repairs in the HPO process tankage, and installing new HPO generation equipment. Under Flow and Load Scenario 1, the existing HPO tanks would continue to be used with no additional reactor volume required. Under Flow and Load Scenarios 2 and 3, additional HPO treatment trains would be constructed. Similar to the conventional activated sludge-BAF alternative, the tertiary MBBR system would be employed to provide nitrification of the secondary clarifier effluent from the HPO treatment train. Secondary clarifier effluent would flow by gravity through the MBBR process. Disc filters would be installed following the MBBR for TSS removal.

Some advantages and disadvantages of Alternative 3 include:

Advantages:

- Operator familiarity
- HPO has higher loading capability than conventional activated sludge process so requires less aeration tank volume
- Two-stage biological treatment system may help protect nitrifier population in the MBBR from inhibitory compounds in the primary effluent
- Flow entirely by gravity; no intermediate pumping required

Disadvantages:

- Operational complexity – two separate biological treatment systems plus effluent filtration
- HPO system requires specialized maintenance, high energy usage
- Potential for TMAH pass through of treatment plant
- Media and screens in MBBR tanks complicate tank cleaning and maintenance

6.3.4 Alternative 4 - Conventional Activated Sludge, Moving Bed Biofilm Reactor, and Filtration

Alternative 4 is comprised of conventional activated sludge for $cBOD_5$ removal followed by MBBR for nitrification. Figure 6.10 presents the BioWin modeling schematic of Alternative 4. Figures 6.11 and 6.12 present the site plan of this alternative under Flow/Load Scenario 1 and Flow/Load Scenarios 2 and 3, respectively. The basis of design for Alternative 4 is included as Appendix E. Similar to Alternative 2, under all three flow and load scenarios, new conventional treatment trains would be constructed to accommodate the increased flow and loads in addition to converting the existing HPO process tanks to conventional aeration tanks. The concrete tank covers over the HPO aeration tanks would be removed along with the mechanical aerators and new fine bubble diffusers would be installed. New turbo blowers would be installed in the Oxygen Generation Building to replace the existing HPO generation equipment. New process air piping would be required to transport air to the modified aeration tanks. Disc filters would be installed following the MBR for TSS removal.

Some of the advantages and disadvantages of Alternative 4 include:

Advantages:

- Two-stage biological treatment system may help protect nitrifier population in the MBBR from inhibitory compounds in the primary effluent
- Flow entirely by gravity; no intermediate pumping required
- Less complex control and instrumentation

Disadvantages:

- Operational complexity – two separate biological treatment systems plus effluent filters
- Conventional activated sludge process and secondary clarifiers have large footprint requirements
- Potential for TMAH pass through of treatment plant
- May be challenging to operate conventional activated sludge process to avoid nitrification in the summer, which would impact effective operation of the MBBR.
- Media and screens in MBBR tanks complicate tank cleaning and maintenance

6.3.5 Alternative 5 - High Purity Oxygen and Biologically Aerated Filter, and Filtration

Alternative 5 consists of HPO for $cBOD_5$ removal followed by BAF for nitrification. Figure 6.13 presents the BioWin modeling schematic of Alternative 5. Figures 6.14 and 6.15 present the site plan of this alternative under Flow/Load Scenario 1 and Flow/Load Scenarios 2 and 3, respectively. The basis of design for Alternative 5 is included as Appendix E.

Similar to Alternative 3, under Flow and Load Scenario 1, the existing HPO tanks would continue to be used with no additional reactor volume required. Under Flow and Load Scenarios 2 and 3, additional HPO treatment trains would be constructed to accommodate the increased flow and

loads. The existing HPO facilities would be rehabilitated under this alternative, including replacing the existing mechanical aerators, completing concrete repairs in the HPO process tankage, and installing new HPO generation equipment. Secondary clarifier effluent would flow into a pump station which would lift the wastewater up into the BAF system for ammonia removal. Under Flow/Load Scenarios 2 and 3, disc filters would be installed following the BAF for additional TSS removal to achieve the required level of treatment anticipated from the projected future effluent limits

Some advantages and disadvantages of Alternative 5 include:

Advantages:

- Operator familiarity
- HPO has higher loading capability than conventional activated sludge process so requires less aeration tank volume
- Two-stage biological treatment system may help protect nitrifier population in the BAF from inhibitory compounds in the primary effluent

Disadvantages:

- Operational complexity – two separate biological treatment systems plus effluent filtration
- HPO system requires specialized maintenance, high energy costs
- Potential for TMAH pass through of treatment plant
- More instrumentation to calibrate and maintain

6.4 Biosolids Treatment and Disposal

As this facility planning effort proceeded, it was decided that stand-alone solids handling facilities should be incorporated under all flow and loading scenarios. This would replace the current practice of transporting thickened sludge to the Metro WWTP. The existing sludge thickeners would be rehabilitated and incorporated into the new solid handling process. New solids treatment facilities would include a conventional anaerobic digestion system with thickening, dewatering, and biogas reuse.

Under a new solids handling approach, primary sludge would be pumped to the refurbished existing gravity sludge thickeners for thickening (up to approximately 6 percent solids). From there, the thickened primary sludge would be is pumped to two new 30,000-gallon blend tanks adjacent to the new digesters. WAS generated by the biological treatment process would be is pumped to new rotary drum thickeners located in the digester complex for thickening (up to approximately 4 percent solids). Thickened WAS would then be pumped to the blend tank and mixed with thickened primary sludge. The blended solids would be pumped to one of three new digesters.

There would be two primary digesters and one secondary digester (all equally sized). The primary digesters would be mesophilic (operated at 35°C); the secondary digester would be unheated. The primary digesters were sized based on minimum HRT of 15 days and maximum VSS loading of approximately 120 lbs VSS/103 ft^3-day. The digesters would be sized to include 33 percent

additional volume to provide for reserve digestion capacity to accommodate outside sludge brought to the site for treatment. For the purposes of this facility plan, the digester tanks are conservatively sized. For example, it is anticipated that an MBR process would generate less sludge than the two-stage process alternatives. Therefore, the sizing of equipment should be fine-tuned during implementation of the recommended alternative.

A summary of anaerobic digestion conceptual design criteria is summarized on Table 6.10.

Table 6.10 Anaerobic Digestion

Parameter	Scenario 1	Scenario 2	Scenario 3
Quantity	3 (2 primary, 1 secondary)	3 (2 primary, 1 secondary)	3 (2 primary, 1 secondary)
Total primary digester volume (gallons)	1,260,000	1,460,000	1,800,000
Total secondary digester volume (gallons)	630,000	730,000	900,000
SRT (days)	21	21	21
VSS loading (lbs VSS/1,000 ft^3-day)	120	120	120

The central digester complex is projected to be a two-story building, plus a basement, with an approximate footprint of 60 feet by 55 feet. The digester feed and sludge transfer pumps would be located at the basement level, while heat exchangers, boilers, and thickened WAS pumps would be located on the main floor. The rotary drum thickeners and polymer equipment would be located on the upper floor.

Following digestion, the digested sludge from the secondary digester tank would be pumped to belt filter press (BFP) units for dewatering, located in an adjacent Solids Processing Building. Dewatering using BFPs was assumed to establish a conservative sludge processing building size. Alternative dewatering processes should be evaluated during implementation. Under all three flow and load scenarios, two 2.0-m BFPs will be required to dewater digested solids. This assumes operating 5 days per week for 10 hours per day at a typical hydraulic loading rate of 500 to 1,000 lbs per meter per hour (lbs/m-hr).

The Solids Processing Building is anticipated to be a two-story building with an approximate footprint of 64 feet by 75 feet, housing dewatering and conveyance equipment. Two belt filter presses and a shafted screw conveyor would be located on the second floor, while the washwater booster pumps, polymer feed equipment and tanks would be located at the ground floor. Once dewatered, the sludge cake would be conveyed to a hopper to be hauled away for disposal.

The Gas Conditioning and Co-Gen Building is anticipated to be a detached single-story building with a footprint of 50 feet by 60 feet containing gas treatment equipment, engine generators, and an electrical room. The system configuration is based on beneficial reuse of the biogas generated from the anaerobic digestion process and is anticipated to be used for cogeneration of electricity and

heat. The heat generated would be used to maintain temperature in the digesters, and where possible, provide some building heat. The electricity would be used to offset on-site usage at the facility.

7. Facility Infrastructure Needs to Support a Plant Upgrade

In addition to the treatment processes needed to meet the requirements of the three flow and load scenarios and provide upgrade biosolids handling, infrastructure improvements that would be needed to support an overall plant upgrade were identified. The cost of these infrastructure needs was considered in the conceptual cost estimate presented in Section 8. It is noteworthy that additional specific infrastructure needs are likely to be identified if the upgrades proceed towards detailed design.

7.1 Electrical Systems

Most of the electrical systems at the Oak Orchard WWTP were installed around 1980 and have been in service for about 40 years. Time and the corrosive atmosphere typically present at wastewater facilities are beginning to take its toll on the plant's electrical system. As part of the facility planning effort, Jade Stone Engineering (JSE) conducted a site visit and review of existing plant drawings to identify conceptual-level improvements to the electrical service, distribution equipment, and standby power systems that would be part of a larger plant upgrade.

7.1.1 Electrical Service

The Oak Orchard WWTP is served by an underground 13,200 volt (medium voltage), three phase electrical service. The electrical service originates from an overhead transmission line (National Grid owned) that runs along the access drive to the site. There are two separate utility drops to the WWTP, each consisting of a utility riser pole with associated conduit riser on the pole, which allows the 13,200 volt service to transition underground to exterior pad-mounted primary switchgear. There are two separate pieces of primary switchgear (one for each utility drop). Each utility drop and associated primary switchgear has the capability to power the entire WWTP. Typically, the WWTP operates using only one of the utility drops and associated primary switchgear. The remaining utility drop and associated primary switchgear serves as a backup and provides a degree of redundancy. However, the second utility drop is on the same grid as the primary drop. Therefore, if the grid loses power, both services could lose power.

Each piece of pad-mounted switchgear contains a series of fused switches and a substation transformer. One switch serves as the main service disconnect and the others are feeder switches to serve various unit substations on site. It is noteworthy that the utility-owned metering equipment is located within the exterior pad-mounted primary switchgear so that it is accessible to the utility company on an as-needed basis. Once through the primary switchgear, power is distributed around the site to various unit substations (i.e., Oxygen Building unit substation and Grit Building unit substation).

A preliminary electrical service demand calculation was developed to estimate existing demand/loading scenarios and potential spare capacity under a plant upgrade. The demand loading for the WWTP was analyzed using two different methods. The first method involved reviewing

existing record drawings and inventorying existing electrical loads. These loads were grouped per motor control center or power distribution panel and implemented into a calculation table. Results of this method indicate a demand of approximately 2,590 kilowatts (kW). Using this method, it would appear the WWTP has already exceeded its current capacity.

The second method to analyze the existing electrical service capacity utilized utility demand data over the course of the previous 12-month time-period (September 2019 through September 2020). Results of previous utility data review showed that the peak demand over the range of dates was 640 kW (built-in 1.25 percent safety factor). Under this method, it would appear the WWTP electrical service is experiencing a lower loading.

There are multiple factors that account for the difference between the two methods. The first is that the service demand calculation assumes a worst-case operating scenario; thus, this calculation assumes that all processes/motors that can be physically operated are running at the same time and at 100 percent capacity. This scenario would also account for these processes all running at the same time as the HVAC systems in the middle of the winter. In reviewing the utility data, it appears the above scenario has never come to fruition (or at least during the period in which utility data was reviewed). For example, it is likely , that only one of the 150-HP compressors operates at any given time, or when multiple compressors do run together, it is at a reduced load (not 100 percent). It is also likely there are existing equipment/processes on site that are no longer used or abandoned. This contributes to the WWTP experiencing a much lower demand (indicated by utility bills) than depicted within the formal service calculation.

If OCDWEP proceeds with a plant upgrade, it is recommended to further evaluate the main incoming service gear/capacity. Based on a preliminary review and calculations, it would appear there is limited spare electrical capacity. Under a minor improvements project (Flow/Load Scenario 1) in which minimal electrical load is added (less than 250 total HP), the existing primary switchgear and service appear to be sufficient to handle the new loads. In a scenario where a major improvement project takes place (Flow/Load Scenarios 2 and 3) and substantial electrical load is added, it is likely the WWTP would require a complete electrical overhaul of the main switchgear, unit substations, and associated service entrance equipment. These items would require replacement with modern gear, sized to sufficiently provide power to all proposed improvements.

7.1.2 Electrical Distribution Equipment

As indicated in Section 7.1.1, the primary pad-mounted switchgear units contain feeder switches. A circuit originates from these switches and is routed to each unit substation. The unit substations contain a primary selector switch or series of circuit breakers that allows the facility to operate using either of the above-mentioned two utility drops.

The electrical distribution system is made up of the primary switchgear, two unit substations, motor control centers, transformers, and panelboards across the site. The distribution equipment is of various sizes, ratings, and manufacture. Most equipment has been manufactured by Square D. It was observed that most distribution equipment appears original to the facility installed within. Original construction is from 1980. The overcurrent protective devices (circuit breakers and fuses) within the distribution equipment are outdated, and thus have slow clearing/trip times in the event of

a fault/problem (in comparison to modern equipment). As a result of slow clearing/trip times, the equipment has the potential to build energy and cause a significant arc flash event, which can be extremely dangerous.

Equipment that dates to 1980 has either reached the end of its useful life and is now considered obsolete or is fast approaching the end of its useful life. The typical useful life of distribution equipment installed at the WWTP is in the 30- to 40-year range. With replacement parts for the existing distribution equipment becoming increasingly difficult to locate, facility downtime could become a significant factor in the event of an equipment failure. This is of most concern regarding the primary switchgear, unit substations, and motor control centers. An additional observation regarding the distribution equipment was that the panelboards and motor control centers were primarily full of branch breakers and buckets with little to no space for future additions.

In the event of a major improvements project (Flow/Load Scenarios 2 and 3), all the distribution equipment should be considered for replacement. The existing switchgear also has little to no space for future additions to distribution equipment. The switchgear would have to be significantly modified to provide power to proposed improvements. As part of these replacements, the existing overcurrent protective devices (circuit breakers and fuses) would be replaced with new equipment.

7.1.3 Standby Power System

The WWTP has a single emergency generator system (EGS). The EGS is natural gas fired, of minimal size (less than 30 kilowatts [kW]) and is manufactured by Generac. The EGS is housed within an outdoor enclosure adjacent/exterior to the Sludge Process Building. This generator provides emergency power to the WWTP SCADA/control systems only, and not provide emergency power to any critical WWTP equipment, motors, or processes. The engine generator system is currently the only means of emergency power at the WWTP.

It is recommended that an EGS be implemented to provide power to critical plant process loads. The EGS would be installed outdoors, in a weatherproof and sound-attenuated enclosure. By installing a generator outdoors, numerous HVAC requirements and monitoring requirements would be avoided. The EGS would be diesel fuel fired. As part of the EGS package, a load bank should be installed along with the generator system to test the EGS at or near full load conditions. The load bank would allow for improved longevity and avoid a “wet-stacking” condition. During design, a single engine generator versus multiple (parallel units or multiple for each unit substation) engine generator systems should be evaluated, as well as the connection point.

An new automatic transfer switch or transfer pair breaker scheme is recommended to provide complete system compatibility. The transfer scheme would be located at the beginning of the electrical distribution system. Note that with a transfer scheme located at the front end of the electrical distribution system, the EGS would have the capability to power any electrical load at the WWTP. This provides the WWTP staff flexibility when under emergency power situations. The critical loads would be staged into different steps to mitigate large in-rush currents.

7.2 Other Infrastructure Modifications

7.2.1 Plant Administrative Facilities

The plant Admiration Building underwent a major rehabilitation that was completed in 2018 involving a complete reconfiguration of the facility's administrative functions (offices, break room, lockers, stock room, façade, etc.) to contemporary design standards. These upgrades were designed to permit use of the facility for OCDWEP maintenance personnel assigned to northern Onondaga County facilities, and to handle additional staff. Therefore, it is anticipated that administrative function upgrades would not be required as part of a plant upgrade.

7.2.2 Plant Controls and SCADA System

A plant upgrade under any flow/load scenario would involve a significant increase in new control equipment. The control panel for the primary treatment area was upgraded in 2016. It is anticipated the control systems and instrumentation that are not impacted by the plant upgrade would also be replaced so the facility is operating under a common technology. This would facilitate operation and maintenance of the equipment. The extent of the improvements would also warrant replacement of the existing SCADA communications network to accommodate the new equipment.

7.2.3 HVAC Systems

The majority of the exiting plant heating, ventilation, and air conditioning (HVAC) system was rehabilitated in 2016. This included new, energy-efficient boilers and exhaust stacks, air handler systems, fans, heaters, and condensate piping and pumps. This equipment is specifically sized for the existing facilities and operation. The new facilities (e.g., equipment buildings, pump stations, galleries, etc.) are expected to have separate HVAC systems. It is recommended an evaluation be performed to determine whether a new steam-heat system should be provided for the new facilities versus stand-alone heating for each new structure.

7.2.4 Structural and Architectural Rehabilitation

The 2016 plant upgrade included rehabilitation of critical structural and architectural systems other than the Administration Building. Modifications to the existing HPO process tankage will include rehabilitation of structural defects. However, the existing structures continue to age, and it is recommended a structural and architectural assessment be performed to identify critical rehabilitation that could be performed during the upgrade

7.2.5 Plant Communication and Safety Systems

During the upgrade, it is anticipated the plant communication systems would be expanded. This would include telephone, surveillance, building access, fire detection, fire suppression (as required by code), internet, and PA systems.

7.2.6 Plant Utilities and Site Modifications

The plant upgrades would significantly change the site configuration. The new processes will require plant water, potable water, electricity, and storm and sanitary services. It is likely the existing potable and plant water loops will need to be substantially modified to accommodate new structures. In addition, the potable water service should be evaluated to verify that it would be sufficient to handle the additional processes. A photometric analysis is recommended followed by exterior lighting modifications to accommodate the new processes and site configuration.

The plant site plan will be reconfigured to accommodate new access roads and parking area modifications, as well as grading and stormwater handling. The removal of one lagoon and additional paved areas will increase the impervious surfaces at the site. The plant upgrade design will need to account for this loss as part of a Stormwater Pollution Prevention Plant. There may be opportunities to implement green technologies as part of the improvements to offset stormwater impacts.

8. Summary of Life Cycle Costs and Implementation Schedule

Two of the most important criteria used in evaluating the alternatives are life cycle cost and implementation schedule, which are detailed in the following sections.

8.1 Conceptual Life Cycle Cost Analysis

Conceptual capital and O&M cost estimates were developed for each alternative under the three flow and load scenarios to determine a 20-year present worth. The capital costs developed represent AACE Class 4 estimates. Class 4 estimates are considered preliminary and are prepared based on the project being between 1 and 15 percent developed. The estimates use factored costs obtained for larger equipment, unit costs, and other parametric methods. Class 4 estimates have an accuracy of -15 to -30 percent on the low range and +20 to +50 percent on the high range. These estimates include 25 percent contingency and 20 percent engineering/administration factors. For those major capital cost components where an equipment quotation was not obtained, costs were based on previous project experience and best engineering judgement.

For the O&M costs, values were developed for each treatment alternative, covering the range of Flow/Load Scenarios 1 through 3. Where possible, specific O&M cost information was obtained from the equipment manufacturers considered for the application. In addition, previous project experience was leveraged to determine a suitable estimate for each of the key items identified for the various treatment alternatives. The estimate of additional staffing needed for the three Flow and Load Scenarios was based on the *Northeast Guide for Estimating Staffing at Publicly and Privately Owned Wastewater Treatment Plants*, published by the New England Interstate Water Pollution Control Commission (2008) This document provides the estimated annual labor hours needed to operate and maintain various WWTP processes based on plant size and number of processes. The O&M costs developed are not all inclusive for the entire Oak Orchard WWTP, but are focused on major items and other differentiating system components among the treatment alternatives to allow for comparison and identification of the least cost alternative. Unit costs for utilities and consumables are based on information provided by OCDWEP.

Tables 8.1, 8.2, and 8.3 summarize the conceptual life-cycle cost comparison for the five alternatives under Flow/Load Scenarios 1, 2, and 3, respectively. Details of the conceptual capital and O&M cost estimates are presented in Appendix I.

8.2 Conceptual Implementation Schedule Summary and Identification of Constructability Challenges

Conceptual implementation schedules were developed for the alternatives for the three Flow and Load Scenarios. Because a start date for implementation is not currently known, the schedules were prepared based on the number of years and months, using January of Year 1 as the start date. The schedule includes major tasks required prior to construction notice to proceed, such as preparing the design request for proposals, design development, securing funding, the State Environmental

Table 8.1 Cost Comparison of Alternatives for Flow and Load Scenario 1

Description	Alternative				
	1 MBR	2 CAS/BAF	3 HPO/MBBR	4 CAS/MBBR	5 HPO/BAF
Preliminary Treatment	$250,000	$250,000	$250,000	$250,000	$250,000
Primary Treatment	$0	$0	$0	$0	$0
Secondary Treatment	$20,000,000	$11,075,000	$12,800,000	$11,075,000	$12,800,000
Tertiary Treatment	$0	$16,700,000	$8,780,000	$8,780,000	$16,700,000
Disinfection	$0	$0	$0	$0	$0
Solids Treatment and Processing	$22,200,000	$22,200,000	$22,200,000	$22,200,000	$22,200,000
Lagoon Fill (Reclamation)	$1,800,000	$1,400,000	$1,500,000	$1,400,000	$1,500,000
Subtotal Capital Costs	**$45,300,000**	**$52,400,000**	**$46,300,000**	**$44,500,000**	**$54,200,000**
Site work	$1,360,000	$1,570,000	$1,390,000	$1,330,000	$1,630,000
Electrical (1)	$7,290,000	$8,360,000	$7,450,000	$7,170,000	$8,630,000
Instrumentation	$4,530,000	$5,240,000	$4,630,000	$4,450,000	$5,420,000
HVAC	$2,260,000	$2,620,000	$2,320,000	$2,220,000	$2,710,000
Subtotal Capital Costs	**$60,700,000**	**$70,200,000**	**$62,100,000**	**$59,700,000**	**$72,600,000**
Mobilization, Bonding, Insurance (8%)	$4,860,000	$5,620,000	$4,970,000	$4,780,000	$5,810,000
Overhead & Profit (20%)	$12,140,000	$14,040,000	$12,420,000	$11,940,000	$14,520,000
Contingency (25%)	$15,180,000	$17,550,000	$15,530,000	$14,930,000	$18,150,000
Total Construction Costs	**$92,880,000**	**$107,400,000**	**$95,000,000**	**$91,350,000**	**$111,080,000**
Engineering/Legal/Administrative	$18,580,000	$21,500,000	$19,000,000	$18,300,000	$22,200,000
Total Design and Construction Services	**$111,000,000**	**$129,000,000**	**$114,000,000**	**$110,000,000**	**$133,000,000**
Inflation to Construction Midpoint (2023) (2)	$10,300,000	$11,900,000	$10,500,000	$10,100,000	$12,300,000
Total Capital Cost	**$121,000,000**	**$141,000,000**	**$125,000,000**	**$120,000,000**	**$145,000,000**
Annual O&M Cost (2020)	**$1,570,000**	**$1,290,000**	**$1,340,000**	**$1,300,000**	**$1,330,000**
20-Year Present-Worth Cost (2)	**$151,000,000**	**$166,000,000**	**$151,000,000**	**$145,000,000**	**$171,000,000**

(1) Electrical cost includes new standby power facilities.
(2) Based on a real discount rate of 0.3% per US Office of Management and Budget, Memo M-20-07.

Table 8.2 Cost Comparison of Alternatives for Flow and Load Scenario 2

Description	Alternative				
	1 MBR	2 CAS/BAF	3 HPO/MBBR	4 CAS/MBBR	5 HPO/BAF
Preliminary Treatment	$3,100,000	$3,100,000	$3,100,000	$3,100,000	$3,100,000
Primary Treatment	$2,070,000	$2,070,000	$2,070,000	$2,070,000	$2,070,000
Secondary Treatment	$24,150,000	$14,720,000	$18,570,000	$14,720,000	$19,510,000
Tertiary Treatment	$0	$25,380,000	$13,380,000	$13,380,000	$25,380,000
Disinfection	$1,810,000	$1,610,000	$1,610,000	$1,610,000	$1,610,000
Solids Treatment and Processing	$24,890,000	$24,890,000	$24,890,000	$24,890,000	$24,890,000
Lagoon Fill (Reclamation)	$1,800,000	$1,400,000	$1,500,000	$1,400,000	$1,500,000
Subtotal Capital Costs	**$57,820,000**	**$73,180,000**	**$65,130,000**	**$61,180,000**	**$78,070,000**
Site Work	$1,730,000	$2,200,000	$1,950,000	$1,840,000	$2,340,000
Electrical (1)	$10,170,000	$12,480,000	$11,270,000	$10,680,000	$13,210,000
Instrumentation	$5,780,000	$7,320,000	$6,510,000	$6,120,000	$7,810,000
HVAC	$2,890,000	$3,660,000	$3,260,000	$3,060,000	$3,900,000
Subtotal Capital Costs	**$78,400,000**	**$98,800,000**	**$88,100,000**	**$82,900,000**	**$105,300,000**
Mobilization, Bonding, Insurance (8%)	$6,280,000	$7,910,000	$7,050,000	$6,640,000	$8,430,000
Overhead & Profit (20%)	$15,680,000	$19,760,000	$17,620,000	$16,580,000	$21,060,000
Contingency (25%)	$19,600,000	$24,700,000	$22,030,000	$20,730,000	$26,330,000
Total Construction Costs	**$120,000,000**	**$151,200,000**	**$134,800,000**	**$126,900,000**	**$161,100,000**
Engineering/Legal/Administrative	$24,000,000	$30,200,000	$26,960,000	$25,370,000	$32,2200,000
Total Design and Construction Services	**$144,000,000**	**$181,000,000**	**$162,000,000**	**$152,000,000**	**$193,000,000**
Inflation to Construction Midpoint (2023) (2)	$13,000,000	$17,000,000	$15,000,000	$14,000,000	$18,000,000
Total Capital Cost	**$157,000,000**	**$198,000,000**	**$177,000,000**	**$166,000,000**	**$211,000,000**
Annual O&M Cost (2020)	**$3,850,000**	**$3,290,000**	**$3,380,000**	**$3,290,000**	**$3,390,000**
20-Year Present-Worth Cost (2)	**$232,000,000**	**$262,000,000**	**$243,000,000**	**$230,000,000**	**$277,000,000**

(1) Electrical cost includes new primary service and new standby power facilities.
(2) Based on annual inflation rate of 3%.

Table 8.3 Cost Comparison of Alternatives for Flow and Load Scenario 3

Description	Alternative				
	1 MBR	2 CAS/BAF	3 HPO/MBBR	4 CAS/MBBR	5 HPO/BAF
Preliminary Treatment	$3,100,000	$3,100,000	$3,100,000	$3,100,000	$3,100,000
Primary Treatment	$2,070,000	$2,070,000	$2,070,000	$2,070,000	$2,070,000
Secondary Treatment	$25,660,000	$16,060,000	$20,660,000	$16,060,000	$20,660,000
Tertiary Treatment	$0	$27,620,000	$15,350,000	$15,350,000	$27,620,000
Disinfection	$2,170,000	$1,970,000	$1,970,000	$1,970,000	$1,970,000
Solids Treatment and Processing	$26,040,000	$26,040,000	$26,040,000	$26,040,000	$26,040,000
Lagoon Fill (Reclamation)	$1,800,000	$1,400,000	$1,500,000	$1,400,000	$1,500,000
Subtotal Capital Costs	**$61,080,000**	**$78,470,000**	**$70,900,000**	**$66,200,000**	**$83,170,000**
Site Work	$1,830,000	$2,350,000	$2,130,000	$1,990,000	$2,500,000
Electrical (1)	$10,660,000	$13,270,000	$12,140,000	$11,430,000	$13,980,000
Instrumentation	$6,110,000	$7,850,000	$7,090,000	$6,620,000	$8,320,000
HVAC	$3,050,000	$3,920,000	$3,550,000	$3,310,000	$4,160,000
Subtotal Capital Costs	**$82,700,000**	**$105,900,000**	**$95,800,000**	**$89,600,000**	**$112,100,000**
Mobilization, Bonding, Insurance (8%)	$6,620,000	$8,480,000	$7,670,000	$7,170,000	$8,970,000
Overhead & Profit (20%)	$16,540,000	$21,180,000	$19,160,000	$17,920,000	$22,420,000
Contingency (25%)	$20,680,000	$26,480,000	$23,950,000	$22,400,000	$28,030,000
Total Construction Costs	**$126,500,000**	**$162,000,000**	**$146,600,000**	**$137,100,000**	**$171,500,000**
Engineering/Legal/Administrative	$25,300,000	$32,400,000	$29,300,000	$27,400,000	$34,300,000
Total Design and Construction Services	**$152,000,000**	**$194,000,000**	**$176,000,000**	**$165,000,000**	**$206,000,000**
Inflation to Construction Midpoint (2023) (2)	$14,000,000	$18,000,000	$16,000,000	$15,000,000	$19,000,000
Total Capital Cost	**$166,000,000**	**$212,000,000**	**$192,000,000**	**$180,000,000**	**$225,000,000**
Annual O&M Cost (2020)	**$4,580,000**	**$3,930,000**	**$4,030,000**	**$3,920,000**	**$4,050,000**
20-Year Present-Worth Cost (2)	**$255,000,000**	**$288,000,000**	**$270,000,000**	**$256,000,000**	**$304,000,000**

(1) Electrical cost includes new primary service and new standby power facilities.
(2) Based on annual inflation rate of 3%.

Quality Review (SEQR) process, regulatory review, and bid/award. Key assumptions made during schedule development included the following:

- Permits for construction would be in place by the time construction starts. Also, a full Environmental Impact Statement would not be required because the plant upgrade would be within existing property and generally within previously disturbed areas.
- Design of the improvements would require 18 months.
- Bid and award of construction would require 6 months.
- Construction funding would be pursued during design.
- New plant processes can be constructed concurrently to reduce construction schedule.
- Large equipment would require up to nine months to be ready from the time of initial submittal.
- The BAF and MBBR facilities are assumed to be constructed in about the same timeframe.
- Tanks, such as clarifiers, aeration tanks and digesters, require approximately 12 – 15 months to construct depending upon size and proximity to other construction.
- Multi-level structures (e.g., MBBR or BAF) require approximately 21 months to construct.
- Single-level structures (e.g., dewatering, disc filtration, headworks) would require approximately 12 to 15 months to construct.
- Once the new headworks is completed (Flow/Load Scenarios 2 and 3 only), plant influent flows would be redirected to the new headworks. Temporary bypass pumping would likely be required to interconnect new and existing facilities.
- Once the new train of primary and secondary treatment is completed, flows would be transferred to the new train to permit reconfiguration of the existing HPO tanks. An effluent pipe from the clarifiers to the disinfection facilities would be required; a junction chamber would be constructed to permit future connection to the ammonia treatment process. Temporary bypass pumping would likely be required to interconnect new and existing facilities.
- Ammonia treatment and solids handling start-up/commissioning would require four months.
- Lagoon 1 would require bypassing from the start of construction. Effluent water quality (TSS in particular) could be impacted until the new clarifiers are operating. A temporary SPDES Permit Variance would need to be requested from the NYSDEC.

8.2.1 Flow and Load Scenario 1

It is anticipated that Flow and Load Scenario 1 would be implemented under a design, bid, build approach, typical of most municipal projects in New York State. Figure 8.1 presents the conceptual

implementation schedule for Alternative 1 (MBR) under Flow/Load Scenario 1. The conceptual schedule for the two alternatives with CAS secondary treatment (Alternatives 2 and 4) is illustrated on Figure 8.2. The schedule for the two HPO alternatives (Nos. 3 and 5) are presented on Figure 8.3. Under all three alternatives, it is anticipated that three years will be required to retain the design engineer, secure funding, complete the design and award a construction contract. Alternative 1 construction is estimated to be complete within about three years (total project length six years), and have ammonia treatment available within two years of notice to proceed (NTP). Alternatives 2 through 5 would have construction completed in about 3.5 years (total project length 6.5 years) and ammonia treatment available approximately 2.5 years after NTP. The MBR can be constructed more quickly than the other alternatives because there are fewer structures to construct.

8.2.2 Flow and Load Scenarios 2 and 3

Two implementation approaches were evaluated under Flow/Load Scenarios 2 and 3. The first is the traditional design, bid build approach. The second, design-build, could be considered in the event that the a new industry requested to discharge to the Oak Orchard WWTP in a shorter time frame. The following figures represent Flow/Load Scenarios 2 and 3 under a design, bid build approach:

- Figure 8.4 – Alternative 1 (MBR)
- Figure 8.5 – CAS treatment (Alternatives 2 and 4)
- Figure 8.6 – HPO treatment (Alternatives 3 and 5)

Similar to Flow/Scenario 1, it is anticipated that three years will be required to retain the design engineer, secure funding, complete the design and award a construction contract. Alternative 1 construction is estimated to be complete within about 3.5 years (total project length 6.5 years), and could start accepting high-tech industry (i.e., ammonia treatment available) within 2.5 years of Notice to Proceed (NTP). Alternatives 2 and 4 would have construction completed in about four years (total project length 7 years) and ammonia treatment available approximately 3.5 years after NTP. Alternatives 3 and 5 a slightly shorter timeline than Alternatives 2 and 4.

The following figures represent Flow/Load Scenarios 2 and 3 under a design - build approach:

- Figure 8.7 – Alternative 1 (MBR)
- Figure 8.8 – CAS treatment (Alternatives 2 and 4)
- Figure 8.9 – HPO treatment (Alternatives 3 and 5)

Under design-build, it is estimated that Alternative 1 would be completed in about 5.5 years and could start accepting high-tech industry in a little over 4.5 years. This represents a schedule savings up to 12 months, as compared to a design, bid, build approach. However, careful consideration is required before committing to a design-build approach. Close regulatory coordination is essential to allow the project to proceed within the intended schedule. Further, this would be, by far, the greatest value project that OCDWEP has undertaken using an alternative procurement process.

8.2.3 Potential Constructability and Schedule Risks

Implementing a plant upgrade of this magnitude will include many constructability and schedule risks. It is recommended that OCDWEP develop a risk register, which involves a thorough review of project risks during the preliminary design phase and establishing measures to effectively manage this risk. A risk register typically describes the risk, potential consequences, criticality of the risk, management approaches and responsibility. The risk register is updated at key design and construction milestones. Examples of risks that could be encountered include the following:

- Access to the plant. A large number of heavy trucks are needed for two to three years. It is recommended the bridge at plant entrance and Oak Orchard Road from Morgan Road to the plant be evaluated, as well as an alternate access plan developed. Determine whether rehabilitation is needed ahead of construction. At a minimum, rehabilitation would be required following construction. A plan should be in place to replace all plant access roads after construction.
- Evaluate lagoon bypass pipe capacity. Replace or install parallel pipe if additional capacity is required.
- American Iron & Steel Compliance/COVID – These two risks could result in project delay, particularly piping, valves, piles, rebar, framework steel, etc. Use of alternative materials should be considered.
- Contractor bonding capacity. If bid as a single project, local contractors may not be able to bid. If multiple bid packages are issued, coordination risk is increased and delays could result.
- Multiple large processes would need to be constructed concurrently. The design needs to account for providing sufficient working area and sequencing.
- The electrical utility process to obtain a new primary service can be lengthy and should be started during preliminary design to mitigate schedule impact. Existing overhead power lines would need relocation.
- Protection of existing structures during excavation and connecting existing structures would be critical to maintain operation of the existing facilities throughout construction. Demolition of the oxidized sludge tanks and construction adjacent to the existing HPO aeration tanks may require underpinning.
- Existing subsurface utilities would likely need to be relocated early in construction to maintain plant operation. Further, the extensive need for temporary connections (air piping, flow interconnections) needs to be incorporated into the design.
- Development of an access plan would be needed to enable chemical deliveries and sludge removal to continue during construction, as well as to provide access for O&M personnel.
- Bypass pumping and temporary power would be needed periodically to enable connection of new facilities to existing facilities to be completed.
- The existing Oxygen Generation Building would be reused. Sequencing and supplemental use of purchased oxygen would be needed to enable existing facilities to operate during construction.

- A portion of the proposed improvements lies within a NYSDEC Wetland Check Zone. A wetland delineation study will be required to verify locations. This could be performed as part of SEQR.
- A Historic Lands Survey in accordance with the State Historic Preservation Office (SHPO) would likely be required for previously undisturbed areas. A Joint Permit with the NYSDEC and United States Army Corps of Engineers may need to be obtained, as work in the lagoons could potentially impact an adjacent watercourse.

9. Recommended Plan and Next Steps

Based on the results and findings from the detailed evaluation of selected treatment alternatives, presented in Section 6, along with the conceptual capital and O&M costs and implementation schedules outlined in Section 8, a final assessment was performed to determine the final recommended treatment alternative for each flow and load scenario. Two sets of recommendations were developed: one for Flow/Load Scenario 1 and one for Flow/Load Scenarios 2 and 3. Under Scenario 1, where no wastewater contribution is planned from a high-technology industry, the flows, loads, and effluent limits would be less impactful than the other two scenarios. The flows and loads for Scenarios 2 and 3 were close enough that the evaluation criteria and results were similar, hence they have the same recommendations. Performance requirements for Scenario 1 are significantly different and less stringent than those anticipated under Scenarios 2 and 3, and thus the weighting factors were adjusted to account for these differences.

A final selection scoring matrix was developed to compare the five screened alternatives. This scoring matrix was similar to that employed to conduct the initial screening of candidate treatment alternatives, but focusing on the most essential and key evaluation criteria as determined by the project team (County and GHD team members) and using modified scoring. The scoring criteria included a blend of cost and non-cost factors, as follows:

1. Capital Cost – Total cost to implement project, including design and construction.
2. Operating Cost – Continuing cost of labor, maintenance, utilities, media, and chemicals necessary to operate the system.
3. Maintenance of Operations During Construction – Complexity of the sequencing of construction and ability to maintain plant operations and permit compliance during construction.
4. Implementation Schedule – Amount of time required to construct new processes to accept increased flows and loads.
5. Reliability of Effluent Performance – Ability to provide a consistent level of treatment that produces effluent that is reliably maintained at or below the permitted limits.
6. Future Compliance Flexibility – Ability to adapt process operations or upgrade/modify the treatment process to meet potential future permit limits.
7. Process Resiliency to Toxicity and Inhibition – Ability to handle toxic or inhibitory organic loading conditions caused by pollutants in the wastewater without significant impacts to the performance and capacity of the biological treatment processes.

The criteria defined above were scored between 1 and 10 points for each alternative, with a higher score representing a superiority for that category. A weighting factor was also assigned for each criterion, ranging from 1 to 3, to represent the importance of that criterion in the final alternative selection. As such, the weighting factors used to evaluate the treatment alternatives for Flow/Load Scenario 1 were different from those used to weigh and score the alternatives under Flow/Load Scenarios 2 and 3. The reason for applying different weighting values between the scenarios is

primarily due to the differences in plant flow and loading, projected effluent discharge limits, and the anticipated impact of the high-technology industrial wastewater on treatment plant operations and effluent performance.

Tables 9.1 and 9.2 present the scoring results from the completed final selection matrices for Flow/Load Scenario 1 and Flow/Load Scenarios 2 and 3, respectively.

9.1 Selection of Recommended Treatment Alternatives

9.1.1 Flow/Load Scenario 1 Recommendation

Under Scenario 1, there is modest growth projected for the organic loading to the Oak Orchard WWTP and a small projected increase in flows. All new flows and loads are projected to come from a mix of residential, commercial, and light industrial sources. Although plant flows and loading capacity would both increase, the plant hydraulic capacity would remain unchanged. To accommodate this scenario, all five alternatives would provide effective treatment to meet the needs of the facility. However, the treatment alternatives that appeared to be the best for the application, based on the final scoring matrix, were as follows:

- Alternative 3 – HPO and MBBR with Cloth Media Filtration
- Alternative 4 – CAS and MBBR with Cloth Media Filtration

These two alternatives scored closely together in the matrix and are similar in their application: using an activated sludge process for $cBOD_5$ removal, followed by a fixed film treatment process (MBBR) to provide the required nitrification. Alternatives 3 and 4 would provide increased treatment capability with respect to the existing facility because of the addition of the fixed-film media system to support additional microbial population for aerobic polishing followed by filtration that can provide a higher quality effluent. For the anticipated wastewater flow projected under Scenario 1 and the modest increase in loading to the facility, these treatment alternatives would meet the needs of the Oak Orchard WWTP for the 20-year planning horizon established for the facility.

Although Alternatives 3 and 4 scored closely, GHD recommends implementing Alternative 3 for Flow and Load Scenario 1 because the plant is already configured to secondary treatment using HPO. This alternative is cost effective as it utilizes existing infrastructure, minimizing space and capital in comparison to the other alternatives. MBBR technology is relatively simple to operate and would increase the current treatment capacity and ability to remove ammonia and TKN. Since this is not an existing treatment process at OCDWEP, implementation of this technology would require some familiarization for operators, but it does have similarities to the BAF technology used at several other OCDWEP treatment facilities. Key modifications for implementation of Alternative 3 include the following:

1. Major Treatment Modifications
    a. Rehabilitation of the existing aerated grit tanks, equipment and odor control covers.
    b. Rehabilitation of the existing HPO process tanks, including gates and mechanical mixers.

Table 9.1 Final Treatment Process Alternatives Selection Matrix - Flow/Load Scenario 1

Alternatives				Capital Cost	Operating Cost	Maintenance of Operations During Construction	Implementation Schedule	Reliability of Effluent Performance	Future Compliance Flexibility	Process Resiliency to Toxicity and Inhibition	Score		Rank (All)
Min-Max Score			(1-10)	1-10	1-10	1-10	1-10	1-10	1-10	1-10			
Weighted Factor			(1-3)	3	3	2	1	2	1	1	Points	%	
No.	**First Stage**	**Second Stage**	**Tertiary Treatment**										
1	MBR	-	--	30	21	6	4	20	7	4	92	77%	4
2	Conventional activated sludge	BAF-N	--	21	30	8	3	14	4	6	86	72%	5
3	HPO	MBBR	Cloth filters	27	27	12	5	16	4	7	98	82%	1
4	Conventional activated sludge	MBBR	Cloth filters	30	30	8	3	16	4	6	97	81%	2
5	HPO	BAF-N	--	21	30	12	5	14	4	7	93	78%	3

Notes:

1. Scoring scale is 1 to 10, where 1 is a poor score and 10 is the best score for any given category.
2. Weighted factors range from 1 to 3, based on level of importance for each criteria.
3. Highest score is best for the purposes of this evaluation.

Table 9.2 Final Treatment Process Alternatives Selection Matrix - Flow/Load Scenarios 2/3

Alternatives				Capital Cost	Operating Cost	Maintenance of Operations During Construction	Implementation Schedule	Reliability of Effluent Performance	Future Compliance Flexibility	Process Resiliency to Toxicity and Inhibition	Score		Rank (All)
Min-Max Score			(1-10)	1-10	1-10	1-10	1-10	1-10	1-10	1-10			
Weighted Factor			(1-3)	3	3	2	2	3	1	2	Points	%	
No.	**First Stage**	**Second Stage**	**Tertiary Treatment**										
1	MBR	-	--	30	24	12	14	24	7	8	119	79%	1
2	Conventional activated sludge	BAF-N	Cloth filters	21	30	12	10	12	4	12	101	67%	4
3	HPO	MBBR	Cloth filters	24	30	8	10	12	4	14	102	68%	3
4	Conventional activated sludge	MBBR	Cloth filters	27	30	12	10	12	4	12	107	71%	2
5	HPO	BAF-N	Cloth filters	18	30	8	10	12	4	14	96	64%	5

Notes:

1. Scoring scale is 1 to 10, where 1 is a poor score and 10 is the best score for any given category.
2. Weighted factors range from 1 to 3, based on level of importance for each criteria.
3. Highest score is best for the purposes of this evaluation.

c. Rehabilitate the oxygen generation building structure.

d. Replace the HPO generation system with a VPSA oxygen generation system, along with air piping to the HPO process tanks. As part of preliminary design, a value-based evaluation could be performed to compare using a VPSA system versus liquid oxygen and cryogenic oxygen generation.

e. Construct three new circular clarifier systems, including a secondary distribution box.

f. Construct a new RAS pump station.

g. Construct a new MBBR process for ammonia removal, including blower building.

h. Construct a new disc filtration system in a new building, including a backwash pump station.

i. Install a new discharge pipe from the disc filter system to the chlorine contact tank.

j. Decommission and demolish the existing secondary clarifiers.

2. Solids Handling Modifications

a. Rehabilitate the existing gravity thickeners.

b. Close, drain, clean, and fill Lagoon 1 to enable construction of new digesters and dewatering facilities.

c. Construct two new sludge blending tanks with mixing.

d. Construct new insulated primary and secondary anaerobic digester tanks for mesophilic digestion, complete with pumped mixing systems, steel fixed and floating covers for the primary and secondary digester, respectively.

e. Construct a new digester complex, including digester mixing equipment, sludge heating equipment and gas handling equipment.

f. Construct a new solids processing facility, including mechanical dewatering and polymer storage and feed system.

g. Construct a new biogas conditioning and cogeneration facility complete with biogas conditioning equipment and power cogeneration equipment for onsite electricity generation.

9.1.2 Flow/Load Scenarios 2 and 3 Recommendation

For Flow/Load Scenarios 2 and 3, which include accommodations for a major contribution from a high-technology industrial wastewater, the Oak Orchard Plant would require a more significant upgrade to meet projected effluent limits. As a result, the outcome of the final scoring matrix and treatment process selection identified Alternative 1, MBR, as the best option to accommodate these higher flow/load scenarios. The MBR technology would provide the highest quality effluent and the most flexibility and adaptability to handle potential changes in plant loading due to the high-technology industrial wastewater. The absolute membrane barrier allows for a much higher mixed liquor content and sludge age, resulting in a smaller footprint and more stable sludge that could

adsorb shock loading and upset conditions that would otherwise result in loss of a non-settling sludge in a conventional clarification process.

MBR is also utilized at semiconductor manufacturing facilities for wastewater treatment. It is anticipated that this technology would be easier to obtain approval for from NYSDEC for challenging wastewater treatment applications with a high industrial contribution, in comparison to the other technologies that rely on settling and/or further filtration for performance.

Although the chemical cleaning, labor, and energy costs are somewhat higher, the clear supernatant is typically easier to disinfect, requiring less disinfectant chemical usage downstream. OCDWEP personnel are not familiar with this technology; therefore, its implementation would require thorough orientation and training for operators to acclimate to the process. MBR technology is reportedly highly automated and relatively easy to operate once an operator is familiar with the instrumentation and controls.

Key modifications for implementation of Alternative 1 include the following:

1. Major Treatment Modifications
    a. Upgrade plant hydraulic capacity to accommodate a peak hourly flow of 38 mgd.
    b. Construct new headworks facility, complete with screenings and grit removal systems, housed in a new building.
    c. Decommission the existing plant headworks.
    d. Construct new primary clarifier adjacent to existing four clarifiers.
    e. Construct intermediate lift pump station, using vertical turbine pumping equipment.
    f. Construct new fine screen facility in new building to protect new MBR treatment process
    g. Construct new activated sludge aeration tanks.
    h. Modify existing HPO aeration tanks for conversion to air activated sludge, including new mechanical aerator/mixer units located where existing HPO mixer units are installed.
    i. Structural modifications and rehabilitation to existing HPO aeration tanks for conversion to air activated sludge and to provide new 20-year design life for concrete tanks.
    j. Provide new membrane bioreactor process, constructed in new membrane tanks with a dedicated Process Equipment Building to house supporting equipment such as pumps, blowers, and chemical cleaning system.
    k. Convert existing HPO Generation Building to Process Aeration Blower Building with new conventional aeration blowers to support MBR treatment process.
    l. Decommission and demolish existing secondary clarifiers.
    m. Expand existing disinfection and dechlorination tanks to accommodate new peak flow.
    n. Upgrade/replace existing chlorination and dechlorination equipment.

2. Solids Handling Modifications

    a. Rehabilitate the existing gravity thickeners.

    b. Close, drain, clean and fill Lagoon 1 to enable construction of new digesters and dewatering facilities.

    c. Construct two new sludge blending tanks with mixing.

    d. Construct new insulated primary and secondary anaerobic digester tanks for mesophilic digestion, complete with pumped mixing systems, steel fixed and floating covers for the primary and secondary digester, respectively.

    e. Construct a new digester complex, including digester mixing equipment, sludge heating equipment and gas handling equipment.

    f. Construct a new solids processing facility, including mechanical dewatering and polymer storage and feed system.

    g. Construct a new biogas conditioning and cogeneration facility complete with biogas conditioning equipment and power cogeneration equipment for onsite electricity generation.

9.1.3 Recommended Support Infrastructure Modifications

In addition to the major process modifications, the following plant infrastructure modifications are recommended to be completed as part of the Oak Orchard WWTP upgrade.

1. If Flow/Load Scenario 2 or 3 is implemented, replace the plant electrical service to meet the electrical load requirements of the upgraded plant, including main switchgear, unit substations, and associated service entrance equipment.
2. Replace MCCs, conduit, and cable of existing facilities impacted by the upgrades.
3. Install a standby power generation system to serve the plant.
4. Replace the existing plant control and SCADA system and associated instrumentation.
5. Provide a separate HVAC system for the new structures. Evaluate whether heat in the new structures should be provided by a common steam system or by stand-alone building systems.
6. Conduct a structural and architectural assessment of existing facilities and implement recommendations.
7. Reconfigure the plant exterior lighting system.
8. Provide fire detection and fire suppression systems for new facilities in accordance with applicable codes.
9. Expand the plant surveillance, security, internet and PA systems to accommodate the new facilities.

10. Expand the plant effluent water and potable water pipe loops. Conduct an evaluation to confirm the plant water service will be sufficiently sized to meet plant upgrade needs.
11. Modify the plant site plan, including grading, access roads and stormwater drainage to accommodate the plant upgrade.
12. Prepare a Stormwater Pollution Prevention Plan (SWPPP) to address the loss of pervious surfaces as a result of the upgrade. Perform a green technology evaluation as part of the SWPPP effort.

9.2 Summary of Next Steps to Implement Recommendations

The first step for further development of the recommended alternative would be to establish the probability of the new high-technology industry committing to development at the White Pine Commerce Park, in addition to the potential timing to start development and begin discharging wastewater. This will provide the County time to encumber funding for infrastructure needs and develop requests for proposals for engineering and other services.

In addition to the timing of the development, knowledge of the quantity and characteristics of the wastewater flow as well as the pretreatment being used by the industry is critical to the proper design of the Oak Orchard WWTP upgrades. This information can be supplemented by supporting data provided by the industry for other similar operating facilities. Discussions should be initiated with other municipal WWTPs that accept similar industries to identify operational challenges and successes. This additional information would be used to confirm the design criteria and performance of the recommended alternative. Design criteria confirmation also would include verifying materials of construction for the plant upgrade to resist anticipated level of constituents, such as chlorides.

Once more information is known about the actual industrial wastewater to be treated, OCDWEP should establish a draft of the pretreatment permit with upstream limits that protect Oak Orchard WWTP processes and the receiving water. This analysis will also be used to estimate contaminants in the resultant sludge and verify the solids can be accepted at a municipal landfill and not be treated as a hazardous material.

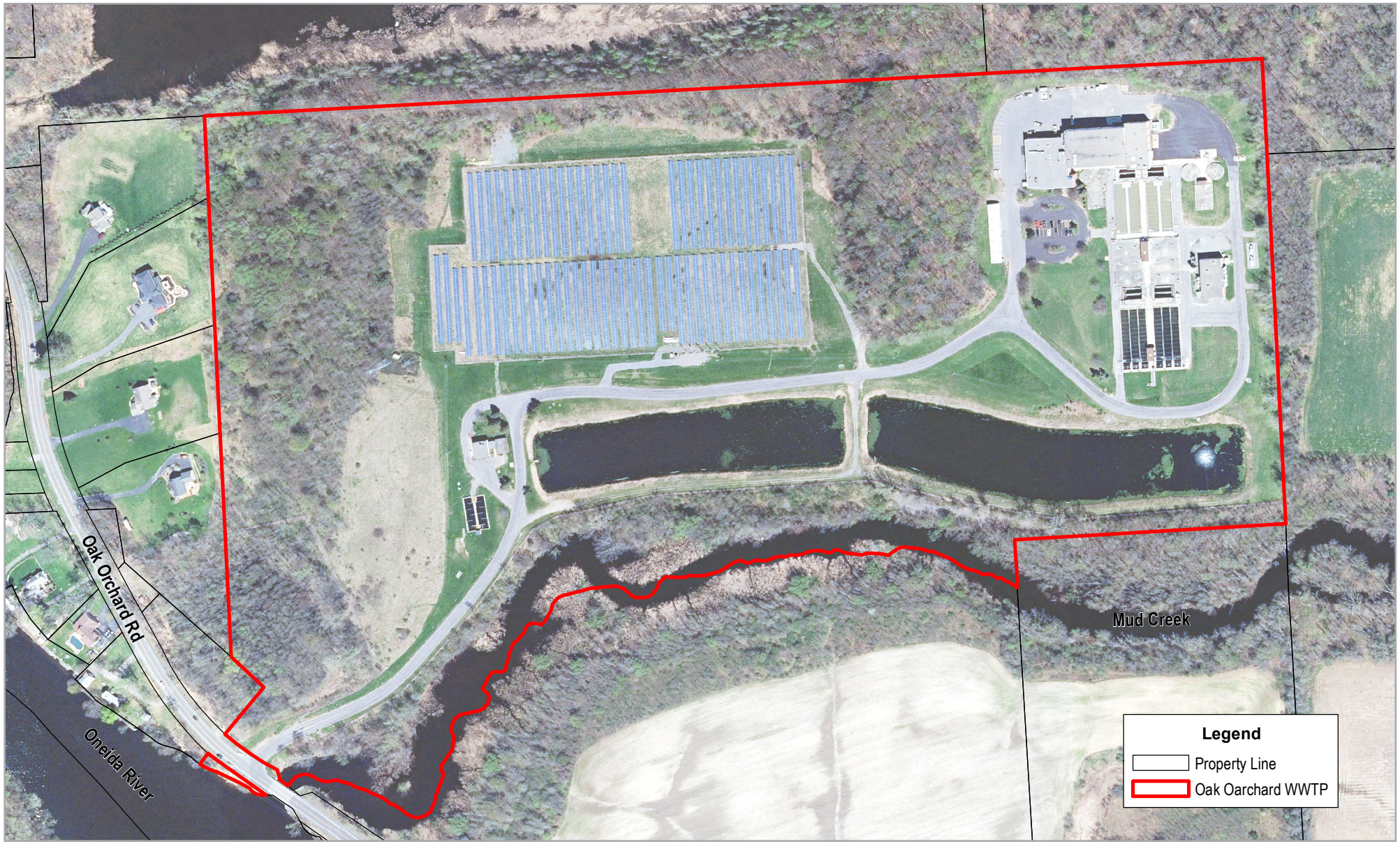
Discussions will need to be initiated with the NYSDEC early in the development process to identify potential implications to the SPDES Permit. Using the estimated industrial wastewater flow and loading characteristics, potential discharge limits should be established with the NYSDEC, as the addition of the industrial wastewater would most likely affect the current discharge permit limits and overall design requirements.

Additional implementation steps that should be considered as part of implementing the recommended alternative include the following:

1. Perform an evaluation of the bridge at the plant entrance and Oak Orchard Road to confirm its ability to handle large and extensive construction traffic for three to four years. Determine if bridge rehabilitation or an upgrade would be required.
2. Determine whether the upgrade project would be completed as a single project or as multiple projects.

3. Evaluate procurement of the contractor via design, bid, build, or using a design-build approach.
4. Complete the SEQR process elements including a Wetland Delineation Study and a State Historic Lands Survey.
5. Complete a headworks analysis to determine if industrial flow contributions could be phased, which would allow more time to design and construct the plant upgrades.

Figures



Paper Size ANSI A

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Feet

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

N

GHD

OCDWEP
WWTP Facilities Plan & Feasibility Study

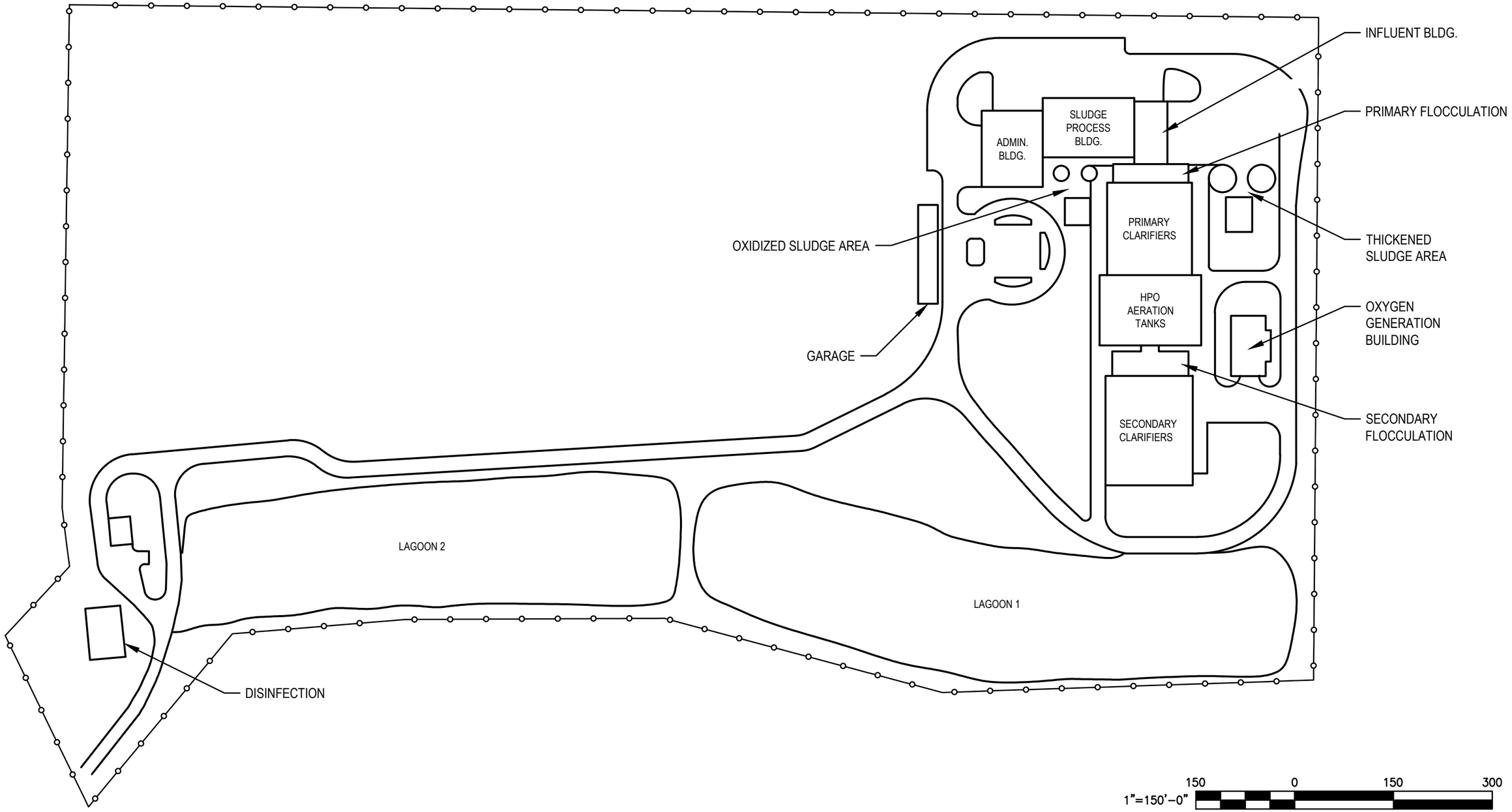
Oak Orchard WWTP Facility Aerial Plan View

Project No. **11214118**
Revision No. **-**
Date **07/06/2020**

FIGURE 1.1

C:\Users\GDKeyser\Desktop\11214118 - OCDWEP Oak Orchard\GIS\Figure 1 - Plan Aerial 1.mxd
Print date: 06 Jul 2020 - 19:11

Data source: . Created by: gdkeyser



SITE PLAN

SCALE: 1"=150'-0"

OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

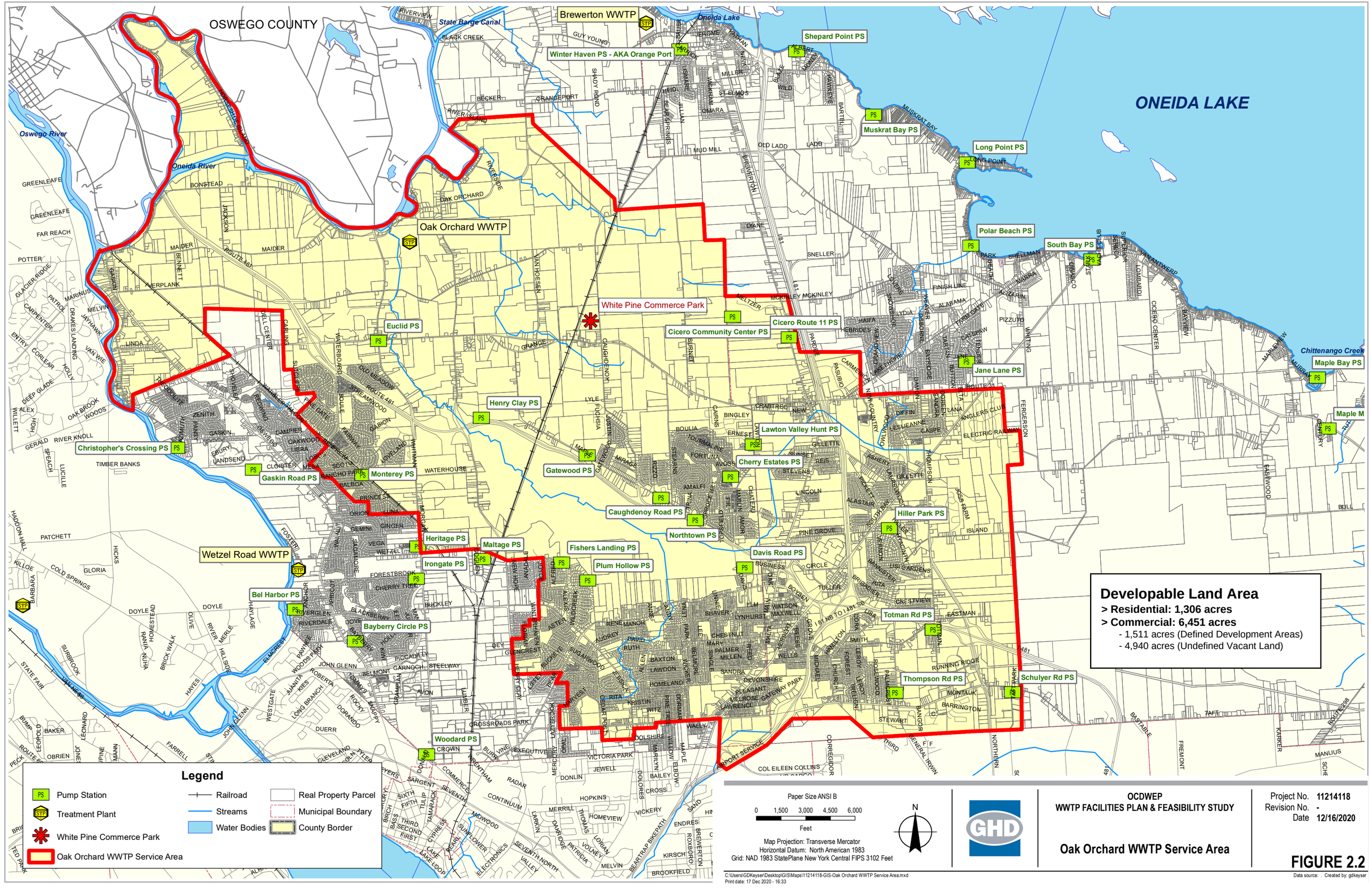
WASTEWATER TREATMENT PLANT EXISTING SITE PLAN

Project No. 11214118
Report No.
Date 12/2020

FIGURE 2.1

Filename: G:\564\11214118\Digital_Design\ACAD 2017\Figures\86-12132 FIG 1 & FIG 2.dwg
Plot Date: 18 December 2020 - 5:07 PM

Source:


OSWEGO COUNTY
ONEIDA LAKE
Brewerton WWTP
Oak Orchard WWTP
Wetzel Road WWTP
White Pine Commerce Park
Oneida Lake
State Barge Canal
Oswego River
Oneida River
Shepard Point PS
Winter Haven PS - AKA Orange Port
Muskrat Bay PS
Long Point PS
Polar Beach PS
South Bay PS
Maple Bay PS
Jane Lane PS
Cicero Route 11 PS
Cicero Community Center PS
Euclid PS
Henry Clay PS
Lawton Valley Hunt PS
Cherry Estates PS
Gatewood PS
Caughdenoy Road PS
Northtown PS
Hiller Park PS
Davis Road PS
Totman Rd PS
Thompson Rd PS
Schuyler Rd PS
Fishers Landing PS
Plum Hollow PS
Maltage PS
Irongate PS
Heritage PS
Monterey PS
Gaskin Road PS
Christopher's Crossing PS
Bel Harbor PS
Bayberry Circle PS
Woodard PS
Developable Land Area
> Residential: 1,306 acres
> Commercial: 6,451 acres
- 1,511 acres (Defined Development Areas)
- 4,940 acres (Undefined Vacant Land)
Legend
Pump Station
Treatment Plant
White Pine Commerce Park
Oak Orchard WWTP Service Area
Railroad
Streams
Water Bodies
Real Property Parcel
Municipal Boundary
County Border
Paper Size ANSI B
0 1,500 3,000 4,500 6,000
Feet
Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane New York Central FIPS 3102 Feet
N
GHD
OCDWEP
WWTP FACILITIES PLAN & FEASIBILITY STUDY
Oak Orchard WWTP Service Area
Project No. 11214118
Revision No. -
Date 12/16/2020
FIGURE 2.2
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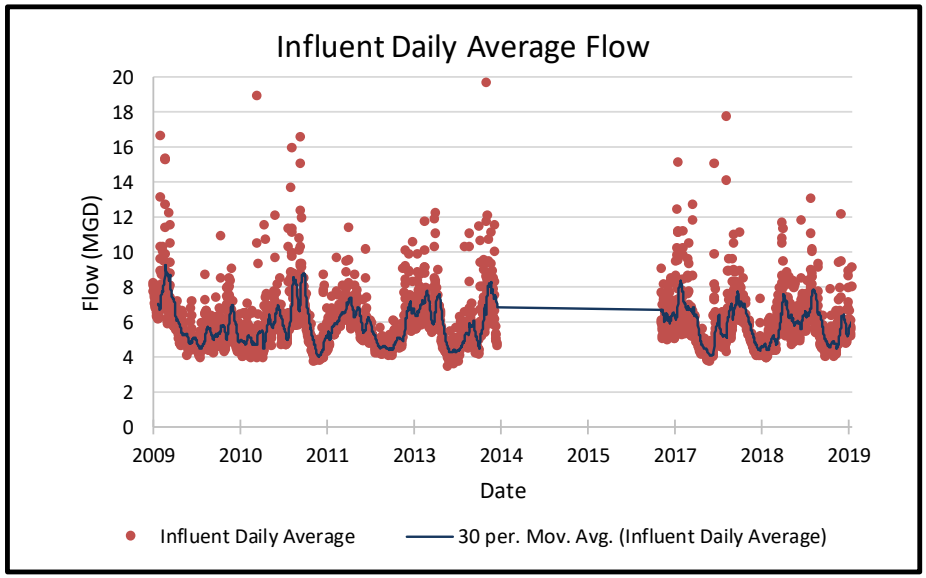
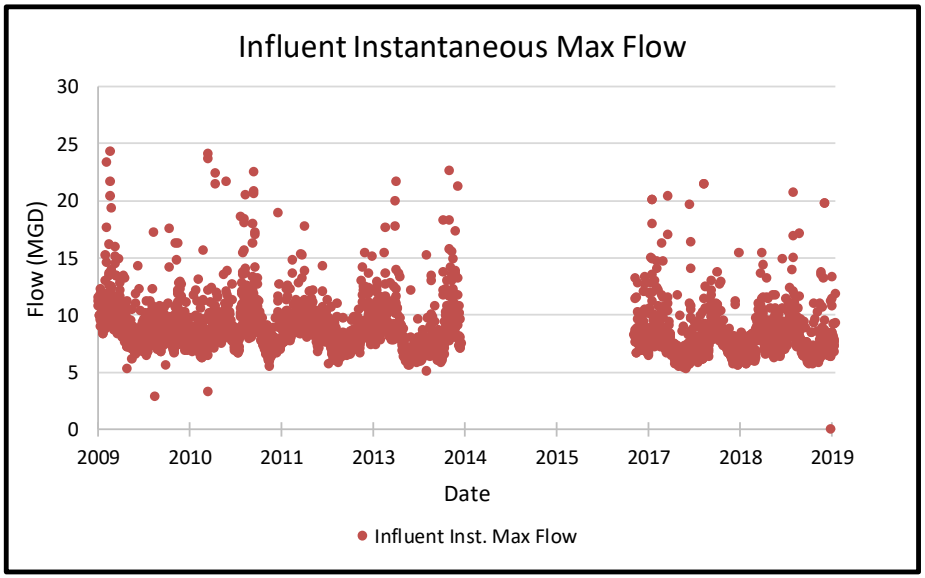
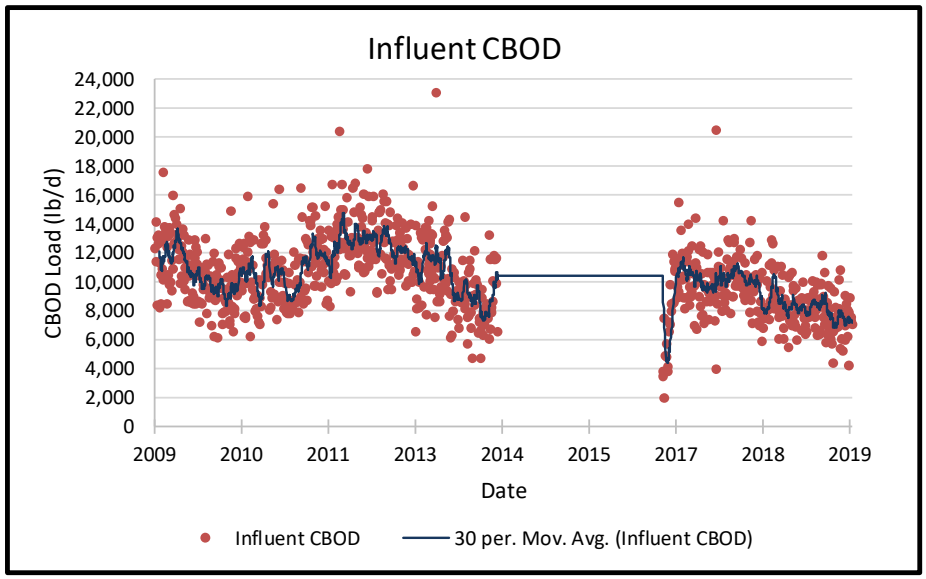
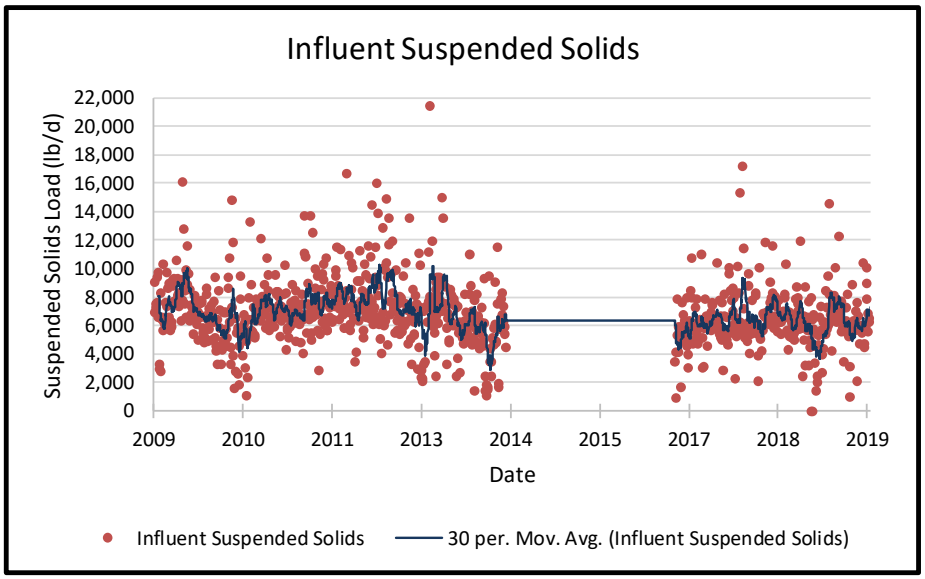






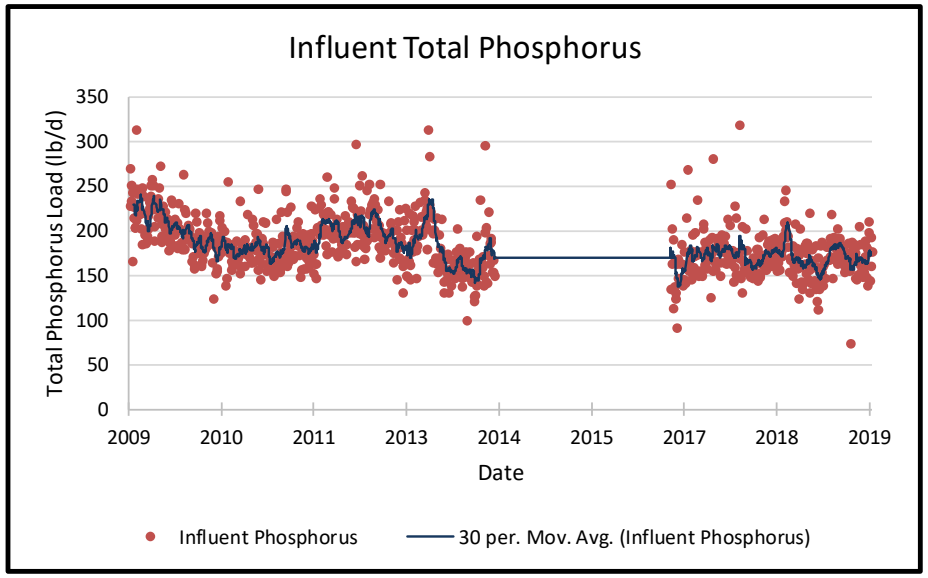


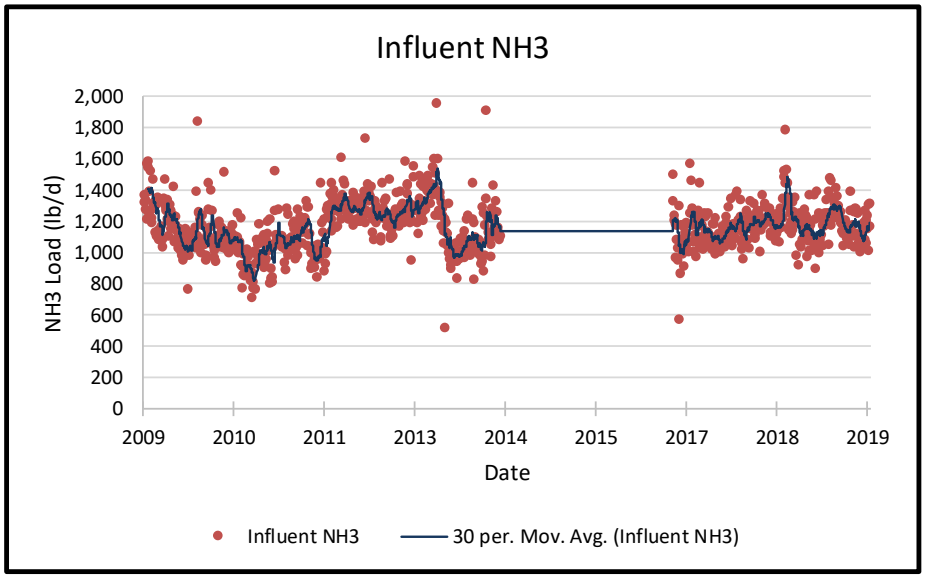
OAK ORCHARD
WWTP FEASIBILITY STUDY

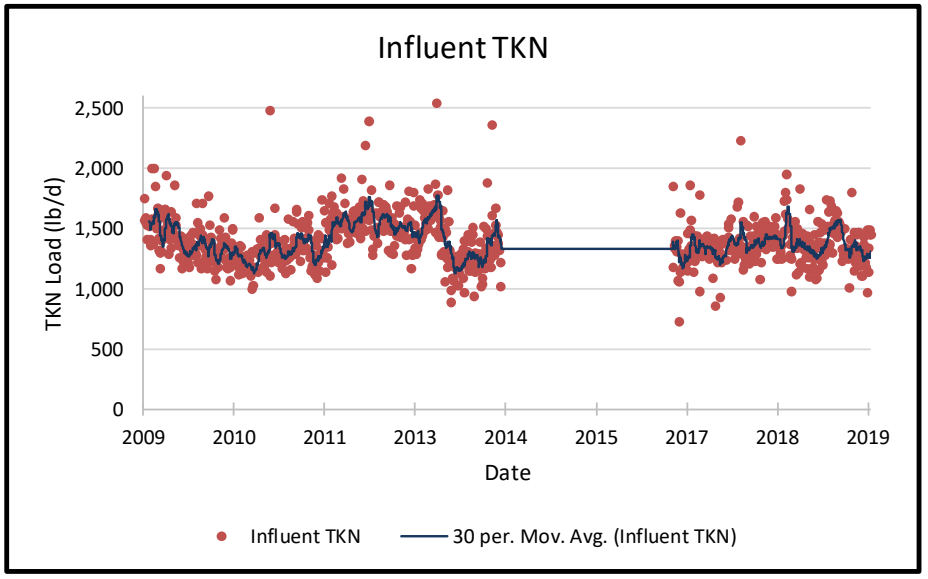
HISTORICAL PLANT LOADING – FLOW, cBOD and TSS

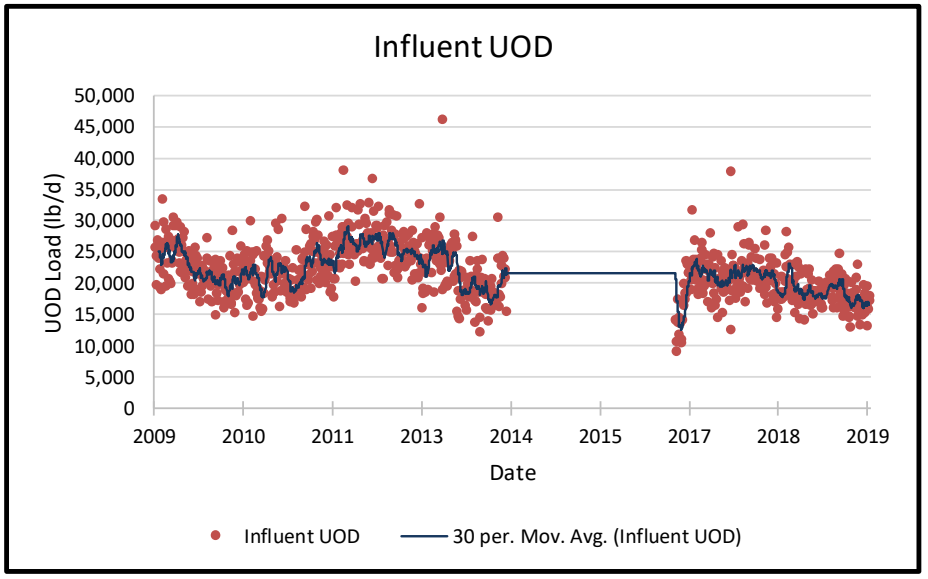
Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 3.1







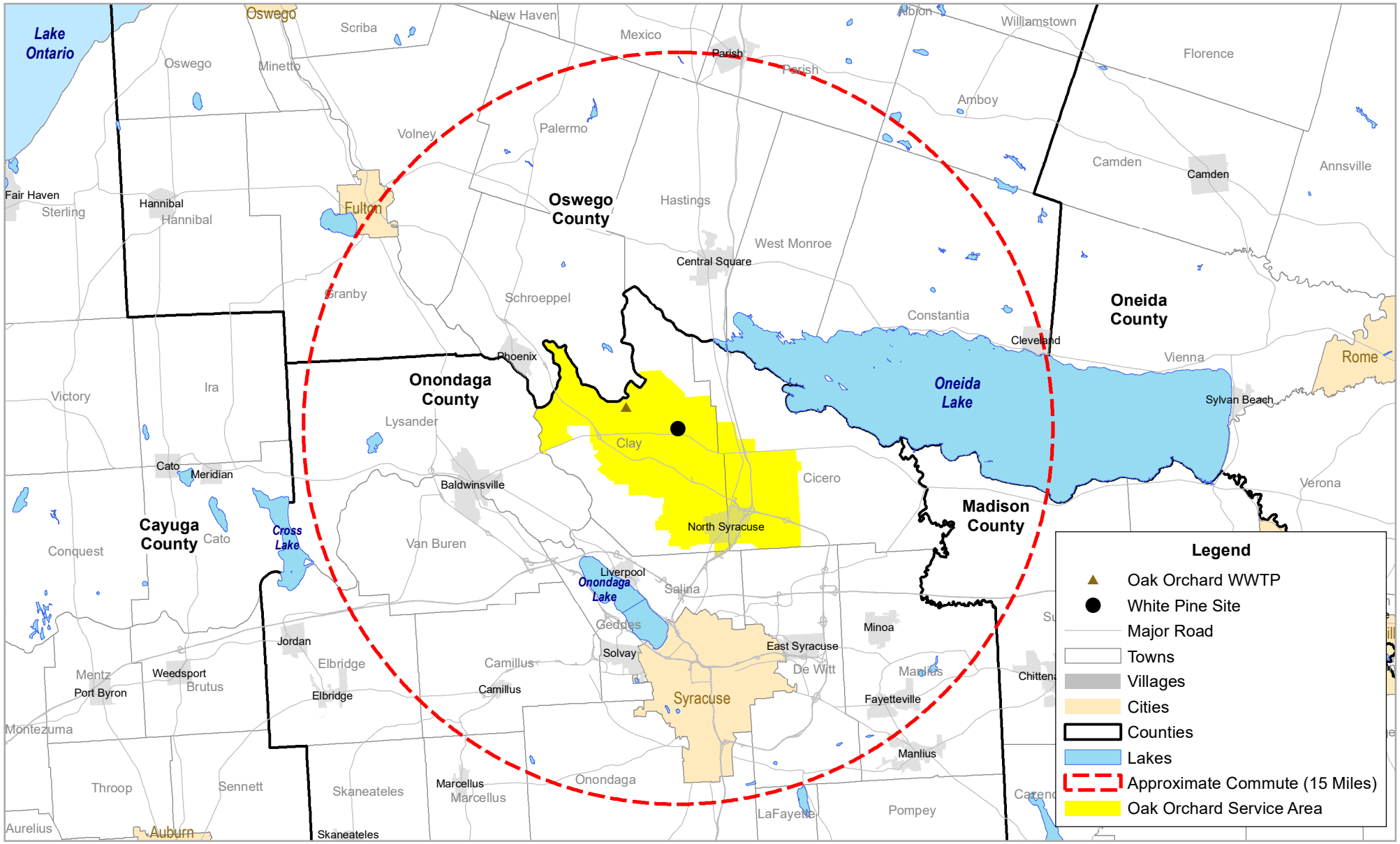


OAK ORCHARD
WWTP FEASIBILITY STUDY

HISTORICAL PLANT LOADING – PHOSPHORUS, NH_3, TKN and UOD

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 3.2



Paper Size ANSI A

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Miles

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

N

GHD

OCDWEP
WWTP Facilities Plan & Feasibility Study

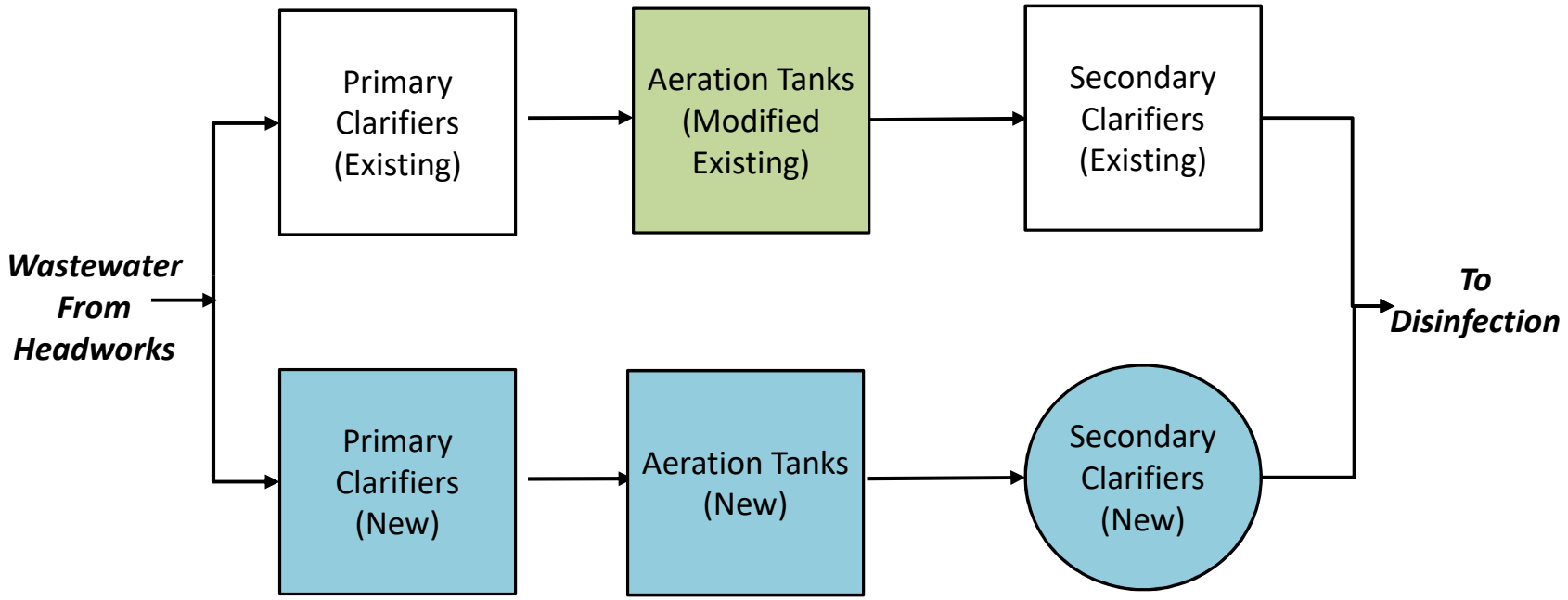
Approximate Commute Distance to the White Pine Commerce Park

Project No. **11214118**
Revision No. **-**
Date **07/06/2020**

FIGURE 3.3

C:\Users\GDKeyser\Desktop\11214118 - OCDWEP Oak Orchard\GIS\Figure 3 - Commute Distance.mxd
Print date: 06 Jul 2020 - 19:09

Data source: . Created by: gdkeyser



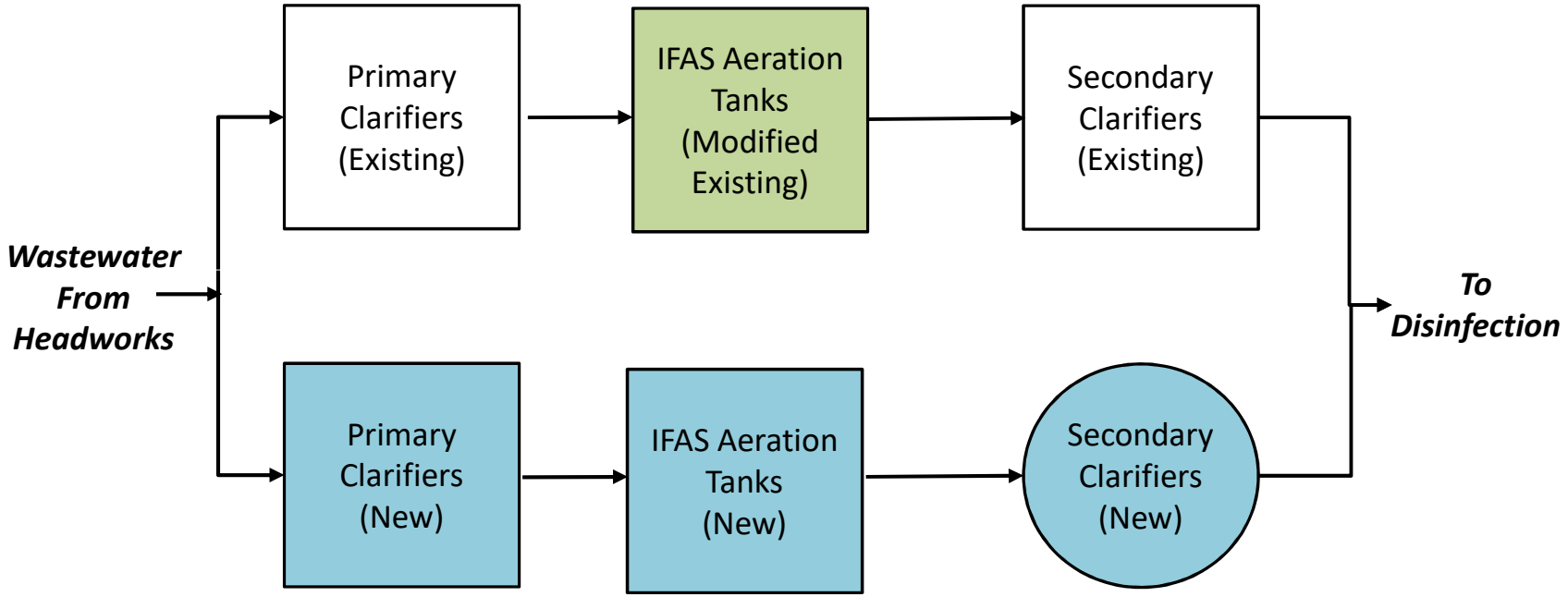
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 1 - CONVENTIONAL ACTIVATED SLUDGE

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.1



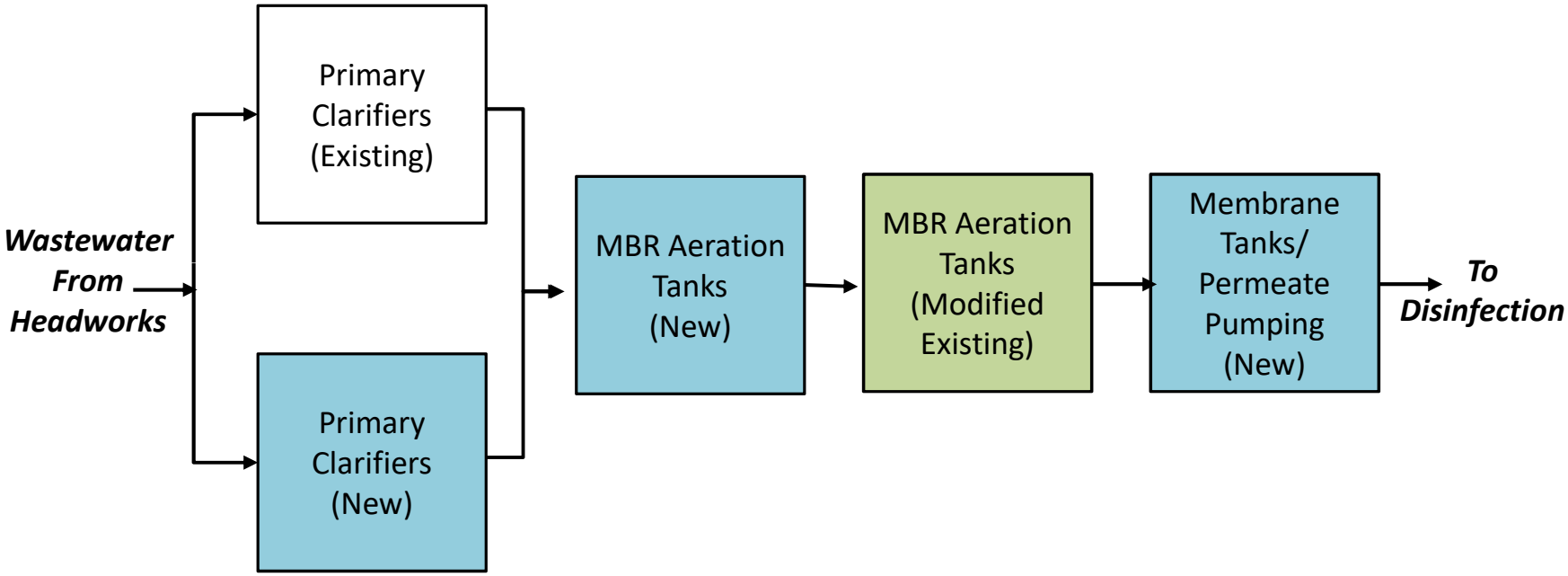
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 2 - IFAS

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.2



Existing
Modified
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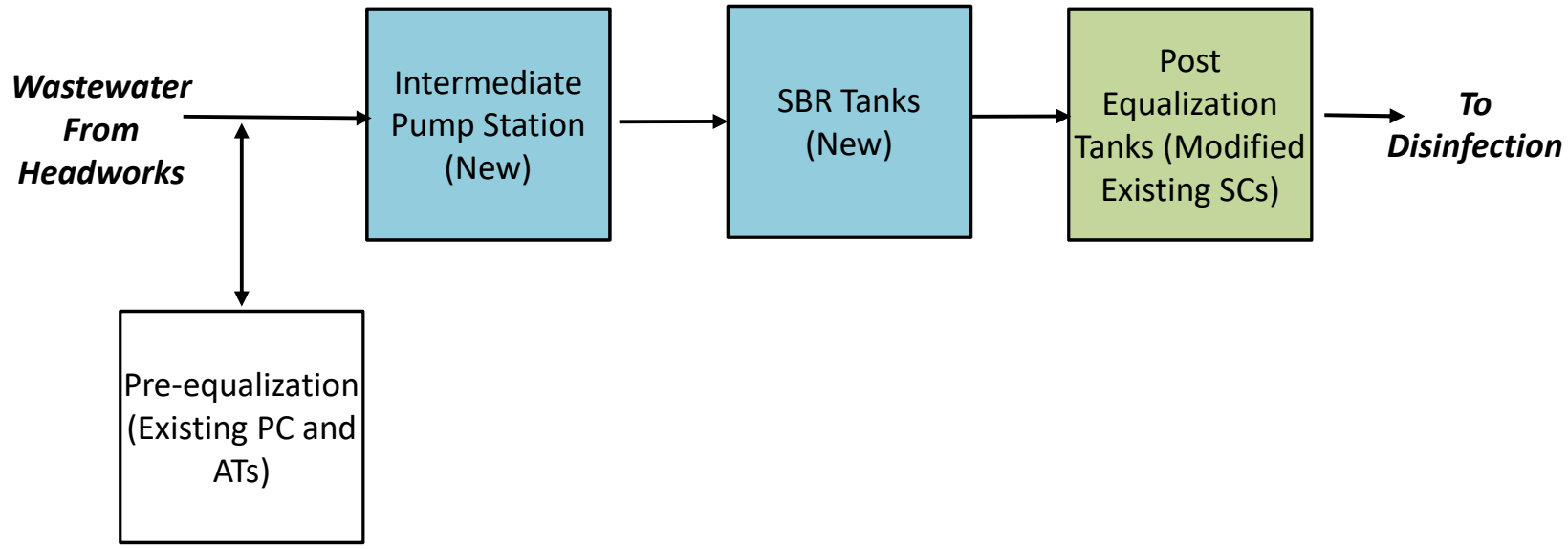
OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 3 - MBR

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.3



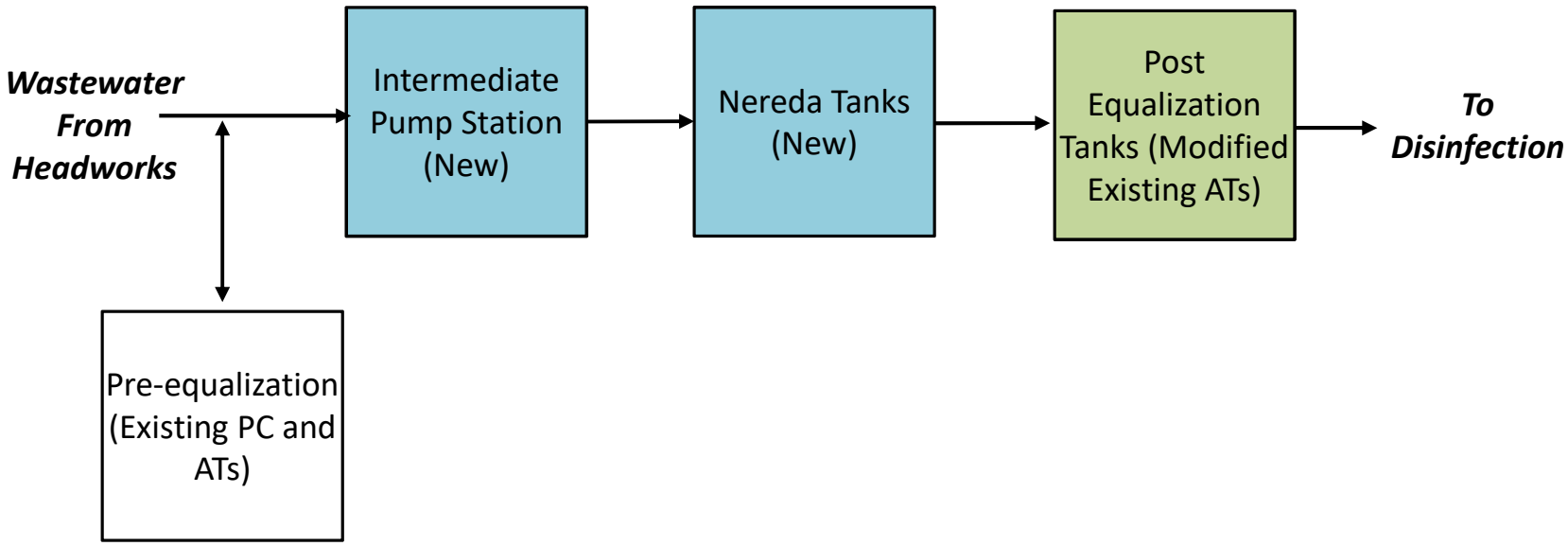
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 4 - SBR

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.4



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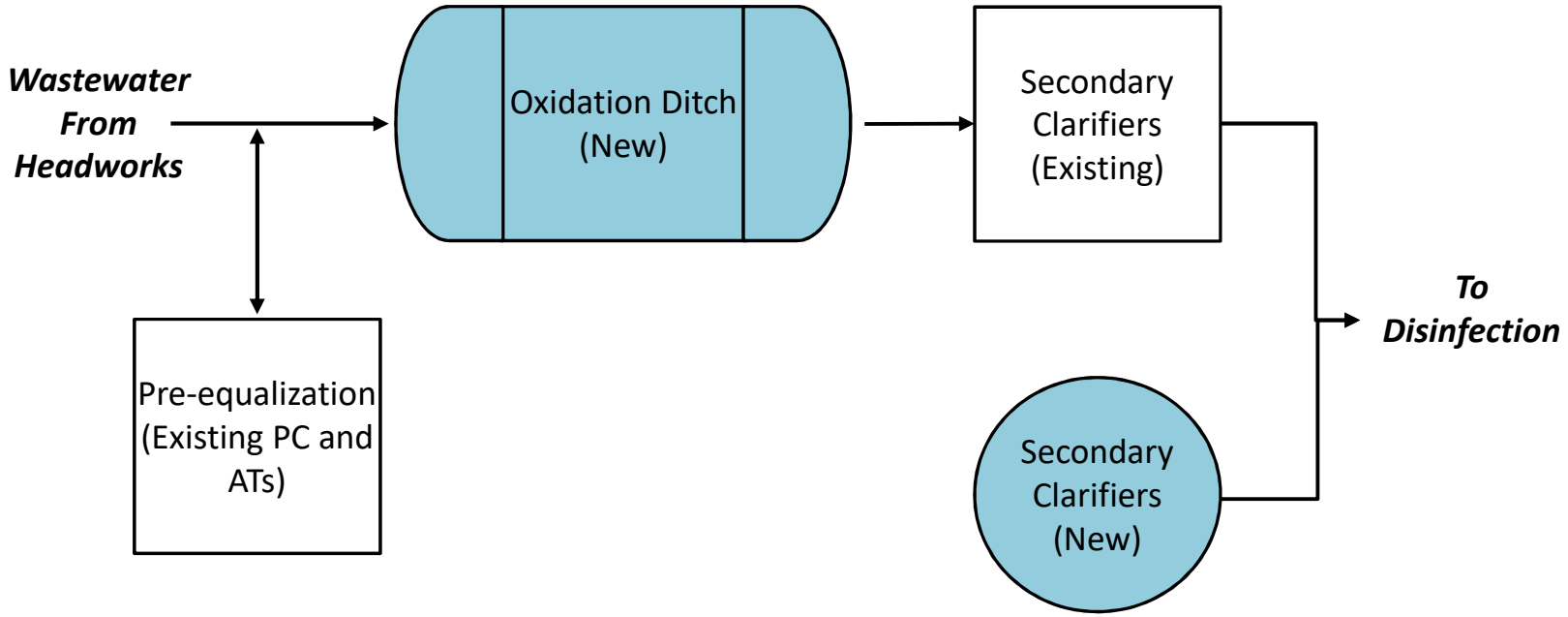
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 5 - NEREDA

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.5



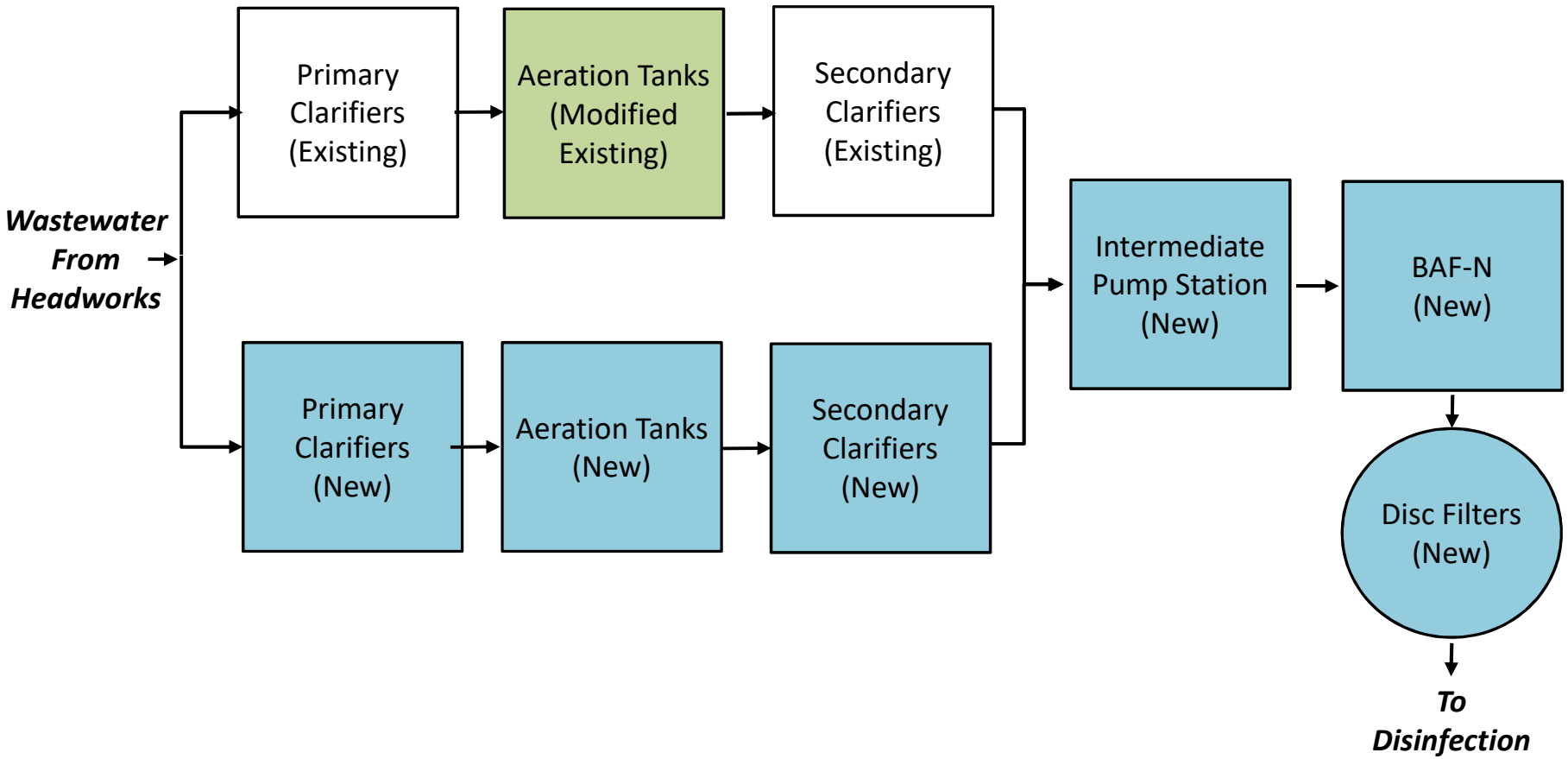
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 6 - OXIDATION DITCH

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.6



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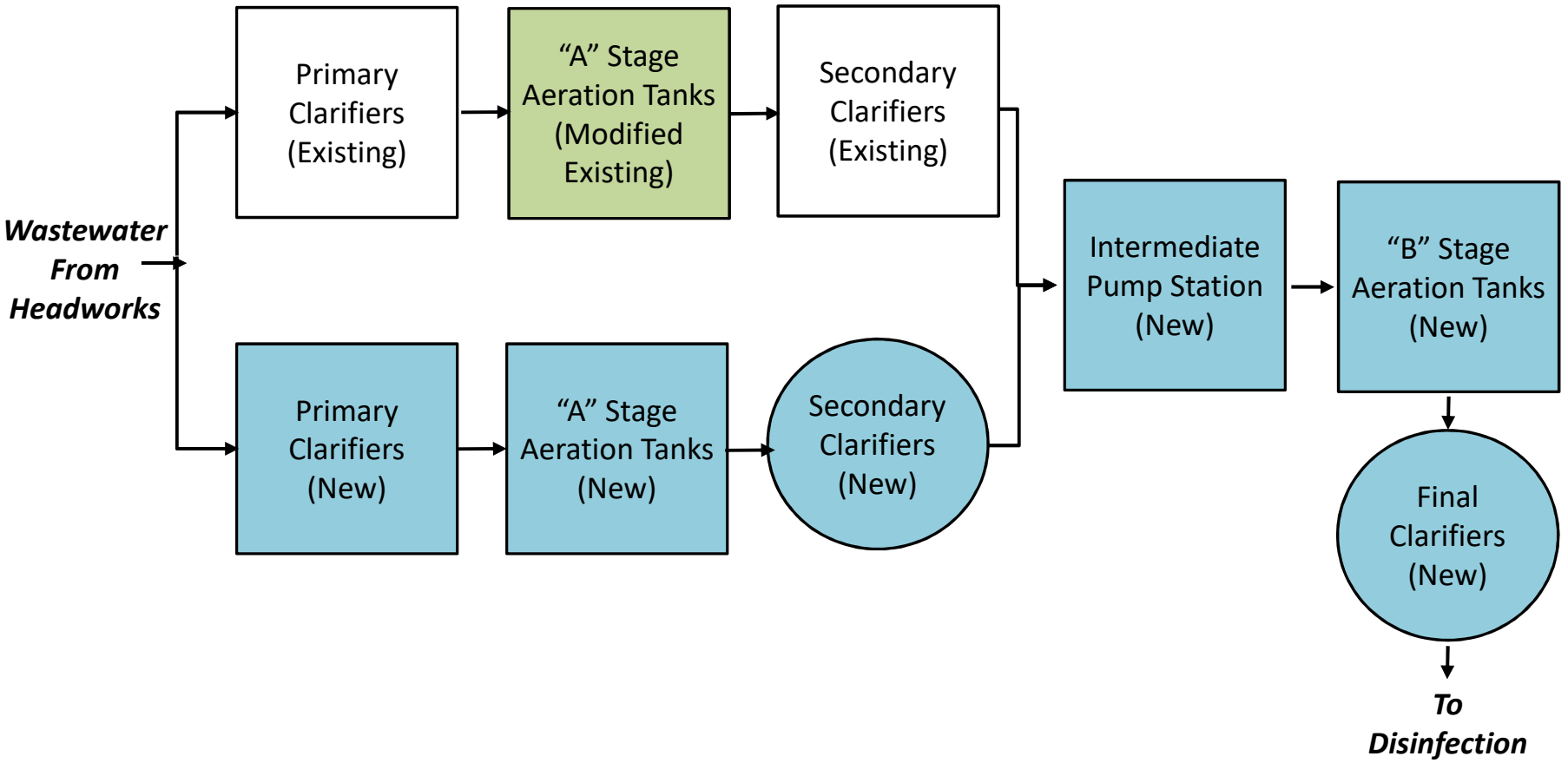
OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 7 - CONVENTIONAL-C + BAF-N

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.7



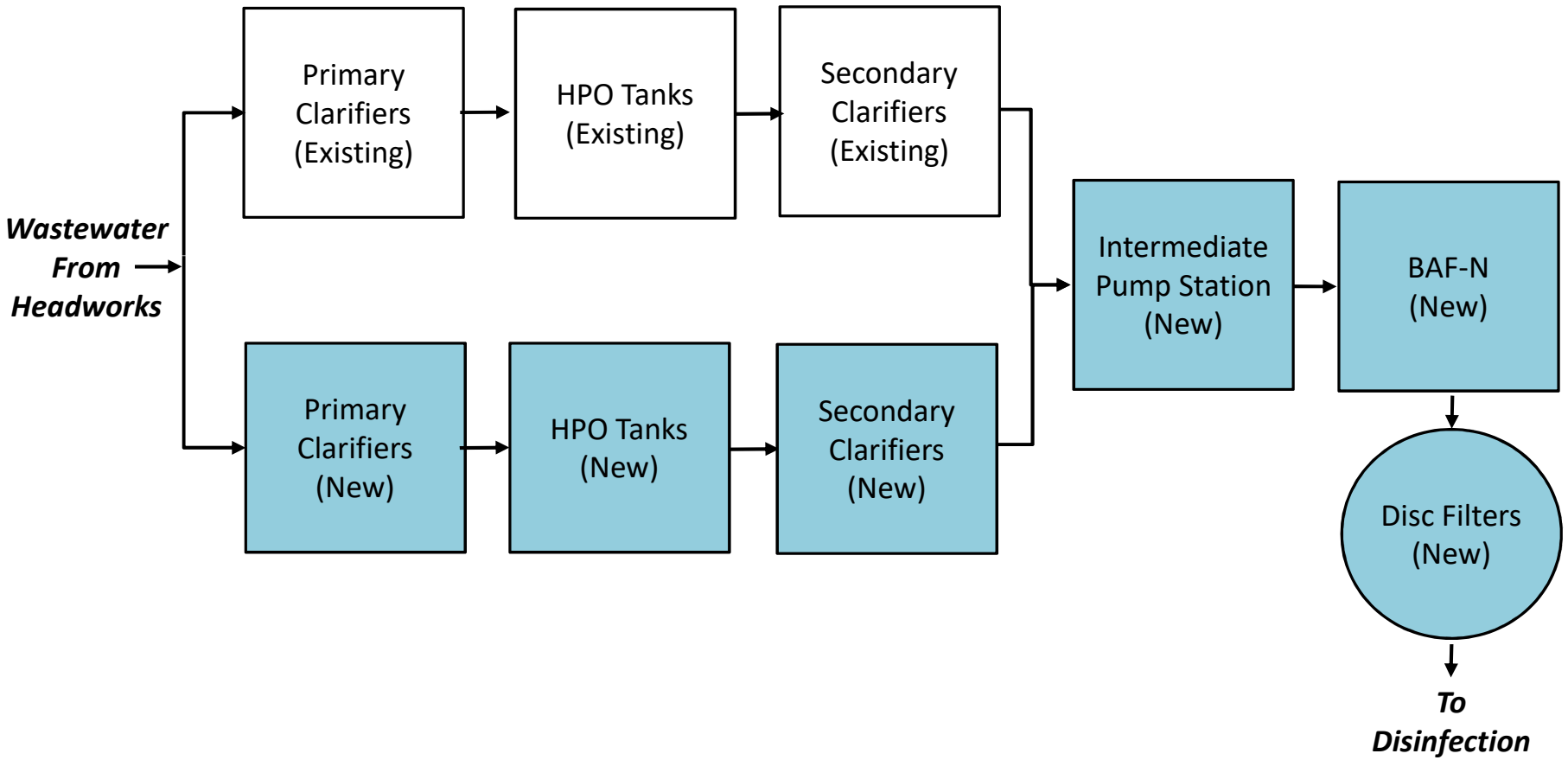
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 8 - CONVENTIONAL-C + CONVENTIONAL-N

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.8



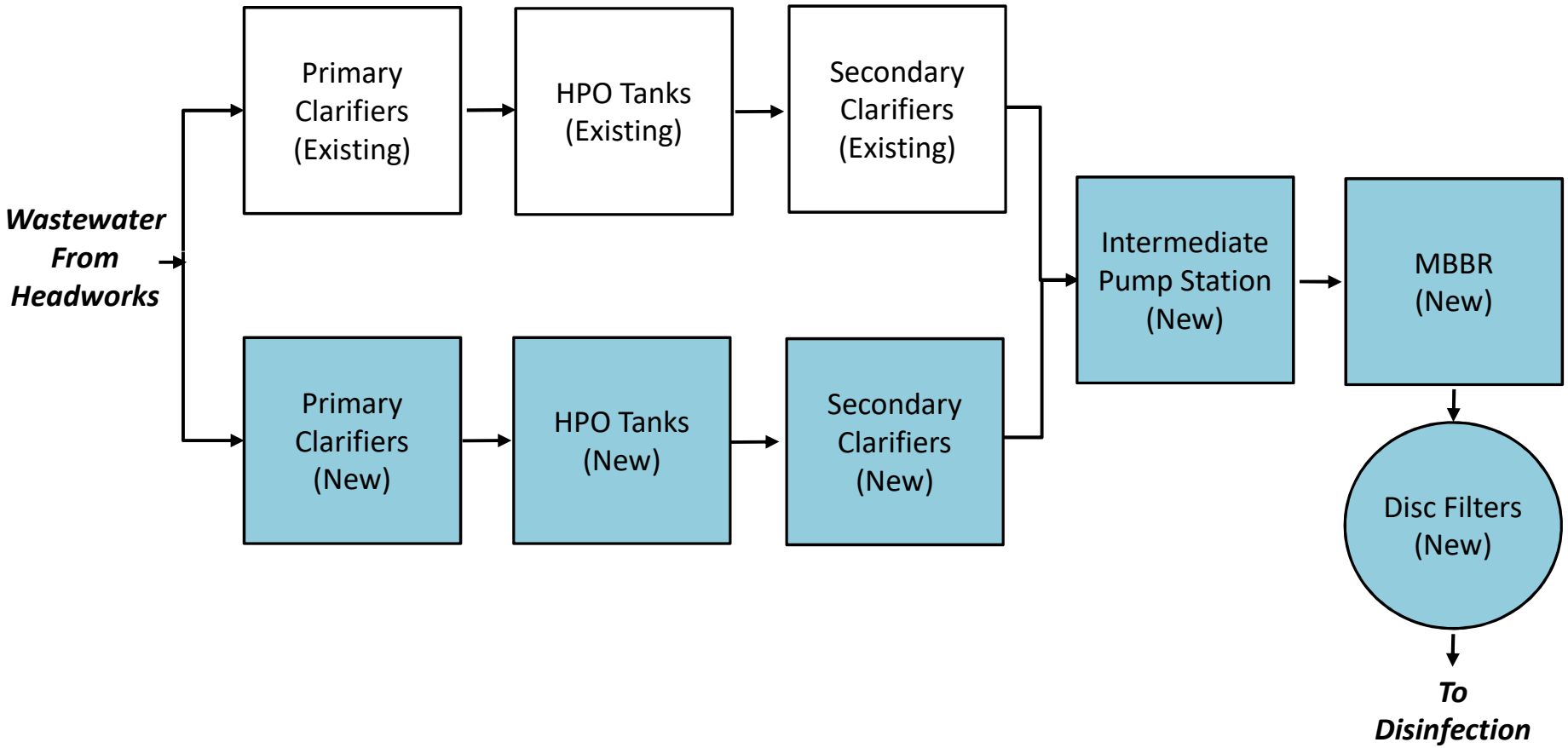
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 9 – HPO + BAF-N

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.9



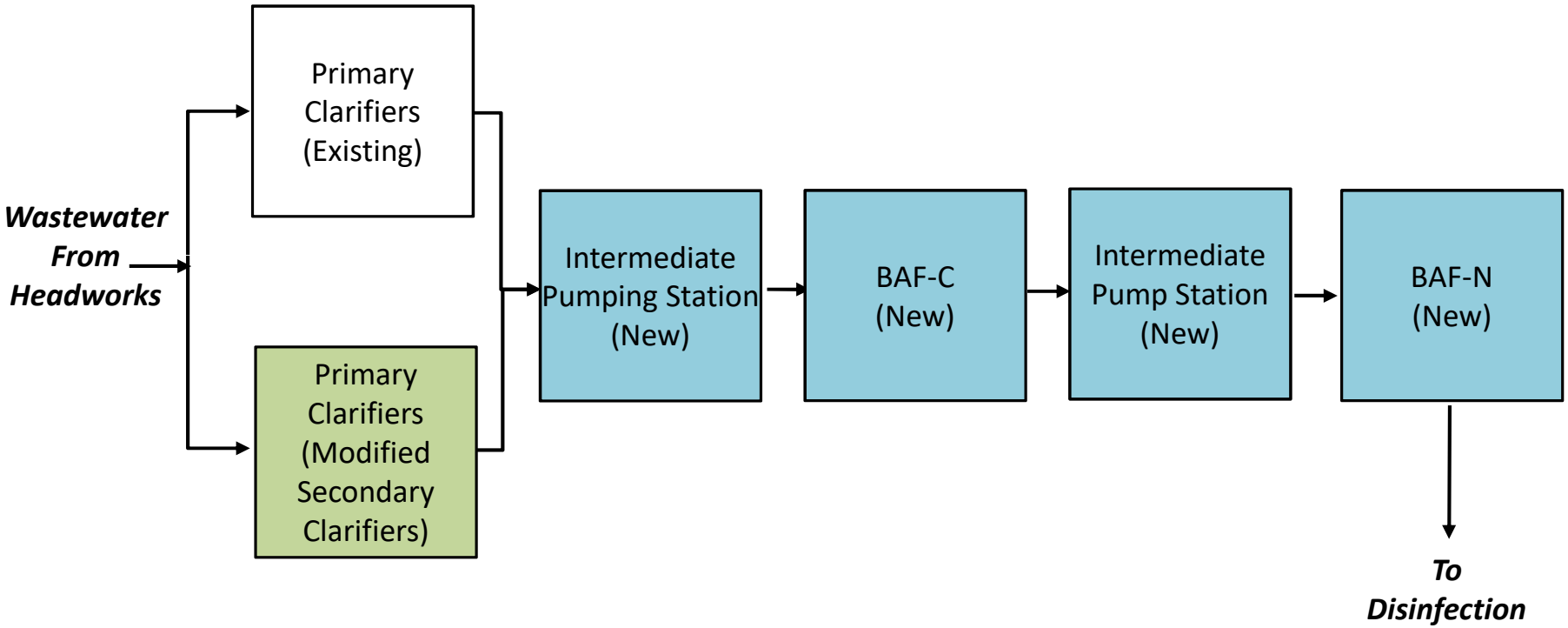
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 10 – HPO + MBBR

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.10



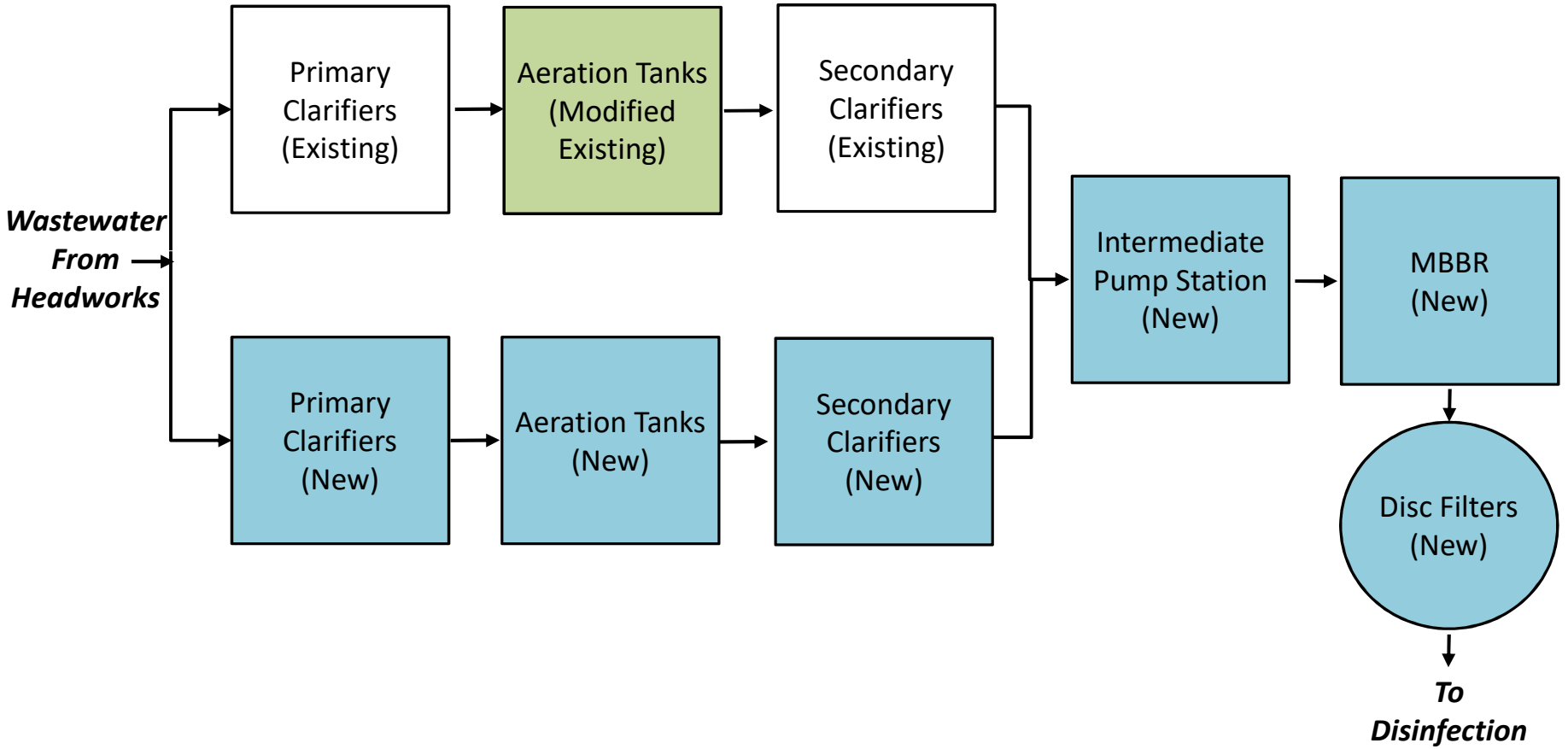
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 11 – BAF-C + BAF-N

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.11



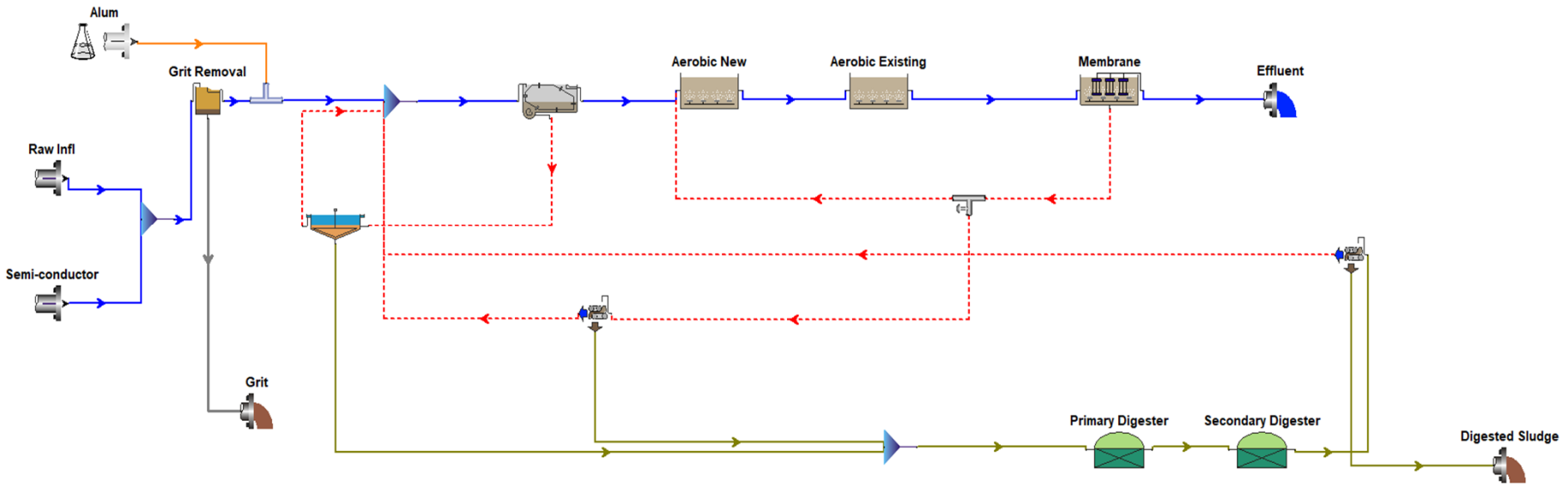
Existing
Modified
New

OAK ORCHARD
WWTP FEASIBILITY STUDY

SCREENING ALTERNATIVE 12 - CONVENTIONAL-C + MBBR

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 5.12

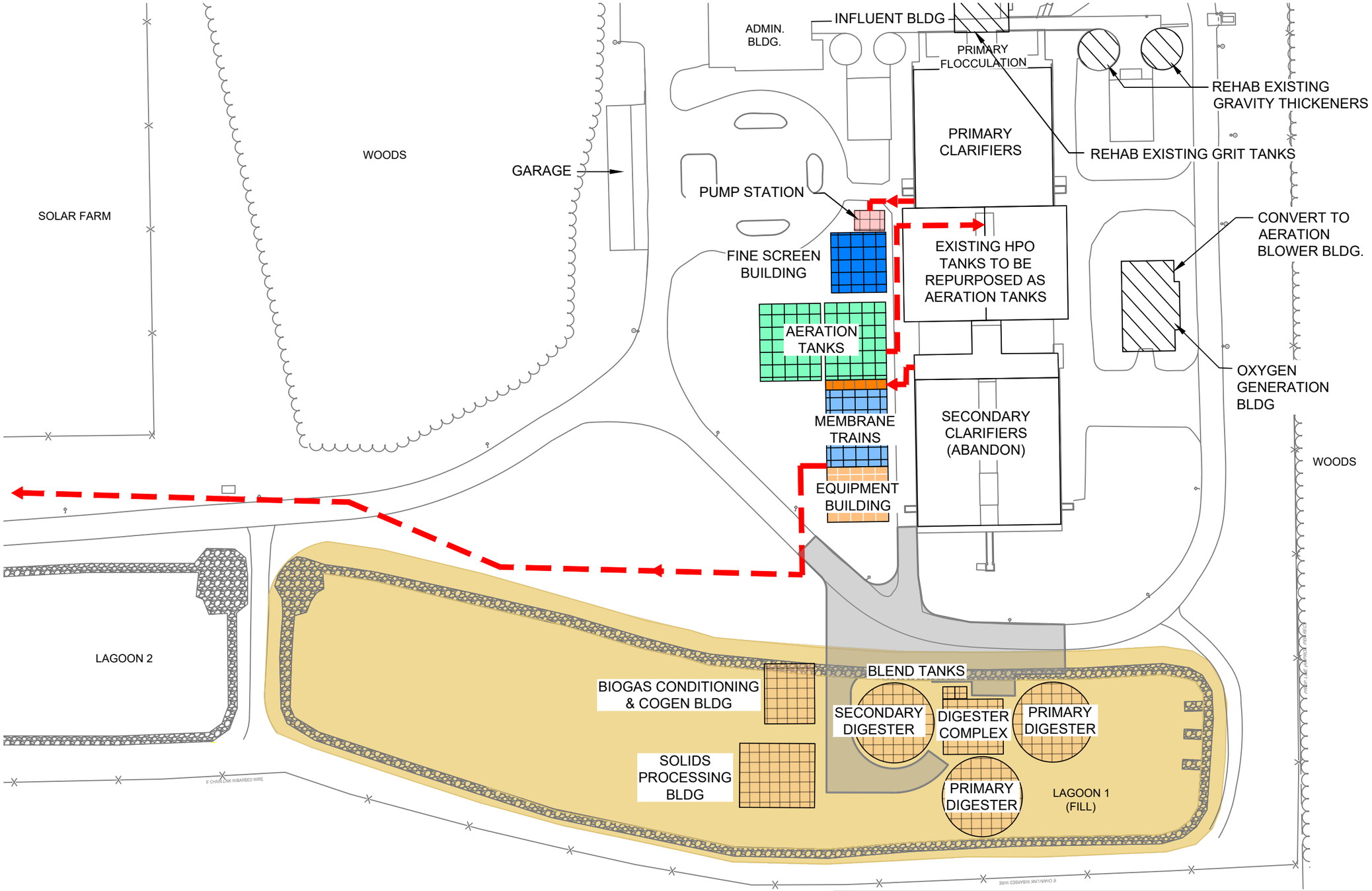


OAK ORCHARD
WWTP FEASIBILITY STUDY

ALTERNATIVE 1 PROCESS SCHEMATIC MBR

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 6.1



SITE PLAN

SCALE:1"= 100'-0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 1- MBR
FLOW / LOAD SCENARIO 1

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.2

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
Plot Date: 18 December 2020 - 5:42 PM

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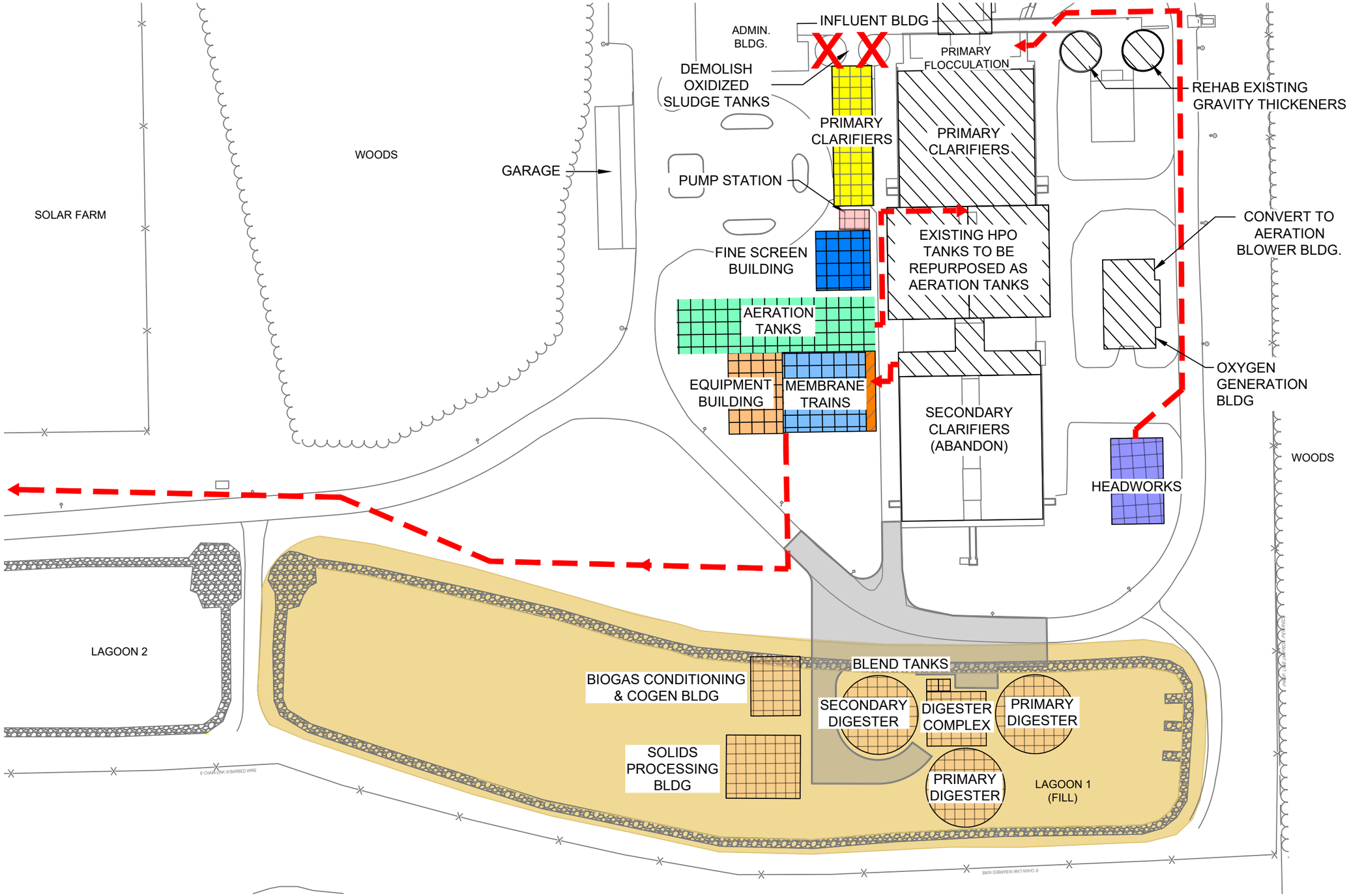

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100 0 100 200

SITE PLAN

SCALE:1"=100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 1 - MBR
FLOW / LOAD SCENARIOS 2 & 3

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.3

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
Plot Date: 18 December 2020 - 5:42 PM

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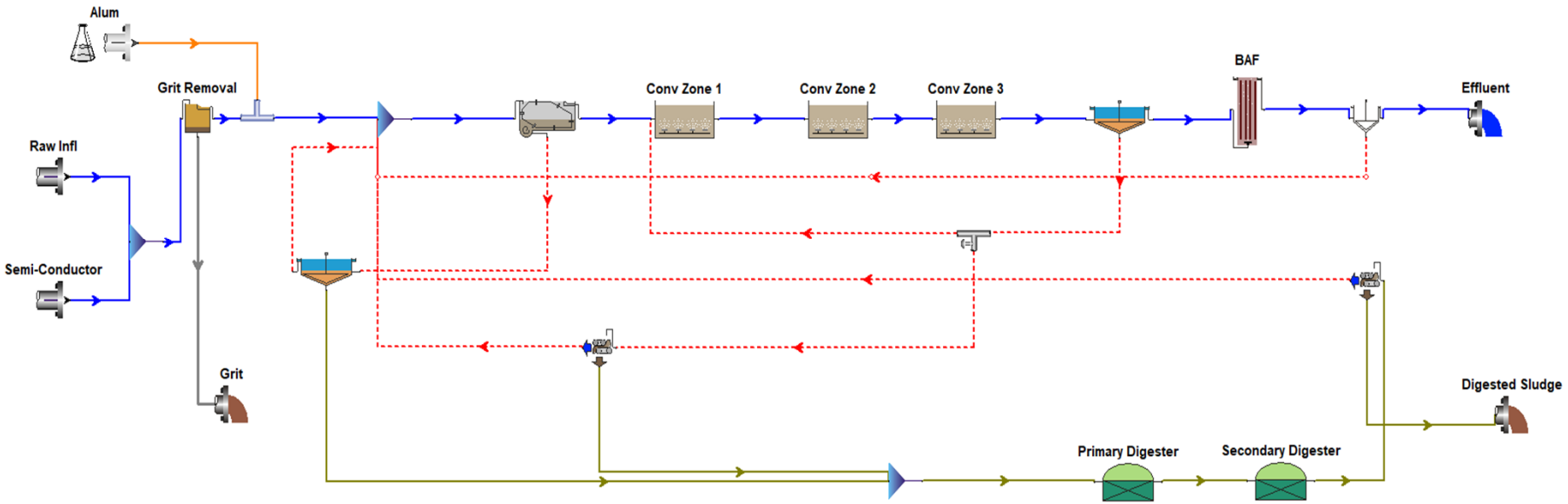
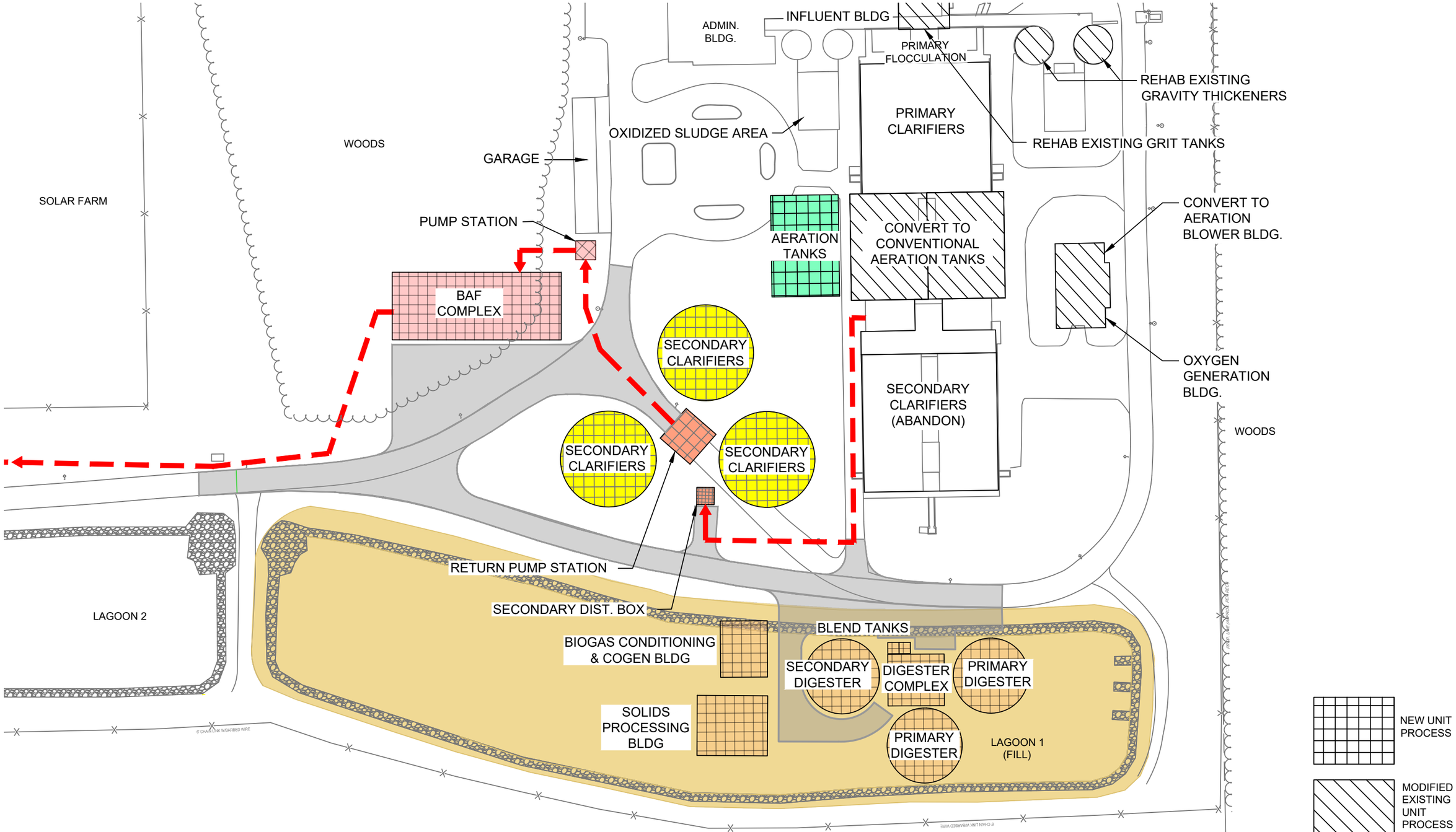


OAK ORCHARD
WWTP FEASIBILITY STUDY

ALTERNATIVE 2 PROCESS SCHEMATIC CONVENTIONAL - BAF

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 6.4



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1"=100'–0"

SITE PLAN

SCALE:1"= 100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 2 - CONV / BAF FLOW / LOAD SCENARIO 1

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.5

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
Plot Date: 18 December 2020 - 5:42 PM

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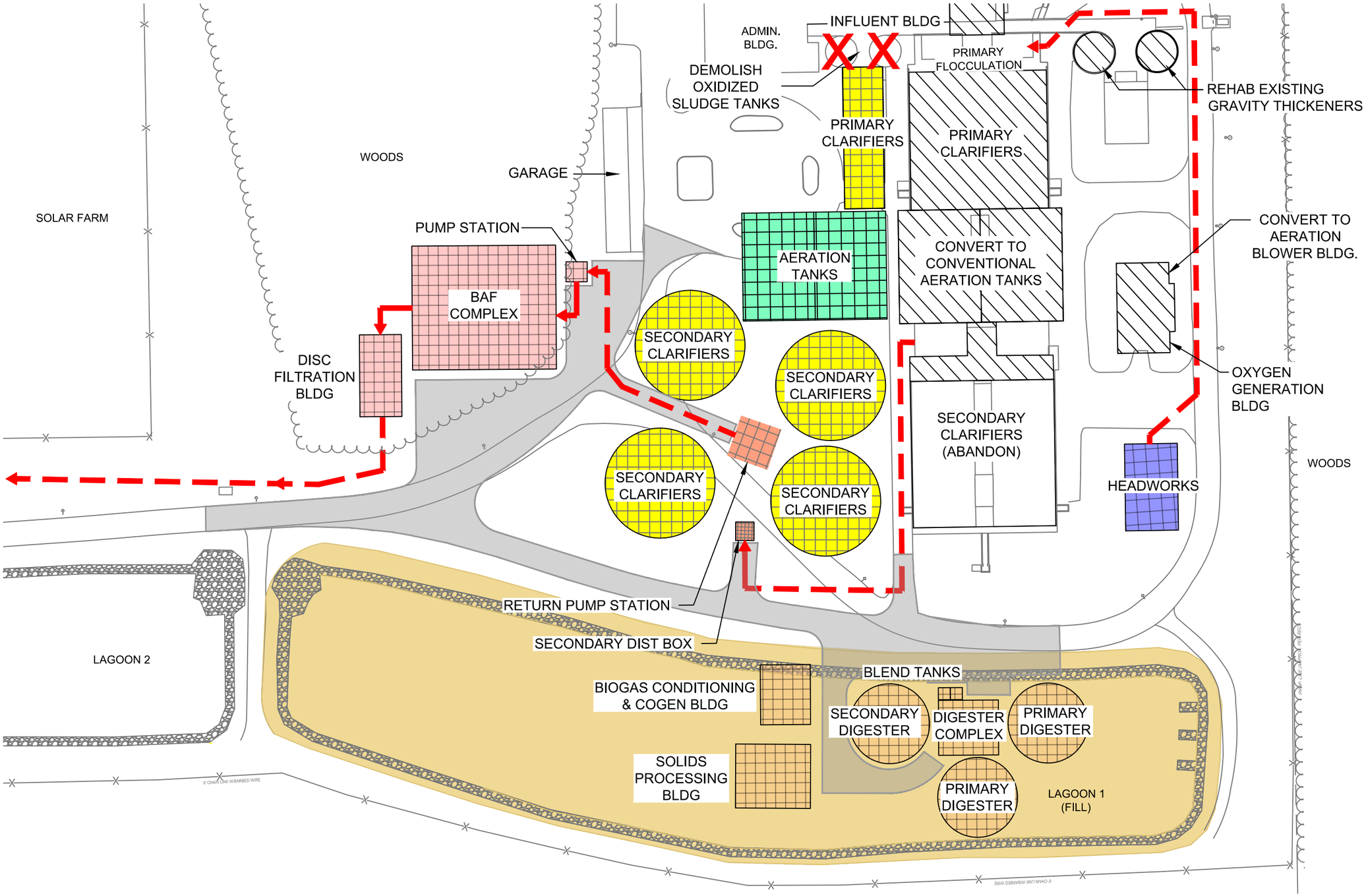

100 0 100 200

1"=100'–0"

SITE PLAN

SCALE: 1"=100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 2 - CONV / BAF
FLOW / LOAD SCENARIOS 2 & 3

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.6

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
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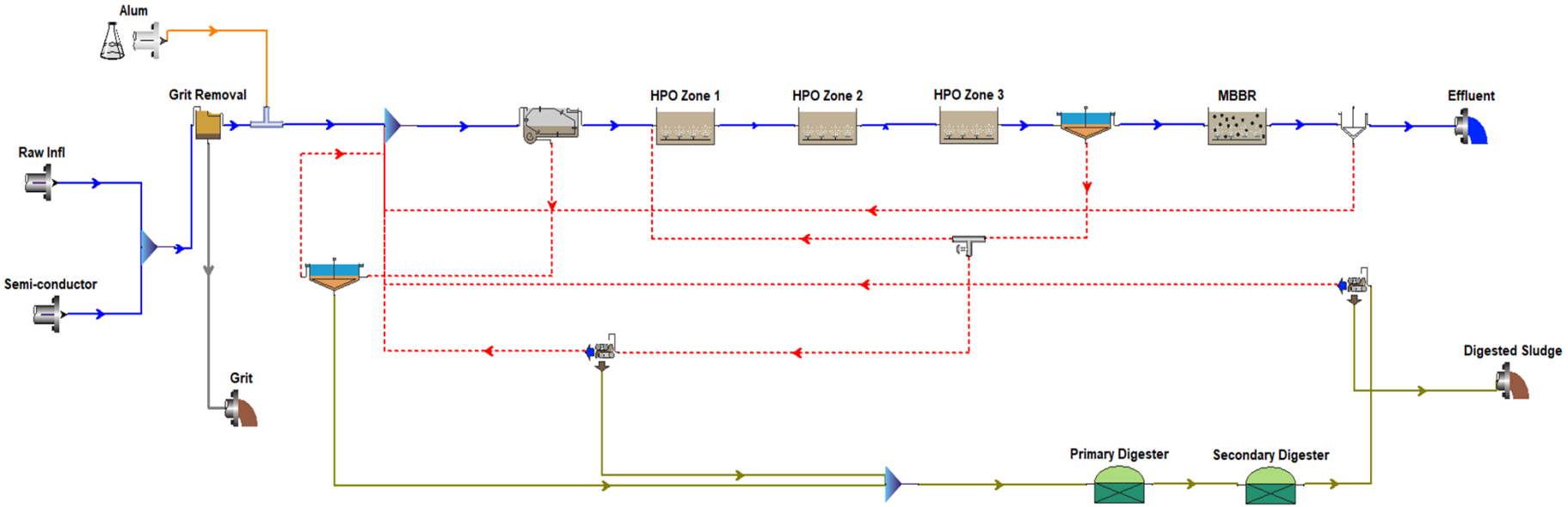
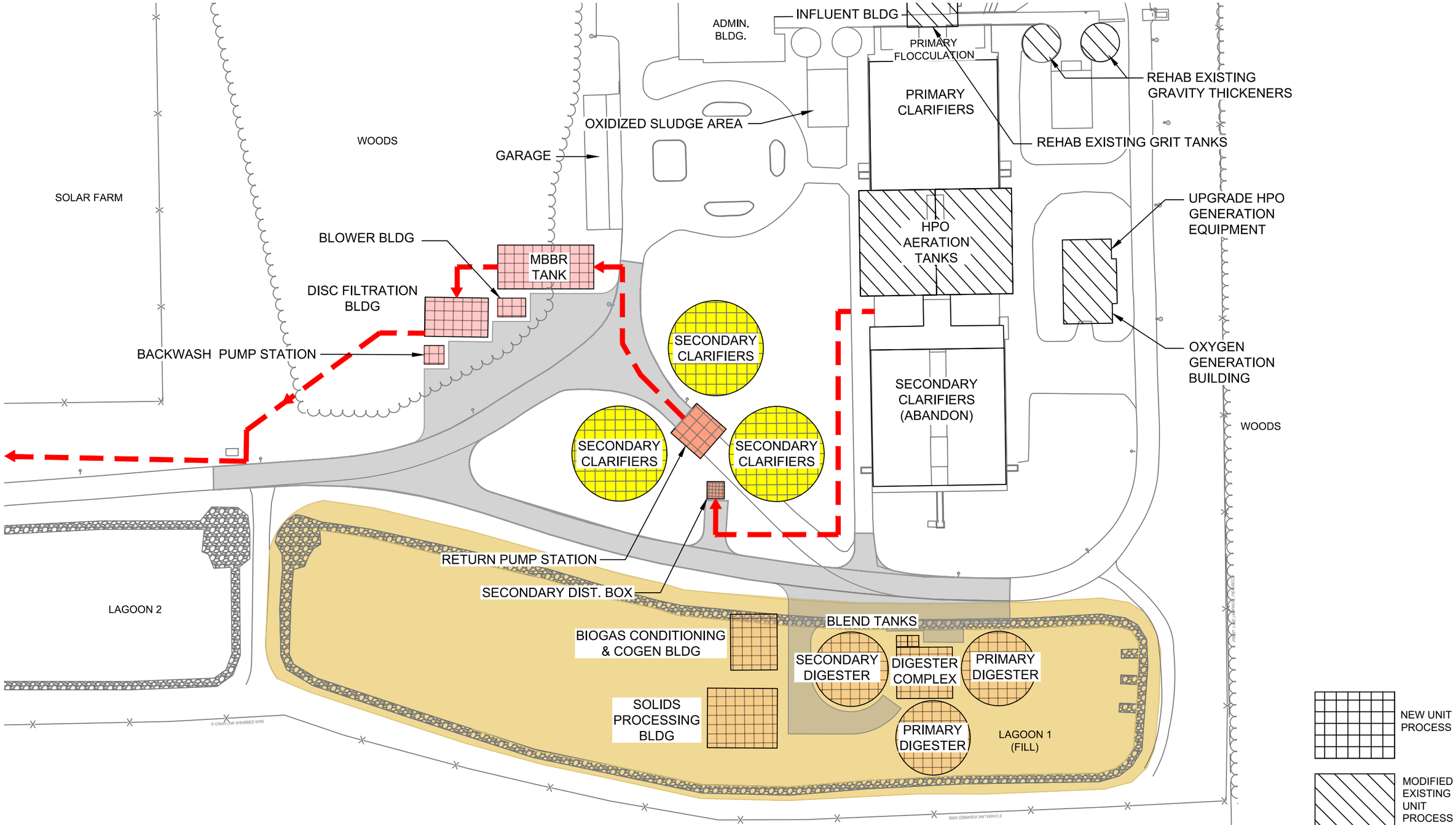


OAK ORCHARD
WWTP FEASIBILITY STUDY

ALTERNATIVE 3 PROCESS SCHEMATIC HPO-MBBR

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 6.7



100 0 100 200

1"=100'–0"

SITE PLAN

SCALE:1"= 100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 3 - HPO / MBBR FLOW / LOAD SCENARIO 1

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.8

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
Plot Date: 18 December 2020 - 5:42 PM

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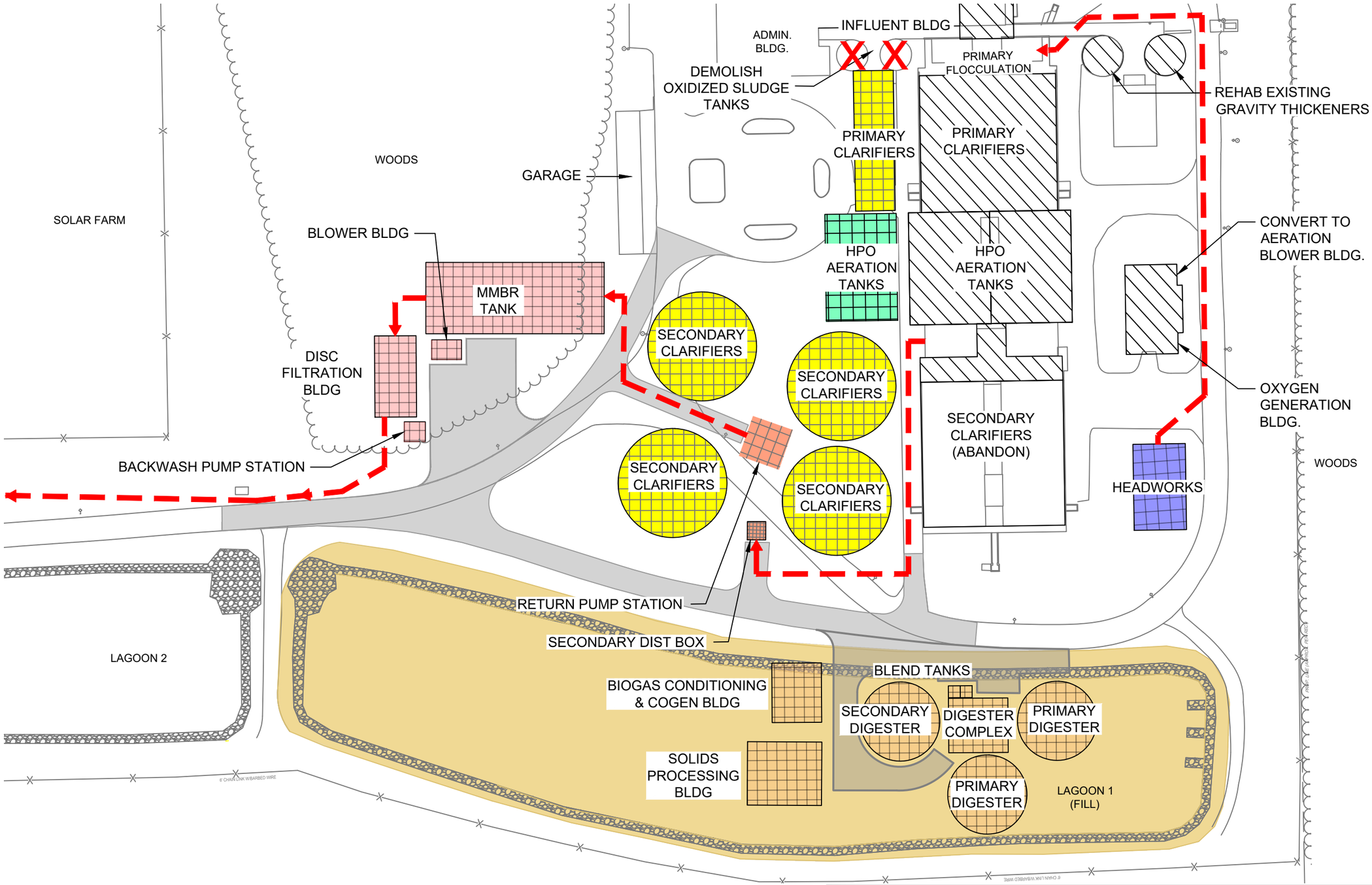

1"=100'–0"

100 0 100 200

SITE PLAN

SCALE:1"=100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 3 - HPO / MBBR FLOW / LOAD SCENARIOS 2 & 3

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.9

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
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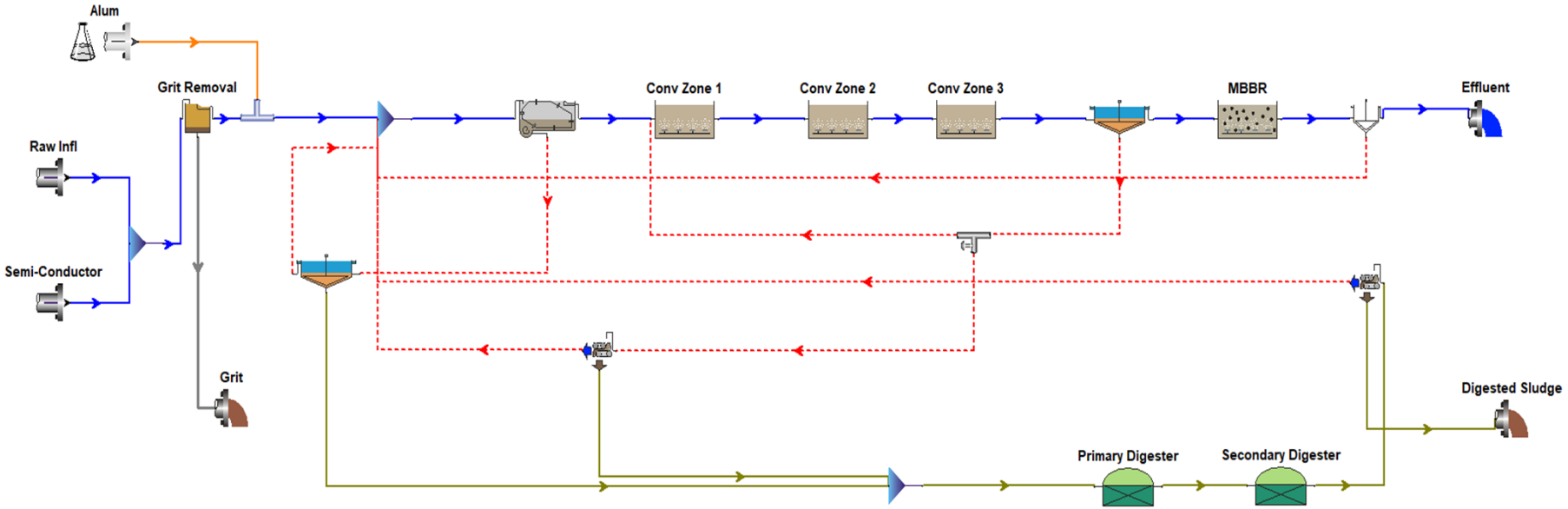
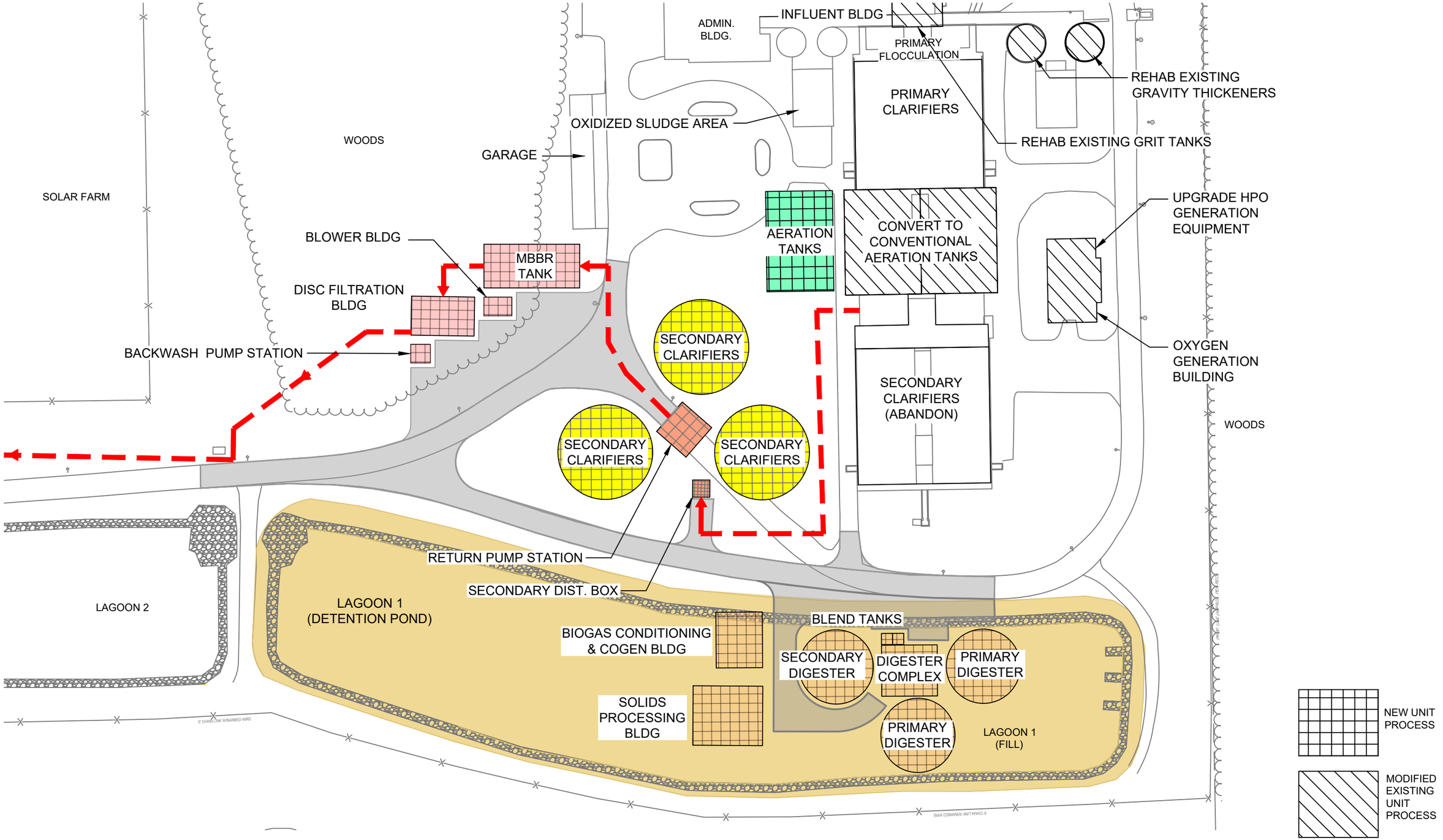


OAK ORCHARD
WWTP FEASIBILITY STUDY

ALTERNATIVE 4 PROCESS SCHEMATIC CONVENTIONAL - MBBR

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 6.10



100 0 100 200

1"=100'–0"

SITE PLAN

SCALE:1"= 100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 4 - CONV / MBBR FLOW / LOAD SCENARIO 1

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.11

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
Plot Date: 18 December 2020 - 5:43 PM

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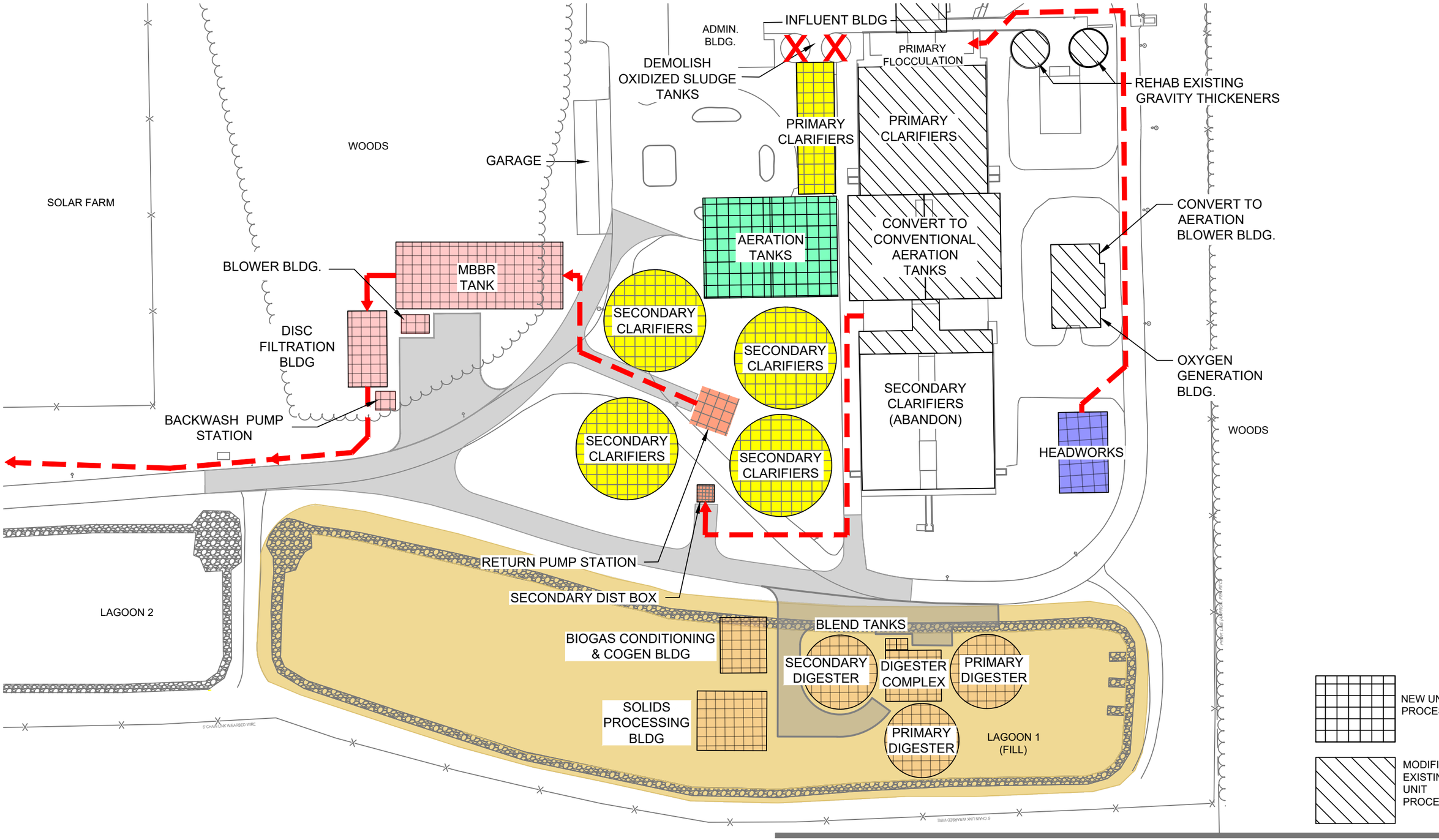

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1"=100'–0"

SITE PLAN

SCALE: 1"=100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 4 - CONV / MBBR FLOW / LOAD SCENARIOS 2 & 3

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.12

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
Plot Date: 18 December 2020 - 5:43 PM

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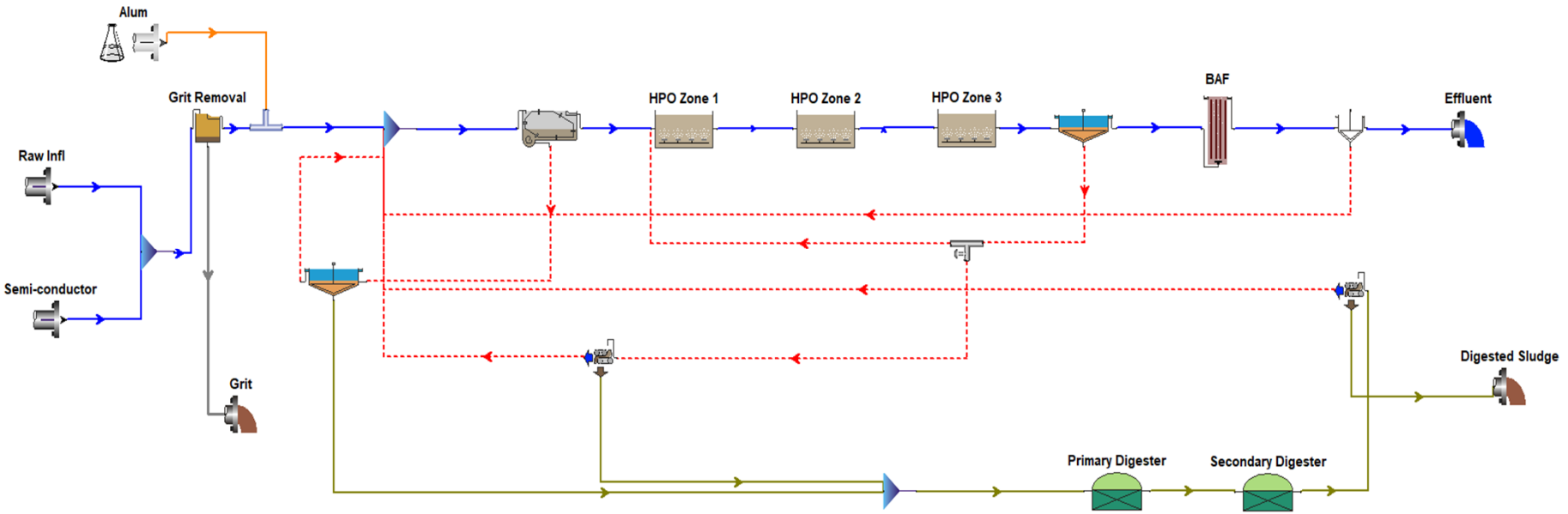
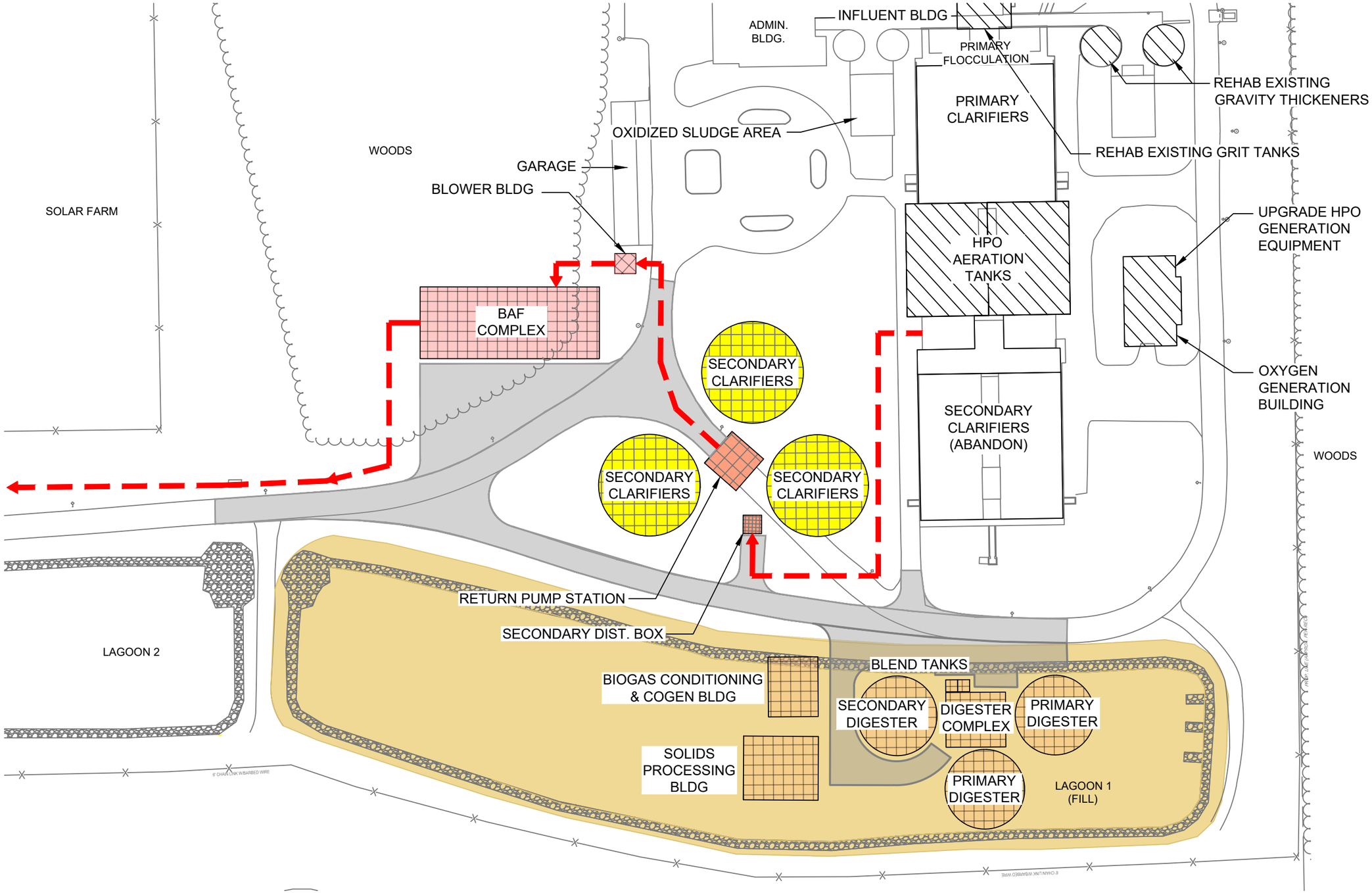


OAK ORCHARD
WWTP FEASIBILITY STUDY

ALTERNATIVE 5 PROCESS SCHEMATIC HPO - BAF

Project No. **11214118**
Report No.
Date **OCT 2020**

FIGURE 6.13



100 0 100 200

1"=100'–0"

SITE PLAN

SCALE:1"= 100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 5 - HPO / BAF FLOW / LOAD SCENARIO 1

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.14

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
Plot Date: 18 December 2020 - 5:43 PM

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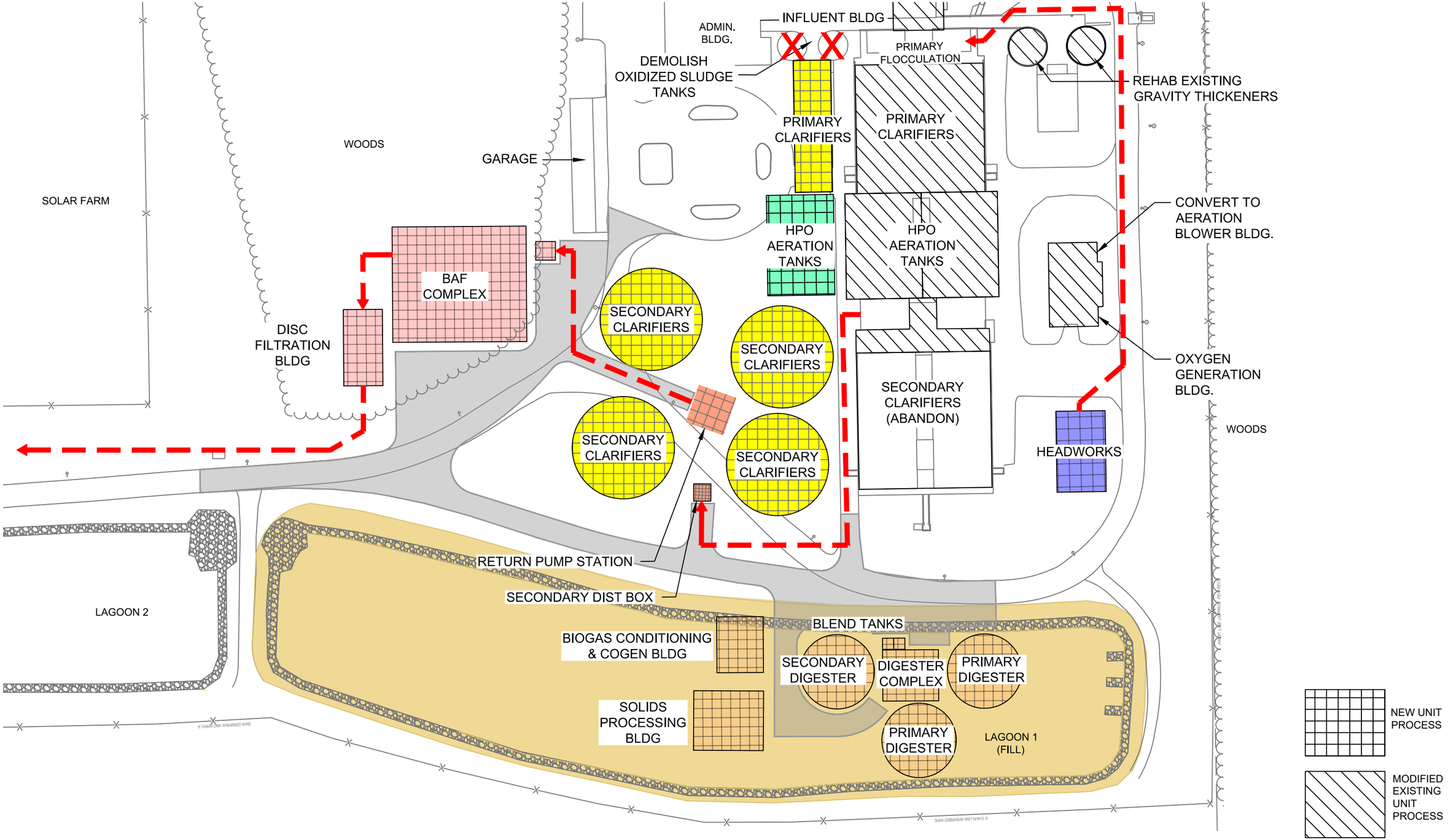


1"=100'–0"

100 0 100 200

SITE PLAN

SCALE: 1"=100'–0"

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

ALTERNATIVE 5 - HPO / BAF
FLOW / LOAD SCENARIOS 2 & 3

Project No.
Report No.
Date OCTOBER 2020

FIGURE 6.15

Filename: C:\Users\skowalczyk\Documents\11214118-BRYANT-FIGURES.dwg
Plot Date: 18 December 2020 - 5:43 PM

Source:

Figure 8.1
Conceptual Project Schedule - Design, Bid, Build Approach
Oak Orchard WWTP
Flow/Load Scenario 1 - Alternative 1 (MBR)

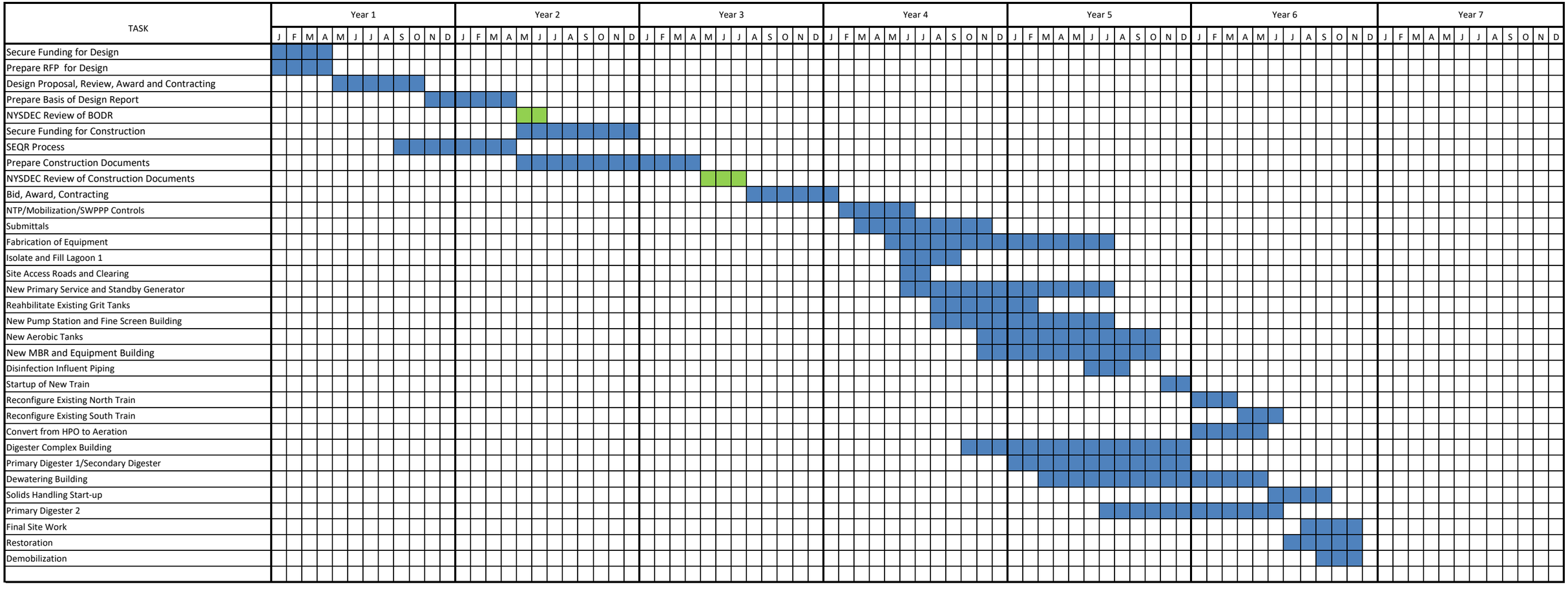


Figure 8.2
Conceptual Project Schedule - Design, Bid, Build Approach
Oak Orchard WWTP
Flow/Load Scenario 1 - Alternatives 2/4 (Conventional Activated Sludge and BAF or MBBR)

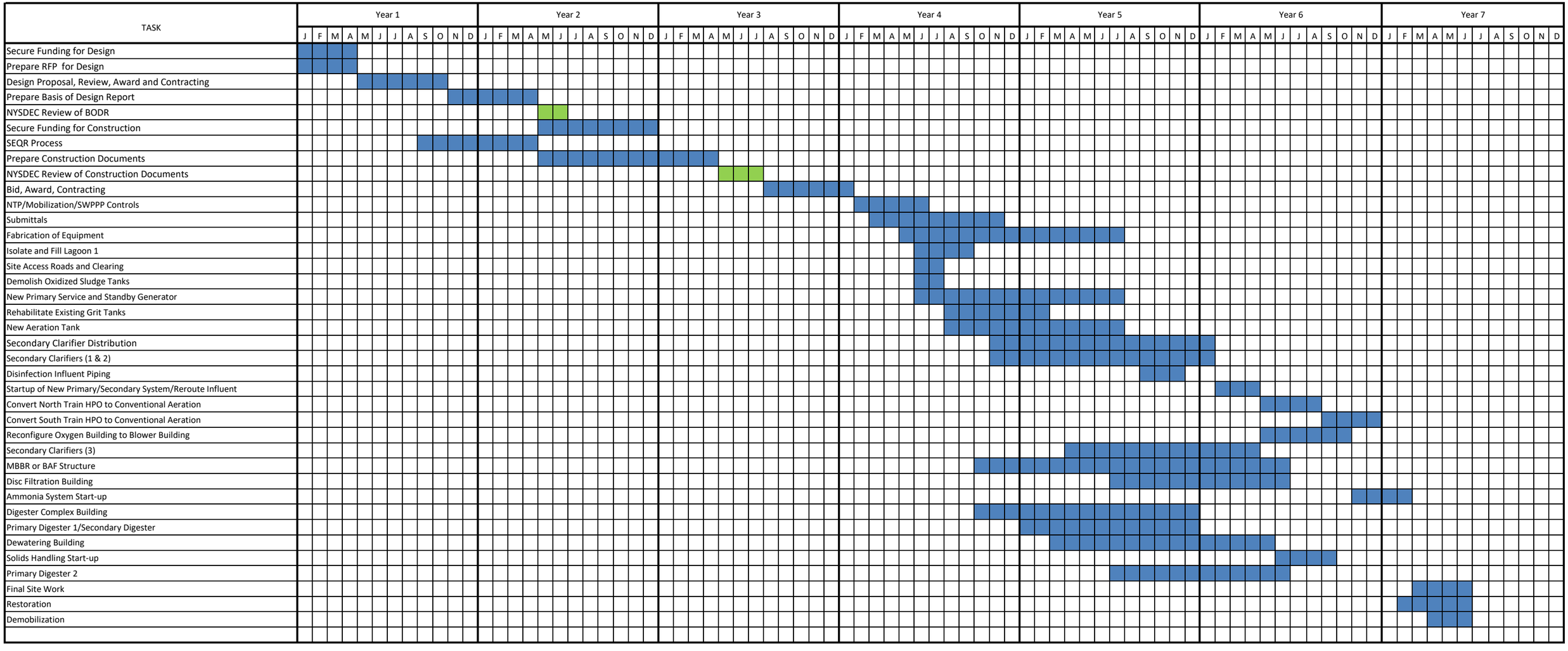


Figure 8.3
Conceptual Project Schedule - Design, Bid, Build Approach
Oak Orchard WWTP
Flow/Load Scenario 1 - Alternatives 3/5 (High Purity Oxygen and MBBR or BAF)

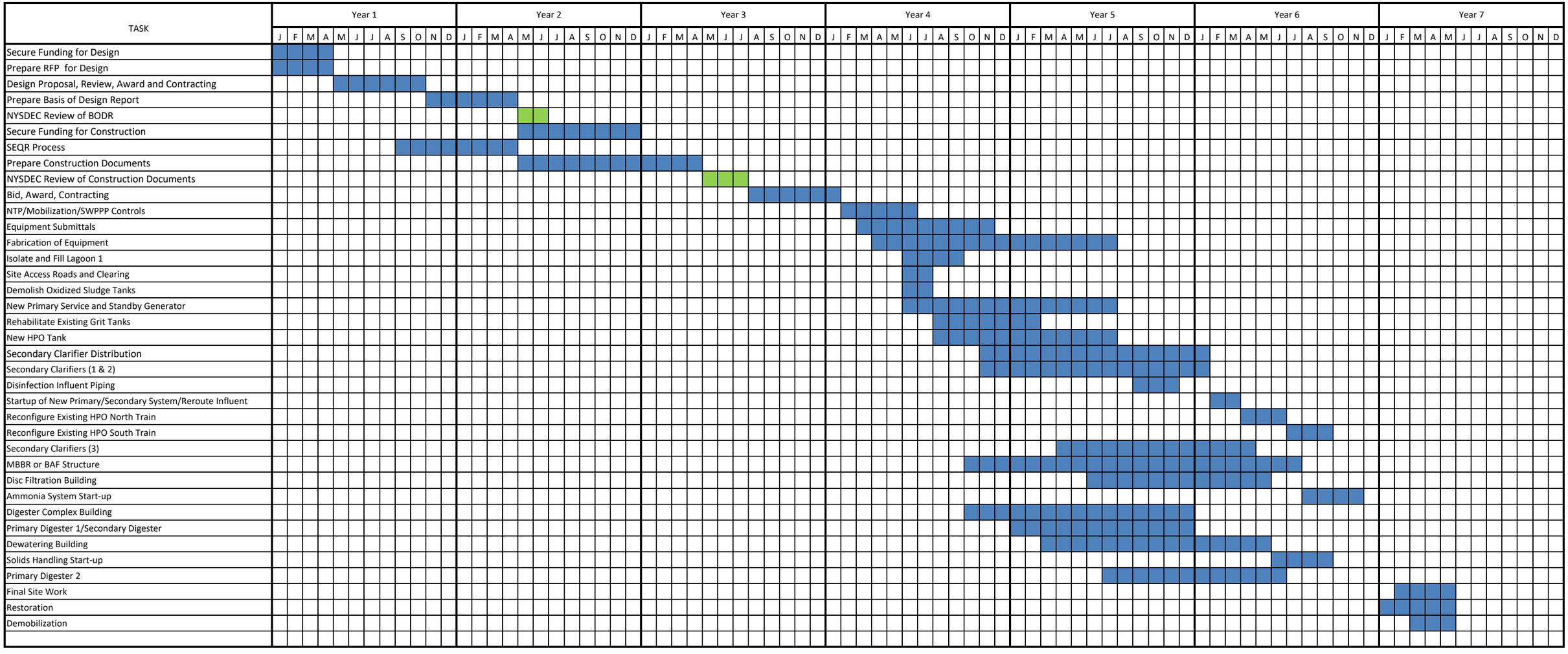


Figure 8.4
Conceptual Project Schedule - Design, Bid, Build Approach
Oak Orchard WWTP
Flow/Load Scenarios 2 & 3 - Alternative 1 (MBR)

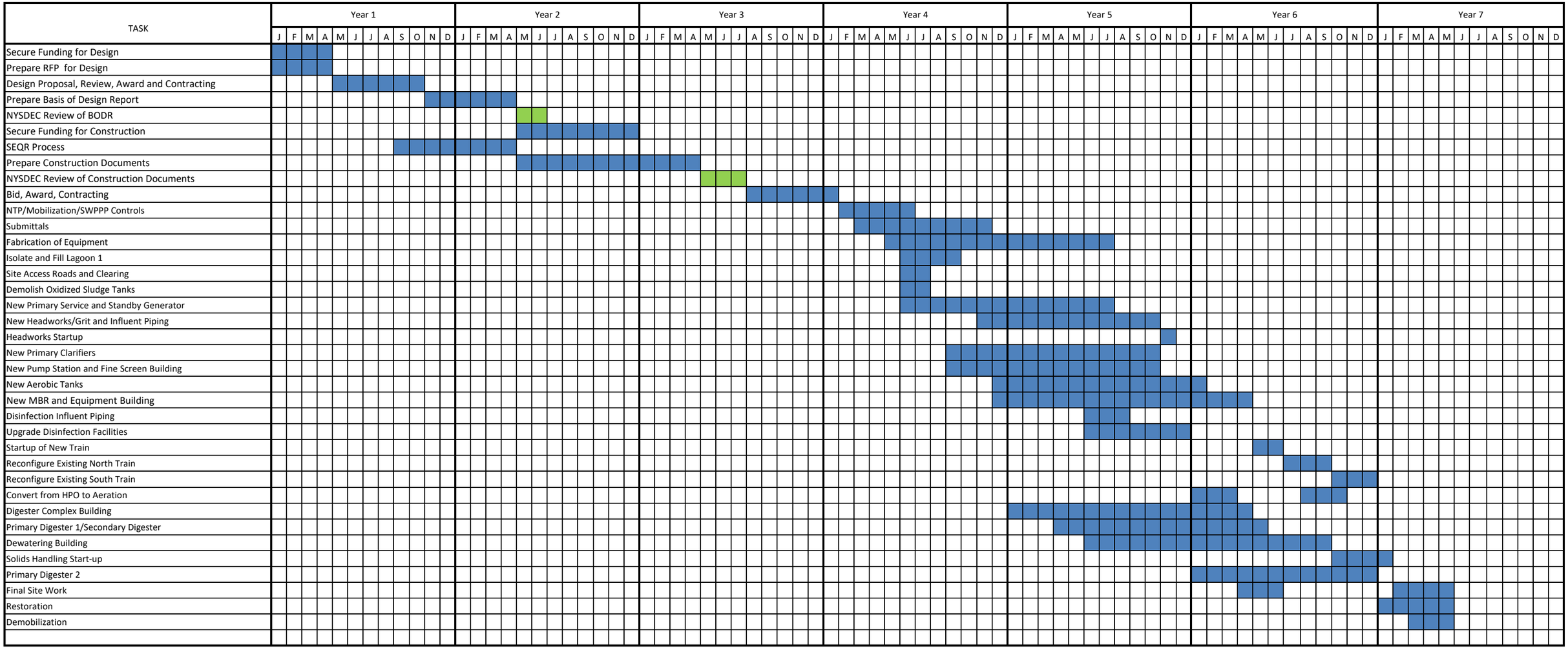


Figure 8.5
Conceptual Project Schedule - Design, Bid, Build Approach
Oak Orchard WWTP
Flow/Load Scenarios 2 & 3 - Alternatives 2/4 (Conventional Activated Sludge and BAF or MBBR)

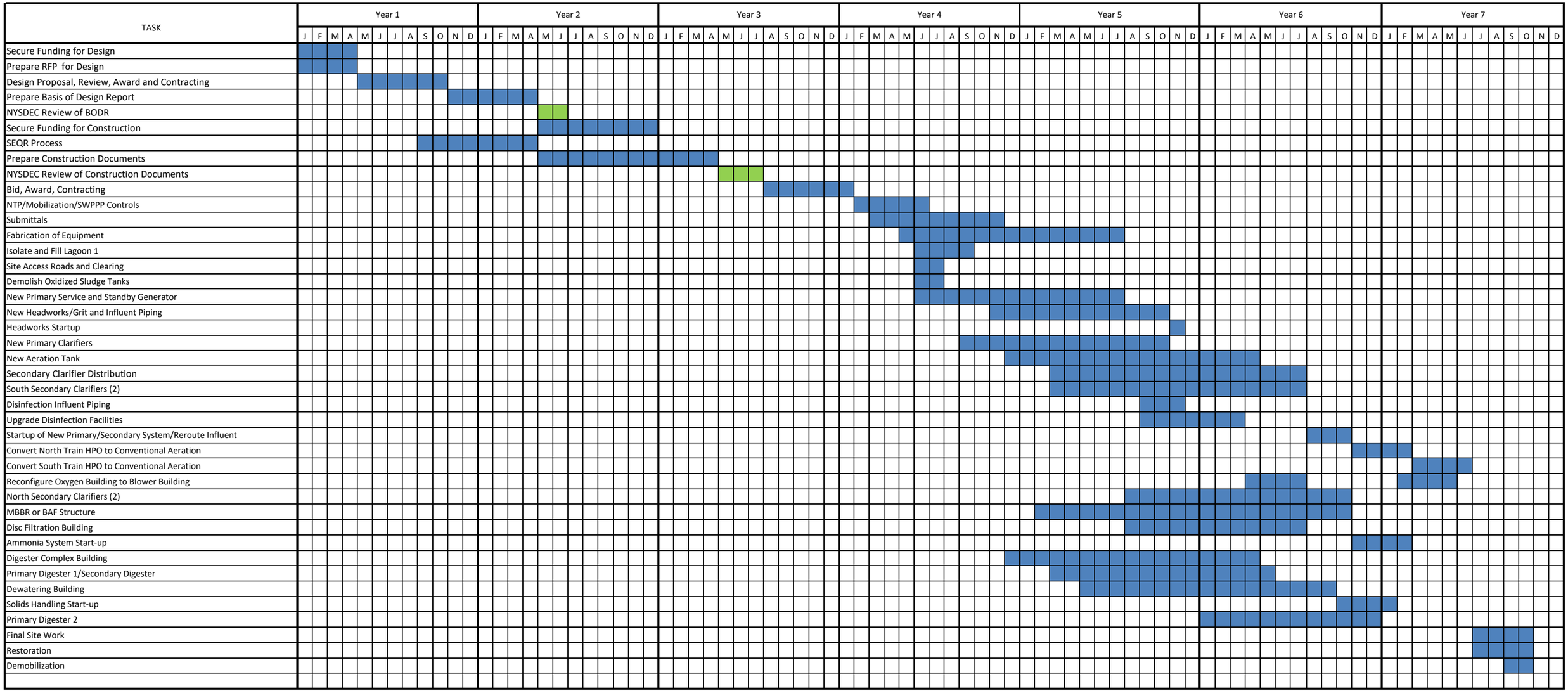


Figure 8.6
Conceptual Project Schedule - Design, Bid, Build Approach
Oak Orchard WWTP
Flow/Load Scenarios 2 & 3 - Alternatives 3/5 (High Purity Oxygen and MBBR or BAF)

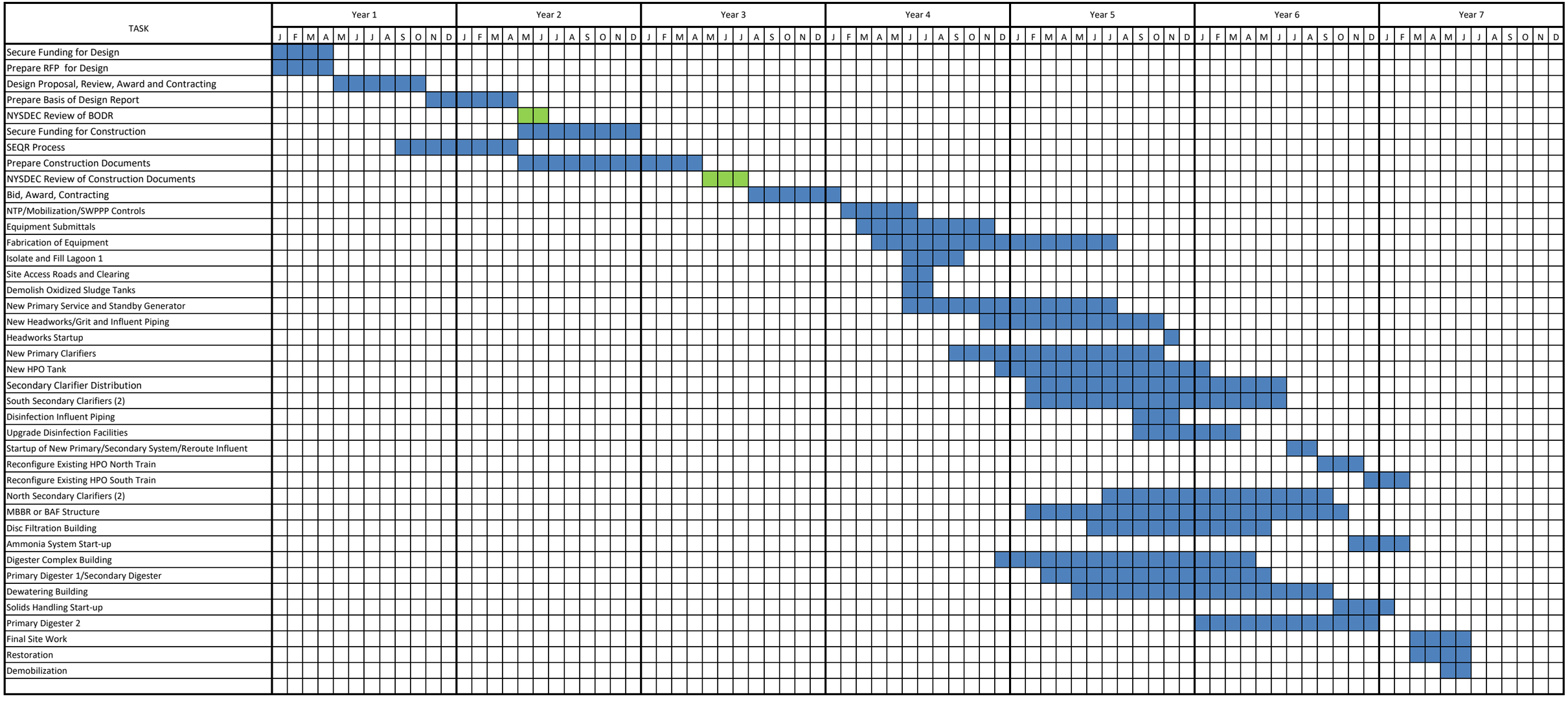


Figure 8.7
Conceptual Project Schedule - Design-Build Approach
Oak Orchard WWTP
Flow/Load Scenarios 2 & 3 - Alternative 1 (MBR)

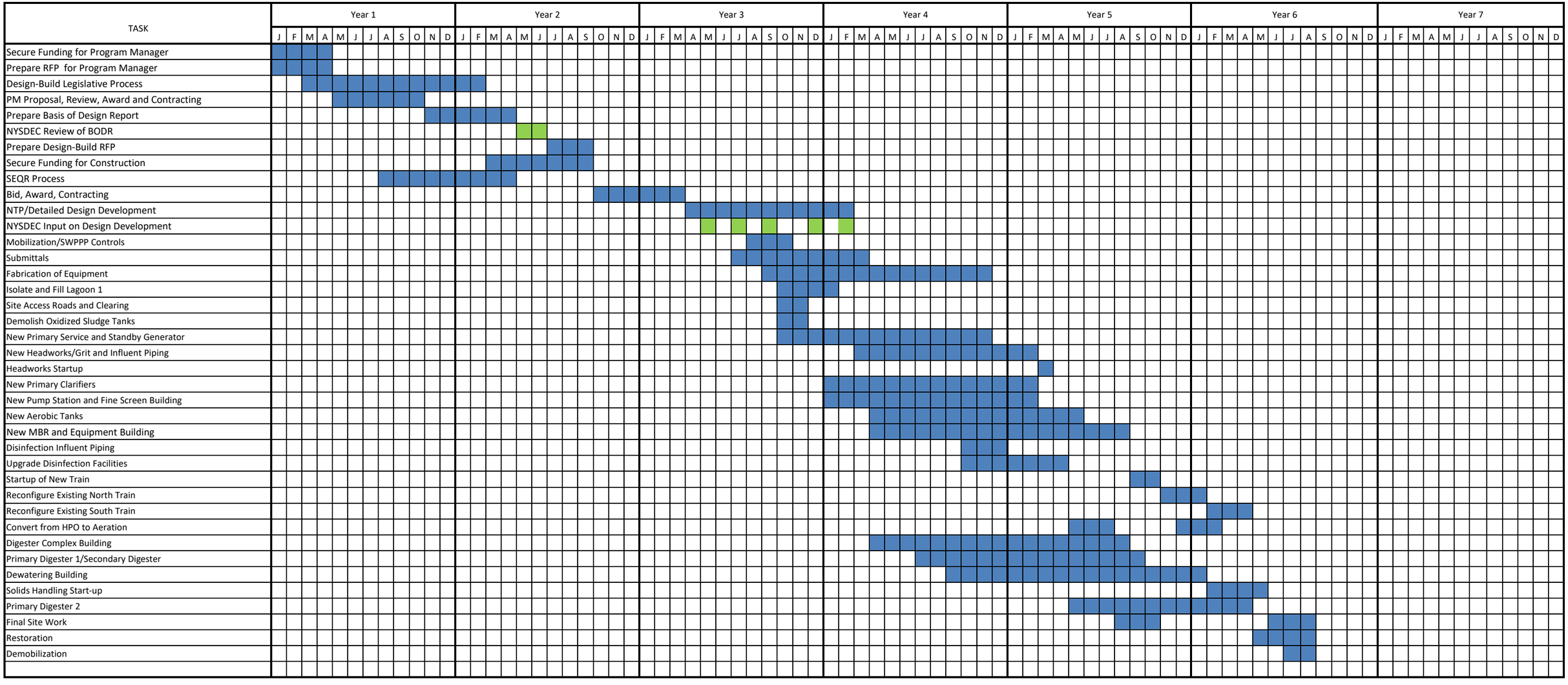
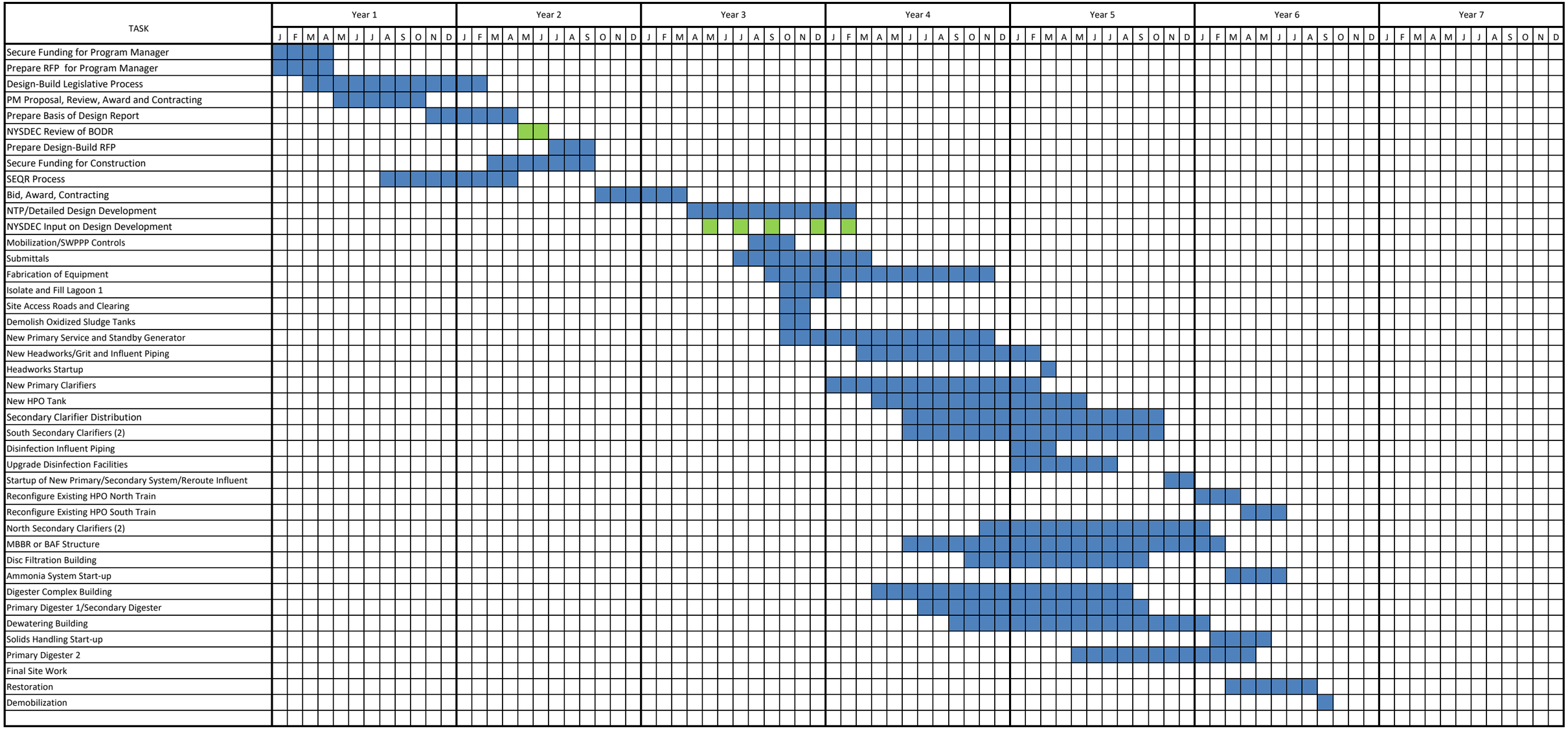


Figure 8.8
Conceptual Project Schedule - Design-Build Approach
Oak Orchard WWTP
Flow/Load Scenarios 2 & 3 - Alternatives 2/4 (Conventional Activated Sludge and BAF or MBBR)

TASK	Year 1												Year 2												Year 3												Year 4												Year 5												Year 6												Year 7											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Secure Funding for Program Manager																																																																																						
Prepare RFP for Program Manager																																																																																												
Design-Build Legislative Process																																																																																												
PM Proposal, Review, Award and Contracting																																																																																												
Prepare Basis of Design Report																																																																																												
NYSDEC Review of BODR																																																																																												
Prepare Design-Build RFP																																																																																												
Secure Funding for Construction																																																																																												
SEQR Process																																																																																												
Bid, Award, Contracting																																																																																												
NTP/Detailed Design Development																																																																																												
NYSDEC Input on Design Development																																																																																												
NTP/Mobilization/SWPPP Controls																																																																																												
Submittals																																																																																							
Fabrication of Equipment																																																																																							
Isolate and Fill Lagoon 1																																																																																							
Site Access Roads and Clearing																																																																																						
Demolish Oxidized Sludge Tanks																																																																																						
New Primary Service and Standby Generator																																																																																						
New Headworks/Grit and Influent Piping																																																																																						
Headworks Startup																																																																																					
New Primary Clarifiers																																																																																				
New Aeration Tank																																																																																				
Secondary Clarifier Distribution																																																																																			
South Secondary Clarifiers (2)																																																																																		
Disinfection Influent Piping																																																																																	
Upgrade Disinfection Facilities																																																																																	
Startup of New Primary/Secondary System/Reroute Influent																																																																																
Convert North Train HPO to Conventional Aeration																																																																																
Convert South Train HPO to Conventional Aeration																																																																															
Reconfigure Oxygen Building to Blower Building																																																																															
North Secondary Clarifiers (2)																																																																											
MBBR or BAF Structure																																																																										
Disc Filtration Building																																																																										
Ammonia System Start-up																																																																										
Digester Complex Building																																																																										
Primary Digester 1/Secondary Digester																																																																										
Dewatering Building																																																																										
Solids Handling Start-up																																																																									
Primary Digester 2																																																																									
Final Site Work																																																																									
Restoration																																																																									
Demobilization																																																																									

Figure 8.9
Conceptual Project Schedule - Design-Build Approach
Oak Orchard WWTP
Flow/Load Scenarios 2 & 3 - Alternatives 3/5 (High Purity Oxygen and MBBR or BAF)



Appendices

Appendix A – Memorandum on Overview of Semiconductor Wastewater

Memorandum

To: Jason Greene, P.E.
From: Sara Martin, P.E.

Re: Overview of Semiconductor Wastewater

The Onondaga County Department of Water and Environmental Protection (OCDWEP), Onondaga County Office of Economic Development (OCIDA) and Syracuse Onondaga County Planning Agency (SOPCA) are working together to attract a new industrial client to the White Pine Commerce Park. The industrial tenant targeted for this opportunity is anticipated to be a high-tech manufacturer of semiconductors. Industrial process wastewater resultant from manufacturing operations will require discharge to the local sewer with ultimate treatment and discharge at the OCDWEP Oak Orchard Wastewater Treatment Plant (WWTP).

The potential tenant is unknown by GHD and CPES at this time as are the characteristics of the wastewater that would be discharged and therefore, this memorandum was developed to provide the following for this initial phase of the project:

- Typical Semiconductor Operations and Pretreatment Processes
- Potential Characteristics of Semiconductor Wastewater
- Review of Categorical Limits for Semiconductor Wastewater
- Considerations for Permitting and Design

Typical Semiconductor Operations and Pretreatment Processes

Each manufacturer typically has a proprietary process that can result in differing wastewater characteristics. Production requires ultra-pure water (UPW) for wet cleaning processes, acid etching solvent processes and tool cleaning. The wastewater can be dependent on the type of materials processed, as well as which chemicals and at what concentration they are used for etching and cleaning.

Since this industry utilizes a large amount of water for production (2,000-3,000 gallons per manufactured chip), water recycling and recovery of waste streams is an important aspect to reduce

the volume and concentrations of spent chemicals and metals within the wastewater prior to discharge. The amount of recycling and recovery also can affect the wastewater characteristics.

There has been a strong push within this industry for upstream recycle and recovery treatment to recover UPW, spent solvents and chemicals, and metals. Typical upstream treatment processes include the following:

- Neutralization of spent acids/alkali solutions.
- Source segregation of wastestreams containing non-biodegradable compounds, such as solvent recovery, air stripping, chemical oxidation, and adsorption.
- Metals recovery through chemical precipitation, coagulation and flocculation, electrochemical recovery, and ion exchange.
- Chemical oxidation of cyanides.
- Dewatering and disposal of hazardous materials in dedicated hazardous landfills.
- Advanced metal removal using membranes and/or other physical chemical treatment methods.
- Removal of recalcitrant organics and halogenated organics using activated carbon or advanced chemical oxidation.
- Reduction in effluent toxicity using reverse osmosis, ion exchange carbon adsorption.
- Containment and treatment of volatile organic compounds stripped from various unit operations.

The amount and type of upstream recovery and/or treatment is specific to each manufacturer and the economics of recovery versus downstream treatment cost. Developing pre-treatment requirements for such an industry must balance upstream pretreatment with Oak Orchard WWTP's ability to treat this specific wastewater and achieve future established permitted discharge compliance.

Typical Characteristics of Semiconductor Wastewater

Semiconductor facility wastewater typically contains contaminants such as solvents, arsenic, antimony, acids, alkalis, salts, fine oxide particles, and other pure organic and inorganic compounds.

Some of the main chemicals used upstream in the manufacturing process are Hydrofluoric Acid (HF), Tetramethylammonium hydroxide (TMAH), Monoethylamine (MEA), Dimethyl Sulfoxide (DMSO),

Ammonia (NH_3), Nitric Acid (HNO_3), N-methyl-2-pyrrolidone (NMP), Hydrochloric Acid (HCl), Nitrate Compounds, Sulfuric Acid (H_2SO_4), and other pure organic and inorganic compounds.

HF is widely used in the etching processes and for cleaning wafers and quartz tubes. TMAH is used for anisotropic silicon etching when metal ion free processing is required. MEA is also used for selective etching.

NH_3 is a toxic gas, used as a blending division for the calibration gases of emissions and in specialty semiconductor manufacturing. HNO_3 in the semiconductor industry is commonly used as a mixture with hydrofluoric acid used in the etching and exposing the critical layer in the front-end processing to adjust between diffusion-limited and rate-limited etching. It is the main oxidizing ingredient of many etching mixtures for metals such as silver, copper, aluminum, silicon, geranium, and gold.

NMP is used as an effective polar solvent for positive photoresist stripping, developing and metal lift off. DMSO has become a recent alternative to NMP.

HCl is the main chemical that is used in the production of the silicon components used in semiconductor manufacturing, as it can be used in the engraving of silica into a mix with ammonium fluoride solution by using it in-house with nitric acid. It also dilutes as a cleaning agent to remove residual oxides as well.

H_2SO_4 is used for resist stripping and wafer cleaning material within semiconductor manufacturing plants.

These chemicals are typically captured upstream for reuse, treatment and/or disposal as a hazardous waste; however, residual amounts could be found in wastewater from operations.

Potential pollutants found in semiconductor wastewater are summarized below – and are highly dependent on the process and recovery methods used upstream:

- Total Organic Halides
- Ammonia
- TDS
- TKN
- Phosphorus
- Oil and Grease (O&G)
- TOC/COD/BOD_5
- Fluoride
- Chloride
- Calcium
- Sulfate
- Hydrogen Peroxide
- Cadmium
- Chromium (total and hexavalent)
- Copper
- Cyanate
- Cyanide
- Lead
- Mercury
- Nickel

- Phosphates
- Silica
- Selenium
- Nickel
- Silver
- Tin
- Zinc

Attached is a table that summarizes potential wastewater characteristics and concentrations from semiconductor industry, obtained through literature search and actual testing from discharge of a confidential plant.

Organic content seems to be slightly lower than typical domestic sanitary wastewater; however, contains excessive organic nitrogen in the form of ammonia. Of note, during the aerobic digestion process, TMAH breaks down to form additional ammonia. This coupled with the toxicity issues makes the initial start-up and formation of the nitrifiers required to break down this additional ammonia that is formed in the initial degradation difficult. Therefore, any modeling effort should use sensitivity to the increased ammonia that could result after the initial biological degradation.

Total phosphorus seems slightly lower than domestic sanitary wastewater and the organic phosphorus content is unknown.

Solids also seem very low compared to domestic sanitary wastewater. However, it should be noted that this wastewater can have a cloudy appearance formed by fine oxide particles that are resultant from the etching process. These particles are typically 0.2 micron or smaller, so they do not show up in the analysis for suspended solids (TSS) as they pass through the 0.45 micron filter that is typically used in the analysis. Therefore, these particles, if present, would show up as TDS due to particle size, which can make process control of inert solids to biological solids difficult to characterize and monitor during design and operations. During characterization it is recommended to obtain the volatile fraction of both suspended and dissolved solids so that an accurate characterization of inert solid ratio can be understood for design purposes.

Another consideration is the potential for high chlorides (>500 ppm). These can lead to corrosion in piping and equipment that is not resistant to chloride attack.

Calcium and hardness present in this wastewater can cause scaling, especially given the high potential for sulfate in this wastewater to form calcium sulfate.

This wastewater also has a potential for low alkalinity and alkalinity may need to be added to facilitate ammonia removal.

Since the characteristics listed above are for just semiconductor wastewater, some of these concerns may be mitigated with blending and dilution, depending on final ratio of domestic sanitary wastewater to process wastewater.

Review of Categorical Limits for Semiconductor Wastewater

United States Department of Environmental Protection (USEPA) Code of Federal Regulations, 40 CFR: Protection of the Environment Part 469 establishes the Electrical and Electronic Components Point Source Category Effluent Limitations Guidelines.

Within 40 CFR Part 469 there is a Subpart A for semiconductor wastewater, as summarized below:

§ 469.17 New source performance standards (NSPS). Any new source subject to this subpart must achieve the following new source performance standards (NSPS).

Subpart A - Semiconductor PSNS Effluent Limitations

Pollutant	Maximum for any 1 day	Ave. Daily Value for 30 days
Total Toxic Organics (TTO)	1.37 mg/l	NA
Fluoride	32.0 mg/l	17.4 mg/l
pH	NA	Range 6.0 to 9.0 SU

§ 469.18 Pretreatment standards for new sources (PSNS). Except as provided in 40 CFR 403.7, any new source subject to this subpart which introduces pollutants into a publicly owned treatment works must comply with 40 CFR part 403 and achieve the following Pretreatment standards for new sources (PSNS):

(a) Subpart A - Semiconductor PSNS Effluent Limitations

Pollutant	Maximum for any 1 day	Ave. Daily Value for 30 days
Total Toxic Organics (TTO)	1.37 mg/l	NA

(b) A new source submitting a certification in lieu of monitoring pursuant to § 469.13 (c) and (d) of this regulation must implement the solvent management plan approved by the control authority.

TTO is defined as the sum of concentrations for each of the identified toxic organic compounds under § 469.12 which is found in the discharge at a concentration greater than 10 µg/L. Table 1 includes the list of TTO from this section. There are provisions within § 469.13 that would allow OCDWEP to work with the semiconductor facility to submit a solvent management plan and certification that the TTO will not be present in the wastewater.

Acceptable end of pipe treatment methods within 40 CFR Part 469 includes neutralization, precipitation and clarification, filtration, activated sludge, advanced oxidation and carbon adsorption.

Considerations for Further Design and Permitting

The first step would be to establish the basis of design from the actual processes to be used at the new manufacturing plant. This can be established through mass balance work and/or extensive sampling if there is a similar plant operating somewhere else.

It is also suggested to talk to operators that have treated this wastewater and get any experience they may have that should be applied to the overall design.

Once the wastewater characteristics are known, discharge limits would need to be established with the New York State Department of Environmental Conservation (NYSDEC), as the addition of the industrial wastewater would most likely affect the current discharge permit limits.

A headworks analysis and additional modeling may need to be done with the actual wastewater characterization specific to the industrial wastewater to help establish an effective pretreatment program with upstream limits that protect Oak Orchard and the receiving water. This analysis will also need to be done to also make sure that resultant sludge will not contain metals in quantities that would require disposal of the sludge as a hazardous material.

The amount of TMAH that could be discharged should be established, as this compound is known to cause inhibition to downstream biological processes. The TMAH compound also breaks down and releases additional ammonia in the initial stage of biological treatment.

Table 1 has an initial review for inhibitory compounds in comparison to EPA inhibitory guidelines. These should be sampled for and reviewed once the final sampling and headworks analysis has been performed. Arsenic and chromium levels are listed in these guidelines but of note, fluoride is not,

although has been shown to have an inhibitory effect, reducing nitrification in the presence of increased ammonia that can be experienced with this wastewater.

Certain characteristics that may not show up in sampling that need to be considered is the opacity given the fine oxide particles as well as corrosion and scaling factors to piping, equipment and diffusers (scaling of fine bubble membranes).

References:

1. International Finance Corporation – World Bank Group. "Environmental, Health and Safety Guidelines – Semiconductors and other Electronics Manufacturing", April 30, 2007.
2. Shen, Chien-Wen, et al. "Chemical Waste Management in the U.S. Semiconductor Industry." *Sustainability*, vol. 10, no. 5, 2018, p. 1545., doi:10.3390/su10051545.
3. Nabin Chowdhury et al. "A Solution for Microelectronics Manufacturing Wastewater Treatment, VWEA, Charlottesville, VA, March 8, 2016.
4. Temple Ballard et al. "A Novel Process for the Treatment of Wastewater from the Microelectronics Industry, International Water Conference (IWC) 13-34.
5. Ferella, F., Innocenzi, V., Zueva, S., Corradini, V., Ippolito, N. M., Birloaga, I. P., . . . Vegliò, F. (2019). Aerobic Treatment of Waste Process Solutions from the Semiconductor Industry: From Lab to Pilot Scale. Sustainability,11(14), 3923. doi:10.3390/su11143923
6. William W. Clarkson et al. "Effect of Fluoride on Nitrification of a Concentrated Industrial Waste", Applied and Environmental Microbiology, January 1989.
7. Pure water, Semiconductors and the Recession. (2009, October). Retrieved July 16, 2020, from https://www.globalwaterintel.com/global-water-intelligence-magazine/10/10/uncategorized /pure-water-semiconductors-and-the-recession

Table 1

Presented at the OCDWEP Scoping Meeting - July 7, 2020

Potential Semiconductor Wastewater Characteristics

	OCWEP Local Limits		40 CFR 469.18/19	EPA Inhibitory Guidleines					7 MGD Loading (lbs.)	10 MGD Loading (lbs.)	Notes
	Daily Allowable	Instantaneous Allowable	EPA Categorical Limits	Activated Sludge	Nitrification	Source 1	Source 2				
pH (S.U.)		5.5-10.5				6-9	6-10				
Temperature (F)		150F									
BOD_5						50	30		2,919	4,170	
COD						160	200		9,341	13,344	
TKN							30				
TSS						50	15		2,919	4,170	
UOD											
Ammonia				480		10	30		1,751	2,502	potential for as high as 100 mg/L with break down of TMAH
Oil and Grease						10	2		584	834	
Total Phosphorus						2	3		175	250	
OCWEP Allowable Local Limitations											
Total Cadmium	2	3		1-10	5.2	0.1	0.005		6	8	PP
Total Chromium	8	12		1-100	0.25-1.9	0.5	0.005		29	42	PP
Hexavalent Chromium	4	6		1	1-10	0.1			6	8	
Total Copper	5	7.5		1	0.05-0.48	0.5	0.02		29	42	PP
Total Lead	1	1.5		1 - 100	0.5	0.1	0.01		6	8	PP
Total Mercury	0.004	0.006		0.1 - 1		0.01	0.01		1	1	PP
Total Cyanide	--	3		0.1 - 5	0.34-0.5	1	0.05		58	83	PP
Free Cyanide						0.1			6	8	
Total Nickel	5	7.5		1 - 2.5		0.5	0.02		29	42	PP
Total Zinc	5	7.5		0.3 - 10	0.08-0.5	2	0.03		117	167	PP
Total Silver	1	1.5				0.1	0.01		6	8	PP
Total Phenolic Compounds		4.5									
Particular to Clintons Ditch											
Molybdenum											
Sulfide				25 - 30							
Sulfate							200		11,676	16,680	scaling/corrosion
Others Listed in Reference not in OCWEP											
TTO			1.37								
1,2,4 Trichlorobenzene Chloroform											
1,2 Dichlorobenzene				5							PP
1,3 Dichlorobenzene				5							PP
1,4 Dichlorobenzene ethylbenzene											
1,1,1 Trichloroethane methylene chloride napthalene											
2 Nitrophenol phenol bis (2-ethylhexyl) phthalate tetrachloroethylene toluene trichloroethylene											
2 chlorophenol				5-200							PP
2,4 dichlorophenol				64	64						PP
4 nitrophenol penta chlorophenol di-n-butyl benzyl pthalate											
1,2 diphenylhydrazine isophorone butyl benzyl phalate											
1,1 dichloroethane											
1,2 dichloroethane											
2,4,6 trichlorophenol carbon tetrachloride											
1,1 trichloroethane dichlorobromomethane			▼								
Selenium						1					PP
Tin						2	0.005				
Arsenic			2.09	0.1	1.5	0.1	0.005				PP
AOX (adsorbable organic bound halogens)						0.5					
TOX							0.4				
Calcium							400				
Hardness							900				scaling
Fluoride			32				4				toxicity
Chloride							900				corrosion
TDS							1,900				
Alkalinity							40				

all units mg/L except where noted otherwise

1. World Bank Group, International Finance Corporation - Envionmental Health and Safety Guidelines for Semiconductor Industry
2. Confidential Source

PP Priority Pollutants

used for loading instead of source 1

Appendix B - Flow and Load Projection Worksheet

APPENDIX B
Oak Orchard WWTP
Future Flow and Load Projections (20-yr planning period)

Notes/Assumptions

Average people per household	2.47	From Census
Typical wastewater flow (gal/capita-day)	76	Metcalf and Eddy Table 3-1
Typical wastewater flow (gal/acre-day)	1,000	Metcalf and Eddy, Ch3, pg 162
Medium Strength Wastewater (mg/L)	See Table	Metcalf and Eddy Table 3-15
Peaking factor	2.25	Ten States

Medium Strength WW Conc (mg/L)			
cBOD	TSS	TKN	UOD
190	210	40	465

Category		Unit	Flow	Load (lb/day)				Notes
		(Capita or Acre)	(mgd)	cBOD	TSS	TKN	UOD	
Existing (2017-2019)	Average	-	5.9	9000	6,700	1,370	19,700	Average values (2017-2019)
	Max Month	-	8.3	11,700	9,300	1,700	24,000	Max month values (2017-2019)
Projected Clinton's Ditch Growth	-	-	0.13	2,000	76	6	3,027	Flow calculated assuming 2,000 mg/L cBOD and Clinton's ditch data provided by County
Project Residential (per Capita)	Baseline	3,314	0.25	399	441	84	977	Assumes 100% build out of current and proposed and 12% of future available land.
	Low	4,864	0.37	586	647	123	1,434	Assumes reduced rental vacancy and 24% of future available land
	High	6,931	0.53	835	923	176	2,043	Assumes 40% of future available land
Projected Commercial (per Acre)	Baseline	210	0.21	333	368	70	814	50% Planned Development Build Out/4.125% Other Commercial Increase
	Low	408	0.41	647	715	136	1,582	75% Planned Development Build Out/8.25% Other Commercial Increase
	High	815	0.82	1,291	1,427	272	3,161	100% Planned Development Build Out/16.5% Other Commercial Increase
Projected Industrial (per Acre)	Baseline	417	0.42	661	730	139	1,617	50% Planned Development Build Out/4.125% Other Commercial Increase
	Low	794	0.79	1,258	1,391	265	3,079	75% Planned Development Build Out/8.25% Other Commercial Increase
	High	1,172	1.17	1,857	2,053	391	4,545	100% Planned Development Build Out/16.5% Other Commercial Increase
Specialized Industrial - Semiconductor	Mid	-	7.0	2,900	2,900	1,750	12,300	Values are BOD, not cBOD
	High	-	10.0	4,200	4,200	2,500	17,500	Values are BOD, not cBOD
Semi-conductor Employee WW (per Capita)	-	8,000	0.16	250	280	50	620	8,000 employees x 20 gal/person-day

Scenario	Max Month Flow (mgd)	Peak Hour Flow (mgd)	Max Month Load (lb/day)					Notes
			BOD[1]	cBOD	TSS	TKN	UOD	
No. 1 - Baseline	9.3	23.3	18,600	15,100	10,900	2,000	30,400	Existing + Clinton's Ditch + baseline values (No semi-conductor)
No. 2 - Low (w/ Semiconductor)	17.3	32.5	21,900	17,700	15,700	4,100	44,000	Existing + Clinton's Ditch + Low values + 7 mgd semi-conductor + Employee WW
No. 3 - High (w/ Semiconductor)	21.1	37.7	27,300	22,100	18,300	5,100	54,900	Existing + Clinton's Ditch + High values + 10 mgd semi-conductor + Employee WW
2009 S&W Facilities Plan	11.0	36.0	19,000	-	15,990	2,480	39,660	Excludes Gaskin Road PS Flows & Loads
2010 S&W Facilities Plan Addendum	12.1	39.5	20,950	-	17,430	2,730	43,710	Includes Gaskin Road PS Flows & Loads
Current Design Capacity	10.0	24.0	17,100	-	16,700	-	-	No TKN Design Basis value on file

1. BOD loads based on historical raw influent cBOD:BOD ratio of 0.81 for the Oak Orchard WWTP.

Appendix C - Oak Orchard WWTP SPDES Permit

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

Industrial Code:	**4952**	SPDES Number:	**NY-0030317**
Discharge Class (CL):	**05**	DEC Number:	**7-3124-00018/00001**
Toxic Class (TX):	**N**	Effective Date (EDP):	**07/01/2014**
Major Drainage Basin:	**07**	Expiration Date (ExDP):	**06/30/2019**
Sub Drainage Basin:	**03**	Modification Dates:(EDPM)	
Water Index Number:	**ONT-66-11**		
Compact Area:	**IJC**		

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name: **Onondaga County** Attention: **Commissioner, WEP**

Street: **650 Hiawatha Blvd. West**

City: **Syracuse** State: **NY** Zip Code: **13204-1194**

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: **Oak Orchard Wastewater Treatment Plant**

Location (C,T,V): **Clay (T)** County: **Onondaga**

Facility Address: **4300 Oak Orchard Road**

City: **Clay** State: **NY** Zip Code: **13212**

NYTM -E: NYTM - N:

From Outfall No.: **001** at Latitude: **43 ° 12 ' 18.6 ''** & Longitude: **76 ° 12 ' 49.7 ''**

into receiving waters known as: **Oneida River** Class: **B**

and; (list other Outfalls, Receiving Waters & Water Classifications)

See stormwater outfalls list, page 2 of permit.

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1 and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: **Onondaga County Department of Water Environment Protection**

Street: **650 Hiawatha Blvd**

City: **Syracuse** State: **NY** Zip Code: **13204-1194**

Responsible Official or Agent: **Head Operator** Phone: **(315) 652-5097**

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:

CO BWP - Permit Coordinator
RWE
RPA
EPA Region II – Michelle Josilo
NYSEFC
NYSDOH District Office
IJC

Chief Permit Permit Administrator: John J. Ferguson

Address: Division of Environmental Permits
625 Broadway
Albany, NY 12233-1750

Signature: Date: 6/8/14

STORMWATER OUTFALLS

The following outfalls discharge on-site stormwater only, from roofs and catch basins:

Outfall	Description	Latitude/Longitude	Receiving Water
002	Stormwater runoff only from catch basin, roof drains, grass covered swales.	43° 12' 12.9" N 76° 12' 42" W	Mud Creek to Oneida River
003	Stormwater runoff only from catch basin and paved roadway areas.	43° 12' 00" N 76° 12' 30.9" W	Drainage area of Oneida River
004	Stormwater runoff only from catch basins, roof drains, grassed areas and paved areas.	43° 11' 53.3" N 76° 12' 40.8" W	Mud Creek to Oneida River

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.		

PARA-METER	EFFLUENT LIMIT	PRACTICAL QUANTITATION LIMIT (ML)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based standards, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the analytical method specified in the permit shall be used to monitor the amount of the pollutant in the outfall to this level, provided that the laboratory analyst has complied with the specified quality assurance/quality control procedures in the relevant method. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This ML can be neither lowered nor raised without a modification of this permit.	Action Levels are monitoring requirements, as defined below in Note 2, that trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, Temperature, concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Note 1: DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day. DAILY MAX: The highest allowable daily discharge. DAILY MIN: The lowest allowable daily discharge. MONTHLY AVG (daily avg): The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week. 12 MRA (twelve month rolling avg): The average of the most recent twelve month's monthly averages. 30 DAY GEOMETRIC MEAN (30 d geo mean): The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of : the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. 7 DAY GEOMETRIC MEAN (7 d geo mean): The highest allowable geometric mean of daily discharges over a calendar week.

Note 2: ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards. The additional monitoring requirement is triggered upon receipt by the permittee of any monitoring results in excess of the stated Action Level.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL No.	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	June 16 to October 31	Oneida River	07/01/2014	06/30/2019

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly average	10.0	mgd	-	-	Continuous	Recorder		X	
$CBOD_5$	Monthly average	25	mg/l	2085	lbs/d	2/week	24-hr. Comp.	X	X	(1)
$CBOD_5$	7 day average	40	mg/l	3336	lbs/d	2/week	24-hr. Comp.	X	X	
BOD_5	Monthly average	Monitor	mg/l	Monitor	lbs/d	1/month	24-hr. Comp.	X		
UOD	Daily maximum	Monitor	mg/l	4289	lbs/d	2/week	24-hr. Comp.	X	X	(2)
Solids, Suspended	Monthly average	30	mg/l	2500	lbs/d	2/week	24-hr. Comp.	X	X	(1)
Solids, Suspended	7 day average	45	mg/l	3750	lbs/d	2/week	24-hr. Comp.	X	X	
Solids, Settleable	Daily maximum	0.3	ml/l	-	-	3/day	Grab	X	X	
pH	Range	6.0 to 9.0	SU	-	-	3/day	Grab	X	X	
Temperature	Daily maximum	Monitor	Deg C	-	-	3/day	Grab	X	X	
Dissolved Oxygen	Daily Minimum	2.0	mg/l	-	-	2/week	Grab		X	
Nitrogen, Ammonia Total (as NH_3)	Monthly average	Monitor	mg/l	307	lbs/d	2/week	24-hr. Comp.		X	
Nitrogen, TKN (as N)	Daily maximum	Monitor	mg/l	-	-	2/week	24-hr. Comp.		X	
Phosphorus, Total (as P)	Monthly average	1.0	mg/l	-	-	2/week	24-hr. Comp.		X	
Mercury, Total	Daily maximum	50	ng/l	-	-	Quarterly	Grab		X	(4)
Effluent Disinfection required: [ ] All Year [X] Seasonal from May 15 to October 15										
Coliform, Fecal	30 day geometric mean	200	No./ 100 ml	-	-	2/week	Grab.		X	
Coliform, Fecal	7 day geometric mean	400	No./ 100 ml	-	-	2/week	Grab.		X	
Chlorine, Total Residual *(Interim – effective EDP to 11/1/2018)*	Daily maximum	0.35	mg/l	-	-	3/day	Grab		X	(5)
Chlorine, Total Residual *(Final – becomes effective 11/1/2018)*	Daily maximum	0.045	mg/l	-	-	3/day	Grab		X	(5)

FOOTNOTES: See page 6

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL No.	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	November 1 to June 15	Oneida River	07/01/2014	06/30/2019

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly average	10.0	mgd	-	-	Continuous	Recorder		X	
$CBOD_5$	Monthly average	25	mg/l	2085	lbs/d	2/week	24-hr. Comp.	X	X	(1)
$CBOD_5$	7 day average	40	mg/l	3336	lbs/d	2/week	24-hr. Comp.	X	X	
BOD_5	Monthly average	Monitor	mg/l	Monitor	lbs/d	1/month	24-hr. Comp.	X		
UOD	Daily maximum	-	mg/l	-	lbs/d	2/week	24-hr. Comp.	X	X	(2)
Solids, Suspended	Monthly average	30	mg/l	2500	lbs/d	2/week	24-hr. Comp.	X	X	(1)
Solids, Suspended	7 day average	45	mg/l	3750	lbs/d	2/week	24-hr. Comp.	X	X	
Solids, Settleable	Daily maximum	0.3	ml/l	-	-	3/day	Grab	X	X	
pH	Range	6.0 to 9.0	SU	-	-	3/day	Grab	X	X	
Temperature	Daily maximum	Monitor	Deg C	-	-	3/day	Grab	X	X	
Dissolved Oxygen	Daily Minimum	2.0	mg/l	-	-	2/week	Grab		X	
Nitrogen, Ammonia Total (as NH_3)	Monthly average	Monitor	mg/l	2,026	lbs/d	2/week	24-hr. Comp.		X	
Nitrogen, TKN (as N)	Daily maximum	Monitor	mg/l	-	-	2/week	24-hr. Comp.		X	
Phosphorus, Total (as P)	Monthly average	1.0	mg/l	-	-	2/week	24-hr. Comp.		X	
Mercury, Total	Daily maximum	50	ng/l	-	-	Quarterly	Grab		X	(4)
Effluent Disinfection required: [ ] All Year [X] Seasonal from May 15 to October 15										
Coliform, Fecal	30 day geometric mean	200	No./ 100 ml	-	-	2/week	Grab.		X	
Coliform, Fecal	7 day geometric mean	400	No./ 100 ml	-	-	2/week	Grab.		X	
Chlorine, Total Residual *(Interim – effective EDP to 11/1/2018)*	Daily maximum	0.35	mg/l	-	-	3/day	Grab		X	5
Chlorine, Total Residual *(Final – becomes effective 11/1/2018)*	Daily maximum	0.045	mg/l	-	-	3/day	Grab		X	5

FOOTNOTES: See page 6

PERMIT LIMITS, ACTION LEVELS AND MONITORING

OUTFALL No.	LEVELS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise noted	Oneida River	07/01/2014	06/30/2019

PARAMETER	EFFLUENT LIMIT		MONITORING ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Monthly Avg.	Daily Max					
Iron, Total Recoverable			Monitor	lbs/day	1/quarter	24 hr. Comp.	
Chloroform			1.3	lbs/day	1/quarter	24 hr. Comp.	(3)
Cadmium, Total Recoverable			0.4	lbs/day	1/quarter	24 hr. Comp.	
Chromium, Total Recoverable			1.9	lbs/day	1/quarter	24 hr. Comp.	
Copper, Total Recoverable			1.8	lbs/day	1/quarter	24 hr. Comp.	
Nickel, Total Recoverable			2.9	lbs/day	1/quarter	24 hr. Comp.	
Zinc, Total Recoverable			5.4	lbs/day	1/quarter	24 hr. Comp.	
Arsenic, Total Recoverable			Monitor	lbs/day	1/quarter	24 hr. Comp.	
Phenols, Total			Monitor	lbs/day	1/quarter	24 hr. Comp.	(3)

FOOTNOTES:

(1) Effluent shall not exceed 15 % and 15 % of influent concentration values for $CBOD_5$ & TSS respectively.
(2) Ultimate Oxygen Demand shall be computed as follows: UOD = 1.5 X $CBOD_5$ + 4.5 X TKN (Total Kjeldahl Nitrogen).
(3) The 24-hr. composites shall be collected as 3 grab samples at 8 hr. intervals. Three grab samples shall be collected and combined in laboratory prior to analysis.
(4) EPA Method 1631 is required for Mercury sampling.
(5) Monitoring of these parameters is only required during the period when disinfection is required.

WHOLE EFFLUENT TOXICITY (WET) TESTING REQUIREMENTS

OUTFALL No.	LEVELS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise noted	Oneida River	07/01/2014	06/30/2019

PARAMETER	EFFLUENT LIMIT		PQL	MONITORING ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Monthly Avg.	Daily Max.	Daily Max.					
WET - Acute Invertebrate				1.5	TUa	Quarterly	seefootnote	1
WET - Acute Vertebrate				1.5	TUa	Quarterly	seefootnote	1
WET - Chronic Invertebrate				9.0	TUc	Quarterly	seefootnote	1
WET - Chronic Vertebrate				9.0	TUc	Quarterly	seefootnote	1

Footnotes:

1. Whole Effluent Toxicity (WET) Testing:

Testing Requirements - WET testing shall consist of Chronic only testing. WET testing shall be performed in accordance with 40 CFR Part 136 and TOGS 1.3.2 unless prior written approval has been obtained from the Department. The test species shall be *Ceriodaphnia dubia* (water flea - invertebrate) and *Pimephales promelas* (fathead minnow - vertebrate). Receiving water collected upstream from the discharge should be used for dilution. The appropriate dilution series bracketing the IWC and including one exposure group of 100% effluent should be used to generate a definitive test endpoint, otherwise an immediate rerun of the test is required. WET testing shall be coordinated with the monitoring of chemical and physical parameters limited by this permit so that the resulting analyses are also representative of the sample used for WET testing. The ratio of critical receiving water flow to discharge flow (i.e. dilution ratio) is 5:1 for acute, and 9:1 for chronic. Discharges which are disinfected using chlorine should be dechlorinated prior to WET testing or samples shall be taken immediately prior to the chlorination system.

Monitoring Period - WET testing shall be performed at the specified sample frequency for the duration of the permit during calendar years ending in 1 and 6 beginning in January and lasting for a period of one full year.

Reporting - Toxicity Units shall be calculated and reported on the DMR as follows: TUa = (100)/(48 hr LC50) or (100)/(48 hr EC50) (note that Acute data is generated by both Acute and Chronic testing) and TUc = (100)/(NOEC) when Chronic testing has been performed or TUc = (TUa) x (10) when only Acute testing has been performed and is used to predict Chronic test results, where the 48 hr LC50 or 48 hr EC50 and NOEC are expressed in % effluent. This must be done for both species and using the Most Sensitive Endpoint (MSE) or the lowest NOEC and corresponding highest TUc. Report a TUa of 0.3 if there is no statistically significant toxicity in 100% effluent as compared to control.

The complete test report including all corresponding results, statistical analyses, reference toxicity data, daily average flow at the time of sampling and other appropriate supporting documentation, shall be submitted within 60 days following the end of each test period to the Toxicity Testing Unit. A summary page of the test results for the invertebrate and vertebrate species indicating TUa, 48 hr LC50 or 48 hr EC50 for Acute tests and/or TUc, NOEC, IC25, and most sensitive endpoints for Chronic tests, should also be included at the beginning of the test report.

WET Testing Action Level Exceedances - If an action level is exceeded then the Department may require the permittee to conduct additional WET testing including Acute and/or Chronic tests. Additionally, the permittee may be required to perform a Toxicity Reduction Evaluation (TRE) in accordance with Department guidance. If such additional testing or performance of a TRE is necessary, the permittee shall be notified in writing by the Regional Water Engineer. The written notification shall include the reason(s) why such testing or a TRE is required.

PRETREATMENT PROGRAM IMPLEMENTATION REQUIREMENTS

A. DEFINITIONS. Generally, terms used in this Section shall be defined as in the General Pretreatment Regulations (40 CFR Part 403). Specifically, the following definitions apply to terms used in this Section (PRETREATMENT PROGRAM IMPLEMENTATION REQUIREMENTS):

1. Categorical Industrial User (CIU) - an industrial user of the POTW that is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N;

2. Local Limits - General Prohibitions, specific prohibitions and specific limits as set forth in 40 CFR 403.5.

3. The Publicly Owned Treatment Works (the POTW) - as defined by 40 CFR 403.3(q) and that discharges in accordance with this permit.

4. Program Submission(s) - requests for approval or modification of the POTW Pretreatment Program submitted in accordance with 40 CFR 403.11 or 403.18 and approved by letter dated June 11, 1984.

5. Significant Industrial User (SIU) -

   a. CIUs;

   b. Except as provided in 40 CFR 403.3(v)(3), any other industrial user that discharges an average of 25,000 gallons per day or more of process wastewater (excluding sanitary, non-contact cooling and boiler blowdown wastewater) to the POTW;

   c. Except as provided in 40 CFR 403.3(v)(3), any other industrial user that contributes a process wastestream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant;

   d. Any other industrial user that the permittee designates as having a reasonable potential for adversely affecting the POTW's operation or for violating a pretreatment standard or requirement.

6. Substances of Concern - Substances identified by the New York State Department of Environmental Conservation Industrial Chemical Survey as substances of concern.

B. IMPLEMENTATION. The permittee shall implement a POTW Pretreatment Program in accordance 40 CFR Part 403 and as set forth in the permittee's approved Program Submission(s). Modifications to this program shall be made in accordance with 40 CFR 403.18. Specific program requirements are as follows:

1. Industrial Survey. To maintain an updated inventory of industrial dischargers to the POTW the permittee shall:

   a. Identify, locate and list all industrial users who might be subject to the industrial pretreatment program from the pretreatment program submission and any other necessary, appropriate and available sources. This identification and location list will be updated, at a minimum, every five years. As part of this update the permittee shall collect a current and complete New York State Industrial Chemical Survey form (or equivalent) from each SIU.

   b. Identify the character and volume of pollutants contributed to the POTW by each industrial user identified in B.1.a above that is classified as a SIU.

   c. Identify, locate and list, from the pretreatment program submission and any other necessary, appropriate and available sources, all significant industrial users of the POTW.

2. Control Mechanisms. To provide adequate notice to and control of industrial users of the POTW the permittee shall:

   a. Inform by certified letter, hand delivery courier, overnight mail, or other means which will provide written acknowledgment of delivery, all industrial users identified in B.1.a. above of applicable pretreatment standards and requirements including the requirement to comply with the local sewer use law, regulation or

PRETREATMENT PROGRAM IMPLEMENTATION REQUIREMENTS (continued)

ordinance and any applicable requirements under section 204(b) and 405 of the Federal Clean Water Act and Subtitles C and D of the Resource Conservation and Recovery Act.

b. Control through permit or similar means the contribution to the POTW by each SIU to ensure compliance with applicable pretreatment standards and requirements. Permits shall contain limitations, sampling frequency and type, reporting and self-monitoring requirements as described below, requirements that limitations and conditions be complied with by established deadlines, an expiration date not later than five years from the date of permit issuance, a statement of applicable civil and criminal penalties and the requirement to comply with Local Limits and any other requirements in accordance with 40 CFR 403.8(f)(1).

3. Monitoring and Inspection. To provide adequate, ongoing characterization of non-domestic users of the POTW, the permittee shall:

a. Receive and analyze self-monitoring reports and other notices. The permittee shall require all SIUs to submit self-monitoring reports at least every six months unless the permittee collects all such information required for the report, including flow data.

b. The permittee shall adequately inspect each SIU at a minimum frequency of once per year.

c. The permittee shall collect and analyze samples from each SIU for all priority pollutants that can reasonably be expected to be detectable at levels greater than the levels found in domestic sewage at a minimum frequency of once per year.

d. Require, through permits, each SIU to collect at least one 24 hour, flow proportioned composite (where feasible) effluent sample every six months and analyze each of those samples for all priority pollutants that can reasonably be expected to be detectable in that discharge at levels greater than the levels found in domestic sewage. The permittee may perform the aforementioned monitoring in lieu of the SIU except that the permittee must also perform the compliance monitoring described in 3.c.

4. Enforcement. To assure adequate, equitable enforcement of the industrial pretreatment program the permittee shall:

a. Investigate instances of noncompliance with pretreatment standards and requirements, as indicated in self-monitoring reports and notices or indicated by analysis, inspection and surveillance activities. Sample taking and analysis and the collection of other information shall be performed with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions. Enforcement activities shall be conducted in accordance with the permittee's Enforcement Response Plan developed and approved in accordance with 40 CFR Part 403.

b. Enforce compliance with all national pretreatment standards and requirements in 40 CFR Parts 406 - 471.

c. Provide public notification of significant non-compliance as required by 40 CFR 403.8(f)(2)(viii).

d. Pursuant to 40 CFR 403.5(e), when either the Department or the USEPA determines any source contributes pollutants to the POTW in violation of Pretreatment Standards or Requirements the Department or the USEPA shall notify the permittee. Failure by the permittee to commence an appropriate investigation and subsequent enforcement action within 30 days of this notification may result in appropriate enforcement action against the source and permittee.

5. Record keeping. The permittee shall maintain and update, as necessary, records identifying the nature, character, and volume of pollutants contributed by SIUs. Records shall be maintained in accordance with 6 NYCRR Part 750-2.5(c).

6. Staffing. The permittee shall maintain minimum staffing positions committed to implementation of the Industrial Pretreatment Program in accordance with the approved pretreatment program.

PRETREATMENT PROGRAM IMPLEMENTATION REQUIREMENTS (continued)

C. SLUDGE DISPOSAL PLAN. The permittee shall notify NYSDEC, and USEPA as long as USEPA remains the approval authority, 60 days prior to any major proposed change in the sludge disposal plan. NYSDEC may require additional pretreatment measures or controls to prevent or abate an interference incident relating to sludge use or disposal.

D. REPORTING. The permittee shall provide to the offices listed on the Monitoring, Reporting and Recording page of this permit and to the Chief-Water Compliance Branch; USEPA Region II; 290 Broadway; New York, NY 10007; a periodic report that briefly describes the permittee's program activities over the previous year. This report shall be submitted to the above noted offices within 60 days of the end of the reporting period. The reporting period shall be ANNUAL with reporting period(s) ending on December 31.

The periodic report shall include:

1. Industrial Survey. Updated industrial survey information in accordance with 40 CFR 403.12(i)(1) (including any NYS Industrial Chemical Survey forms updated during the reporting period).

2. Implementation Status. Status of Program Implementation, to include:

   a. Any interference, upset or permit violations experienced at the POTW directly attributable to industrial users.

   b. Listing of significant industrial users issued permits.

   c. Listing of significant industrial users inspected and/or monitored during the previous reporting period and summary of results.

   d. Listing of significant industrial users notified of promulgated pretreatment standards or applicable local standards who are on compliance schedules. The listing should include for each facility the final date of compliance.

   e. Summary of POTW monitoring results not already submitted on Discharge Monitoring Reports and toxic loadings from SIU's organized by parameter.

   f. A summary of additions or deletions to the list of SIUs, with a brief explanation for each deletion.

3. Enforcement Status. Status of enforcement activities to include:

   a. Listing of significant industrial users in Significant Non-Compliance (as defined by 40 CFR 403.8(f)(2)(viii)) with federal or local pretreatment standards at end of the reporting period.

   b. Summary of enforcement activities taken against non-complying significant industrial users. The permittee shall provide a copy of the public notice of significant violators as specified in 40 CFR Part 403.8(f)(2)(viii).

MERCURY MINIMIZATION PROGRAM – High Priority POTWs

1. **General** - The permittee shall develop, implement, and maintain a Mercury Minimization Program (MMP). The MMP is required because the 50 ng/L permit limit exceeds the statewide water quality based effluent limit (WQBEL) of 0.70 nanograms/liter (ng/L) for Total Mercury. The goal of the MMP will be to reduce mercury effluent levels in pursuit of the WQBEL. Note – The mercury-related requirements in this permit conform to the mercury Multiple Discharge Variance specified in NYSDEC policy *DOW 1.3.10*.

2. **MMP Elements** - The MMP shall be documented in narrative form and shall include any necessary drawings or maps. Other related documents already prepared for the facility may be used as part of the MMP and may be incorporated by reference. As a minimum, the MMP shall include an on-going program consisting of: periodic monitoring designed to quantify and, over time, track the reduction of mercury; an acceptable control strategy for reducing mercury discharges via cost-effective measures, which may include more stringent control of tributary waste streams; and submission of periodic status reports.

A. Monitoring - The permittee shall conduct periodic monitoring designed to quantify and, over time, track the reduction of mercury. All permit-related wastewater and stormwater mercury compliance point (outfall) monitoring shall be performed using EPA Method 1631. Use of EPA Method 1669 during sample collection is recommended. Unless otherwise specified, all samples shall be grabs. Monitoring at influent and other locations tributary to compliance points may be performed using either EPA Methods 1631 or 245.7. Monitoring of raw materials, equipment, treatment residuals, and other non-wastewater/non-stormwater substances may be performed using other methods as appropriate. Monitoring shall be coordinated so that the results can be effectively compared between internal locations and final outfalls. Minimum required monitoring is as follows:

i. Sewage Treatment Plant Influent & Effluent, and Type II SSO Outfalls - Samples at each of these locations must be collected in accordance with the minimum frequency specified on the mercury permit limits page.
ii. Key Locations in the Collection System and Potential Significant Mercury Sources - The minimum monitoring frequency at these locations shall be semi-annual. Monitoring of properly treated dental facility discharges is not required.
iii. Hauled Wastes - Hauled wastes which may contain significant mercury levels must be periodically tested prior to acceptance to ensure compliance with pretreatment/local limits requirements and/or determine mercury load.
iv. Additional monitoring must be completed as may be required elsewhere in this permit or upon Department request.

B. Control Strategy - An acceptable control strategy is required for reducing mercury discharges via cost-effective measures, including but not limited to more stringent control of industrial users and hauled wastes. The control strategy will become enforceable under this permit and shall contain the following minimum elements:

i. Pretreatment/Local Limits - The permittee shall evaluate and revise current requirements in pursuit of the goal.
ii. Periodic Inspection - The permittee shall inspect users as necessary to support the MMP. Each dental facility shall be inspected at least once every five years to verify compliance with the wastewater treatment operation, maintenance, and notification elements of 6NYCRR Part 374.4. Other mercury sources shall also be inspected once every five years. Alternatively, the permittee may develop an outreach program which informs these users of their responsibilities once every five years and is supported by a subset of site inspections. Monitoring shall be performed as above.
iii. Systems with CSO & Type II SSO Outfalls - Priority shall be given to controlling mercury sources upstream of CSOs and Type II SSOs through mercury reduction activities and/or controlled-release discharge. Effective control is necessary to avoid the need for the Department to establish mercury permit limits at these outfalls.
iv. Equipment and Materials – Equipment and materials which may contain mercury shall be evaluated by the permittee and replaced with mercury-free alternatives where environmentally preferable.

C. Annual Status Report - An annual status report shall be submitted to the Regional Water Engineer and to the Bureau of Water Permits summarizing: (a) all MMP monitoring results for the previous year; (b) a list of known and potential mercury sources; (c) all action undertaken pursuant to the strategy during the previous year; (d) actions planned for the upcoming year; and, (e) progress toward the goal. The first annual status report is due one year after the permit is modified to include the MMP requirement and follow-up status reports are due annually thereafter. A file shall be maintained containing all MMP documentation, including the dental forms required by 6NYCRR Part 374.4, which shall be available for review by NYSDEC representatives. Copies shall be provided upon request.

3. **MMP Modification** - The MMP shall be modified whenever: (a) changes at the facility or within the collection system increase the potential for mercury discharges; (b) actual discharges exceed 50 ng/L; (c) a letter from the Department identifies inadequacies in the MMP; or, (d) pursuant to a permit modification.

STORM WATER POLLUTION PREVENTION PLAN FOR POTWs WITH STORMWATER OUTFALLS

1. General - The Department has determined that stormwater discharges from POTWs with design flows at or above 1 mgd shall be covered under the SPDES permit. If the permittee has already submitted a Notice of Intent to the Department for coverage under the General Storm Water permit, the permittee shall submit a Notice of Termination to the Department upon receipt of this final SPDES permit containing the requirement to develop a SWPPP.

The permittee is required to develop, maintain, and implement a Storm Water Pollutant Prevention Plan (SWPPP) to prevent releases of significant amounts of pollutants to the waters of the State through plant site runoff; spillage and leaks; sludge or waste disposal; and other stormwater discharges including, but not limited to, drainage from raw material storage.

The SWPPP shall be documented in narrative form and shall include the 13 minimum elements below and plot plans, drawings, or maps necessary to clearly delineate the direction of stormwater flow and identify the conveyance, such as ditch, swale, storm sewer or sheet flow, and receiving water body. Other documents already prepared for the facility such as a Safety Manual or a Spill Prevention, Control and Countermeasure (SPCC) plan may be used as part of the SWPPP and may be incorporated by reference. A copy of the current SWPPP shall be submitted to the Department as required in item (2.) below and a copy must be maintained at the facility and shall be available to authorized Department representatives upon request.

2. Compliance Deadlines - The initial completed SWPPP shall be submitted by EDP + 6 months to the Regional Water Engineer. The SWPPP shall be implemented within 6 months of submission, unless a different time frame is approved by the Department. The SWPPP shall be reviewed annually and shall be modified whenever: (a) changes at the facility materially increase the potential for releases of pollutants; (b) actual releases indicate the SWPPP is inadequate, or (c) a letter from the Department identifies inadequacies in the SWPPP. The permittee shall certify in writing, as an attachment to the December Discharge Monitoring Report (DMR), that the annual review has been completed. All SWPPP revisions (with the exception of minimum elements - see item (4.B.) below) must be submitted to the Regional Water Engineer within 30 days. Note that the permittee is not required to obtain Department approval of the SWPPP (or of any minimum elements) unless notified otherwise. Subsequent modifications to or renewal of this permit does not reset or revise these deadlines unless a new deadline is set explicitly by such permit modification or renewal.

3. Facility Review - The permittee shall review all facility components or systems (including but not limited to material storage areas; in-plant transfer, process, and material handling areas; loading and unloading operations; storm water, erosion, and sediment control measures; process emergency control systems; and sludge and waste disposal areas) where materials or pollutants are used, manufactured, stored or handled to evaluate the potential for the release of pollutants to the waters of the State. In performing such an evaluation, the permittee shall consider such factors as the probability of equipment failure or improper operation, cross-contamination of storm water by process materials, settlement of facility air emissions, the effects of natural phenomena such as freezing temperatures and precipitation, fires, and the facility's history of spills and leaks. The relative toxicity of the pollutant shall be considered in determining the significance of potential releases.

The review shall address all substances present at the facility that are identified in Tables 6-10 of SPDES application Form NY-2C (available at *http://www.dec.state.ny.us/website/dcs/permits/olpermits/form2c.pdf*) as well as those that are required to be monitored by the SPDES permit.

4. A. 13 Minimum elements - Whenever the potential for a release of pollutants to State waters is determined to be present, the permittee shall identify Best Management Practices (BMPs) that have been established to prevent or minimize such potential releases. Where BMPs are inadequate or absent, appropriate BMPs shall be established. In selecting appropriate BMPs, the permittee shall consider good industry practices and, where appropriate, structural measures such as secondary containment and erosion/sediment control devices and practices. USEPA guidance for development of minimum elements of the SWPPP and BMPs is available in the September 1992 manual *Storm Water Management for Industrial Activities,* EPA 832-R-92-006 (available on-line at http://nepis.epa.gov/pubtitleOW.htm). At a minimum, the plan shall include the following elements:

1. Pollution Prevention Team
2. Reporting of BMP Incidents
3. Risk Identification & Assessment
4. Employee Training
5. Inspections and Records
6. Security
7. Preventive Maintenance
8. Good Housekeeping
9. Materials/Waste Handling, Storage, & Compatibility
10. Spill Prevention & Response
11. Erosion & Sediment Control
12. Management of Runoff
13. Street Sweeping

STORM WATER POLLUTION PREVENTION PLAN FOR POTWs WITH STORMWATER OUTFALLS (continued)

Note that for some facilities, especially those with few employees, some of the above may not be applicable. It is acceptable in these cases to indicate "Not Applicable" for the portion(s) of the SWPPP that do not apply to your facility, along with an explanation, for instance if street sweeping did not apply because no streets exist at the facility.

B. Stormwater Pollution Prevention Plans (SWPPPs) Required for Discharges of Stormwater From Construction Activity to Surface Waters - As part of the erosion of and sediment control element, a SWPPP shall be developed prior to the initiation of any site disturbance of one acre or more of uncontaminated area. Uncontaminated area means soils or groundwater which are free of contamination by any toxic or non-conventional pollutants identified in Tables 6-10 of SPDES application Form NY-2C. Disturbance of any size contaminated area(s) and the resulting discharge of contaminated stormwater is not authorized by this permit unless the discharge is under State or Federal oversight as part of a remedial program or after review by the Regional Water Engineer; nor is such discharge authorized by any SPDES general permit for stormwater discharges. SWPPPs are not required for discharges of stormwater from construction activity to groundwaters.

The SWPPP shall conform to the *New York Standards and Specifications for Erosion and Sediment Control* and *New York State Stormwater Management Design Manual,* unless a variance has been obtained from the Regional Water Engineer, and to any local requirements. The permittee shall submit a copy of the SWPPP and any amendments thereto to the local governing body and any other authorized agency having jurisdiction or regulatory control over the construction activity at least 30 days prior to soil disturbance. The SWPPP shall also be submitted to the Regional Water Engineer if contamination, as defined above, is involved and the permittee must obtain a determination of any SPDES permit modifications and/or additional treatment which may be required prior to soil disturbance. Otherwise, the SWPPP shall be submitted to the Department only upon request. When a SWPPP is required, a properly completed *Notice of Intent* (NOI) form shall be submitted (available at *www.dec.state.ny.us/website/dow/toolbox/swforms.html*) prior to soil disturbance. Note that submission of a NOI is required for informational purposes; the permittee is not eligible for and will not obtain coverage under any SPDES general permit for stormwater discharges, nor are any additional permit fees incurred. SWPPPs must be developed and submitted for subsequent site disturbances in accordance with the above requirements. The permittee is responsible for ensuring that the provisions of each SWPPP is properly implemented.

DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c) and (g) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed before initiation of any discharge.

(b) Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

(c) The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address :

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years.

(f) The permittee shall periodically inspect the outfall identification sign(s) in order to ensure they are maintained, are still visible, and contain information that is current and factually correct. Signs that are damaged or incorrect shall be replaced within 3 months of inspection.

DISCHARGE NOTIFICATION REQUIREMENTS (continued)

(g) All requirements of the Discharge Notification Act, including public repository requirements, are waived for any outfall meeting any of the following circumstances, provided Department notification is made in accordance with (h) below:

(i) such sign would be inconsistent with any other state or federal statute;

(ii) the Discharge Notification Requirements contained herein would require that such sign could only be located in an area that is damaged by ice or flooding due to a one-year storm or storms of less severity;

(iii) instances in which the outfall to the receiving water is located on private or government property which is restricted to the public through fencing, patrolling, or other control mechanisms. Property which is posted only, without additional control mechanisms, does not qualify for this provision;

(iv) instances where the outfall pipe or channel discharges to another outfall pipe or channel, before discharge to a receiving water; or

(v) instances in which the discharge from the outfall is located in the receiving water, two-hundred or more feet from the shoreline of the receiving water.

(h) If the permittee believes that any outfall which discharges wastewater from the permitted facility meets any of the waiver criteria listed in (g) above, notification (form enclosed) must be made to the Department's Bureau of Water Permits, Central Office, of such fact, and, provided there is no objection by the Department, a sign and DMR repository for the involved outfall(s) are not required. This notification must include the facility's name, address, telephone number, contact, permit number, outfall number(s), and reason why such outfall(s) is waived from the requirements of discharge notification. The Department may evaluate the applicability of a waiver at any time, and take appropriate measures to assure that the ECL and associated regulations are complied with.

SCHEDULE OF COMPLIANCE

a) The permittee shall comply with the following schedule:

Outfall(s)	Parameter(s) Affected	Interim Effluent Limit(s)	Compliance Action	Due Date
001	Chlorine, Total Residual	0.35 mg/l	Interim Permit Limit	Effective 07/01/2014 to 11/1/2018
001	Chlorine, Total Residual	-	Permittee must provide plans to the Department for achieving final permit limit	04/01/2015
001	Chlorine, Total Residual	-	Permittee must provide status report to the Department documenting progress toward achieving final permit limit.	01/01/2016 (see note (b) below)
001	Chlorine, Total Residual	0.045 mg/l (final)	Final Permit Limit	Effective 11/1/2018

The above compliance actions are one time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT," the permittee is not required to repeat the submission(s) noted above. The above due dates are independent from the effective date of the permit stated in the "SPDES NOTICE/RENEWAL APPLICATION/PERMIT" letter.

b) For any action where the compliance date is greater than 9 months past the previous compliance due date, the permittee shall submit interim progress reports to the Department every nine (9) months until the due date for these compliance items are met.

c) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:

1. A short description of the non-compliance;
2. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
3. A description or any factors which tend to explain or mitigate the non-compliance; and
4. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

d) The permittee shall submit copies of any document required by the above schedule of compliance to the NYSDEC Regional Water Engineer at the location listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS and to the Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505, unless otherwise specified in this permit or in writing by the Department.

SPECIAL CONDITIONS: Schedule of Submittals

The permittee shall submit the following information to the Regional Water Engineer at the address listed on the Recording, Reporting and Monitoring page of this Permit, and to the Bureau of Water Permits, 625 Broadway, Albany NY 12233-3505:

Outfall	Required Action	Due Date
001	Mercury Minimization Program: Submit annual status report by April 1st of each calendar year (for the previous year) with follow-up reports due annually thereafter.	Annually, by April 1st
	Whole Effluent Toxicity Testing: WET testing shall be performed at the specified sample frequency during calendar years ending in 1 and 6 beginning in January and lasting for a period of one full year.	Years ending in 1 and 6

Notes:

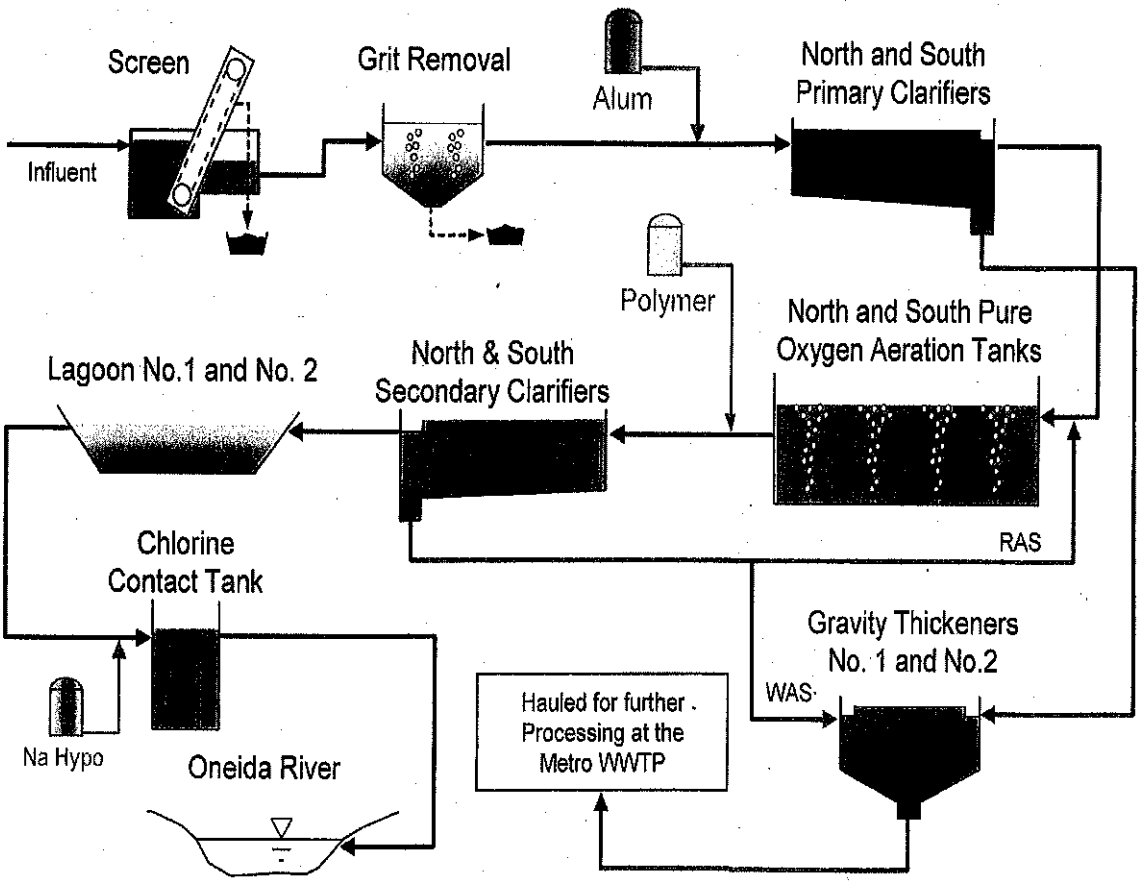
1. The permittee shall make every effort to comply with the above dates. Requests for extension, with justification, may be made to the Regional Water Engineer at the address listed above. Failure to submit either the information requested or a request for an extension by the dates listed above shall constitute noncompliance with this Permit.

MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the location(s) specified below:

Oak Orchard WWTP

Process Flow Diagram



GENERAL REQUIREMENTS

A. The regulations in 6 NYCRR Part 750 are hereby incorporated by reference and the conditions are enforceable requirements under this permit. The permittee shall comply with all requirements set forth in this permit and with all the applicable requirements of 6 NYCRR Part 750 incorporated into this permit by reference, including but not limited to the regulations in paragraphs B through H as follows:.

B. General Conditions

1.	Duty to comply	6 NYCRR Part 750-2.1(e) & 2.4
2.	Duty to reapply	6 NYCRR Part 750-1.16(a)
3.	Need to halt or reduce activity not a defense	6 NYCRR Part 750-2.1(g)
4.	Duty to mitigate	6 NYCRR Part 750-2.7(f)
5.	Permit actions	6 NYCRR Part 750-1.1(c), 1.18, 1.20 & 2.1(h)
6.	Property rights	6 NYCRR Part 750-2.2(b)
7.	Duty to provide information	6 NYCRR Part 750-2.1(i)
8.	Inspection and entry	6 NYCRR Part 750-2.1(a) & 2.3

C. Operation and Maintenance

1.	Proper Operation & Maintenance	6 NYCRR Part 750-2.8
2.	Bypass	6 NYCRR Part 750-1.2(a)(17), 2.8(b) & 2.7
3.	Upset	6 NYCRR Part 750-1.2(a)(94) & 2.8(c)

D. Monitoring and Records

1.	Monitoring and records	6 NYCRR Part 750-2.5(a)(2), 2.5(c)(1), 2.5(c)(2), 2.5(d) & 2.5(a)(6)
2.	Signatory requirements	6 NYCRR Part 750-1.8 & 2.5(b)

E. Reporting Requirements

1.	Reporting requirements	6 NYCRR Part 750-2.5, 2.6, 2.7 & 1.17
2.	Anticipated noncompliance	6 NYCRR Part 750-2.7(a)
3.	Transfers	6 NYCRR Part 750-1.17
4.	Monitoring reports	6 NYCRR Part 750-2.5(e)
5.	Compliance schedules	6 NYCRR Part 750-1.14(d)
6.	24-hour reporting	6 NYCRR Part 750-2.7(c) & (d)
7.	Other noncompliance	6 NYCRR Part 750-2.7(e)
8.	Other information	6 NYCRR Part 750-2.1(f)
9.	Additional conditions applicable to a POTW	6 NYCRR Part 750-2.9
10.	Special reporting requirements for discharges that are not POTWs	6 NYCRR Part 750-2.6

F. Planned Changes

1. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

   a. The alteration or addition to the permitted facility may meet of the criteria for determining whether facility is a new source in 40 CFR §122.29(b); or
   b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, or to notification requirements under 40 CFR §122.42(a)(1); or
   c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

   In addition to the Department, the permittee shall submit a copy of this notice to the United States Environmental Protection Agency at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

GENERAL REQUIREMENTS continued

G. Notification Requirement for POTWs

1. All POTWs shall provide adequate notice to the Department and the USEPA of the following:
   a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; or
   b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
   c. For the purposes of this paragraph, adequate notice shall include information on:
      i. the quality and quantity of effluent introduced into the POTW, and
      ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

POTWs shall submit a copy of this notice to the United States Environmental Protection Agency, at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

H. Sludge Management

The permittee shall comply with all applicable requirements of 6 NYCRR Part 360.

I. SPDES Permit Program Fee

The permittee shall pay to the Department an annual SPDES permit program fee within 30 days of the date of the first invoice, unless otherwise directed by the Department, and shall comply with all applicable requirements of ECL 72-0602 and 6 NYCRR Parts 480, 481 and 485. Note that if there is inconsistency between the fees specified in ECL 72-0602 and 6 NYCRR Part 485, the ECL 72-0602 fees govern.

J. Water Treatment Chemicals (WTCs)

New or increased use and discharge of a WTC requires prior Department review and authorization. At a minimum, the permittee must notify the Department in writing of its intent to change WTC use by submitting a completed *WTC Notification Form* for each proposed WTC. The Department will review that submittal and determine if a SPDES permit modification is necessary or whether WTC review and authorization may proceed outside of the formal permit administrative process. The majority of WTC authorizations do not require SPDES permit modification. In any event, use and discharge of a WTC shall not proceed without prior authorization from the Department. Examples of WTCs include biocides, coagulants, conditioners, corrosion inhibitors, defoamers, deposit control agents, flocculants, scale inhibitors, sequestrants, and settling aids.

1. WTC use shall not exceed the rate explicitly authorized by this permit or otherwise authorized in writing by the Department.
2. The permittee shall **maintain a logbook** of all WTC use, noting for each WTC the date, time, exact location, and amount of each dosage, and, the name of the individual applying or measuring the chemical. The logbook must also document that adequate process controls are in place to ensure that excessive levels of WTCs are not used.
3. The permittee shall **submit a completed *WTC Annual Report Form*** each year that they use and discharge WTCs. This form shall be attached to either the December DMR or the annual monitoring report required below.

The *WTC Notification Form* and *WTC Annual Report Form* are available from the Department's website at http://www.dec.ny.gov/permits/93245.html .

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

A. The monitoring information required by this permit shall be summarized, signed and retained for a period of at least five years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each 1 month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 each year and must summarize information for January to December of the previous year in a format acceptable to the Department.

[ ] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:
[ ] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:
Department of Environmental Conservation
Division of Water, Bureau of Water Compliance
625 Broadway, Albany, New York 12233-3506
Phone: (518) 402-8177

Send an **additional copy** of each DMR page to:
Onondaga Co. Dept. of Health
PO Box 1325
421 Montgomery Street
Syracuse, NY 13202

Send the **first copy** (second sheet) of each DMR page to:
Department of Environmental Conservation
Regional Water Engineer, Region 7
615 Erie Blvd West
Syracuse, New York 13204-2400
(315) 426-7500

B. Monitoring and analysis shall be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

C. More frequent monitoring of the discharge(s), monitoring point(s), or waters of the State than required by the permit, where analysis is performed by a certified laboratory or where such analysis is not required to be performed by a certified laboratory, shall be included in the calculations and recording of the data on the corresponding DMRs.

D. Calculations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

E. Unless otherwise specified, all information recorded on the DMRs shall be based upon measurements and sampling carried out during the most recently completed reporting period.

F. Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section 502 of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be directed to the New York State Department of Health, Environmental Laboratory Accreditation Program.

Appendix D - Alternatives Screening Evaluation Matrix

APPENDIX - D
Alternatives Screening Evaluation Matrix
Oak Orchard WWTP

ALTERNATIVES				Capital Cost	Operating Cost	Maintenance Complexity	Generation and Control of Odors	Constructability/ Maintenance of Operations	Implementation Schedule	Regulatory Approval	Siting Requirements	Performance Expectation	Similar Experience	Operation Complexity	Process Flexibility	Resistance to Toxicity and Inhibition	Sustainable (Green) Energy Efficiency	SCORE		RANK	RANK (ALL)
Min - Max Score				1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5				
Weighted Factor				3	3	2	1	3	3	2	1	3	2	2	2	3	2	pts	%		
No.	First Stage	Second Stage	Tertiary Treatment																		
	Single-Stage Process																				
1	Conventional Activated Sludge	-	Cloth Filters	9	12	8	3	9	6	10	3	9	8	8	8	3	6	102	78%	3	7
2	IFAS	-	Cloth Filters	9	9	6	4	9	6	6	4	12	6	6	8	6	4	95	73%	5	11
3	MBR	-	-	12	9	4	4	9	6	8	5	15	8	10	8	6	4	108	83%	1	3
4	SBR	-	Cloth Filters	3	12	8	3	15	12	8	1	6	4	8	8	9	6	103	79%	2	6
5	Granular Activated Sludge (Nereda)	-	Cloth Filters	6	12	8	3	15	3	2	2	9	2	6	6	12	6	92	71%	6	12
6	Oxidation Ditch	-	Cloth Filters	3	9	8	3	15	12	8	1	6	4	8	8	9	4	98	75%	4	10
	Two-Stage Process																				
7	Conventional Activated Sludge	BAF-N	Cloth Filters	6	9	6	3	9	6	10	2	15	10	8	10	15	4	113	87%	2	2
8	Conventional Activated Sludge	Conventional Activated Sludge	Cloth Filters	3	9	6	3	9	6	10	1	12	8	8	10	15	6	106	82%	3	4
9	HPO	BAF-N	Cloth Filters	9	6	4	5	12	9	8	3	15	10	6	8	15	4	114	88%	1	1
10	HPO	MBBR	Cloth Filters	9	6	4	5	12	9	6	3	12	6	6	8	15	4	105	81%	4	5
11	BAF-C	BAF-N	Cloth Filters	6	6	4	5	15	12	8	4	12	6	8	6	6	4	102	78%	5	7
12	Conventional Activated Sludge	MBBR	Cloth Filters	6	9	6	3	9	6	6	2	12	6	6	10	15	4	100	77%	6	9

Notes:

1. Scoring scale is 1 to 5, where 1 is a poor score and 5 is the best score for any given category
2. Weighted Factors range from 1 to 3, based on level of importance for each criteria
3. Highest score is best for the purposes of this evaluation

Appendix E - Conceptual Basis of Design Summary for Alternatives

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP

Alternative 1 Scenario 1: MBR

Unit Process/Design Criteria	Value
Influent Screening (Existing)	
No. of Units	2
Type	Mechanical Bar Screen
Screen Spacing	3/8-inch
Influent Screen Capacity	24
Dimensions (feet)	
Channel Width (feet)	4
Channel Depth (feet)	1.5
Grit Removal (Existing)	
No. of Units	2
Type	Aerated Grit
Dimensions (each)	
Length (feet)	34
Width (feet)	16
Side Water Depth (feet)	12
Total Volume (gallons)	98,000
Capacity (each)	365 cfm
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	11
Total Surface Area (ft^2)	15,120
Peak Surface Overflow Rate (gpd/ft2)	1,541
Fine Screening (NEW)	
No of Units	**3**
Type	**Rotating Drum**
Screen Spacing	**2 mm**
Dimensions (feet)	
Channel Width (feet)	**4**
Channel Depth (feet)	**7**
Influent Screen Capacity	**12 MGD**

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Alternative 1 Scenario 1: MBR

Unit Process/Design Criteria	Value
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**77**
Width (feet)	**61**
Side Water Depth (feet)	**10**
Total Volume (gallons)	**350,000**
Design MLSS (mg/L)	**<8,000**
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Volume (gallons)	**1,050,000**
Total Aeration Volume (gallons)	**1,400,000**
HRT @ Max Month Flow (hours)	**3.4**
Design MLSS (mg/L)	**<8,000**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**3**
Blower Type	**Turbo Blower**
Blower Size (hp)	**250 HP**
Capacity (scfm)	**16,000**
Membrane Bioreactor (MBR) (New)	
No. of Units	**6**
Length (feet)	**75**
Width (feet)	**9**
Side Water Depth (feet)	**13**
Total Volume (gallons)	**390,000**
Number of Cassettes Per Train	**10.0**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**7**
Blower Type	**Turbo Blower**
Blower Size (hp)	**75 HP**
Capacity (scfm)	**13,500**
Disinfection- Chlorine Contact Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	25
Length (ft)	83
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP

Alternative 2 Scenario 1: Conventional BAF

Unit Process/Design Criteria	Value
Influent Screening (Existing)	
No. of Units	2
Type	Mechanical Bar Screen
Screen Spacing	3/8-inch
Influent Screen Capacity	24
Dimensions (feet)	
Channel Width (feet)	4
Channel Depth (feet)	1.5
Grit Removal (Existing)	
No. of Units	2
Type	Aerated Grit
Dimensions (each)	
Length (feet)	34
Width (feet)	16
Side Water Depth (feet)	12
Total Volume (gallons)	98,000
Capacity (each)	365 cfm
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	11
Total Surface Area (ft^2)	15,120
Peak Surface Overflow Rate (gpd/ft2)	1,541
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**520,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**

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Alternative 2 Scenario 1: Conventional BAF

Unit Process/Design Criteria	Value
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**1,570,000**
HRT @ Max Month Flow (hours)	**3.8**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**71.9**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**4**
Blower Type	**Turbo**
Blower Size (hp)	**75**
Capacity (scfm)	**7,500**
Secondary Clarification (NEW)	
No. of units	**3**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal** **Spiral Collector**
Dimensions (each)	
Diameter (feet)	**102**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**24,514**
Total Peak Surface Overflow Rate (gpd/ft2)	**950**
Biological Aerated Filter (BAF) (New)	
No. of Cells	**6**
Cell Size (ft^2)	**940**
Total Filter Area (ft^2)	**5640**
Media Size (mm)	**3.6**
Media Depth (feet)	**9.8**
Total Media Volume (ft^3)	**55,272**
Hydraulic Loading	
Design Month (N-1)(gpm/ft^2)	**1.40**
Peak (N-1) (gpm/ft^2)	**4**
Mudwell Working Volume (gallons)	
Daily Backwash Volume (MGD)	**1.03**
Peak Air Demand (scfm)	**3,200**
Disinfection- Chlorine Contact Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	25
Length (ft)	83
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

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Oak Orchard WWTP

Alternative 3 Scenario 1: HPO MBBR

Unit Process/Design Criteria	Value
Influent Screening (Existing)	
No. of Units	2
Type	Mechanical Bar Screen
Screen Spacing	3/8-inch
Influent Screen Capacity	24
Dimensions (feet)	
Channel Width (feet)	4
Channel Depth (feet)	1.5
Grit Removal (Existing)	
No. of Units	2
Type	Aerated Grit
Dimensions (each)	
Length (feet)	34
Width (feet)	16
Side Water Depth (feet)	12
Total Volume (gallons)	98,000
Capacity (each)	365 cfm
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	11
Total Surface Area (ft^2)	15,120
Peak Surface Overflow Rate (gpd/ft2)	1,541
Aeration Tanks (Existing)	
No. of units	2
Dimensions (each)	
Length (feet)	108
Width (feet)	72
Side Water Depth (feet)	9
Total Volume (gallons)	1,050,000
HRT @ Max Month Flow (hours)	2.5
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**107.6**
Design MLSS (mg/L)	<2,500
Aeration System Type	HPO - Surface Aeration
High Purity Oxygen (HPO) Generation - NEW	
No. of Units	**TBD**
Type	**Vacuum-Pressure Swing Adsorption**
Capacity (tpd)	**7.5**
Liquid Oxygen Storage - NEW	
Capacity (gallons)	**11,000.0**

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Alternative 3 Scenario 1: HPO MBBR

Unit Process/Design Criteria	Value
Secondary Clarification (NEW)	
No. of units	**3**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal** **Spiral Collector**
Dimensions (each)	
Diameter (feet)	**102**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**24,514**
Total Peak Surface Overflow Rate (gpd/ft2)	**950**
Moving Bed Biofilm Reactor (MBBR)- NEW	
No. of units	**4**
Dimensions (each)	
Length (feet)	**47**
Width (feet)	**25**
Side Water Depth (feet)	**18**
Total Volume (gallons)	**620,000**
Process Air Requirement (scfm)	**3,036**
Disc Filtration - NEW	
No. of units	**4**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,388**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.58**
Disinfection- Chlorine Contact Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	25
Length (ft)	83
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

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Alternative 4 Scenario 1: Conventional MBBR

Unit Process/Design Criteria	Value
Influent Screening (Existing)	
No. of Units	2
Type	Mechanical Bar Screen
Screen Spacing	3/8-inch
Influent Screen Capacity	24
Dimensions (feet)	
Channel Width (feet)	4
Channel Depth (feet)	1.5
Grit Removal (Existing)	
No. of Units	2
Type	Aerated Grit
Dimensions (each)	
Length (feet)	34
Width (feet)	16
Side Water Depth (feet)	12
Total Volume (gallons)	98,000
Capacity (each)	365 cfm
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	11
Total Surface Area (ft^2)	15,120
Peak Surface Overflow Rate (gpd/ft2)	1,541
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**520,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**

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Alternative 4 Scenario 1: Conventional MBBR

Unit Process/Design Criteria	Value
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**1,570,000**
HRT @ Max Month Flow (hours)	**3.8**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**71.9**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**4**
Blower Type	**Turbo**
Blower Size (hp)	**75**
Capacity (scfm)	**7,500**
Secondary Clarification (NEW)	
No. of units	**3**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal** **Spiral Collector**
Dimensions (each)	
Diameter (feet)	**102**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**24,514**
Total Peak Surface Overflow Rate (gpd/ft2)	**950**
Moving Bed Biofilm Reactor (MBBR) (NEW)	
No. of units	**4**
Dimensions (each)	
Length (feet)	**47**
Width (feet)	**25**
Side Water Depth (feet)	**18**
Total Volume (gallons)	**620,000**
Process Air Requirement (scfm)	**3,036**
Disc Filtration (NEW)	
No. of units	**4**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,388**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.58**
Disinfection- Chlorine Contact Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	25
Length (ft)	83
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

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Alternative 5 Scenario 1: HPO BAF

Unit Process/Design Criteria	Value
Influent Screening (Existing)	
No. of Units	2
Type	Mechanical Bar Screen
Screen Spacing	3/8-inch
Influent Screen Capacity	24
Dimensions (feet)	
Channel Width (feet)	4
Channel Depth (feet)	1.5
Grit Removal (Existing)	
No. of Units	2
Type	Aerated Grit
Dimensions (each)	
Length (feet)	34
Width (feet)	16
Side Water Depth (feet)	12
Total Volume (gallons)	98,000
Capacity (each)	365 cfm
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	11
Total Surface Area (ft^2)	15,120
Peak Surface Overflow Rate (gpd/ft2)	1,541
Aeration Tanks (Existing)	
No. of units	2
Dimensions (each)	
Length (feet)	108
Width (feet)	72
Side Water Depth (feet)	9
Total Volume (gallons)	1,050,000
HRT @ Max Month Flow (hours)	2.5
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**107.6**
Design MLSS (mg/L)	<2,500
Aeration System Type	**HPO - Surface Aeration**
High Purity Oxygen (HPO) Generation - NEW	
No. of Units	**TBD**
Type	**Vacuum-Pressure Swing Adsorption**
Capacity (tpd)	**7.5**
Liquid Oxygen Storage - NEW	
Capacity (gallons)	**11,000.0**

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Alternative 5 Scenario 1: HPO BAF

Unit Process/Design Criteria	Value
Secondary Clarification (NEW)	
No. of units	**3**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal** **Spiral Collector**
Dimensions (each)	
Diameter (feet)	**102**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**24,514**
Total Peak Surface Overflow Rate (gpd/ft2)	**950**
Biological Aerated Filter (BAF) (New)	
No. of Cells	**6**
Cell Size (ft^2)	**940**
Total Filter Area (ft^2)	**5640**
Media Size (mm)	**3.6**
Media Depth (feet)	**9.8**
Total Media Volume (ft^3)	**55,272**
Hydraulic Loading	
Design Month (N-1)(gpm/ft^2)	**1.40**
Peak (N-1) (gpm/ft^2)	**4**
Mudwell Working Volume (gallons)	
Daily Backwash Volume (MGD)	**1.03**
Peak Air Demand (scfm)	**3,200**
Disinfection- Chlorine Contact Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	25
Length (ft)	83
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

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Alternative 1 Scenario 2: MBR

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Fine Screening (NEW)	
No of Units	**3**
Type	**Rotating Drum**
Screen Spacing	**2 mm**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**5**
Influent Screen Capacity	**20 MGD**
Influent Press Capacity	**177 ft^3/hr**

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Alternative 1 Scenario 2: MBR

Unit Process/Design Criteria	Value
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**55**
Side Water Depth (feet)	**18**
Total Volume (gallons)	**1,000,000**
Design MLSS (mg/L)	**<8,000**
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Volume (gallons)	**1,050,000**
Total Aeration Volume (gallons)	**2,050,000**
HRT @ Max Month Flow (hours)	**2.3**
Design MLSS (mg/L)	**<8,000**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**3**
Blower Type	**Turbo**
Blower Size (hp)	**350 HP**
Capacity (scfm)	**22,000**
Membrane Bioreactor (MBR) (New)	
No. of Units	**8**
Length (feet)	**81.67**
Width (feet)	**9**
Side Water Depth (feet)	**13**
Total Volume (gallons)	**570,000**
Number of Cassettes Per Train	**12.0**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**9**
Blower Type	**Turbo**
Blower Size (hp)	**75 HP**
Capacity (scfm)	**17,000**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**100**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

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Alternative 2 Scenario 3: Conventional BAF

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Aeration Tanks (NEW)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**1,050,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**2,100,000**
HRT @ Max Month Flow (hours)	**2.9**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**63.0**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**4**
Blower Type	**Turbo**
Blower Size (hp)	**100**
Capacity (scfm)	**12,000**

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Alternative 2 Scenario 3: Conventional BAF

Unit Process/Design Criteria	Value
Secondary Clarification (NEW)	
No. of units	**4**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal Spiral Collector**
Dimensions (each)	
Diameter (feet)	**102**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**32,685**
Total Peak Surface Overflow Rate (gpd/ft2)	**994**
Biological Aerated Filter (BAF) (New)	
No. of Cells	**8**
Cell Size (ft^2)	**940**
Total Filter Area (ft^2)	**9400**
Media Size (mm)	**3.6**
Media Depth (feet)	**11.5**
Total Media Volume (ft^3)	**86,480**
Hydraulic Loading	
Design Month (gpm/ft^2)	**1.90**
Peak (gpm/ft^2)	**3.3**
Daily Backwash Volume (MGD)	**2.02**
Peak Air Demand (scfm)	**5,300**
Disc Filtration - NEW	
No. of units	**4**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,388**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.58**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**100**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

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Alternative 3 Scenario 2: HPO MBBR

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**520,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**1,570,000**
HRT @ Max Month Flow (hours)	**2.2**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**84.3**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**HPO - Surface Aeration**
High Purity Oxygen (HPO) Generation - NEW	
No. of Units	**TBD**
Type	**Vacuum-Pressure Swing Adsorption**
Capacity (tpd)	**10.0**
Liquid Oxygen Storage - NEW	
Capacity (gallons)	**11,000.0**

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Alternative 3 Scenario 2: HPO MBBR

Unit Process/Design Criteria	Value
Secondary Clarification (NEW)	
No. of units	**4**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal**
	Spiral Collector
Dimensions (each)	
Diameter (feet)	**102**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**32,685**
Total Peak Surface Overflow Rate (gpd/ft2)	**994**
Moving Bed Biofilm Reactor (MBBR)- NEW	
No. of units	**10**
Dimensions (each)	
Length (feet)	**46**
Width (feet)	**25**
Side Water Depth (feet)	**18**
Total Volume (gallons)	**1,543,000**
Process Air Requirement (scfm)	**3,036**
Disc Filtration - NEW	
No. of units	**4**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,388**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.58**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**100**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

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Alternative 4 Scenario 2: Conventional MBBR

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Aeration Tanks (NEW)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**1,050,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**2,100,000**
HRT @ Max Month Flow (hours)	**2.9**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**63.0**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**4**
Blower Type	**Turbo**
Blower Size (hp)	**100**
Capacity (scfm)	**12,000**

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Alternative 4 Scenario 2: Conventional MBBR

Unit Process/Design Criteria	Value
Secondary Clarification (NEW)	
No. of units	**4**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal**
	Spiral Collector
Dimensions (each)	
Diameter (feet)	**102**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**32,685**
Total Peak Surface Overflow Rate (gpd/ft2)	**994**
Moving Bed Biofilm Reactor (MBBR)- NEW	
No. of units	**10**
Dimensions (each)	
Length (feet)	**46**
Width (feet)	**25**
Side Water Depth (feet)	**18**
Total Volume (gallons)	**1,543,000**
Process Air Requirement (scfm)	**3,036**
Disc Filtration - NEW	
No. of units	**4**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,388**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.58**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**100**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

Onondaga County Department of Water Environment Protection
Oak Orchard WPCP

Alternative 5 Scenario 2 - HPO BAF

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,720
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**520,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**

Onondaga County Department of Water Environment Protection
Oak Orchard WPCP

Alternative 5 Scenario 2 - HPO BAF

Unit Process/Design Criteria	Value
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**1,570,000**
HRT @ Max Month Flow (hours)	**2.2**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**84.3**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**HPO - Surface Aeration**
High Purity Oxygen (HPO) Generation - NEW	
No. of Units	**TBD**
Type	**Vacuum-Pressure Swing Adsorption**
Capacity (tpd)	**10.0**
Liquid Oxygen Storage - NEW	
Capacity (gallons)	**11,000.0**
Secondary Clarification (NEW)	
No. of units	**4**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal** **Spiral Collector**
Dimensions (each)	
Diameter (feet)	**102**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**32,685**
Total Peak Surface Overflow Rate (gpd/ft2)	**994**
Biological Aerated Filter (BAF) (New)	
No. of Cells	**8**
Cell Size (ft^2)	**940**
Total Filter Area (ft^2)	**9400**
Media Size (mm)	**3.6**
Media Depth (feet)	**11.5**
Total Media Volume (ft^3)	**86,480**
Hydraulic Loading	
Design Month (gpm/ft^2)	**1.90**
Peak (gpm/ft^2)	**3.3**
Daily Backwash Volume (MGD)	**2.02**
Peak Air Demand (scfm)	**5,300**
Disc Filtration - NEW	
No. of units	**4**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,388**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.58**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**100**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP

Alternative 1 Scenario 3: MBR

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Fine Screening (NEW)	
No of Units	**3**
Type	**Rotating Drum**
Screen Spacing	**2 mm**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**5**
Influent Screen Capacity	**20 MGD**
Influent Press Capacity	**177 ft^3/hr**

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Alternative 1 Scenario 3: MBR

Unit Process/Design Criteria	Value
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**200**
Width (feet)	**55**
Side Water Depth (feet)	**18**
Total Volume (gallons)	**1,480,000**
Design MLSS (mg/L)	**<8,000**
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Volume (gallons)	**1,050,000**
Total Aeration Volume (gallons)	**2,530,000**
HRT @ Max Month Flow (hours)	**2.9**
Design MLSS (mg/L)	**<8,000**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**3**
Blower Type	**Turbo**
Blower Size (hp)	**350 HP**
Capacity (scfm)	**22,000**
Membrane Bioreactor (MBR) (New)	
No. of Units	**8**
Length (feet)	**81.67**
Width (feet)	**9**
Side Water Depth (feet)	**13**
Total Volume (gallons)	**570,000**
Number of Cassettes Per Train	**12.0**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**9**
Blower Type	**Turbo**
Blower Size (hp)	**75 HP**
Capacity (scfm)	**17,000**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**127**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP

Alternative 2 Scenario 3: Conventional BAF

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Aeration Tanks (NEW)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**1,050,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**2,100,000**
HRT @ Max Month Flow (hours)	**2.4**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**78.7**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**4**
Blower Type	**Turbo**
Blower Size (hp)	**100**
Capacity (scfm)	**12,000**

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Alternative 2 Scenario 3: Conventional BAF

Unit Process/Design Criteria	Value
Secondary Clarification (NEW)	
No. of units	**4**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal**
	Spiral Collector
Dimensions (each)	
Diameter (feet)	**110**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**38,013**
Total Peak Surface Overflow Rate (gpd/ft2)	**992**
Biological Aerated Filter (BAF) (New)	
No. of Cells	**10**
Cell Size (ft^2)	**940**
Total Filter Area (ft^2)	**9400**
Media Size (mm)	**3.6**
Media Depth (feet)	**11.5**
Total Media Volume (ft^3)	**108,100**
Hydraulic Loading	
Design Month (gpm/ft^2)	**1.90**
Peak (gpm/ft^2)	**3.3**
Daily Backwash Volume (MGD)	**2.02**
Peak Air Demand (scfm)	**5,300**
Disc Filtration - NEW	
No. of units	**5**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,786**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.61**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**127**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

Onondaga County Department of Water Environment Protection
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Alternative 3 Scenario 3: HPO MBBR

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**520,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**1,570,000**
HRT @ Max Month Flow (hours)	**1.8**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**105.3**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**HPO - Surface Aeration**
High Purity Oxygen (HPO) Generation - NEW	
No. of Units	**TBD**
Type	**Vacuum-Pressure Swing Adsorption**
Capacity (tpd)	**10.0**
Liquid Oxygen Storage - NEW	
Capacity (gallons)	**11,000.0**

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Alternative 3 Scenario 3: HPO MBBR

Unit Process/Design Criteria	Value
Secondary Clarification (NEW)	
No. of units	**4**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal**
	Spiral Collector
Dimensions (each)	
Diameter (feet)	**110**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**38,013**
Total Peak Surface Overflow Rate (gpd/ft2)	**992**
Moving Bed Biofilm Reactor (MBBR)- NEW	
No. of units	**10**
Dimensions (each)	
Length (feet)	**46**
Width (feet)	**25**
Side Water Depth (feet)	**18**
Total Volume (gallons)	**1,543,000**
Process Air Requirement (scfm)	**3,036**
Disc Filtration - NEW	
No. of units	**5**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,786**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.61**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**127**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

Onondaga County Department of Water Environment Protection
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Alternative 4 Scenario 3: Conventional MBBR

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Aeration Tanks (NEW)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**1,050,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**2,100,000**
HRT @ Max Month Flow (hours)	**2.4**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**78.7**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**Diffused Fine Bubble**
Process Air Blowers	
No. of Units	**4**
Blower Type	**Turbo**
Blower Size (hp)	**100**
Capacity (scfm)	**12,000**

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Alternative 4 Scenario 3: Conventional MBBR

Unit Process/Design Criteria	Value
Secondary Clarification (NEW)	
No. of units	**4**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal**
	Spiral Collector
Dimensions (each)	
Diameter (feet)	**110**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**38,013**
Total Peak Surface Overflow Rate (gpd/ft2)	**992**
Moving Bed Biofilm Reactor (MBBR)- NEW	
No. of units	**10**
Dimensions (each)	
Length (feet)	**46**
Width (feet)	**25**
Side Water Depth (feet)	**18**
Total Volume (gallons)	**1,543,000**
Process Air Requirement (scfm)	**3,036**
Disc Filtration - NEW	
No. of units	**5**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,786**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.61**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**127**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

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Alternative 5 Scenario 3 - HPO BAF

Unit Process/Design Criteria	Value
Influent Screening (NEW)	
No. of Units	**3**
Type	**Mechanical Bar Screen**
Screen Spacing	**3/8-inch**
Influent Screen Capacity	**37.7 MGD**
Dimensions (feet)	
Channel Width (feet)	**6**
Channel Depth (feet)	**7.5**
Influent Press Capacity	
Grit Removal (NEW)	
No. of Units	**2**
Type	**Vortex System**
Capacity	**18.85 mgd/unit**
Grit Pump Capacity	**200 gpm**
Primary Clarification (New)	
No. of units	**1**
Type	**Rectangular**
Mechanism	**Chain & Flight Collectors**
Dimensions (each)	
Length (feet)	**135**
Width (feet)	**28**
Side Water Depth (feet)	**10.9**
Total New Surface Area (ft^2)	**3,780**
Primary Clarification (Existing)	
No. of units	4
Type	Rectangular
Mechanism	Chain & Flight Collectors
Dimensions (each)	
Length (feet)	135
Width (feet)	28
Side Water Depth (feet)	10.9
Total Existing Surface Area (ft^2)	15,120
Total Surface Area (ft^2)	18,900
Total Peak Surface Overflow Rate (gpd/ft2)	1,995
Aeration Tanks (NEW)	
No. of units	**1**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total New Volume (gallons)	**520,000**
Design MLSS (mg/L)	
Aeration System Type	**Diffused Fine Bubble**

Onondaga County Department of Water Environment Protection
Oak Orchard WPCP

Alternative 5 Scenario 3 - HPO BAF

Unit Process/Design Criteria	Value
Aeration Tanks (Modified Existing)	
No. of units	**2**
Dimensions (each)	
Length (feet)	**108**
Width (feet)	**72**
Side Water Depth (feet)	**9**
Total Existing Volume (gallons)	**1,050,000**
Total Volume - New and Existing (gallons)	**1,570,000**
HRT @ Max Month Flow (hours)	**1.8**
Design organic loading rate (lbs $cBOD_5$/1,000 ft^3)	**105.3**
Design MLSS (mg/L)	**<2,500**
Aeration System Type	**HPO - Surface Aeration**
High Purity Oxygen (HPO) Generation - NEW	
No. of Units	**TBD**
Type	**Vacuum-Pressure Swing Adsorption**
Capacity (tpd)	**10.0**
Liquid Oxygen Storage - NEW	
Capacity (gallons)	**11,000.0**
Secondary Clarification (NEW)	
No. of units	**4**
Type	**Circular**
Mechanism	**Center Feed - Peripheral withdrawal** **Spiral Collector**
Dimensions (each)	
Diameter (feet)	**110**
Side Water Depth (feet)	**14**
Total Surface Area (ft^2)	**38,013**
Total Peak Surface Overflow Rate (gpd/ft2)	**992**
Biological Aerated Filter (BAF) (New)	
No. of Cells	**10**
Cell Size (ft^2)	**940**
Total Filter Area (ft^2)	**9400**
Media Size (mm)	**3.6**
Media Depth (feet)	**11.5**
Total Media Volume (ft^3)	**108,100**
Hydraulic Loading	
Design Month (gpm/ft^2)	**1.90**
Peak (gpm/ft^2)	**3.3**
Daily Backwash Volume (MGD)	**2.02**
Peak Air Demand (scfm)	**5,300**
Disc Filtration - NEW	
No. of units	**5**
Disc Diameter (m)	**2.2**
Filter Area (ft2)	**2,786**
Peak Hydraulic Loading Rate (gpm/ft2)	**3.61**
Disinfection- Chlorine Contact Tanks (Modified)	
No. of units	**2**
Depth (ft)	**10**
Width (ft)	**25**
Length (ft)	**127**
Dechlor - Dechlorination Tanks (Existing)	
No. of units	2
Depth (ft)	10
Width (ft)	5.2
Length (ft)	34.5

BOLD = New or Modified Units

Appendix F - BioWin Modeling Summary Table

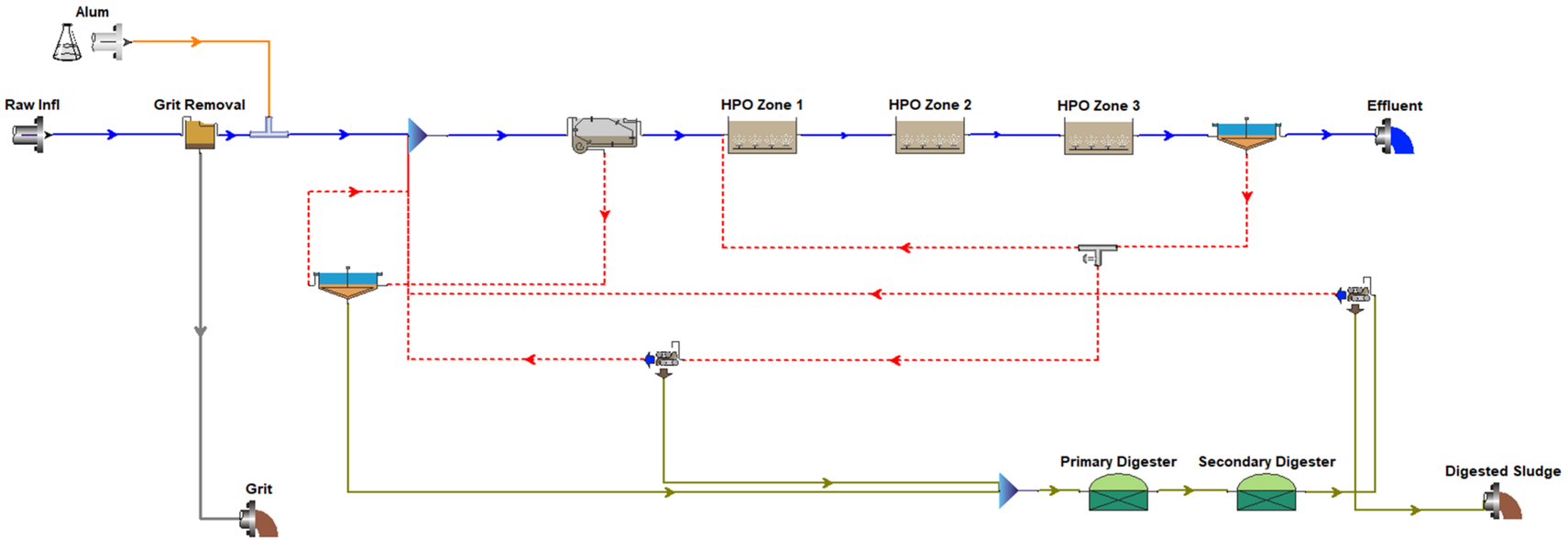
APPENDIX F
Oak Orchard WWTP
Biowin Modeling Summary Table

Parameter	Units	Alternative 3/5 HPO-MBBR/BAF	Alternative 2/4 Conventional-BAF/MBBR	Alternative 1 MBR	Alternative 3/5 HPO-MBBR/BAF	Alternative 2/4 Conventional-BAF/MBBR	Alternative 1 MBR	Alternative 3/5 HPO-MBBR/BAF	Alternative 2/4 Conventional-BAF/MBBR	Alternative 1 - MBR
Flow Scenario		**Scenario 1**			**Scenario 2**			**Scenario 3**		
Raw Influent Flow	**mgd**	**10**			**10.3**			**11.1**		
Semi-conductor Flow	**mgd**	**0**			**7**			**10**		
Pre-Thickening PS	**lbs TSS/day**	7,856	7,644	7,639	9,572	9,436	9,365	12,296	11,699	11,466
	gal/day	103,674	109,691	81,112	179,667	187,978	175,666	218,418	228,294	215,150
	mg TSS/L	9,080	8,350	11,285	6,384	6,015	6,388	6,745	6,140	6,416
Pre-Thickening WAS	**lbs TSS/day**	9,973	10,550	6,711	11,905	11,885	8,026	14,878	14,365	9,661
	gal/day	186,228	358,000	81,309	351,372	439,996	129,386	358,445	440,153	147,720
	mg TSS/L	6,417	3,531	9,890	4,060	3,236	7,433	4,973	3,910	7,836
Post-Thickening PS	**lbs TSS/day**	7,070	6,880	6,875	8,615	8,493	8,429	11,066	10,529	10,320
	gal/day	14,203	13,930	13,667	17,427	16,918	16,864	22,060	21,117	20,344
	mg TSS/L	59,652	59,179	60,277	59,237	60,155	59,891	60,111	59,749	60,784
Post-Thickening WAS	**lb TSS/day**	9,474	10,022	6,375	11,310	11,291	7,625	14,134	13,657	9,178
	gal/day	27,934	30,609	18,701	33,731	34,319	22,642	43,013	41,374	26,737
	mg TSS/L	40,641	39,237	40,851	40,178	39,423	40,354	39,376	39,525	41,133
Combined Digester Influent (PS + WAS)	**lbs TSS/day**	16,545	16,903	13,251	19,926	19,784	16,048	25,201	24,177	19,498
	lb VSS/day	13,981	14,365	10,430	16,889	16,690	12,503	21,650	20,626	15,555
	gal/day	42,137	44,539	32,368	51,159	51,237	39,496	65,073	62,491	47,081
	mg TSS/L	47,049	45,474	49,054	46,671	46,269	48,688	46,405	46,359	49,624
Digested Sludge to Dewatering	**lbs TSS/day**	7,797	7,668	8,044	9,221	9,161	9,718	11,276	10,963	11,524
	lb VSS/day	5,465	5,386	5,217	6,347	6,199	6,074	7,975	7,604	7,474
	gal/day	42,137	44,539	32,368	51,159	51,237	39,496	65,073	62,491	47,081
	mg TSS/L	21,564	20,630	29,781	21,598	21,425	29,485	20,765	21,022	29,330
Final Dewatered Cake Sludge	**lbs TSS/day**	7,407	7,284	7,642	8,760	8,703	9,232	10,713	10,415	10,948
	% solids	22	22	22	22	22	22	22	22	22
Primary Digester Total Volume	**gallons**	950,000	950,000	650,000	1,100,000	1,100,000	800,000	1,350,000	1,350,000	1,000,000
Secondary Digester Total Volume	**gallons**	475,000	475,000	325,000	550,000	550,000	400,000	675,000	675,000	500,000
Primary Digester HRT	**days**	22.5	21.0	20.2	12.5	21.5	20.2	21.1	21.6	21.2
Primary Digester Loading Rate	**lbs VSS/10^3 ft3-d**	110	113	120	115	113	117	120	114	116
Primary Digester Predicted VSS Destruction	**%**	57.4	58.1	47.21	58.1	58.58	48.62	58.9	58.7	49.25
Primary Digester Off Gas Flow Rate (dry)	**ft3/min**	82.5	87.16	52.26	102.9	97.27	64.7	134.3	121.7	81.7
Primary Digester Off gas Methane	**%**	63.2	63.47	64.05	63.3	66.7	63.93	63.2	66.4	63.7
SRT	**days**	2	2	12	2	2	12	2	2	12
MLSS	**mg/L**	2,134	1,142	7,920	1,350	1,240	5,946	1,650	1,264	6,250
HRT	**hours**	1.8	2.4	0.9	1.2	1.8	0.7	1.2	1.5	2.9
RAS	**%**	50	50	400	50	50	400	50	50	400
Existing Tank Volume	**gallons**	1,047,000	1,047,000	1,047,000	1,047,000	1,047,000	1,047,000	1,047,000	1,047,000	1,047,000
New Tank Volume	**gallons**	0	523,500	350,000	523,500	1,047,000	1,200,000	523,500	1,047,000	1,480,000
Alum	**gal/day**	425	450	725	665	735	1200	730	830	1215
Effluent cBOD	**mg/L**	1.2	3.0	0.8	1.4	3.0	0.9	1.5	3.0	0.9
Effluent TKN	**mg N/L**	2.2	3.3	1.2	2.2	2.2	1.2	2.3	2.2	1.2
Effluent NH3	**mg N/L**	1.1	0.7	0.1	1.1	0.9	0.1	1.2	0.9	0.1
Effluent TSS	**mg/L**	0.9	3.2	0.0	0.7	3.3	0.0	0.8	3.6	0.0
Effluent TP	**mg/L**	0.75	0.76	0.75	0.75	0.75	0.75	0.75	0.75	0.75

Appendix G - BioWin Modeling Output Reports

Biowin Summary

Existing HPO – Flow/Load Scenario 1



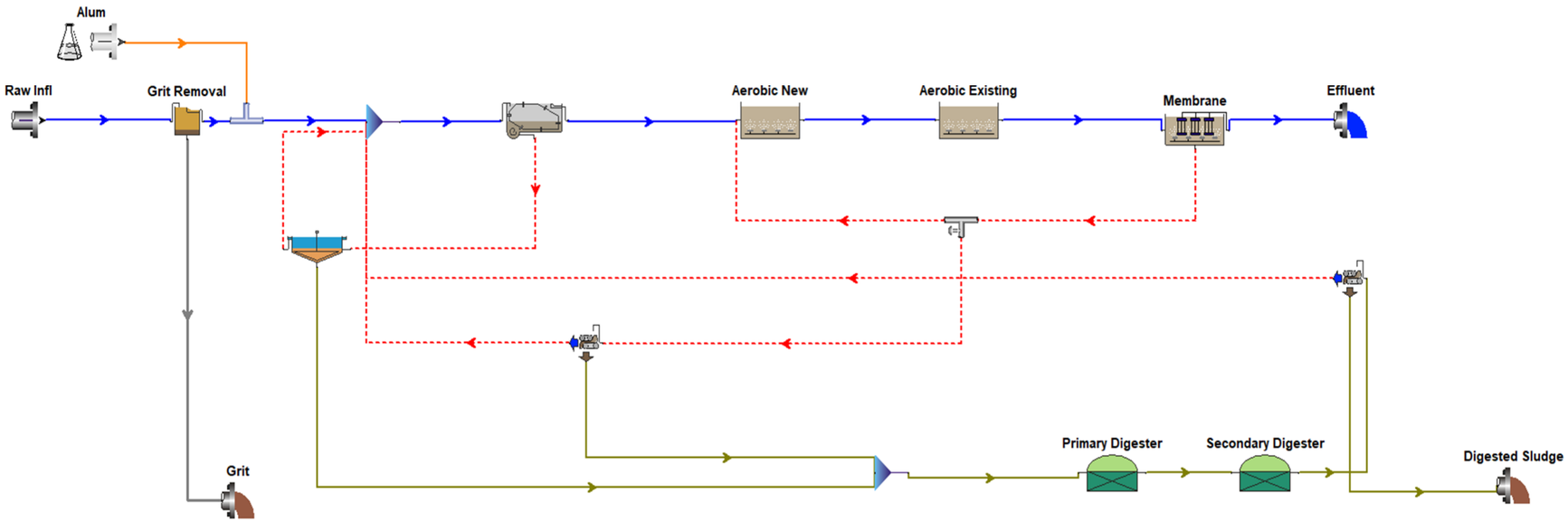
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Alum	480.0	0	0	0	0	0	0	0	0	0
Combined Digester Inf	36,503.3	19,123	8,076	14,824	12,513	743	6	0	344	0
Combined PC Influent	10,167,245.2	32,918	16,681	14,590	12,768	2,604	2,102	1	432	237
Dewater Pressate	32,926.0	395	30	348	236	360	342	0	65	50
Dewatering Inf	36,503.3	7,184	505	6,967	4,720	743	379	0	344	56
Digested Sludge	3,577.3	6,789	475	6,618	4,484	382	37	0	279	5
Effluent	9,976,902.7	2,174	749	1,358	1,106	1,578	1,433	153	62	18
Grav Thick Underflow	14,335.8	10,093	4,431	7,222	6,320	179	3	0	97	0
Gravity Thickener Perme	87,336.6	1,227	558	802	702	39	18	0	13	2
Grit Eff w/ Alum	9,980,480.0	30,816	15,900	13,039	11,504	2,165	1,732	0	341	185
Grit Effluent	9,980,000.0	30,816	15,900	12,371	11,504	2,165	1,732	0	341	185
Grit Underflow	20,000.0	62	32	825	23	4	3	0	1	0
HPO Zone 1 Eff	14,976,902.7	543,647	220,549	454,683	371,082	35,733	2,431	124	14,743	81
HPO Zone 2 Eff	14,976,902.7	540,903	218,742	453,879	370,102	35,665	2,274	178	14,743	43
HPO Zone 3 Eff	14,976,902.7	538,388	217,106	452,585	368,701	35,599	2,150	230	14,743	27
Mechanical Thickening F	66,502.5	479	192	400	326	39	10	1	13	0
PC Effluent	10,065,572.7	21,597	11,692	6,565	5,746	2,386	2,081	1	323	235
PC Underflow	101,672.5	11,321	4,989	8,024	7,022	218	21	0	110	2
Prim Digester Eff	36,503.3	7,899	997	7,512	5,198	743	333	0	344	37
RAS	4,911,329.9	526,706	212,520	443,225	361,076	33,417	705	75	14,421	9
Raw Influent	10,000,000.0	30,878	15,932	13,196	11,527	2,170	1,736	0	342	185
SC Underflow	5,000,000.0	536,215	216,357	451,227	367,595	34,021	718	77	14,681	9
WAS Thick Influent	88,670.1	9,509	3,837	8,002	6,519	603	13	1	260	0
WAS Thick Underflow	22,167.5	9,030	3,644	7,602	6,193	564	3	0	247	0

		Concentration								
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Alum	480.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
Combined Digester Inf	36,503.3	62,775	26,509	48,661	41,076	2,438.2	20.2	1.1	1,129.3	1.23
Combined PC Influent	10,167,245.2	388	197	172	150	30.7	24.8	0.0	5.1	2.80
Dewater Pressate	32,926.0	1,438	111	1,268	859	1,311.8	1,245.6	0.0	235.9	183.46
Dewatering Inf	36,503.3	23,584	1,658	22,869	15,493	2,438.2	1,245.6	0.0	1,129.3	183.46
Digested Sludge	3,577.3	227,412	15,898	221,689	150,190	12,804.9	1,245.6	0.0	9,352.2	183.46
Effluent	9,976,902.7	26	9	16	13	19.0	17.2	1.8	0.7	0.22
Grav Thick Underflow	14,335.8	84,364	37,039	60,365	52,827	1,494.5	24.8	0.0	809.1	2.80
Gravity Thickener Perm	87,336.6	1,684	765	1,101	963	53.3	24.8	0.0	17.5	2.80
Grit Eff w/ Alum	9,980,480.0	370	191	157	138	26.0	20.8	0.0	4.1	2.22
Grit Effluent	9,980,000.0	370	191	149	138	26.0	20.8	0.0	4.1	2.22
Grit Underflow	20,000.0	370	191	4,945	138	26.0	20.8	0.0	4.1	2.22
HPO Zone 1 Eff	14,976,902.7	4,350	1,765	3,638	2,969	285.9	19.5	1.0	118.0	0.65
HPO Zone 2 Eff	14,976,902.7	4,328	1,750	3,631	2,961	285.3	18.2	1.4	118.0	0.34
HPO Zone 3 Eff	14,976,902.7	4,308	1,737	3,621	2,950	284.8	17.2	1.8	118.0	0.22
Mechanical Thickening	66,502.5	863	347	721	587	70.9	17.2	1.8	23.7	0.22
PC Effluent	10,065,572.7	257	139	78	68	28.4	24.8	0.0	3.8	2.80
PC Underflow	101,672.5	13,342	5,880	9,457	8,276	256.5	24.8	0.0	129.1	2.80
Prim Digester Eff	36,503.3	25,931	3,274	24,657	17,062	2,438.2	1,092.5	0.0	1,129.3	122.24
RAS	4,911,329.9	12,851	5,185	10,814	8,810	815.3	17.2	1.8	351.8	0.22
Raw Influent	10,000,000.0	370	191	158	138	26.0	20.8	0.0	4.1	2.22
SC Underflow	5,000,000.0	12,851	5,185	10,814	8,810	815.3	17.2	1.8	351.8	0.22
WAS Thick Influent	88,670.1	12,851	5,185	10,814	8,810	815.3	17.2	1.8	351.8	0.22
WAS Thick Underflow	22,167.5	48,813	19,700	41,092	33,476	3,048.5	17.2	1.8	1,336.4	0.22

Appendix G.2

Biowin Summary

Alternative 1 – MBR – Flow/Load Scenario 1



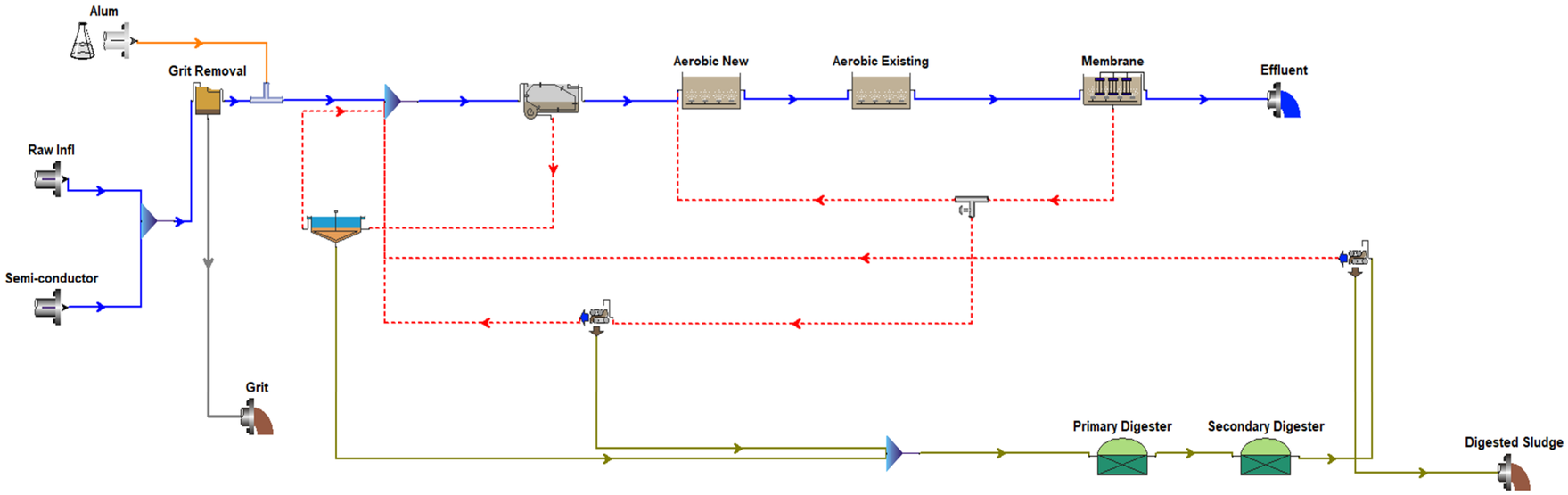
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Aerobic New Eff	49,976,660.1	3,487,077	853,235	3,054,395	2,368,594	209,096	1,102	6,383	106,037	355
Alum	475.0	0	0	0	0	0	0	0	0	0
Combined Digester Inf	32,329.7	17,010	6,068	13,204	10,930	591	3	3	308	0
Combined PC Influent	10,142,126.1	32,796	16,546	14,333	12,514	2,419	1,924	10	394	201
Dewater Pressate	28,514.8	412	20	371	253	198	179	0	29	15
Dewatering Inf	32,329.7	7,693	329	7,416	5,060	591	203	0	308	17
Digested Sludge	3,814.9	7,281	309	7,045	4,807	393	24	0	279	2
Effluent	9,976,660.1	500	70	0	0	54	11	1,452	63	63
Grav Thick Underflow	14,199.0	10,049	4,373	7,095	6,195	175	3	0	96	0
Gravity Thickener Perme	66,938.0	1,197	536	788	688	33	13	0	12	1
Grit Eff w/ Alum	9,980,475.0	30,816	15,900	12,852	11,324	2,165	1,732	0	341	185
Grit Effluent	9,980,000.0	30,816	15,900	12,191	11,324	2,165	1,732	0	341	185
Grit Underflow	20,000.0	62	32	825	23	4	3	0	1	0
MBR Influent	49,976,660.1	3,480,253	848,627	3,051,808	2,365,808	208,173	179	7,165	106,037	318
Mechanical Thickening F	66,198.3	370	90	322	249	22	0	10	12	0
PC Effluent	10,060,989.1	21,549	11,637	6,450	5,631	2,211	1,909	10	286	199
PC Underflow	81,137.0	11,247	4,909	7,883	6,883	208	15	0	108	2
Prim Digester Eff	32,329.7	8,156	642	7,757	5,359	591	174	0	308	5
RAS	40,000,000.0	3,476,928	846,680	3,050,227	2,364,189	207,975	43	5,822	105,974	252
RAS post split	39,915,671.0	3,469,598	844,895	3,043,797	2,359,205	207,537	43	5,810	105,751	252
Raw Inf	10,000,000.0	30,878	15,932	13,016	11,347	2,170	1,736	0	342	185
WAS Thick Influent	84,329.0	7,330	1,785	6,431	4,984	438	0	12	223	1
WAS Thick Underflow	18,130.7	6,960	1,695	6,109	4,735	416	0	3	212	0

	Concentration									
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Aerobic New Eff	49,976,660.1	8,361	2,046	7,323	5,679	501.3	2.6	15.3	254.2	0.85
Alum	475.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
Combined Digester Inf	32,329.7	63,045	22,491	48,938	40,510	2,192.0	10.1	9.8	1,140.5	1.47
Combined PC Influent	10,142,126.1	387	195	169	148	28.6	22.7	0.1	4.7	2.38
Dewater Pressate	28,514.8	1,732	84	1,558	1,063	833.2	751.4	0.0	122.4	61.18
Dewatering Inf	32,329.7	28,515	1,220	27,487	18,754	2,191.9	751.4	0.0	1,140.5	61.18
Digested Sludge	3,814.9	228,701	9,712	221,292	150,989	12,347.2	751.4	0.0	8,750.3	61.18
Effluent	9,976,660.1	6	1	0	0	0.6	0.1	17.4	0.8	0.76
Grav Thick Underflow	14,199.0	84,808	36,903	59,872	52,277	1,478.6	22.7	0.1	808.9	2.38
Gravity Thickener Perm	66,938.0	2,143	959	1,411	1,232	58.7	22.7	0.1	21.4	2.38
Grit Eff w/ Alum	9,980,475.0	370	191	154	136	26.0	20.8	0.0	4.1	2.22
Grit Effluent	9,980,000.0	370	191	146	136	26.0	20.8	0.0	4.1	2.22
Grit Underflow	20,000.0	370	191	4,943	136	26.0	20.8	0.0	4.1	2.22
MBR Influent	49,976,660.1	8,344	2,035	7,317	5,672	499.1	0.4	17.2	254.2	0.76
Mechanical Thickening	66,198.3	669	162	582	451	40.3	0.1	17.4	20.9	0.76
PC Effluent	10,060,989.1	257	139	77	67	26.3	22.7	0.1	3.4	2.38
PC Underflow	81,137.0	16,610	7,249	11,642	10,165	307.2	22.7	0.1	159.2	2.38
Prim Digester Eff	32,329.7	30,230	2,378	28,749	19,863	2,191.9	645.6	0.0	1,140.5	17.66
RAS	40,000,000.0	10,416	2,536	9,137	7,082	623.0	0.1	17.4	317.5	0.76
RAS post split	39,915,671.0	10,416	2,536	9,137	7,082	623.0	0.1	17.4	317.5	0.76
Raw Inf	10,000,000.0	370	191	156	136	26.0	20.8	0.0	4.1	2.22
WAS Thick Influent	84,329.0	10,416	2,536	9,137	7,082	623.0	0.1	17.4	317.5	0.76
WAS Thick Underflow	18,130.7	46,002	11,204	40,375	31,294	2,750.7	0.1	17.4	1,400.2	0.76

Appendix G.3

Biowin Summary

Alternative 1 – MBR – Flow/Load Scenario 2



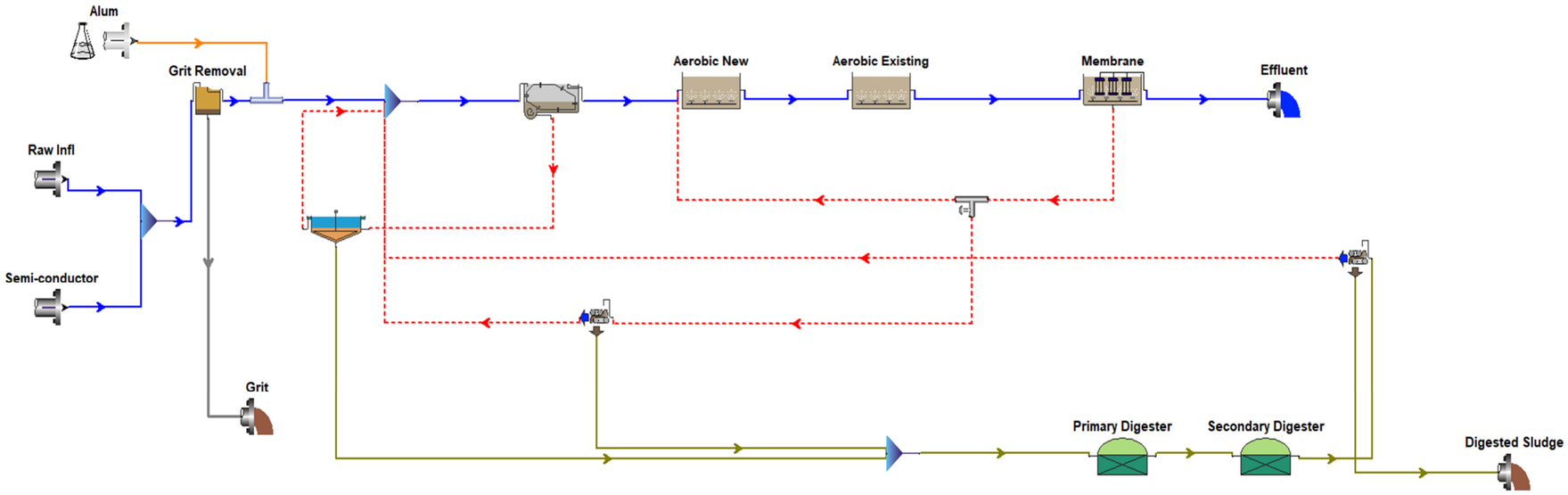
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Aerobic New Eff	86,261,359.8	5,100,194	1,162,955	4,602,407	3,472,064	299,356	1,137	15,033	182,272	572
Alum	890.0	0	0	0	0	0	0	0	0	0
Combined Digester Inf	39,760.0	20,146	6,892	15,996	13,012	717	4	4	437	0
Combined Influent	17,300,000.0	35,768	17,737	15,017	13,631	4,104	3,470	9	510	270
Combined PC Influent	17,553,467.9	38,101	18,457	17,405	15,042	4,423	3,712	26	578	285
Dewater Pressate	34,829.8	513	24	476	317	239	216	0	34	13
Dewatering Inf	39,760.0	9,578	387	9,515	6,348	717	246	0	437	15
Digested Sludge	4,930.2	9,066	364	9,039	6,030	478	31	0	403	2
Effluent	17,261,359.8	1,104	124	0	0	124	11	3,207	106	106
Grav Thick Underflow	17,377.9	11,981	5,035	8,615	7,446	239	4	0	145	0
Gravity Thickener Perme	158,156.7	1,455	633	957	827	62	33	0	19	3
Grit Eff w/ Alum	17,266,290.0	35,697	17,701	15,583	13,604	4,096	3,463	9	509	269
Grit Effluent	17,265,400.0	35,697	17,701	14,344	13,604	4,096	3,463	9	509	269
Grit Underflow	34,600.0	72	35	673	27	8	7	0	1	1
MBR Inf	86,261,359.8	5,095,026	1,159,452	4,600,498	3,469,950	298,393	191	15,890	182,272	536
MBR RAS	69,000,000.0	5,090,758	1,157,233	4,598,762	3,468,154	298,098	44	12,818	182,166	425
Mechanical Thickening F	94,191.4	436	98	388	293	26	0	17	16	1
PC Effluent	17,377,933.2	24,664	12,788	7,832	6,769	4,122	3,675	26	414	282
PC Underflow	175,534.7	13,437	5,669	9,573	8,273	301	37	0	164	3
Prim Digester Eff	39,760.0	10,104	742	9,899	6,686	717	214	0	437	2
RAS	68,883,426.5	5,082,158	1,155,278	4,590,992	3,462,295	297,594	43	12,797	181,858	424
Raw Influent	10,300,000.0	23,209	11,577	9,525	8,665	2,235	1,788	0	352	191
Semi-conductor	7,000,000.0	12,560	6,159	5,492	4,966	1,869	1,682	9	158	79
WAS Thick Influent	116,573.5	8,601	1,955	7,769	5,859	504	0	22	308	1
WAS Thick Underflow	22,382.1	8,165	1,857	7,381	5,566	478	0	4	292	0

		Concentration								
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Aerobic New Eff	86,261,359.8	7,085	1,615	6,393	4,823	415.8	1.6	20.9	253.2	0.80
Alum	890.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
Combined Digester Inf	39,760.0	60,716	20,771	48,209	39,215	2,161.8	11.1	12.6	1,317.0	1.27
Combined Influent	17,300,000.0	248	123	104	94	28.4	24.0	0.1	3.5	1.87
Combined PC Influent	17,553,467.9	260	126	119	103	30.2	25.3	0.2	3.9	1.95
Dewater Pressate	34,829.8	1,764	82	1,637	1,092	823.1	741.6	0.0	117.7	45.14
Dewatering Inf	39,760.0	28,867	1,167	28,675	19,130	2,161.6	741.6	0.0	1,317.0	45.14
Digested Sludge	4,930.2	220,335	8,837	219,691	146,562	11,617.6	741.6	0.0	9,789.2	45.14
Effluent	17,261,359.8	8	1	0	0	0.9	0.1	22.3	0.7	0.74
Grav Thick Underflow	17,377.9	82,616	34,721	59,405	51,341	1,651.4	25.3	0.2	1,001.0	1.95
Gravity Thickener Perm	158,156.7	1,103	480	725	627	46.8	25.3	0.2	14.1	1.95
Grit Eff w/ Alum	17,266,290.0	248	123	108	94	28.4	24.0	0.1	3.5	1.87
Grit Effluent	17,265,400.0	248	123	100	94	28.4	24.0	0.1	3.5	1.87
Grit Underflow	34,600.0	248	123	2,330	94	28.4	24.0	0.1	3.5	1.87
MBR Inf	86,261,359.8	7,078	1,611	6,391	4,820	414.5	0.3	22.1	253.2	0.74
MBR RAS	69,000,000.0	8,841	2,010	7,986	6,023	517.7	0.1	22.3	316.4	0.74
Mechanical Thickening	94,191.4	554	125	494	373	32.8	0.1	22.3	20.3	0.74
PC Effluent	17,377,933.2	170	88	54	47	28.4	25.3	0.2	2.9	1.95
PC Underflow	175,534.7	9,172	3,870	6,535	5,647	205.6	25.3	0.2	111.8	1.95
Prim Digester Eff	39,760.0	30,450	2,235	29,834	20,149	2,161.6	644.2	0.0	1,317.0	5.45
RAS	68,883,426.5	8,841	2,010	7,986	6,023	517.7	0.1	22.3	316.4	0.74
Raw Influent	10,300,000.0	270	135	111	101	26.0	20.8	0.0	4.1	2.22
Semi-conductor	7,000,000.0	215	105	94	85	32.0	28.8	0.2	2.7	1.35
WAS Thick Influent	116,573.5	8,841	2,010	7,986	6,023	517.7	0.1	22.3	316.4	0.74
WAS Thick Underflow	22,382.1	43,712	9,940	39,515	29,801	2,558.0	0.1	22.3	1,562.4	0.74

Appendix G.4

Biowin Summary

Alternative 1 – MBR – Flow/Load Scenario 3



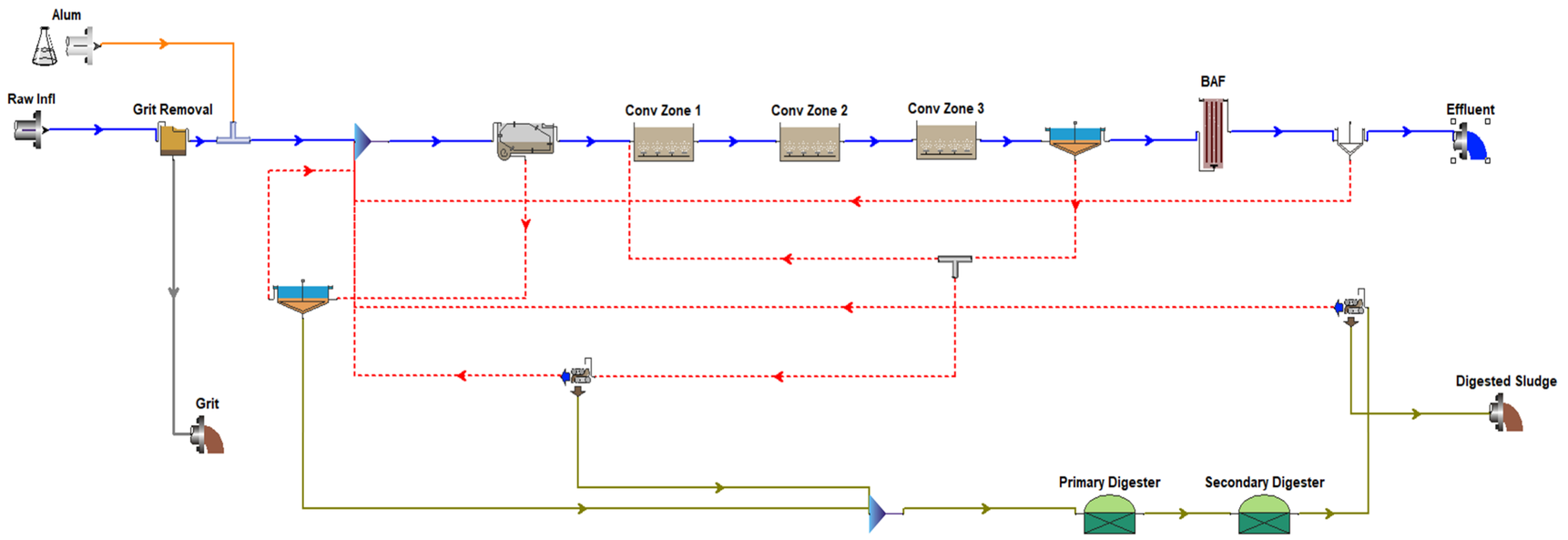
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Aerobic New Eff	###########	6,167,014	1,462,029	5,461,230	4,207,783	363,400	1,066	18,990	207,291	696
Alum	950.0	0	0	0	0	0	0	0	0	0
Combined Digester Inf	48,440.5	25,050	8,698	19,606	16,213	885	5	5	515	1
Combined Influent	21,100,000.0	44,206	21,890	18,605	16,928	5,079	4,330	13	605	318
Combined PC Influent	21,414,130.7	47,093	22,792	21,336	18,678	5,474	4,632	35	688	340
Dewater Pressate	42,433.9	628	30	569	390	297	268	0	43	19
Dewatering Inf	48,440.5	11,727	483	11,390	7,798	885	306	0	515	21
Digested Sludge	6,006.6	11,099	454	10,820	7,408	587	38	0	472	3
Effluent	21,052,743.4	1,500	153	0	0	158	13	3,971	132	132
Grav Thick Underflow	21,200.0	14,854	6,285	10,561	9,246	286	5	0	173	0
Gravity Thickener Perme	192,941.3	1,803	788	1,173	1,027	75	42	0	22	3
Grit Eff w/ Alum	21,058,750.0	44,117	21,846	19,117	16,894	5,069	4,322	12	604	317
Grit Effluent	21,057,800.0	44,117	21,846	17,795	16,894	5,069	4,322	12	604	317
Grit Underflow	42,200.0	88	44	811	34	10	9	0	1	1
MBR Inf	###########	6,161,655	1,458,407	5,459,166	4,205,529	362,523	201	19,759	207,291	663
Mechanical Thickening F	120,005.5	545	128	476	367	32	0	23	19	1
PC Effluent	21,199,989.4	30,437	15,718	9,601	8,405	5,113	4,585	35	493	336
PC Underflow	214,141.3	16,657	7,074	11,735	10,273	361	46	0	195	3
Prim Digester Eff	48,440.5	12,392	933	11,881	8,229	885	265	0	515	4
RAS	84,400,000.0	6,156,877	1,456,085	5,457,372	4,203,678	362,198	51	15,918	207,159	528
RAS post split	84,252,754.0	6,146,136	1,453,545	5,447,851	4,196,345	361,566	51	15,890	206,798	527
Raw Influent	11,100,000.0	25,011	12,477	10,264	9,338	2,408	1,927	0	380	205
Semi-conductor Inf	10,000,000.0	19,194	9,413	8,341	7,590	2,671	2,403	13	225	113
WAS Thick Influent	147,246.0	10,741	2,540	9,521	7,334	632	0	28	361	1
WAS Thick Underflow	27,240.5	10,196	2,412	9,045	6,967	599	0	5	343	0

	Concentration									
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Aerobic New Eff	###########	7,008	1,661	6,206	4,781	412.9	1.2	21.6	235.5	0.79
Alum	950.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
Combined Digester Inf	48,440.5	61,966	21,515	48,500	40,105	2,189.3	11.4	12.8	1,274.9	1.25
Combined Influent	21,100,000.0	251	124	106	96	28.8	24.6	0.1	3.4	1.81
Combined PC Influent	21,414,130.7	264	128	119	105	30.6	25.9	0.2	3.9	1.90
Dewater Pressate	42,433.9	1,773	84	1,608	1,101	840.0	757.8	0.0	122.1	52.36
Dewatering Inf	48,440.5	29,008	1,195	28,174	19,291	2,189.1	757.8	0.0	1,274.9	52.36
Digested Sludge	6,006.6	221,405	9,048	215,850	147,790	11,720.0	757.8	0.0	9,418.7	52.36
Effluent	21,052,743.4	9	1	0	0	0.9	0.1	22.6	0.8	0.75
Grav Thick Underflow	21,200.0	83,957	35,526	59,695	52,258	1,614.1	25.9	0.2	976.4	1.90
Gravity Thickener Perm	192,941.3	1,120	490	729	638	46.8	25.9	0.2	13.8	1.90
Grit Eff w/ Alum	21,058,750.0	251	124	109	96	28.8	24.6	0.1	3.4	1.81
Grit Effluent	21,057,800.0	251	124	101	96	28.8	24.6	0.1	3.4	1.81
Grit Underflow	42,200.0	251	124	2,302	96	28.8	24.6	0.1	3.4	1.81
MBR Inf	###########	7,002	1,657	6,203	4,779	411.9	0.2	22.5	235.5	0.75
Mechanical Thickening	120,005.5	544	128	475	366	32.4	0.1	22.6	18.7	0.75
PC Effluent	21,199,989.4	172	89	54	48	28.9	25.9	0.2	2.8	1.90
PC Underflow	214,141.3	9,321	3,958	6,566	5,748	202.0	25.9	0.2	109.1	1.90
Prim Digester Eff	48,440.5	30,655	2,307	29,389	20,356	2,189.1	655.8	0.0	1,274.9	9.75
RAS	84,400,000.0	8,741	2,067	7,748	5,968	514.2	0.1	22.6	294.1	0.75
RAS post split	84,252,754.0	8,741	2,067	7,748	5,968	514.2	0.1	22.6	294.1	0.75
Raw Influent	11,100,000.0	270	135	111	101	26.0	20.8	0.0	4.1	2.22
Semi-conductor Inf	10,000,000.0	230	113	100	91	32.0	28.8	0.2	2.7	1.35
WAS Thick Influent	147,246.0	8,741	2,067	7,748	5,968	514.2	0.1	22.6	294.1	0.75
WAS Thick Underflow	27,240.5	44,851	10,612	39,787	30,647	2,636.9	0.1	22.6	1,507.2	0.75

Appendix G.5

Biowin Summary

Alternatives 2/4 - Conventional – BAF/MBBR – Flow/Load Scenario 1



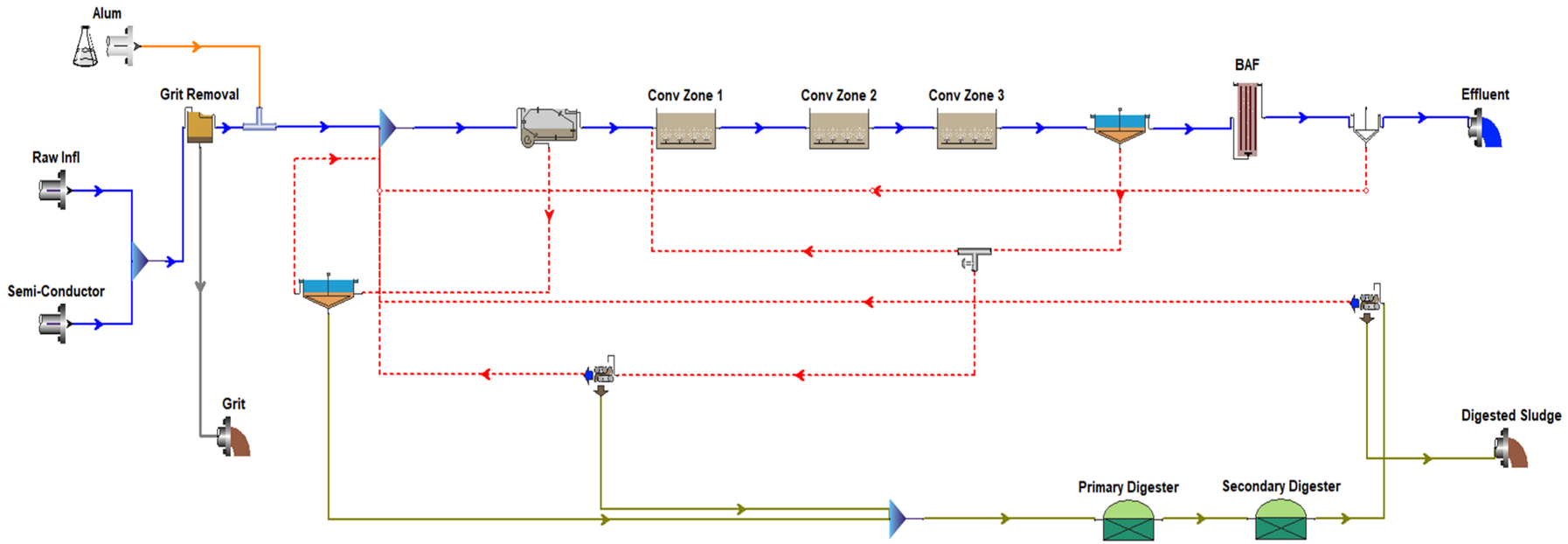
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Alum	335.0	0	0	0	0	0	0	0	0	0
BAF Effluent	10,501,302.7	1,252	361	562	478	140	48	1,512	74	56
BAF Influent	10,501,302.7	1,361	492	447	379	1,581	1,503	95	74	60
BAF/Filter Return	525,065.1	410	153	309	263	29	2	76	12	3
CAS Zone1 Eff	15,501,302.7	192,166	84,720	148,665	126,483	12,902	2,572	107	4,541	181
CAS Zone2 Eff	15,501,302.7	190,134	83,323	149,260	126,847	12,849	2,379	120	4,541	123
CAS Zone3 Eff	15,501,302.7	188,404	82,218	148,841	126,276	12,795	2,218	140	4,541	89
Combined Digester Inf	45,526.8	23,279	9,924	17,463	15,114	923	7	0	405	1
Combined PC Influent	10,968,992.6	33,684	16,417	14,887	13,233	2,793	2,250	79	511	303
Dewater Pressate	41,429.4	484	41	391	286	470	449	0	125	111
Dewatering Inf	45,526.8	8,765	686	7,812	5,727	923	493	0	405	122
Digested Sludge	4,097.4	8,281	645	7,421	5,441	453	44	0	280	11
Effluent	9,976,237.6	842	208	253	215	111	46	1,436	61	54
Grav Thick Underflow	14,917.8	10,580	4,372	7,369	6,550	206	3	0	103	0
Gravity Thickener Perme	94,772.1	1,280	550	819	728	43	19	1	14	3
Grit Eff w/ Alum	9,980,335.0	30,816	15,372	12,837	11,505	2,165	1,732	0	341	185
Grit Effluent	9,980,000.0	30,816	15,372	12,371	11,505	2,165	1,732	0	341	185
Grit Underflow	20,000.0	62	31	827	23	4	3	0	1	0
Mechanical Thickening F	327,391.0	693	300	531	451	86	47	3	18	2
PC Effluent	10,859,302.7	21,824	11,494	6,699	5,955	2,544	2,227	78	394	300
PC Underflow	109,689.9	11,860	4,922	8,188	7,278	249	22	1	117	3
Prim Digester Eff	45,526.8	9,686	1,320	8,525	6,343	923	433	0	405	94
RAS	4,642,000.0	173,651	75,874	137,770	116,883	10,411	664	42	4,148	27
Raw Influent	10,000,000.0	30,878	15,403	13,197	11,528	2,170	1,736	0	342	185
SC Underflow	5,000,000.0	187,043	81,726	148,395	125,897	11,214	716	45	4,468	29
WAS Thick Influent	358,000.0	13,392	5,852	10,625	9,014	803	51	3	320	2
WAS Thick Underflow	30,609.0	12,699	5,552	10,094	8,564	717	4	0	302	0

Pipe Name	FLOW gal/d	Concentration COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Alum	335.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
BAF Effluent	10,501,302.7	14	4	6	5	1.6	0.5	17.2	0.8	0.64
BAF Influent	10,501,302.7	16	6	5	4	18.0	17.1	1.1	0.8	0.69
BAF/Filter Return	525,065.1	94	35	70	60	6.6	0.5	17.2	2.8	0.64
CAS Zone1 Eff	15,501,302.7	1,485	655	1,149	978	99.7	19.9	0.8	35.1	1.40
CAS Zone2 Eff	15,501,302.7	1,470	644	1,154	981	99.3	18.4	0.9	35.1	0.95
CAS Zone3 Eff	15,501,302.7	1,456	636	1,151	976	98.9	17.1	1.1	35.1	0.69
Combined Digester Inf	45,526.8	61,270	26,120	45,962	39,780	2,429.3	19.6	1.0	1,066.9	1.55
Combined PC Influent	10,968,992.6	368	179	163	145	30.5	24.6	0.9	5.6	3.31
Dewater Pressate	41,429.4	1,401	119	1,130	828	1,360.0	1,297.6	0.0	362.2	321.23
Dewatering Inf	45,526.8	23,071	1,805	20,561	15,074	2,429.2	1,297.6	0.0	1,066.9	321.23
Digested Sludge	4,097.4	242,180	18,854	217,028	159,111	13,240.5	1,297.6	0.0	8,191.8	321.23
Effluent	9,976,237.6	10	3	3	3	1.3	0.5	17.2	0.7	0.64
Grav Thick Underflow	14,917.8	84,982	35,119	59,190	52,615	1,653.6	24.6	0.9	829.1	3.31
Gravity Thickener Perm	94,772.1	1,619	696	1,035	920	54.5	24.6	0.9	17.8	3.31
Grit Eff w/ Alum	9,980,335.0	370	185	154	138	26.0	20.8	0.0	4.1	2.22
Grit Effluent	9,980,000.0	370	185	149	138	26.0	20.8	0.0	4.1	2.22
Grit Underflow	20,000.0	370	185	4,953	138	26.0	20.8	0.0	4.1	2.22
Mechanical Thickening	327,391.0	254	110	194	165	31.4	17.1	1.1	6.5	0.69
PC Effluent	10,859,302.7	241	127	74	66	28.1	24.6	0.9	4.3	3.31
PC Underflow	109,689.9	12,956	5,377	8,944	7,951	272.0	24.6	0.9	128.1	3.31
Prim Digester Eff	45,526.8	25,494	3,474	22,438	16,694	2,429.2	1,139.2	0.0	1,066.9	248.36
RAS	4,642,000.0	4,483	1,959	3,556	3,017	268.7	17.1	1.1	107.1	0.69
Raw Influent	10,000,000.0	370	185	158	138	26.0	20.8	0.0	4.1	2.22
SC Underflow	5,000,000.0	4,483	1,959	3,556	3,017	268.7	17.1	1.1	107.1	0.69
WAS Thick Influent	358,000.0	4,483	1,959	3,556	3,017	268.7	17.1	1.1	107.1	0.69
WAS Thick Underflow	30,609.0	49,714	21,734	39,515	33,524	2,807.3	17.1	1.1	1,182.7	0.69

Appendix G.6

Biowin Summary

Alternatives 2/4 - Conventional – BAF/MBBR – Flow/Load Scenario 2



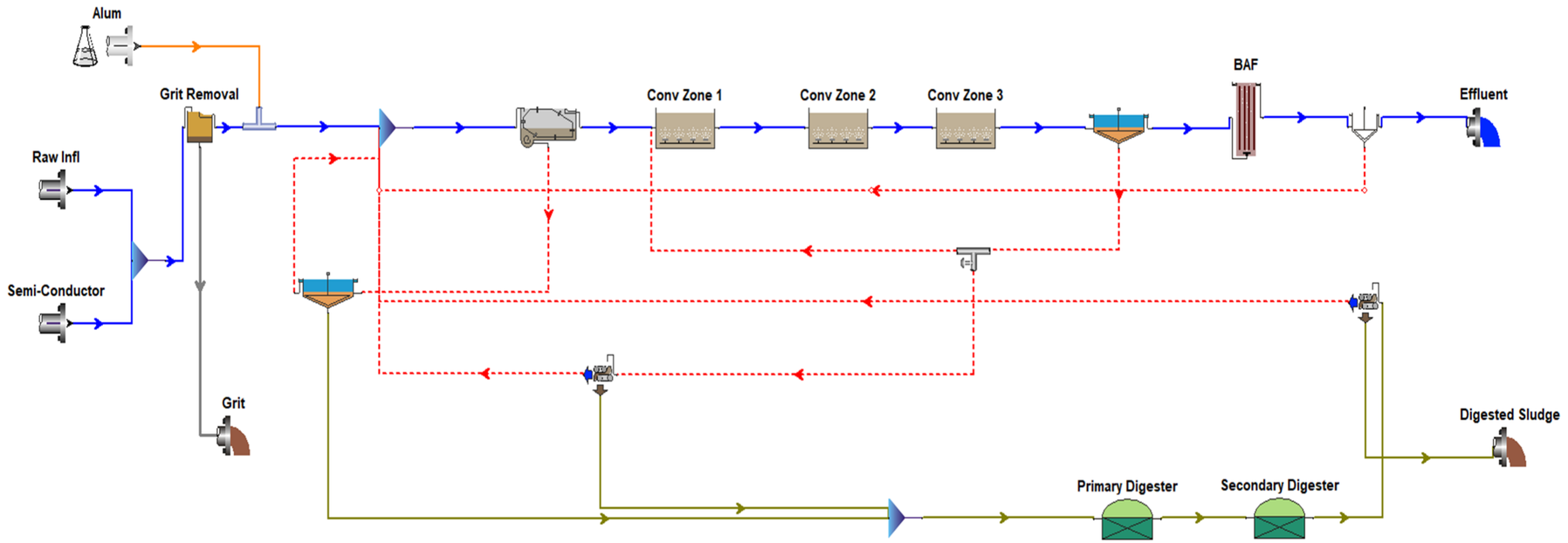
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Alum	650.0	0	0	0	0	0	0	0	0	0
BAF Effluent	18,169,754.0	2,634	752	1,139	963	362	148	3,230	131	94
BAF Influent	18,169,754.0	2,660	878	834	696	3,189	3,005	457	131	104
BAF Return	908,487.7	829	325	627	530	62	7	162	25	5
Combined Digester Inf	51,437.7	26,293	11,330	20,054	17,167	1,070	9	1	524	1
Combined Influent	17,300,000.0	35,768	17,737	15,017	13,631	4,104	3,470	9	510	270
Combined PC Influent	18,724,788.5	39,336	19,063	17,909	15,817	4,884	4,096	180	697	379
Conv Zone1 Eff	26,819,754.0	348,300	152,678	277,499	232,039	24,534	5,000	462	9,249	263
Conv Zone2 Eff	26,819,754.0	345,917	151,037	278,226	232,460	24,381	4,702	565	9,249	194
Dewater Pressate	46,654.0	537	46	460	321	557	533	0	121	100
Dewatering Inf	51,437.7	9,703	771	9,196	6,426	1,069	588	0	524	111
Digested Sludge	4,783.7	9,165	724	8,736	6,105	512	55	0	403	10
Effluent	17,261,266.3	1,805	427	513	433	300	141	3,069	106	89
Grav Thick Underflow	17,601.3	12,539	5,325	8,865	7,829	274	4	0	158	0
Gravity Thickener Perme	169,646.6	1,519	666	985	870	69	37	2	21	3
Grit Eff w/ Alum	17,266,050.0	35,697	17,701	15,249	13,604	4,096	3,463	9	509	269
Grit Effluent	17,265,400.0	35,697	17,701	14,344	13,604	4,096	3,463	9	509	269
Grit Underflow	34,600.0	72	35	673	27	8	7	0	1	1
Mechanical Thickening F	333,950.3	754	324	589	491	99	55	8	21	2
PC Effluent	18,537,540.6	25,278	13,072	8,059	7,117	4,541	4,055	178	519	376
PC Underflow	187,247.9	14,058	5,991	9,850	8,699	343	41	2	179	4
Prim Digester Eff	51,437.7	10,753	1,493	10,020	7,130	1,069	519	0	524	76
RAS	8,282,213.4	326,705	142,517	265,228	221,342	20,145	1,370	208	8,730	47
Raw Influent	10,300,000.0	23,209	11,577	9,525	8,665	2,235	1,788	0	352	191
SC Underflow	8,650,000.0	341,213	148,846	277,006	231,172	21,039	1,430	218	9,118	49
Secondary Clarifier Inf	26,819,754.0	343,873	149,724	277,839	231,867	24,228	4,435	675	9,249	153
Semi-cond Inf	7,000,000.0	12,560	6,159	5,492	4,966	1,869	1,682	9	158	79
WAS Thick Influent	367,786.6	14,508	6,329	11,778	9,829	895	61	9	388	2
WAS Thick Underflow	33,836.4	13,754	6,005	11,189	9,338	795	6	1	367	0

		Concentration								
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_x-N mg/L	TP mg/L	PO_4-P mg/L
Alum	650.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
BAF Effluent	18,169,754.0	17	5	8	6	2.4	1.0	21.3	0.9	0.62
BAF Influent	18,169,754.0	18	6	5	5	21.0	19.8	3.0	0.9	0.68
BAF Return	908,487.7	109	43	83	70	8.2	1.0	21.3	3.3	0.62
Combined Digester Inf	51,437.7	61,252	26,393	46,717	39,991	2,491.5	22.0	2.4	1,221.2	1.28
Combined Influent	17,300,000.0	248	123	104	94	28.4	24.0	0.1	3.5	1.87
Combined PC Influent	18,724,788.5	252	122	115	101	31.3	26.2	1.2	4.5	2.43
Conv Zone1 Eff	26,819,754.0	1,556	682	1,240	1,037	109.6	22.3	2.1	41.3	1.18
Conv Zone2 Eff	26,819,754.0	1,546	675	1,243	1,039	108.9	21.0	2.5	41.3	0.87
Dewater Pressate	46,654.0	1,380	119	1,181	825	1,431.8	1,369.6	0.0	310.8	257.70
Dewatering Inf	51,437.7	22,603	1,795	21,422	14,971	2,491.4	1,369.6	0.0	1,221.2	257.70
Digested Sludge	4,783.7	229,583	18,143	218,824	152,926	12,825.1	1,369.6	0.0	10,099.7	257.70
Effluent	17,261,266.3	13	3	4	3	2.1	1.0	21.3	0.7	0.62
Grav Thick Underflow	17,601.3	85,365	36,252	60,352	53,300	1,865.7	26.2	1.2	1,073.6	2.43
Gravity Thickener Perm	169,646.6	1,073	471	696	614	49.0	26.2	1.2	14.8	2.43
Grit Eff w/ Alum	17,266,050.0	248	123	106	94	28.4	24.0	0.1	3.5	1.87
Grit Effluent	17,265,400.0	248	123	100	94	28.4	24.0	0.1	3.5	1.87
Grit Underflow	34,600.0	248	123	2,330	94	28.4	24.0	0.1	3.5	1.87
Mechanical Thickening	333,950.3	270	116	211	176	35.6	19.8	3.0	7.6	0.68
PC Effluent	18,537,540.6	163	84	52	46	29.4	26.2	1.2	3.4	2.43
PC Underflow	187,247.9	8,996	3,834	6,303	5,567	219.7	26.2	1.2	114.3	2.43
Prim Digester Eff	51,437.7	25,050	3,479	23,343	16,609	2,491.4	1,209.2	0.0	1,221.2	176.42
RAS	8,282,213.4	4,727	2,062	3,837	3,202	291.5	19.8	3.0	126.3	0.68
Raw Influent	10,300,000.0	270	135	111	101	26.0	20.8	0.0	4.1	2.22
SC Underflow	8,650,000.0	4,727	2,062	3,837	3,202	291.5	19.8	3.0	126.3	0.68
Secondary Clarifier Inf	26,819,754.0	1,536	669	1,241	1,036	108.2	19.8	3.0	41.3	0.68
Semi-cond Inf	7,000,000.0	215	105	94	85	32.0	28.8	0.2	2.7	1.35
WAS Thick Influent	367,786.6	4,727	2,062	3,837	3,202	291.5	19.8	3.0	126.3	0.68
WAS Thick Underflow	33,836.4	48,708	21,265	39,624	33,068	2,817.0	19.8	3.0	1,297.9	0.68

Appendix G.7

Biowin Summary

Alternatives 2/4 - Conventional – BAF/MBBR – Flow/Load Scenario 3



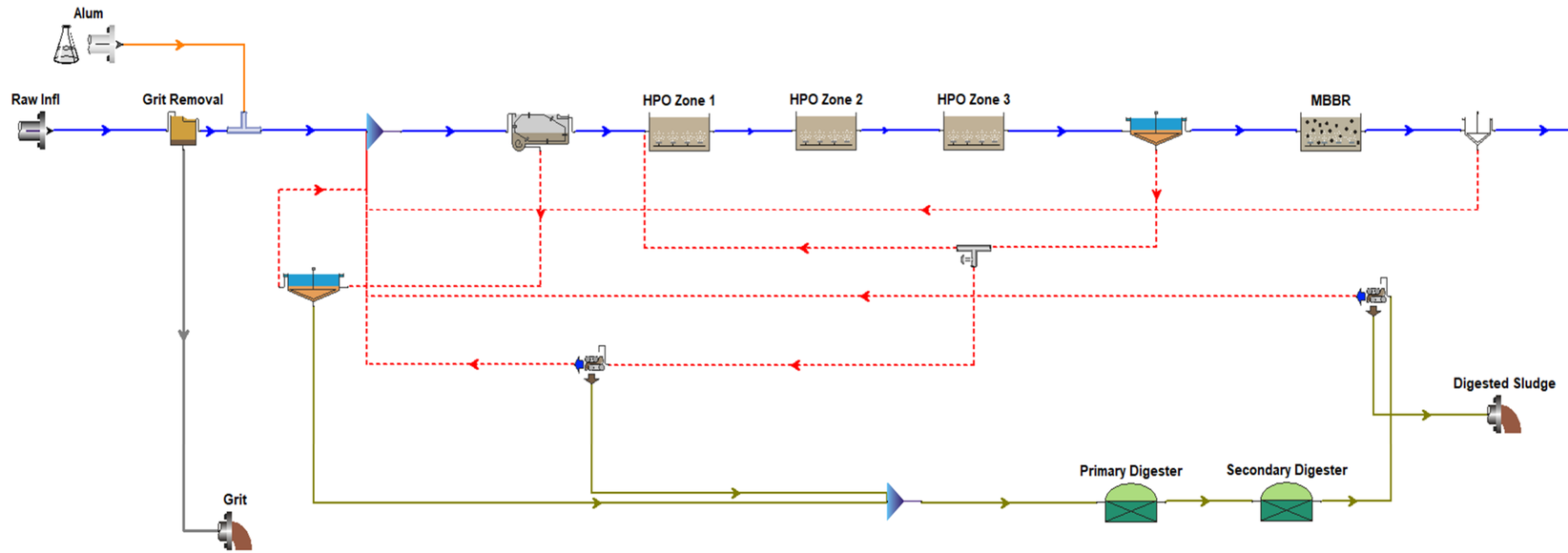
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Alum	710.0	0	0	0	0	0	0	0	0	0
BAF Eff	22,160,915.5	3,403	927	1,411	1,200	436	165	4,022	170	125
BAF Return	1,108,045.8	1,038	403	776	660	77	8	201	31	6
Combined Digester Inf	62,669.4	32,485	14,070	24,577	21,225	1,303	12	1	622	1
Combined Influent	21,100,000.0	44,206	21,890	18,605	16,928	5,079	4,330	13	605	318
Combined PC Influent	22,827,611.2	48,624	23,535	22,042	19,633	6,031	5,093	226	843	464
Conv Zone1 Eff	32,660,915.5	436,943	192,228	345,132	291,135	30,591	6,216	561	11,185	336
Conv Zone2 Eff	32,660,915.5	434,036	190,226	346,032	291,668	30,410	5,848	682	11,185	253
Dewater Pressate	57,029.1	657	56	551	394	679	650	0	158	134
Dewatering Inf	62,669.4	11,846	943	11,029	7,871	1,303	714	0	622	147
Digested Sludge	5,640.2	11,189	887	10,477	7,478	624	64	0	465	13
Effluent	21,052,869.8	2,365	524	635	540	359	157	3,821	139	119
Grav Thick Underflow	21,458.0	15,542	6,641	10,911	9,718	328	5	0	188	0
Gravity Thickener Perme	206,818.2	1,881	829	1,212	1,080	85	46	2	25	4
Grit Eff w/ Alum	21,058,510.0	44,117	21,846	18,783	16,894	5,069	4,322	12	604	317
Grit Effluent	21,057,800.0	44,117	21,846	17,795	16,894	5,069	4,322	12	604	317
Grit Underflow	42,200.0	88	44	811	34	10	9	0	1	1
Mechanical Thickening F	397,208.1	931	401	719	606	121	67	10	25	2
PC Effluent	22,599,335.1	31,201	16,065	9,919	8,835	5,618	5,042	223	630	460
PC Underflow	228,276.1	17,423	7,469	12,123	10,798	413	51	2	213	5
Prim Digester Eff	62,669.4	13,141	1,834	12,039	8,738	1,303	629	0	622	106
RAS	10,061,580.5	410,210	179,694	330,152	277,975	25,154	1,700	250	10,555	62
Raw Influent	11,100,000.0	25,011	12,477	10,264	9,338	2,408	1,927	0	380	205
SC Underflow	10,500,000.0	428,085	187,523	344,538	290,087	26,250	1,774	261	11,015	65
Secondary Clarifier Eff	22,160,915.5	3,460	1,102	1,037	873	3,977	3,745	551	170	137
Secondary Clarifier Inf	32,660,915.5	431,545	188,625	345,574	290,960	30,227	5,519	813	11,185	202
Semi-cond Inf	10,000,000.0	19,194	9,413	8,341	7,590	2,671	2,403	13	225	113
WAS Thick Influent	438,419.5	17,874	7,830	14,386	12,112	1,096	74	11	460	3
WAS Thick Underflow	41,211.4	16,944	7,429	13,667	11,507	975	7	1	435	0

		Concentration								
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Alum	710.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
BAF Eff	22,160,915.5	18	5	8	6	2.4	0.9	21.7	0.9	0.68
BAF Return	1,108,045.8	112	44	84	71	8.3	0.9	21.7	3.3	0.68
Combined Digester Inf	62,669.4	62,113	26,902	46,993	40,583	2,491.6	22.5	2.4	1,190.1	1.32
Combined Influent	21,100,000.0	251	124	106	96	28.8	24.6	0.1	3.4	1.81
Combined PC Influent	22,827,611.2	255	124	116	103	31.7	26.7	1.2	4.4	2.44
Conv Zone1 Eff	32,660,915.5	1,603	705	1,266	1,068	112.2	22.8	2.1	41.0	1.23
Conv Zone2 Eff	32,660,915.5	1,592	698	1,270	1,070	111.6	21.5	2.5	41.0	0.93
Dewater Pressate	57,029.1	1,380	119	1,159	827	1,427.5	1,365.1	0.0	331.1	281.13
Dewatering Inf	62,669.4	22,650	1,803	21,088	15,050	2,491.5	1,365.1	0.0	1,190.1	281.13
Digested Sludge	5,640.2	237,716	18,839	222,591	158,866	13,249.7	1,365.1	0.0	9,875.6	281.13
Effluent	21,052,869.8	13	3	4	3	2.0	0.9	21.7	0.8	0.68
Grav Thick Underflow	21,458.0	86,788	37,082	60,929	54,269	1,831.3	26.7	1.2	1,048.7	2.44
Gravity Thickener Perm	206,818.2	1,090	480	702	626	49.0	26.7	1.2	14.5	2.44
Grit Eff w/ Alum	21,058,510.0	251	124	107	96	28.8	24.6	0.1	3.4	1.81
Grit Effluent	21,057,800.0	251	124	101	96	28.8	24.6	0.1	3.4	1.81
Grit Underflow	42,200.0	251	124	2,302	96	28.8	24.6	0.1	3.4	1.81
Mechanical Thickening	397,208.1	281	121	217	183	36.5	20.2	3.0	7.6	0.74
PC Effluent	22,599,335.1	165	85	53	47	29.8	26.7	1.2	3.3	2.44
PC Underflow	228,276.1	9,146	3,921	6,364	5,668	216.6	26.7	1.2	111.7	2.44
Prim Digester Eff	62,669.4	25,126	3,506	23,018	16,708	2,491.5	1,202.9	0.0	1,190.1	203.24
RAS	10,061,580.5	4,885	2,140	3,932	3,310	299.6	20.2	3.0	125.7	0.74
Raw Influent	11,100,000.0	270	135	111	101	26.0	20.8	0.0	4.1	2.22
SC Underflow	10,500,000.0	4,885	2,140	3,932	3,310	299.6	20.2	3.0	125.7	0.74
Secondary Clarifier Eff	22,160,915.5	19	6	6	5	21.5	20.2	3.0	0.9	0.74
Secondary Clarifier Inf	32,660,915.5	1,583	692	1,268	1,067	110.9	20.2	3.0	41.0	0.74
Semi-cond Inf	10,000,000.0	230	113	100	91	32.0	28.8	0.2	2.7	1.35
WAS Thick Influent	438,419.5	4,885	2,140	3,932	3,310	299.6	20.2	3.0	125.7	0.74
WAS Thick Underflow	41,211.4	49,266	21,601	39,737	33,457	2,835.3	20.2	3.0	1,263.7	0.74

Appendix G.8

Biowin Summary

Alternatives 3/5 - HPO – MBBR/BAF - Scenario 1



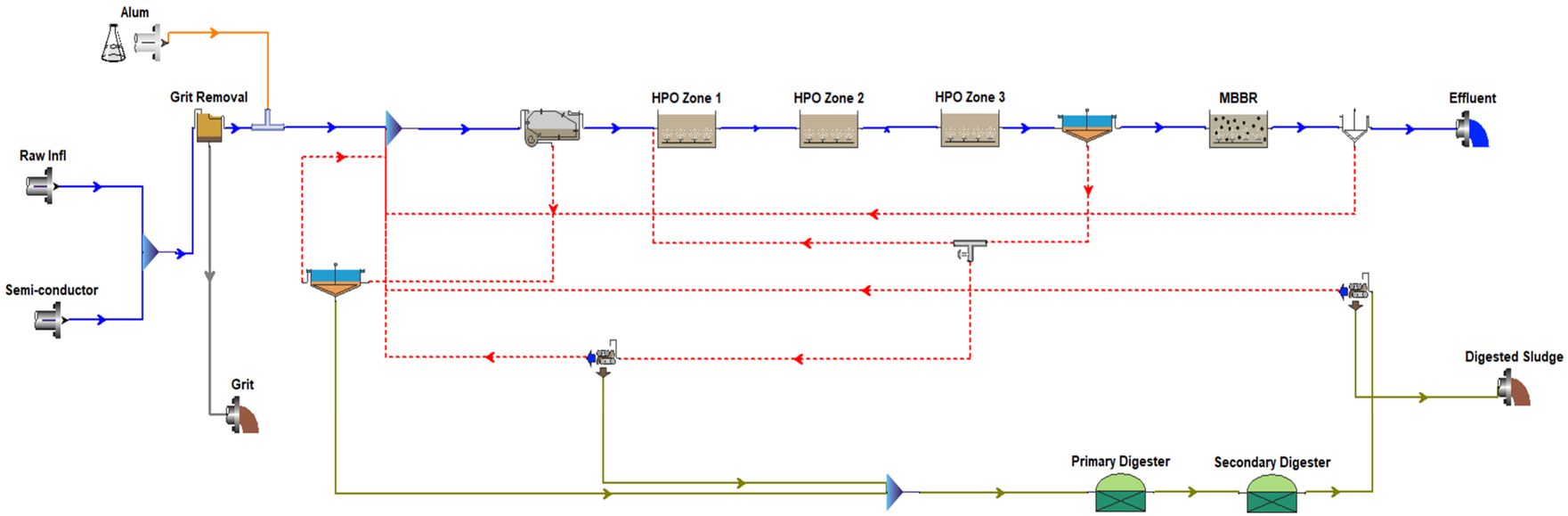
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_x-N lb/d	TP lb/d	PO_4-P lb/d
Alum	343.0	0	0	0	0	0	0	0	0	0
Cloth Filter Return	100,771.8	745	265	602	506	47	1	15	19	1
Combined Digester Inf	44,165.4	23,328	9,881	17,549	15,170	938	7	1	406	1
Combined PC Influent	10,423,236.2	34,025	16,526	15,211	13,491	2,803	2,239	19	512	294
Dewater Pressate	40,234.7	487	40	397	291	478	456	0	120	105
Dewatering Inf	44,165.4	8,890	670	7,942	5,815	938	500	0	406	116
Digested Sludge	3,930.7	8,403	630	7,544	5,524	460	45	0	286	10
Final Effluent	9,976,412.3	615	117	67	56	151	99	1,498	56	53
Grav Thick Underflow	14,905.2	10,767	4,430	7,529	6,678	217	3	0	108	0
Gravity Thickener Perme	89,327.1	1,300	556	837	742	44	19	0	14	3
Grit Eff w/ Alum	9,980,343.0	30,816	15,372	12,848	11,505	2,165	1,732	0	341	185
Grit Effluent	9,980,000.0	30,816	15,372	12,371	11,505	2,165	1,732	0	341	185
Grit Underflow	20,000.0	62	31	827	23	4	3	0	1	0
HPO Zone 1 Eff	15,077,184.1	279,085	121,812	218,704	185,747	18,008	2,544	168	6,578	174
HPO Zone 2 Eff	15,077,184.1	277,055	120,421	219,198	186,010	17,934	2,331	231	6,578	117
HPO Zone 3 Eff	15,077,184.1	275,300	119,299	218,721	185,380	17,859	2,147	296	6,578	83
MBBR Effluent	10,077,184.1	1,360	383	668	562	198	100	1,513	75	54
MBBR Inf	10,077,184.1	1,581	576	656	556	1,528	1,435	198	75	55
Mechanical Thickening F	212,559.5	677	291	527	447	69	30	4	17	1
PC Effluent	10,319,003.8	21,958	11,539	6,845	6,071	2,542	2,216	19	389	291
PC Underflow	104,232.4	12,067	4,986	8,366	7,420	262	22	0	123	3
Prim Digester Eff	44,165.4	9,814	1,306	8,647	6,434	938	440	0	406	91
RAS	4,758,180.3	260,481	112,981	207,519	175,885	15,541	678	94	6,189	26
Raw Influent	10,000,000.0	30,878	15,403	13,197	11,528	2,170	1,736	0	342	185
SC Underflow	5,000,000.0	273,719	118,723	218,065	184,823	16,330	712	98	6,503	27
WAS Thick Influent	241,819.7	13,238	5,742	10,546	8,939	790	34	5	315	1
WAS Thick Underflow	29,260.2	12,561	5,450	10,019	8,492	721	4	1	298	0

	Concentration									
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Alum	343.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
Cloth Filter Return	100,771.8	885	316	715	602	55.7	1.2	18.0	22.8	0.64
Combined Digester Inf	44,165.4	63,293	26,808	47,612	41,158	2,545.8	20.0	1.6	1,100.9	1.58
Combined PC Influent	10,423,236.2	391	190	175	155	32.2	25.7	0.2	5.9	3.38
Dewater Pressate	40,234.7	1,450	120	1,183	866	1,423.3	1,357.9	0.0	356.9	313.69
Dewatering Inf	44,165.4	24,119	1,818	21,546	15,777	2,545.7	1,357.9	0.0	1,100.9	313.69
Digested Sludge	3,930.7	256,158	19,198	229,990	168,405	14,034.5	1,357.9	0.0	8,716.5	313.69
Final Effluent	9,976,412.3	7	1	1	1	1.8	1.2	18.0	0.7	0.64
Grav Thick Underflow	14,905.2	86,561	35,616	60,531	53,686	1,748.5	25.7	0.2	868.8	3.38
Gravity Thickener Perm	89,327.1	1,744	746	1,122	995	59.2	25.7	0.2	19.4	3.38
Grit Eff w/ Alum	9,980,343.0	370	185	154	138	26.0	20.8	0.0	4.1	2.22
Grit Effluent	9,980,000.0	370	185	149	138	26.0	20.8	0.0	4.1	2.22
Grit Underflow	20,000.0	370	185	4,953	138	26.0	20.8	0.0	4.1	2.22
HPO Zone 1 Eff	15,077,184.1	2,218	968	1,738	1,476	143.1	20.2	1.3	52.3	1.38
HPO Zone 2 Eff	15,077,184.1	2,202	957	1,742	1,478	142.5	18.5	1.8	52.3	0.93
HPO Zone 3 Eff	15,077,184.1	2,188	948	1,738	1,473	141.9	17.1	2.4	52.3	0.66
MBBR Effluent	10,077,184.1	16	5	8	7	2.4	1.2	18.0	0.9	0.64
MBBR Inf	10,077,184.1	19	7	8	7	18.2	17.1	2.4	0.9	0.66
Mechanical Thickening	212,559.5	382	164	297	252	38.9	17.1	2.4	9.5	0.66
PC Effluent	10,319,003.8	255	134	79	70	29.5	25.7	0.2	4.5	3.38
PC Underflow	104,232.4	13,873	5,732	9,618	8,530	300.7	25.7	0.2	140.9	3.38
Prim Digester Eff	44,165.4	26,628	3,543	23,461	17,455	2,545.7	1,193.6	0.0	1,100.9	247.95
RAS	4,758,180.3	6,560	2,845	5,226	4,429	391.4	17.1	2.4	155.9	0.66
Raw Influent	10,000,000.0	370	185	158	138	26.0	20.8	0.0	4.1	2.22
SC Underflow	5,000,000.0	6,560	2,845	5,226	4,429	391.4	17.1	2.4	155.9	0.66
WAS Thick Influent	241,819.7	6,560	2,845	5,226	4,429	391.4	17.1	2.4	155.9	0.66
WAS Thick Underflow	29,260.2	51,440	22,321	41,031	34,776	2,952.0	17.1	2.4	1,219.1	0.66

Appendix G.9

Biowin Summary

Alternatives 3/5 - HPO – MBBR/BAF - Scenario 2



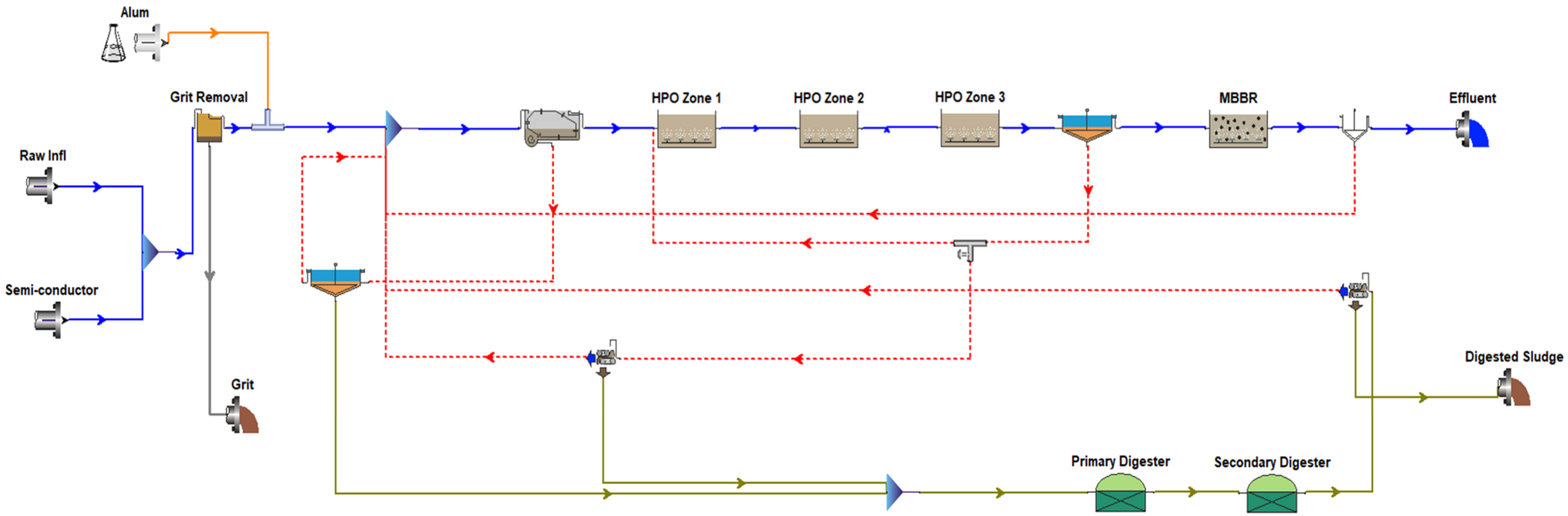
	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Alum	590.0	0	0	0	0	0	0	0	0	0
Combined Digester Inf	52,363.5	26,632	11,406	20,258	17,404	1,093	10	1	535	1
Combined Influent	17,300,000.0	35,768	17,737	15,017	13,631	4,104	3,470	9	510	270
Combined PC Influent	17,926,173.8	39,735	19,159	18,198	16,131	4,897	4,087	50	718	387
Dewater Pressate	47,493.7	550	48	466	331	564	539	0	132	112
Dewatering Inf	52,363.5	9,978	800	9,312	6,617	1,093	594	0	535	123
Digested Sludge	4,869.8	9,428	753	8,847	6,286	529	55	0	403	11
Effluent	17,261,120.2	1,293	202	108	90	289	158	3,224	107	103
Grav Thick Underflow	18,105.4	12,767	5,378	9,008	7,985	288	4	0	164	0
Gravity Thickener Perme	161,156.3	1,543	671	1,001	887	70	37	0	22	3
Grit Eff w/ Alum	17,265,990.0	35,697	17,701	15,165	13,604	4,096	3,463	9	509	269
Grit Effluent	17,265,400.0	35,697	17,701	14,344	13,604	4,096	3,463	9	509	269
Grit Underflow	34,600.0	72	35	673	27	8	7	0	1	1
HPO Zone 1 Eff	26,085,474.9	413,269	180,284	329,522	276,349	28,334	4,998	446	11,016	272
HPO Zone 2 Eff	26,085,474.9	410,924	178,662	330,265	276,783	28,161	4,677	606	11,016	203
HPO Zone 3 Eff	26,085,474.9	408,907	177,363	329,891	276,202	27,988	4,387	767	11,016	162
MBBR Eff	17,435,474.9	2,483	617	1,083	903	366	160	3,256	141	104
MBBR Inf	17,435,474.9	2,822	948	990	829	3,125	2,932	513	141	108
MBBR Return	174,354.7	1,191	415	974	813	77	2	33	34	1
Mechanical Thickening F	277,179.0	755	324	592	496	91	47	8	21	2
PC Effluent	17,746,912.1	25,426	13,110	8,189	7,259	4,539	4,046	49	532	383
PC Underflow	179,261.7	14,309	6,049	10,009	8,872	359	41	0	186	4
Prim Digester Eff	52,363.5	11,050	1,537	10,141	7,334	1,093	524	0	535	91
RAS	8,338,562.9	391,465	170,064	317,060	265,459	23,967	1,402	245	10,484	52
Raw Influent	10,300,000.0	23,209	11,577	9,525	8,665	2,235	1,788	0	352	191
SC Underflow	8,650,000.0	406,085	176,416	328,902	275,373	24,863	1,455	255	10,876	54
Semi-conductor Influent	7,000,000.0	12,560	6,159	5,492	4,966	1,869	1,682	9	158	79
WAS Thick Influent	311,437.1	14,621	6,352	11,842	9,915	895	52	9	392	2
WAS Thick Underflow	34,258.1	13,866	6,028	11,250	9,419	805	6	1	370	0

		Concentration								
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Alum	590.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
Combined Digester Inf	52,363.5	60,944	26,101	46,358	39,826	2,500.6	22.6	2.4	1,223.8	1.38
Combined Influent	17,300,000.0	248	123	104	94	28.4	24.0	0.1	3.5	1.87
Combined PC Influent	17,926,173.8	266	128	122	108	32.7	27.3	0.3	4.8	2.59
Dewater Pressate	47,493.7	1,387	121	1,175	835	1,422.4	1,359.0	0.0	333.6	281.67
Dewatering Inf	52,363.5	22,834	1,832	21,310	15,143	2,500.3	1,359.0	0.0	1,223.8	281.67
Digested Sludge	4,869.8	231,995	18,518	217,685	154,684	13,012.8	1,359.0	0.0	9,905.2	281.67
Effluent	17,261,120.2	9	1	1	1	2.0	1.1	22.4	0.7	0.71
Grav Thick Underflow	18,105.4	84,492	35,592	59,619	52,845	1,907.2	27.3	0.3	1,088.1	2.59
Gravity Thickener Perm	161,156.3	1,147	499	744	660	52.4	27.3	0.3	16.1	2.59
Grit Eff w/ Alum	17,265,990.0	248	123	105	94	28.4	24.0	0.1	3.5	1.87
Grit Effluent	17,265,400.0	248	123	100	94	28.4	24.0	0.1	3.5	1.87
Grit Underflow	34,600.0	248	123	2,330	94	28.4	24.0	0.1	3.5	1.87
HPO Zone 1 Eff	26,085,474.9	1,898	828	1,514	1,269	130.2	23.0	2.1	50.6	1.25
HPO Zone 2 Eff	26,085,474.9	1,888	821	1,517	1,271	129.4	21.5	2.8	50.6	0.93
HPO Zone 3 Eff	26,085,474.9	1,878	815	1,515	1,269	128.6	20.2	3.5	50.6	0.74
MBBR Eff	17,435,474.9	17	4	7	6	2.5	1.1	22.4	1.0	0.71
MBBR Inf	17,435,474.9	19	7	7	6	21.5	20.2	3.5	1.0	0.74
MBBR Return	174,354.7	818	285	670	559	52.7	1.1	22.4	23.3	0.71
Mechanical Thickening	277,179.0	326	140	256	214	39.2	20.2	3.5	9.2	0.74
PC Effluent	17,746,912.1	172	89	55	49	30.6	27.3	0.3	3.6	2.59
PC Underflow	179,261.7	9,565	4,044	6,691	5,930	239.7	27.3	0.3	124.4	2.59
Prim Digester Eff	52,363.5	25,287	3,516	23,207	16,782	2,500.3	1,198.5	0.0	1,223.8	208.83
RAS	8,338,562.9	5,625	2,444	4,556	3,815	344.4	20.2	3.5	150.7	0.74
Raw Influent	10,300,000.0	270	135	111	101	26.0	20.8	0.0	4.1	2.22
SC Underflow	8,650,000.0	5,625	2,444	4,556	3,815	344.4	20.2	3.5	150.7	0.74
Semi-conductor Influent	7,000,000.0	215	105	94	85	32.0	28.8	0.2	2.7	1.35
WAS Thick Influent	311,437.1	5,625	2,444	4,556	3,815	344.4	20.2	3.5	150.7	0.74
WAS Thick Underflow	34,258.1	48,499	21,084	39,349	32,945	2,814.2	20.2	3.5	1,295.5	0.74

Appendix G.10

Biowin Summary

Alternatives 3/5 - HPO – MBBR/BAF - Scenario 3



	Mass Rate									
Pipe Name	FLOW gal/d	COD lb/d	cBOD lb/d	TSS lb/d	VSS lb/d	TKN lb/d	NH_4-N lb/d	NO_X-N lb/d	TP lb/d	PO_4-P lb/d
Alum	665.0	0	0	0	0	0	0	0	0	0
Combined Digester Inf	63,969.0	32,895	14,160	24,879	21,514	1,332	12	1	639	1
Combined Influent	21,100,000.0	44,206	21,890	18,605	16,928	5,079	4,330	13	605	318
Combined PC Influent	21,832,682.0	49,215	23,705	22,532	20,094	6,047	5,075	62	866	468
Dewater Pressate	57,892.0	672	59	562	406	684	653	0	167	143
Dewatering Inf	63,969.0	12,191	985	11,243	8,111	1,332	722	0	639	158
Digested Sludge	6,077.1	11,519	926	10,681	7,705	648	69	0	472	15
Effluent	21,052,387.9	1,748	257	143	120	379	212	3,974	132	127
Grav Thick Underflow	22,051.0	15,875	6,731	11,153	9,947	349	5	0	198	0
Gravity Thickener Perme	196,275.8	1,916	838	1,239	1,105	86	46	1	26	4
Grit Eff w/ Alum	21,058,465.0	44,117	21,846	18,720	16,894	5,069	4,322	12	604	317
Grit Effluent	21,057,800.0	44,117	21,846	17,795	16,894	5,069	4,322	12	604	317
Grit Underflow	42,200.0	88	44	811	34	10	9	0	1	1
HPO Zone 1 Eff	31,815,038.3	551,069	241,202	437,220	368,997	37,224	6,197	559	14,280	336
HPO Zone 2 Eff	31,815,038.3	548,207	239,222	438,129	369,536	37,009	5,793	757	14,280	251
HPO Zone 3 Eff	31,815,038.3	545,746	237,638	437,679	368,834	36,793	5,427	959	14,280	200
MBBR Eff	21,265,038.3	3,331	821	1,431	1,201	480	214	4,015	176	128
MBBR Return	212,650.4	1,583	564	1,288	1,081	102	2	40	44	1
Mechanical Thickening F	307,398.8	926	398	722	609	106	52	9	25	2
PC Effluent	21,614,355.1	31,423	16,136	10,139	9,042	5,612	5,024	62	643	464
PC Underflow	218,326.8	17,791	7,569	12,393	11,052	435	51	1	224	5
Prim Digester Eff	63,969.0	13,515	1,894	12,262	8,996	1,332	635	0	639	121
RAS	10,200,683.2	524,052	228,581	421,918	355,552	31,827	1,740	307	13,637	64
Raw Influent	11,100,000.0	25,011	12,477	10,264	9,338	2,408	1,927	0	380	205
SC Underflow	10,550,000.0	541,998	236,409	436,366	367,728	32,917	1,800	318	14,104	66
Secondary Clarifier Eff	21,265,038.3	3,748	1,229	1,313	1,107	3,877	3,628	641	176	134
Semi-conductor Inf	10,000,000.0	19,194	9,413	8,341	7,590	2,671	2,403	13	225	113
WAS Thick Influent	349,316.8	17,946	7,828	14,448	12,176	1,090	60	11	467	2
WAS Thick Underflow	41,918.0	17,020	7,429	13,726	11,567	984	7	1	442	0

	Concentration									
Pipe Name	FLOW gal/d	COD mg/L	cBOD mg/L	TSS mg/L	VSS mg/L	TKN mg/L	NH_4-N mg/L	NO_X-N mg/L	TP mg/L	PO_4-P mg/L
Alum	665.0	0	0	0	0	0.0	0.0	0.0	0.0	0.00
Combined Digester Inf	63,969.0	61,618	26,525	46,604	40,299	2,495.9	23.0	2.5	1,197.8	1.38
Combined Influent	21,100,000.0	251	124	106	96	28.8	24.6	0.1	3.4	1.81
Combined PC Influent	21,832,682.0	270	130	124	110	33.2	27.9	0.3	4.8	2.57
Dewater Pressate	57,892.0	1,391	122	1,164	839	1,415.3	1,351.7	0.0	346.4	296.57
Dewatering Inf	63,969.0	22,836	1,845	21,060	15,193	2,495.6	1,351.7	0.0	1,197.8	296.57
Digested Sludge	6,077.1	227,133	18,262	210,600	151,933	12,786.3	1,351.7	0.0	9,308.5	296.57
Effluent	21,052,387.9	10	1	1	1	2.2	1.2	22.6	0.8	0.72
Grav Thick Underflow	22,051.0	86,265	36,578	60,608	54,050	1,894.3	27.9	0.3	1,073.8	2.57
Gravity Thickener Perm	196,275.8	1,170	511	757	675	52.7	27.9	0.3	15.9	2.57
Grit Eff w/ Alum	21,058,465.0	251	124	107	96	28.8	24.6	0.1	3.4	1.81
Grit Effluent	21,057,800.0	251	124	101	96	28.8	24.6	0.1	3.4	1.81
Grit Underflow	42,200.0	251	124	2,302	96	28.8	24.6	0.1	3.4	1.81
HPO Zone 1 Eff	31,815,038.3	2,076	908	1,647	1,390	140.2	23.3	2.1	53.8	1.26
HPO Zone 2 Eff	31,815,038.3	2,065	901	1,650	1,392	139.4	21.8	2.9	53.8	0.94
HPO Zone 3 Eff	31,815,038.3	2,055	895	1,648	1,389	138.6	20.4	3.6	53.8	0.75
MBBR Eff	21,265,038.3	19	5	8	7	2.7	1.2	22.6	1.0	0.72
MBBR Return	212,650.4	892	318	726	609	57.2	1.2	22.6	24.7	0.72
Mechanical Thickening	307,398.8	361	155	282	237	41.3	20.4	3.6	9.8	0.75
PC Effluent	21,614,355.1	174	89	56	50	31.1	27.9	0.3	3.6	2.57
PC Underflow	218,326.8	9,765	4,154	6,802	6,066	238.7	27.9	0.3	122.8	2.57
Prim Digester Eff	63,969.0	25,317	3,547	22,968	16,851	2,495.6	1,189.5	0.0	1,197.8	225.86
RAS	10,200,683.2	6,156	2,685	4,956	4,177	373.9	20.4	3.6	160.2	0.75
Raw Influent	11,100,000.0	270	135	111	101	26.0	20.8	0.0	4.1	2.22
SC Underflow	10,550,000.0	6,156	2,685	4,956	4,177	373.9	20.4	3.6	160.2	0.75
Secondary Clarifier Eff	21,265,038.3	21	7	7	6	21.8	20.4	3.6	1.0	0.75
Semi-conductor Inf	10,000,000.0	230	113	100	91	32.0	28.8	0.2	2.7	1.35
WAS Thick Influent	349,316.8	6,156	2,685	4,956	4,177	373.9	20.4	3.6	160.2	0.75
WAS Thick Underflow	41,918.0	48,652	21,237	39,237	33,065	2,812.4	20.4	3.6	1,263.0	0.75

Appendix H – Process Calculations

Onondaga County DWEP - Oak Orchard WPCP		9/9/2020	11214118
Client		Date	Job No.
Clarifier Sizing - Flow/Load Scenario 1		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the required Primary and Secondary Clarifiers

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	6.00
Max Month Flow (MMF)	10.00
Peak Hourly Flow (PHF)	24.00

Design Guidelines

Parameter	Units	Primary Clarification		Secondary Clarification
		Average Flow	Peak Flow	Peak Flow
Surface Overflow Rate [1]	gpd/SF	1,000	2,000	1,000
Solids Loading Rate [2, 3]	lb/day/SF	-	-	40

Condition	Value
MLSS Conc (mg/L)	2,100
RAS Rate (%)	50

Primary Clarifier Sizing (Rectangular Type)

Surface Area Required @ Average Flow	6,000
Total Surface Area Required @ Peak Flow	12,000

Existing

Existing Total Surface Area (SF)	15,120
Current Number of Clarifiers	4
Clarifier Width, each (ft)	28
Clarifier Length, each (ft)	135

Secondary Clarifier Sizing (Circular Type)

Total Surface Area Required @ Peak Flow	24,000
Solids Loading Rate (lb/day)	595,476
Total Surface Area Required @ Peak Solids Loading Rate (SF)	14,887
Number of Clarifiers	**3**
Clarifier Diameter, each (ft)	**102**

Onondaga County DWEP - Oak Orchard WPCP		9/9/2020	11214118
Client		Date	Job No.
Clarifier Sizing - Flow/Load Scenario 2		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the required Primary and Secondary Clarifiers

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	13.00
Max Month Flow (MMF)	17.30
Peak Hourly Flow (PHF)	32.50

Design Guidelines

Parameter	Units	Primary Clarification		Secondary Clarification
		Average Flow	Peak Flow	Peak Flow
Surface Overflow Rate [1]	gpd/SF	1,000	2,000	1,000
Solids Loading Rate [2, 3]	lb/day/SF	-	-	40

Condition	Value
MLSS Conc (mg/L)	2,100
RAS Rate (%)	50

Primary Clarifier Sizing (Rectangular Type)

Surface Area Required @ Average Flow	13,000
Total Surface Area Required @ Peak Flow	16,250

Existing

Existing Total Surface Area (SF)	15,120
Current Number of Clarifiers	4
Clarifier Width, each (ft)	28
Clarifier Length, each (ft)	135

New Addition

Additional Total Surface Area (SF) Needed	**1130**
Number of Additional Clarifiers	1
Clarifier Width, each (ft)	**28**
Clarifier Length, each (ft)	**40**

Secondary Clarifier Sizing (Circular Type)

Total Surface Area Required @ Peak Flow	32,500
Solids Loading Rate (lb/day)	872,197
Total Surface Area Required @ Peak Solids Loading Rate (SF)	21,805
Number of Clarifiers	**4**
Clarifier Diameter, each (ft)	**102**

Onondaga County DWEP - Oak Orchard WPCP		9/9/2020	11214118
Client		Date	Job No.
Clarifier Sizing - Flow/Load Scenario 3		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the required Primary and Secondary Clarifiers

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	16.00
Max Month Flow (MMF)	21.10
Peak Hourly Flow (PHF)	37.70

Design Guidelines

Parameter	Units	Primary Clarification		Secondary Clarification
		Average Flow	Peak Flow	Peak Flow
Surface Overflow Rate [1]	gpd/SF	1,000	2,000	1,000
Solids Loading Rate [2, 3]	lb/day/SF	-	-	40

Condition	Value
MLSS Conc (mg/L)	2,100
RAS Rate (%)	50

Primary Clarifier Sizing (Rectangular Type)

Surface Area Required @ Average Flow	16,000
Total Surface Area Required @ Peak Flow	18,850

Existing

Existing Total Surface Area (SF)	15,120
Current Number of Clarifiers	4
Clarifier Width, each (ft)	28
Clarifier Length, each (ft)	135

New Addition

Additional Total Surface Area (SF) Needed	**3730**
Number of Additional Clarifiers	1
Clarifier Width, each (ft)	**28**
Clarifier Length, each (ft)	**135**

Secondary Clarifier Sizing (Circular Type)

Total Surface Area Required @ Peak Flow	37,700
Solids Loading Rate (lb/day)	1,029,823
Total Surface Area Required @ Peak Solids Loading Rate (SF)	25,746
Number of Clarifiers	**4**
Clarifier Diameter, each (ft)	**110**

Onondaga County DWEP - Oak Orchard WPCP		9/9/2020	11214118
Client		Date	Job No.
Diffuser Sizing		MMM	JDG
Subject		Comp. By	Checked By

	# Aeration Basins	Volume/Basin (ft^3)	Surface Area/Basin (ft^2)	Total Volume (ft^3)	Depth (ft)	Surface Area (ft^2)	Air Rate (scfm)	Avg. Ozygen Requirement (lb/d)	# Diffusers per Basin	Total # Diffusers	Cost for Diffusers	Cost/Diffuser	Power (HP)
Brewerton- Evoqua	6	15,225	1,015	91,350	15	6,090	525	13,300	212	1,272	$ 103,500	$ 81	14
Brewerton- Sanitaire							3265		282	1,692	$ 164,000	$ 97	63.9
Metro	8	182,000	13,000	1,456,000	14	104,000	5727	22,320	5,280	42,240	$ 990,000	$ 23	221
Oak Orchard	**4**	**69,984**	**7,776**	**279,936**	**9**	**31,104**	**3811 - 3222**	**14,500**	**3,101**	**7,086**	**$ 398,911**	**$ 56**	**130**

* Fine Bubble Aeration

Oak Orchard Baseline Cost =	**$**	**300,000**
Oak Orchard High Growth Cost =	**$**	**400,000**

	Onondaga County DWEP - Oak Orchard WPCP	9/10/2020	11214118
	Client	Date	Job No.
	Disinfection Tank Sizing - Flow/Load Scenario No. 1	MMM	JDG
	Subject	Comp. By	Checked By

Objective: Sizing of the required Disinfection Tank

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	6.00
Max Month Flow (MMF)	10.00
Peak Hourly Flow (PHF)	24.00

Regulations

	Ten States	TR-16
Chlorine Dose (mg/L)	8	25
Minimum Contact Time (minutes)	15	30
Minimum L:W Ratio	-	40:1
Minimum L:D Ratio	-	1:1

Calculations

Total Volume Needed (gal)	250,000
Total Volume Needed (ft^3)	33,420

Existing

Tank No	Depth (ft)	Width (ft)	Length (ft)	Volume (ft^3)	Volume (gal)
1	10	25	83	20,750	155,221
2	10	25	83	20,750	155,221
				Total	310,442
			Additional Volume needed?	**No**	

Onondaga County DWEP - Oak Orchard WPCP		9/10/2020	11214118
Client		Date	Job No.
Disinfection Tank Sizing - FloW/Load Scenario 2		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the required Disinfection Tank

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	13.00
Max Month Flow (MMF)	17.30
Peak Hourly Flow (PHF)	32.50

Regulations

	Ten States	TR-16
Chlorine Dose (mg/L)	8	25
Minimum Contact Time (minutes)	15	30
Minimum L:W Ratio	-	40:1
Minimum L:D Ratio	-	1:1

* Calculations Below Meet Standard

* Calculations Below DO NOT Meet Standard

Calculations

Total Volume Needed (gal)	338,542
Total Volume Needed (ft^3)	45,256

Existing

Tank No	Depth (ft)	Width (ft)	Length (ft)	Volume (ft^3)	Volume (gal)
1	10	25	83	20,750	155,221
2	10	25	83	20,750	155,221
				Total	310,442

Additional Needed

Option	Volume (gal)	Volume (ft^3)	Depth (ft)	Width (ft)	Length (ft)			
Option 1 - Extend Length	28,100	3,756	10	25	**15**	**Total Length Added:**	**15**	**ft on East side**
Option 2 - Extend Width	28,100	3,756	10	**5**	83	Total Width Added:	**2**	ft on North and South, each

Onondaga County DWEP - Oak Orchard WPCP		9/10/2020	11214118
Client		Date	Job No.
Disinfection Tank Sizing - Flow/Load Scenario 3		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the required Disinfection Tank

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	16.00
Max Month Flow (MMF)	21.10
Peak Hourly Flow (PHF)	37.70

Regulations

	Ten States	TR-16
Chlorine Dose (mg/L)	8	25
Minimum Contact Time (minutes)	15	30
Minimum L:W Ratio	-	40:1
Minimum L:D Ratio	-	1:1

* Calculations Below Meet Standard

* Calculations Below DO NOT Meet Standard

Calculations

Total Volume Needed (gal)	392,708
Total Volume Needed (ft^3)	52,497

Existing

Tank No	Depth (ft)	Width (ft)	Length (ft)	Volume (ft^3)	Volume (gal)
1	10	25	83	20,750	155,221
2	10	25	83	20,750	155,221
				Total	310,442

Additional Needed

Option	Volume (gal)	Volume (ft^3)	Depth (ft)	Width (ft)	Length (ft)			
Option 1 - Extend Length	82,267	10,997	10	25	**44**	**Total Length Added:**	**44**	**ft on East side**
Option 2 - Extend Width	82,267	10,997	10	**13**	83	Total Width Added:	**7**	ft on North and South, each

Onondaga County DWEP - Oak Orchard WPCP		9/10/2020	11214118
Client		Date	Job No.
Dechlorination Tank Sizing - Flow/Load Scenario 1		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the Dechlorination Tank

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	6.00
Max Month Flow (MMF)	10.00
Peak Hourly Flow (PHF)	24.00

Regulations

	Ten States	TR-16
Sodium Bisulfate Dose (mg/L)	1.46	9
Minimum Contact Time (minutes)	0.5	2

Calculations

Total Volume Needed (gal)	8,333
Total Volume Needed (ft^3)	1,114

Existing

Tank No	Depth (ft)	Width (ft)	Length (ft)	Volume (ft^3)	Volume (gal)
Section 1	10.0	7.3	6.5	477	3,566
Section 2	10.0	34.5	5.2	1,783	13,334
Section 3	10.0	34.5	5.2	1,783	13,334
				Total	30,234

Do we have enough volume? YES

Onondaga County DWEP - Oak Orchard WPCP		9/10/2020	11214118
Client		Date	Job No.
Dechlorination Tank Sizing - Floaw/Load Scenario 2		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the Dechlorination Tank

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	13.00
Max Month Flow (MMF)	17.30
Peak Hourly Flow (PHF)	32.50

Regulations

	Ten States	TR-16
Sodium Bisulfate Dose (mg/L)	1.46	9
Minimum Contact Time (minutes)	0.5	2

Calculations

Total Volume Needed (gal)	11,285
Total Volume Needed (ft^3)	1,509

Existing

Tank No	Depth (ft)	Width (ft)	Length (ft)	Volume (ft^3)	Volume (gal)
Section 1	10.0	7.3	6.5	477	3,566
Section 2	10.0	34.5	5.2	1,783	13,334
Section 3	10.0	34.5	5.2	1,783	13,334
				Total	30,234

Do we have enough volume? YES

Onondaga County DWEP - Oak Orchard WPCP		9/10/2020	11214118
Client		Date	Job No.
Dechlorination Tank Sizing - Flow/Load Scenario 3		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the Dechlorination Tank

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Design MGD
Ave. Daily Flow (ADF)	16.00
Max Month Flow (MMF)	21.10
Peak Hourly Flow (PHF)	37.70

Regulations

	Ten States	TR-16
Sodium Bisulfate Dose (mg/L)	1.46	9
Minimum Contact Time (minutes)	0.5	2

Calculations

Total Volume Needed (gal)	13,090
Total Volume Needed (ft^3)	1,750

Existing

Tank No	Depth (ft)	Width (ft)	Length (ft)	Volume (ft^3)	Volume (gal)
Section 1	10.0	7.3	6.5	477	3,566
Section 2	10.0	34.5	5.2	1,783	13,334
Section 3	10.0	34.5	5.2	1,783	13,334
				Total	30,234

Do we have enough volume? YES

Onondaga County DWEP - Oak Orchard WPCP		9/22/2020	11214118
Client		Date	Job No.
Pipe Sizing to Disinfection Tank		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the HDPE pipe to the disinfection tank.

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

TR-16 Regulations

Sewers 48 inches (1200 mm) or larger should be designed and constructed to give mean velocities, when flowing full, of not less than 3.0 feet per second (0.9 m/s), based on Manning's formula using an "n" value of 0.013.

Ten States Standards

N.A.

Inputs

	Normal Flow				High Flow			
Q (MGD)	16	16	16	16	38	38	38	38
Q (ft3/s)	24.76	24.76	24.76	24.76	58.79	58.79	58.79	58.79
D (in)	42	48	54		42	48	54	
D (in)- Inner Diameter	36.78	42.014	47.266	54	36.78	42.014	47.266	54
D (ft)	3.07	3.50	3.94	4.50	3.07	3.50	3.94	4.50
L (ft)	1700	1700	1700	1700	1700	1700	1700	1700
Hazen Williams Coeff (C)	150	150	150	150	150	150	150	150

Outputs

	Normal Flow				High Flow			
V (ft/s)	3.36	2.57	2.03	1.56	7.97	6.11	4.83	3.70
Slope (ft/ft)	7.19E-04	3.76E-04	2.12E-04	1.11E-04	3.57E-03	1.87E-03	1.05E-03	5.49E-04
Head Loss (ft)	1.22	0.64	0.36	0.19	6.06	3.17	1.79	0.93

Onondaga County DWEP - Oak Orchard WPCP		9/28/2020	11214118
Client		Date	Job No.
Gravity Thickener Tank Sizing - Scenario 1		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the required Gravity Thickener Tanks

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Flow	Solids
	gal/d	lbs/day
Alternative 3 (High Growth)	109681.00	8400

Regulations

	Ten States	TR-16
Side Water Depth (SWD) (ft)	-	10-14
Diameter (ft)	-	60-80
Slope	-	2:12 - 3:12
Loading Rates (lb/ft^2/d)	-	20-30
Loading Rates (% Solids)	-	5-10
Overflow Rates (gpd/ft^2)	-	400-800

Calculations

Loading Rates

	# Tanks[1]	Loading Rates (lb/ft^2/d)	Surface Area Needed (ft^2)	Diameter (ft)
Lower End of Loading Rate	1	20	**420.00**	**23.12**
Higher End of Loading Rate	1	30	**280.00**	**18.88**

*Assuming one tank was not in use.

Overflow Rates

	# Tanks[1]	Overflow Rates (gpd/ft^2)	Surface Area Needed (ft^2)	Diameter (ft)
Lower End of Overflow Rate	1	400	**274.20**	**18.68**
Higher End of Overflow Rate	1	800	**137.10**	**13.21**

Existing

Tank No	Diameter (ft)	SWD (ft)	Surface Area (ft^2)	Loading Rate (lb/ft^2/d)	Overflow Rates (gpd/ft^2)
1	40	8	**1,256.64**	**6.68**	**87.28**
2	40	8	**1,256.64**	**6.68**	**87.28**
				Total SA (ft^2):	**2,513.27**
				Total Loading Rates (lb/ft^2/d):	**3.34**
				Overflow Rates (gpd/ft^2):	**43.64**
				Is this sufficent?	**Yes**

Notes:

(1) Assuming one tank is not in use.

Onondaga County DWEP - Oak Orchard WPCP		9/28/2020	11214118
Client		Date	Job No.
Gravity Thickener Tank Sizing - Scenario 2		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the required Gravity Thickener Tanks

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Flow	Solids
	gal/d	lbs/day
Alternative 2 (Low Growth)	228276.00	12,500.00

Regulations

	Ten States	TR-16
Side Water Depth (SWD) (ft)	-	10-14
Diameter (ft)	-	60-80
Slope	-	2:12 - 3:12
Loading Rates (lb/ft^2/d)	-	20-30
Loading Rates (% Solids)	-	5-10
Overflow Rates (gpd/ft^2)	-	400-800

Calculations

Loading Rates

	# Tanks[1]	Loading Rates (lb/ft^2/d)	Surface Area Needed (ft^2)	Diameter (ft)
Lower End of Loading Rate	1	20	**625.00**	**28.21**
Higher End of Loading Rate	1	30	**416.67**	**23.03**

*Assuming one tank was not in use.

Overflow Rates

	# Tanks[1]	Overflow Rates (gpd/ft^2)	Surface Area Needed (ft^2)	Diameter (ft)
Lower End of Overflow Rate	1	400	**570.69**	**26.96**
Higher End of Overflow Rate	1	800	**285.35**	**19.06**

Existing

Tank No	Diameter (ft)	SWD (ft)	Surface Area (ft^2)	Loading Rate (lb/ft^2/d)	Overflow Rates (gpd/ft^2)
1	40	8	**1,256.64**	**9.95**	**181.66**
2	40	8	**1,256.64**	**9.95**	**181.66**
				Total SA (ft^2):	**2,513.27**
				Total Loading Rates (lb/ft^2/d):	**4.97**
				Overflow Rates (gpd/ft^2):	**90.83**
				Is this sufficent? Yes	

Notes:

(1) Assuming one tank is not in use.

Onondaga County DWEP - Oak Orchard WPCP		9/28/2020	11214118
Client		Date	Job No.
Gravity Thickener Tank Sizing - Scenario 3		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the required Gravity Thickener Tanks

Design Criteria: TR-16 and Ten States Standards for primary and secondary clarifiers.

Design Conditions	Flow	Solids
	gal/d	lbs/day
Alternative 3 (High Growth)	179000.00	10,400.00

Regulations

	Ten States	TR-16
Side Water Depth (SWD) (ft)	-	10-14
Diameter (ft)	-	60-80
Slope	-	2:12 - 3:12
Loading Rates (lb/ft^2/d)	-	20-30
Loading Rates (% Solids)	-	5-10
Overflow Rates (gpd/ft^2)	-	400-800

Calculations

Loading Rates

	# Tanks[1]	Loading Rates (lb/ft^2/d)	Surface Area Needed (ft^2)	Diameter (ft)
Lower End of Loading Rate	1	20	**520.00**	**25.73**
Higher End of Loading Rate	1	30	**346.67**	**21.01**

*Assuming one tank was not in use.

Overflow Rates

	# Tanks[1]	Overflow Rates (gpd/ft^2)	Surface Area Needed (ft^2)	Diameter (ft)
Lower End of Overflow Rate	1	400	**447.50**	**23.87**
Higher End of Overflow Rate	1	800	**223.75**	**16.88**

Existing

Tank No	Diameter (ft)	SWD (ft)	Surface Area (ft^2)	Loading Rate (lb/ft^2/d)	Overflow Rates (gpd/ft^2)
1	40	8	**1,256.64**	**8.28**	**142.44**
2	40	8	**1,256.64**	**8.28**	**142.44**
				Total SA (ft^2):	**2,513.27**
				Total Loading Rates (lb/ft^2/d):	**4.14**
				Overflow Rates (gpd/ft^2):	**71.22**
				Is this sufficent? Yes	

Notes:

(1) Assuming one tank is not in use.

Onondaga County DWEP - Oak Orchard WPCP		12/20/2020	11214118
Client		Date	Job No.
Digester Sizing - Flow/Load Scenario 1		TMM	CPM
Subject		Comp. By	Checked By

Objective: Sizing of the required Anaerobic Digesters

Design Criteria: TR-16 and Ten States Standards for anaerobic digesters

Design Conditions	Flow	VSS	
	gal/d	lbs/day	
Scenario 1	44,600	14,500	

Regulations

	Ten States	TR-16
Minimum Side Water Depth (SWD) (ft)	20	
Loading Rates (lb VSS/1000ft^3/d)	-	0.12-0.16
Minimum HRT (days)	-	15
Mesophlic Temperature (°C)	-	35 - 37.8
Feed Solids (%)		4-6

Calculations

Loading Rate

	# Tanks	Loading Rates (lb VSS/1000ft3-d)	Volume Needed per Digester (ft^3)	Total Volume Needed per Digester + 33% (ft^3)	Digester Size (gal)
Lower End of Loading Rate	2	119	**60,924**	**81,029**	**607,000**
High End of Loading Rate	2	160	**45,313**	**60,266**	**451,000**

HRT

	# Tanks	HRT (days)	Volume Needed per Digester (ft^3)	Total Volume Needed per Digester + 33% (ft^3)	Digester Size (gal)
Minimum HRT	2	15	**44,723**	**59,481**	**445,000**
Target HRT	2	21	**62,612**	**83,274**	**623,000**

Onondaga County DWEP - Oak Orchard WPCP		12/20/2020	11214118
Client		Date	Job No.
Digester Sizing - Flow/Load Scenario 2		TMM	CPM
Subject		Comp. By	Checked By

Objective: Sizing of the required Anaerobic Digesters

Design Criteria: TR-16 and Ten States Standards for anaerobic digesters

Design Conditions	Flow	VSS	
	gal/d	lbs/day	
Scenario 2	51,000	16,700	

Regulations

	Ten States	TR-16
Minimum Side Water Depth (SWD) (ft)	20	
Loading Rates (lb VSS/1000ft^3/d)	-	0.12-0.16
Minimum HRT (days)	-	15
Mesophlic Temperature (°C)	-	35 - 37.8
Feed Solids (%)		4-6

Calculations

Loading Rate

	# Tanks	Loading Rates (lb VSS/1000ft3-d)	Volume Needed per Digester (ft^3)	Total Volume Needed per Digester + 33% (ft^3)	Digester Size (gal)
Lower End of Loading Rate	2	115	**72,609**	**96,570**	**723,000**
High End of Loading Rate	2	160	**52,188**	**69,409**	**520,000**

HRT

	# Tanks	HRT (days)	Volume Needed per Digester (ft^3)	Total Volume Needed per Digester + 33% (ft^3)	Digester Size (gal)
Minimum HRT	2	15	**51,140**	**68,017**	**509,000**
Target HRT	2	22	**73,301**	**97,490**	**730,000**

Onondaga County DWEP - Oak Orchard WPCP		12/20/2020	11214118
Client		Date	Job No.
Digester Sizing - Flow/Load Scenario 3		TMM	CPM
Subject		Comp. By	Checked By

Objective: Sizing of the required Anaerobic Digesters

Design Criteria: TR-16 and Ten States Standards for anaerobic digesters

Design Conditions	Flow	VSS	
	gal/d	lbs/day	
Scenario 3	62,500	20,600	

Regulations

	Ten States	TR-16
Minimum Side Water Depth (SWD) (ft)	20	
Loading Rates (lb VSS/1000ft^3/d)	-	0.12-0.16
Minimum HRT (days)	-	15
Mesophlic Temperature (°C)	-	35 - 37.8
Feed Solids (%)		4-6

Calculations

Loading Rate

	# Tanks	Loading Rates (lb VSS/1000ft3-d)	Volume Needed per Digester (ft^3)	Total Volume Needed per Digester + 33% (ft^3)	Digester Size (gal)
Lower End of Loading Rate	2	114	**90,351**	**120,167**	**899,000**
High End of Loading Rate	2	160	**64,375**	**85,619**	**641,000**

HRT

	# Tanks	HRT (days)	Volume Needed per Digester (ft^3)	Total Volume Needed per Digester + 33% (ft^3)	Digester Size (gal)
Minimum HRT	2	15	**62,672**	**83,354**	**624,000**
Target HRT	2	22	**90,248**	**120,029**	**898,000**

Onondaga County DWEP - Oak Orchard WPCP		9/25/2020	11214118
Client		Date	Job No.
Belt Filter Press Sizing - Flow/Load Scenario 1		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the belt filter presses.

Sludge Stream	Baseline		
	Flow (gpd)	Solids (mg TSS/L)	Solids lbs/day
Digested Sludge to Dewatering	44,200	21,500	8,000

Assumptions

Operating conditions (days/week)	5
Operating conditions (Hours/day)	10
Typical Hydraulic loading (GPM/m)	40 - 50
Typical Solids loading (lbs/m hr)	500 - 1000
Effective belt width (m)	2
BFP hydraulic load (GPM/m)	48
BFP solids load (lb/m/hr)	500

Flow

Digested sludge flow to BFPs gpm (7 days/week and 24 hours/d)	31
Flow to BFP at operating conditions (GPM)	103
Number of BFPs	1.1

Solids loading

Solids loading to BFPs (lb/hr)	1,123
Number of BFPs	1.1

Number of BFPs Needed	**2.0**

Onondaga County DWEP - Oak Orchard WPCP		9/25/2020	11214118
Client		Date	Job No.
Belt Filter Press Sizing - Flow/Load Scenario 2		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the belt filter presses.

Sludge Stream	Baseline		
	Flow (gpd)	Solids (mg TSS/L)	Solids lbs/day
Digested Sludge to Dewatering	52,000	22,000	9,000

Assumptions

Operating conditions (days/week)	5
Operating conditions (Hours/day)	10
Typical Hydraulic loading (GPM/m)	40 - 50
Typical Solids loading (lbs/m hr)	500 - 1000
Effective belt width (m)	2
BFP hydraulic load (GPM/m)	48
BFP solids load (lb/m/hr)	500

Flow

Digested sludge flow to BFPs gpm (7 days/week and 24 hours/d)	36
Flow to BFP at operating conditions (GPM)	121
Number of BFPs	1.3

Solids loading

Solids loading to BFPs (lb/hr)	1,263
Number of BFPs	1.3

Number of BFPs Needed	**2.0**

Onondaga County DWEP - Oak Orchard WPCP		9/25/2020	11214118
Client		Date	Job No.
Belt Filter Press Sizing - Flow/Load Scenario 3		MMM	JDG
Subject		Comp. By	Checked By

Objective: Sizing of the belt filter presses.

Sludge Stream	Baseline		
	Flow (gpd)	Solids (mg TSS/L)	Solids lbs/day
Digested Sludge to Dewatering	48,500	28,500	11,500

Assumptions

Operating conditions (days/week)	5
Operating conditions (Hours/day)	10
Typical Hydraulic loading (GPM/m)	40 - 50
Typical Solids loading (lbs/m hr)	500 - 1000
Effective belt width (m)	2
BFP hydraulic load (GPM/m)	48
BFP solids load (lb/m/hr)	500

Flow

Digested sludge flow to BFPs gpm (7 days/week and 24 hours/d)	34
Flow to BFP at operating conditions (GPM)	113
Number of BFPs	1.2

Solids loading

Solids loading to BFPs (lb/hr)	1,614
Number of BFPs	1.6

Number of BFPs Needed	**2.0**

Appendix I – Cost Estimates

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP
Alternatives Summary of Conceptual Construction Cost Estimates - Flow/Load Scenario 1

Description		Alternative 1 MBR	Alternative 2 Conventional/BAF	Alternative 3 HPO/MBBR	Alternative 4 Conventional/MBBR	Alternative 5 HPO/BAF	Notes (following page)
Headworks							
Rehabilitate Grit Tanks		$250,000	$250,000	$250,000	$250,000	$250,000	1
Headworks Building		NA	NA	NA	NA	NA	2
Primary Clarification							
Primary Clarifier		NA	NA	NA	NA	NA	2
Secondary Treatment							
Fine Screen Building		$1,560,000	NA	NA	NA	NA	2
MBR Lift Station		$614,000	NA	NA	NA	NA	2
Aeration Tanks		$2,780,000	$1,925,000	NA	$1,925,000	NA	2,3
Membrane Tanks		$7,352,000	NA	NA	NA	NA	2
MBR Process Building		$5,122,000	NA	NA	NA	NA	2
MBR Distribution Box		$310,000	NA	NA	NA	NA	2
Demolish Oxidized Sludge tanks		NA	NA	NA	NA	NA	2
Rehabilitate Existing HPO Aeration Tanks		NA	NA	$3,500,000	NA	$3,500,000	2,4
Existing HPO Aeration Tanks (Convert to Conventional Aeration Tanks)		$1,500,000	$800,000	NA	$800,000	NA	2, 5, 6
Oxygen Generation Building (Upgrade HPO Equipment)		NA	NA	$1,750,000	NA	$1,750,000	2,7
Oxygen Generation Building (Convert to Aeration Blower Building)		$510,000	$800,000	NA	$800,000	NA	2,8, 9
Secondary Clarifiers		NA	$5,830,000	$5,830,000	$5,830,000	$5,830,000	2
Return Sludge Pump Station		NA	$1,040,000	$1,040,000	$1,040,000	$1,040,000	2
Secondary Distribution Box		NA	$390,000	$390,000	$390,000	$390,000	2
Demolish Existing Secondary Clarifiers		$250,000	$250,000	$250,000	$250,000	$250,000	1
Tertiary Treatment							
BAF Complex		NA	$15,790,000	NA	NA	$15,790,000	2
MBBR Tanks			NA	$4,330,000	$4,330,000	NA	2
BAF Pump Station		NA	$714,000	TBD	TBD	$714,000	2
Blower Building		NA	NA	$580,000	$580,000	NA	2
Disc Filter Building		NA	NA	$3,680,000	$3,680,000	NA	2
Backwash Pump Station		NA	$190,000	$190,000	$190,000	$190,000	2
Disinfection							
Chlorination/Dechlorination Tank		NA	NA	NA	NA	NA	2
Parallel Lagoon Bypass Pipeling		$990,000	$800,000	$800,000	$800,000	$800,000	
Solids Treatment							
Thickened Sludge Blend Tanks		$300,000	$300,000	$300,000	$300,000	$300,000	
BioGas Cogeneration Building (1 story)		$2,970,000	$2,970,000	$2,970,000	$2,970,000	$2,970,000	10
Primary Digester Tanks		$5,340,000	$5,340,000	$5,340,000	$5,340,000	$5,340,000	
Secondary Digester Tank		$2,870,000	$2,870,000	$2,870,000	$2,870,000	$2,870,000	
Digester Complex (3 Story - 2 plus basement)		$5,760,000	$5,760,000	$5,760,000	$5,760,000	$5,760,000	10
Rehabilitate Gravity Thickeners		$300,000	$300,000	$300,000	$300,000	$300,000	11
Solids Processing Building (2-Story)		$4,680,000	$4,680,000	$4,680,000	$4,680,000	$4,680,000	10
% Lagoon Fill reused from Site Excavation		23%	40%	34%	40%	34%	12
Lagoon Fill (Abandon)		$1,800,000	$1,400,000	$1,500,000	$1,400,000	$1,500,000	12
Subtotal Capital Costs		**$45,260,000**	**$52,400,000**	**$46,310,000**	**$44,490,000**	**$54,220,000**	
Sitework	3%	$1,360,000	$1,570,000	$1,390,000	$1,330,000	$1,630,000	
Standby Power Facilities		$500,000	$500,000	$500,000	$500,000	$500,000	13
Electrical	15%	$6,790,000	$7,860,000	$6,950,000	$6,670,000	$8,130,000	
Instrumentation	10%	$4,530,000	$5,240,000	$4,630,000	$4,450,000	$5,420,000	
HVAC	5%	$2,260,000	$2,620,000	$2,320,000	$2,220,000	$2,710,000	
Subtotal Capital Costs		**$60,700,000**	**$70,200,000**	**$62,100,000**	**$59,700,000**	**$72,600,000**	
Mobilization, Bonding, Ins.	8%	$4,860,000	$5,620,000	$4,970,000	$4,780,000	$5,810,000	
Contractor Profit	20%	$12,140,000	$14,040,000	$12,420,000	$11,940,000	$14,520,000	
Contingency	25%	$15,180,000	$17,550,000	$15,530,000	$14,930,000	$18,150,000	
Construction Subtotal		**$92,880,000**	**$107,410,000**	**$95,020,000**	**$91,350,000**	**$111,080,000**	
Engineering, Administration & Legal Fees	20%	$18,576,000	$21,482,000	$19,004,000	$18,270,000	$22,216,000	
Subtotal		**$111,000,000**	**$129,000,000**	**$114,000,000**	**$110,000,000**	**$133,000,000**	
ESTIMATED PROJECT COST (2023 DOLLARS) - based on 3% annual inflation		**$121,000,000**	**$141,000,000**	**$125,000,000**	**$120,000,000**	**$145,000,000**	

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP
Alternatives Summary of Conceptual Construction Cost Estimates - Flow/Load Scenario 1
Explanation of Notes

Note	Comment
1	Assumed value of $250,000 used for cost.
2	NA = Not applicable for the alternative.
3	Cost of new aeration tanks under Flow/Load Scenario 1, Alternatives 2 & 4 assumed to be half the cost of aeration tanks under Flow/Load Scenario 3. Scenario 1 has 1 new tank while Scenario 3 has 2 new tanks.
4	Cost to rehabilitate existing HPO Tanks under Alternatives 3 & 5 based on equipment quote of $3 million from Kruger/Veolia plus $500,000 for installation and miscellaneous concrete repairs.
5	Conversion of HPO tanks to aeration tanks under Alterntive 1 based on $200,000 per train for demolition and concrete repairs, $200,000 per train for new fine bubble diffusers plus $350,000 per train for a new Invent-type mixing system.
6	Conversion of HPO tanks to aeration tanks under Alternatives 2 & 4 based on $200,000 per train for demolition and concrete repairs and $200,000 per tank for installing fine bubble diffusers.
7	Cost to replace the existing PSA system with a new PSA system based on $1.35 million quote obtained during preparation of 2013 memo for improvments to the OOWWTP updated to current dollars using ENRCCi, plus $150,000 for demolition and piping.
8	Cost to replace exsiting PSA system with conventional air blowers under Alternative 1 based upon a cost of $260,000 for installing blowers, $150,000 for piping and valves, plus $100,000 for demolition.
9	Cost to replace exsiting PSA system with conventional air blowers under Alternative 2 & 4 based upon a cost of $500,000 for installing blowers, $200,000 for piping and valves, plus $100,000 for demolition.
10	Cost of new facility under Flow/Load Scenario 1 assumed to be 90% of the cost of the new facility under Flow/Load Scenario 3.
11	Assumed value of $300,000 used for cost.
12	CADD mapping used to determine fill volume for Lagoon 1. Cost fill Lagoon 1 was first determined based on use of 100% offsite soil. Cost reduced for Alternatives 1 - 5 based on the estimated excavated soild that coule be reused to fill Lagoon 1.
13	Standby power generation assumed to be $500,000.

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP
Alternatives Summary of Conceptual Construction Cost Estimates - Flow/Load Scenario 2

Description		Alternative 1 MBR	Alternative 2 Conventional/BAF	Alternative 3 HPO/MBBR	Alternative 4 Convetional/MBBR	Alternative 5 HPO/BAF	Notes (following page)
Headworks							
Rehabilitate Grit Tanks		NA	NA	NA	NA	NA	1
Headworks Building		$3,100,000	$3,100,000	$3,100,000	$3,100,000	$3,100,000	2
Primary Clarification							
Primary Clarifier		$2,070,000	$2,070,000	$2,070,000	$2,070,000	$2,070,000	2
Secondary Treatment							
Fine Screen Building		$1,896,000	NA	NA	NA	NA	1,3
MBR Lift Station		$898,000	NA	NA	NA	NA	1,3
Aeration Tanks		$3,277,000	$3,273,000	$2,247,000	$3,273,000	$2,247,000	1,3
Membrane Tanks		$9,100,000	NA	NA	NA	NA	1,3
MBR Process Building		$6,262,000	NA	NA	NA	NA	1,3
MBR Distribution Box		$401,000	NA	NA	NA	NA	1,3
Demolish Oxidized Sludge tanks		$60,000	$60,000	$60,000	$60,000	$60,000	4
Rehabilitate Existing HPO Aeration Tanks		NA	NA	$3,500,000	NA	$3,500,000	1,5
HPO Aeration Tanks (Convert to Conventional Aeration Tanks)		$1,500,000	$800,000	NA	$800,000	NA	1,6,7
Oxygen Generation Building (Upgrade HPO Equipment)		NA	NA	$2,975,000	NA	$2,975,000	1,3
Oxygen Generation Building (Convert to Aeration Blower Building)		$510,000	$800,000	NA	$800,000	NA	1,8,9
Secondary Clarifiers		NA	$8,028,000	$8,028,000	$8,028,000	$8,970,000	1,3
Return Sludge Pump Station		NA	$1,117,000	$1,117,000	$1,117,000	$1,117,000	1,3
Secondary Distribution Box		NA	$390,000	$390,000	$390,000	$390,000	1,2
Demolish Existing Secondary Clarifiers		$250,000	$250,000	$250,000	$250,000	$250,000	10
Tertiary Treatment							
BAF Complex		NA	$19,983,000	NA	NA	$19,983,000	1,3
MBBR Tanks			NA	$8,033,000	$8,033,000	NA	1,3
BAF Pump Station		NA	$1,012,000	TBD	TBD	$1,012,000	1,3
Blower Building		NA	NA	$650,000	$650,000	NA	1,3
Disc Filter Building		NA	$4,195,000	$4,506,000	$4,506,000	$4,195,000	1,3,10
Backwash Pump Station			$190,000	$190,000	$190,000	$190,000	2
Disinfection							
Chlorination/Dechlorination Tank		$819,000	$819,000	$819,000	$819,000	$819,000	3
Parallel Lagoon Bypass Pipeline		$990,000	$800,000	$800,000	$800,000	$800,000	2
Solids Treatment							
Thickened Sludge Blend Tanks		$300,000	$300,000	$300,000	$300,000	$300,000	12
BioGas Cogen Building (1 story)		$3,200,000	$3,200,000	$3,200,000	$3,200,000	$3,200,000	3
Primary Digester Tanks		$6,425,000	$6,425,000	$6,425,000	$6,425,000	$6,425,000	3
Secondary Digester Tank		$3,416,000	$3,416,000	$3,416,000	$3,416,000	$3,416,000	3
Digester Complex (3 Story - 2 plus basement)		$6,208,000	$6,208,000	$6,208,000	$6,208,000	$6,208,000	3
Rehabilitate Gravity Thickeners		$300,000	$300,000	$300,000	$300,000	$300,000	12
Solids Processing Building (2-Story)		$5,044,000	$5,044,000	$5,044,000	$5,044,000	$5,044,000	3
% Lagoon Fill reused from Site Excavation		23%	40%	34%	40%	34%	13
Lagoon Fill (Abandon)		$1,800,000	$1,400,000	$1,500,000	$1,400,000	$1,500,000	13
Subtotal Capital Costs		**$57,830,000**	**$73,180,000**	**$65,130,000**	**$61,180,000**	**$78,070,000**	
Sitework	3%	$1,730,000	$2,200,000	$1,950,000	$1,840,000	$2,340,000	
New Primary Service and Standby Power		$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	14
Electrical	15%	$8,670,000	$10,980,000	$9,770,000	$9,180,000	$11,710,000	
Instrumentation	10%	$5,780,000	$7,320,000	$6,510,000	$6,120,000	$7,810,000	
HVAC	5%	$2,890,000	$3,660,000	$3,260,000	$3,060,000	$3,900,000	
Subtotal Capital Costs		**$78,400,000**	**$98,800,000**	**$88,100,000**	**$82,900,000**	**$105,300,000**	
Mobilization, Bonding, Ins.	8%	$6,280,000	$7,910,000	$7,050,000	$6,640,000	$8,430,000	
Contractor Overhead & Profit	20%	$15,680,000	$19,760,000	$17,620,000	$16,580,000	$21,060,000	
Contingency	25%	$19,600,000	$24,700,000	$22,030,000	$20,730,000	$26,330,000	
Construction Subtotal		**$119,960,000**	**$151,170,000**	**$134,800,000**	**$126,850,000**	**$161,120,000**	
Engineering, Consulting, & Legal Fees	20%	$23,992,000	$30,234,000	$26,960,000	$25,370,000	$32,224,000	
Subtotal		**$144,000,000**	**$181,000,000**	**$162,000,000**	**$152,000,000**	**$193,000,000**	
ESTIMATED PROJECT COST (2023 DOLLARS) 0 based on 3% annual inflation		**$157,000,000**	**$198,000,000**	**$177,000,000**	**$166,000,000**	**$211,000,000**	

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP
Alternatives Summary of Conceptual Construction Cost Estimates - Flow/Load Scenario 2
Explanation of Notes

Note	Comment
1	NA = Not applicable for the alternative.
2	Cost assumed to be the same as Scenario 3 - facilities will essentially be the same size.
3	Scenario 1 capacity is 10 mgd and Scenario 3 capaity is 20 mgd. At 7 mgd, Scenario 2 is 70% of the difference between Scenarios 1 and 3. Cost conservatively determined based on 70% of the difference between Scenarios 1 and 3, plus Scenario 1 cost.
4	Assumed value of $60,000 used for cost.
5	Cost to rehabilitate existing HPO Tanks under Alternatives 3 & 5 based on equipment quote of $3 million from Kruger/Veolia plus $500,000 for installation and miscellaneous concrete repairs.
6	Conversion of HPO tanks to aeration tanks under Alterntive 1 based on $200,000 per train for demolition and concrete repairs, $200,000 per train for new fine bubble diffusers plus $350,000 per train for a new Invent-type mixing system.
7	Conversion of HPO tanks to aeration tanks under Alternatives 2 & 4 based on $200,000 per train for demolition and concrete repairs and $200,000 per tank for installing fine bubble diffusers.
8	Cost to replace exsiting PSA system with conventional air blowers under Alternative 1 based upon a cost of $260,000 for installing blowers, $150,000 for piping and valves, plus $100,000 for demolition.
9	Cost to replace exsiting PSA system with conventional air blowers under Alternative 2 & 4 based upon a cost of $500,000 for installing blowers, $200,000 for piping and valves, plus $100,000 for demolition.
10	Assumed value of $250,000 used for cost.
11	Cost for Alternatives 2 & 5 assumed to be 10% less than the cost for Alternatives 3 & 4.
12	Assumed value of $300,000 used for cost.
13	CADD mapping used to determine fill volume for Lagoon 1. Cost fill Lagoon 1 was first determined based on use of 100% offsite soil. Cost reduced for Alternatives 1 - 5 based on the estimated excavated soild that coule be reused to fill Lagoon 1.
14	New primary service assumed to be $1,000,000 and new standby power facilities assumed to be $500,000.

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP
Alternatives Summary of Conceptual Construction Cost Estimates - Flow/Load Scenario 3

Description		Alternative 1 MBR	Alternative 2 Conventional/BAF	Alternative 3 HPO/MBBR	Altermative 4 Convetional/MBBR	Alternative 5 HPO/BAF	Notes (following page)
Headworks							
Rehabilitate Grit Tanks		NA	NA	NA	NA	NA	1
Headworks Building		$3,100,000	$3,100,000	$3,100,000	$3,100,000	$3,100,000	
Primary Clarification							
Primary Clarifier		$2,070,000	$2,070,000	$2,070,000	$2,070,000	$2,070,000	
Secondary Treatment							
Fine Screen Building		$2,040,000	NA	NA	NA	NA	1
MBR Lift Station		$1,020,000	NA	NA	NA	NA	1
Aeration Tanks		$3,490,000	$3,850,000	$3,210,000	$3,850,000	$3,210,000	
Membrane Tanks		$9,850,000	NA	NA	NA	NA	1
MBR Process Building		$6,750,000	NA	NA	NA	NA	1
MBR Distribution Box		$440,000	NA	NA	NA	NA	1
Demolish Oxidized Sludge tanks		$60,000	$60,000	$60,000	$60,000	$60,000	1,2
Rehabilitate Existing HPO Aeration Tanks		NA	NA	$3,500,000	NA	$3,500,000	1,3
HPO Aeration Tanks (Convert to Conventional Aeration Tanks)		$1,500,000	$800,000	NA	$800,000	NA	1,4,5
Oxygen Generation Building (Upgrade HPO Equipment)		NA	NA	$3,340,000	NA	$3,340,000	1,6
Oxygen Generation Building (Convert to Aeration Blower Building)		$510,000	$800,000	NA	$800,000	NA	1,7,8
Secondary Clarifiers		NA	$8,970,000	$8,970,000	$8,970,000	$8,970,000	1
Return Sludge Pump Station		NA	$1,150,000	$1,150,000	$1,150,000	$1,150,000	1
Secondary Distribution Box		NA	$390,000	$390,000	$390,000	$390,000	1
Demolish Existing Secondary Clarifiers		$250,000	$250,000	$250,000	$250,000	$250,000	9
Tertiary Treatment							
BAF Complex		NA	$21,780,000	NA	NA	$21,780,000	1
MBBR Tanks			NA	$9,620,000	$9,620,000	NA	1
BAF Pump Station		NA	$1,140,000	TBD	TBD	$1,140,000	1
Blower Building		NA	NA	$680,000	$680,000	NA	1
Disc Filter Building		NA	$4,510,000	$4,860,000	$4,860,000	$4,510,000	1,10
Backwash Pump Station			$190,000	$190,000	$190,000	$190,000	
Disinfection							
Chlorination/Dechlorination Tank		$1,170,000	$1,170,000	$1,170,000	$1,170,000	$1,170,000	
Parallel Lagoon Bypass Pipeline		$990,000	$800,000	$800,000	$800,000	$800,000	
Solids Treatment							
Thickened Sludge Blend Tanks		$300,000	$300,000	$300,000	$300,000	$300,000	
BioGas Cogen Building (1 story)		$3,300,000	$3,300,000	$3,300,000	$3,300,000	$3,300,000	
Primary Digester Tanks		$6,890,000	$6,890,000	$6,890,000	$6,890,000	$6,890,000	
Secondary Digester Tank		$3,650,000	$3,650,000	$3,650,000	$3,650,000	$3,650,000	
Digester Complex (3 Story - 2 plus basement)		$6,400,000	$6,400,000	$6,400,000	$6,400,000	$6,400,000	
Rehabilitate Gravity Thickeners		$300,000	$300,000	$300,000	$300,000	$300,000	11
Solids Processing Building (2-Story)		$5,200,000	$5,200,000	$5,200,000	$5,200,000	$5,200,000	
% Lagoon Fill reused from Site Excavation		23%	40%	34%	40%	34%	12
Lagoon Fill (Abandon)		$1,800,000	$1,400,000	$1,500,000	$1,400,000	$1,500,000	12
Subtotal Capital Costs		**$61,080,000**	**$78,470,000**	**$70,900,000**	**$66,200,000**	**$83,170,000**	
Sitework	3%	$1,830,000	$2,350,000	$2,130,000	$1,990,000	$2,500,000	
New Primary Service and Standby Power		$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	13
Electrical	15%	$9,160,000	$11,770,000	$10,640,000	$9,930,000	$12,480,000	
Instrumentation	10%	$6,110,000	$7,850,000	$7,090,000	$6,620,000	$8,320,000	
HVAC	5%	$3,050,000	$3,920,000	$3,550,000	$3,310,000	$4,160,000	
Subtotal Capital Costs		**$82,700,000**	**$105,900,000**	**$95,800,000**	**$89,600,000**	**$112,100,000**	
Mobilization, Bonding, Ins.	8%	$6,620,000	$8,480,000	$7,670,000	$7,170,000	$8,970,000	
Contractor Overhead & Profit	20%	$16,540,000	$21,180,000	$19,160,000	$17,920,000	$22,420,000	
Contingency	25%	$20,680,000	$26,480,000	$23,950,000	$22,400,000	$28,030,000	
Construction Subtotal		**$126,540,000**	**$162,040,000**	**$146,580,000**	**$137,090,000**	**$171,520,000**	
Engineering, Consulting, & Legal Fees	20%	$25,308,000	$32,408,000	$29,316,000	$27,418,000	$34,304,000	
Subtotal		**$152,000,000**	**$194,000,000**	**$176,000,000**	**$165,000,000**	**$206,000,000**	
ESTIMATED PROJECT COST (2023 DOLLARS) 0 based on 3% annual inflation		**$166,000,000**	**$212,000,000**	**$192,000,000**	**$180,000,000**	**$225,000,000**	

Onondaga County Department of Water Environment Protection
Oak Orchard WWTP
Alternatives Summary of Conceptual Construction Cost Estimates - Flow/Load Scenario 3
Explanation of Notes

Note	Comment
1	NA = Not applicable for the alternative.
2	Assumed value of $60,000 used for cost.
3	Cost to rehabilitate existing HPO Tanks under Alternatives 3 & 5 based on equipment quote of $3 million from Kruger/Veolia plus $500,000 for installation and miscellaneous concrete repairs.
4	Conversion of HPO tanks to aeration tanks under Alterntive 1 based on $200,000 per train for demolition and concrete repairs, $200,000 per train for new fine bubble diffusers plus $350,000 per train for a new Invent-type mixing system.
5	Conversion of HPO tanks to aeration tanks under Alternatives 2 & 4 based on $200,000 per train for demolition and concrete repairs and $200,000 per tank for installing fine bubble diffusers.
6	Cost to replace the existing PSA system with a new PSA system based on $2.64 million quote obtained during preparation of 2013 memo for improvments to the OOWWTP updated to current dollars using ENRCCi, plus $150,000 for demolition and piping.
7	Cost to replace exsiting PSA system with conventional air blowers under Alternative 1 based upon a cost of $260,000 for installing blowers, $150,000 for piping and valves, plus $100,000 for demolition.
8	Cost to replace exsiting PSA system with conventional air blowers under Alternative 2 & 4 based upon a cost of $500,000 for installing blowers, $200,000 for piping and valves, plus $100,000 for demolition.
9	Assumed value of $250,000 used for cost.
10	Cost for Alternatives 2 & 5 assumed to be 10% less than the cost for Alternatives 3 & 4.
11	Assumed value of $300,000 used for cost.
12	CADD mapping used to determine fill volume for Lagoon 1. Cost fill Lagoon 1 was first determined based on use of 100% offsite soil. Cost reduced for Alternatives 1 - 5 based on the estimated excavated soild that coule be reused to fill Lagoon 1.
13	New primary service assumed to be $1,000,000 and new standby power facilities assumed to be $500,000.

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**New Headworks Building - Flow/Load Scenario 3, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Influent Building	2400	SF	$260	$624,000						$624,000
Concrete										
Slab Concrete	151	CY	$800	$120,889						$120,890
Wall Concrete	97	CY	$1,000	$97,037						$97,040
Civil										
Excavation	4459	CY	$30	$133,760						$133,760
Crushed Stone Bedding	5	CY	$60	$320						$320
Backfill (on-site material)	3840	CY	$30	$115,200						$115,200
Hauling	619	CY	$50	$30,933						$30,930
Piles	600	LF	$40	$24,000						$24,000
Equipment										
Grit Removal System	1	LS	$942,000	$942,000					$188,400	$1,130,400
- Classifiiers										
- Dewatering										
- Grit Pumps										
- Controls										
Influent Mech Bar Screens	1	LS	$486,000	$486,000					$97,200	$583,200
bar screen OPTIONAL EQUIP	1	LS	$145,000	$145,000					$29,000	$174,000
Parshall Flume & Level Sensor	1	LS	$15,000	$15,000					$7,500	$22,500
Piping/valve allowance	1	LS	$50,000	$50,000						$50,000
Misc. Metals										
Handrails	50	LF	$150	$7,500						$7,500
Stairs	21	EA	$560	$11,520						$11,520
Aluminum Grating	60	SF	$90	$5,400						$5,400
	General Conditions									
	Subtotal			$2,808,600					322100	**$3,131,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$2,808,600					$322,100	**$3,131,000**
	Mobilization/Demobilization									
	TOTAL			$2,809,000					$322,000	**$3,100,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Primary Clarifiers - Flow/Load Scenario 3, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	469	CY	$800	$375,467						$375,470
Wall Concrete	311	CY	$1,000	$311,111						$311,110
Civil										
Excavation	4875	CY	$30	$146,250						$146,250
Crushed Stone Bedding	235	CY	$60	$14,080						$14,080
Backfill (on-site material)	1764	CY	$30	$52,917						$52,920
Hauling	3111	CY	$30	$93,333						$93,330
Piles	4659	LF	$35	$163,059						$163,060
Sheet Piling	12852	SF	$30	$385,560						$385,560
Equipment										
Clarifier Equipment	1	LS	$128,475	$128,475					$40,977	$169,000
30" Slide Gates	1	EA	$10,000	$10,000					$5,000	$15,000
Piping/valve allowance	1	LS	$100,000	$100,000						$100,000
Misc. Metals										
Handrails	720	LF	$150	$108,000						$108,000
Stairs	16	EA	$560	$8,960						$8,960
Aluminum Grating	1440	SF	$90	$129,600						$129,600
General Conditions										
Subtotal				$2,026,800					$46,000	**$2,073,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$2,026,800					$46,000	**$2,073,000**
Mobilization/Demobilization										
TOTAL				$2,027,000					$46,000	**$2,070,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Fine Screen - Flow/Load Scenario 1, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
MBR Fine Screen Bldg	1350	SF	$260	$351,000						$351,000
Civil										
Excavation	566	CY	$30	$16,967						$16,970
Crushed Stone Bedding	56	CY	$60	$3,342						$3,340
Backfill (on-site material)	266	CY	$30	$7,967						$7,970
Hauling	300	CY	$30	$9,000						$9,000
Piles	1074	LF	$40	$42,971						$42,970
Sheet Piling	6150	SF	$10	$61,500						$61,500
Concrete										
Equip Pads	2	CY	$1,000	$2,000						$2,000
Slab Concrete	111	CY	$800	$89,126						$89,130
Wall Concrete	83	CY	$1,000	$83,333						$83,330
Elevated Slab		CY	$1,000							
Equipment										
Three (3) Rotating Drum 2-mm Fine Screens	1	LS	$585,000	$585,000					$117,000	$702,000
Misc Equip	1	EA	$50,000	$50,000					$10,000	$60,000
- screenings containers										
- hoisting equip or similar										
Piping/valve allowance	1	LS	$75,000	$75,000						$75,000
Misc. Metals										
Stairs	16	EA	$560	$8,960						$8,960
Handrail	100	FT	$150	$15,000						$15,000
Grating	400	SF	$90	$36,000						$36,000
	General Conditions									
		Subtotal		$1,437,200					127000	**$1,564,000**
		Taxes	**Tax-Exempt**	$0	**0%**	$0		**0%**	$0	
		Overhead								
		Profit								
		Subtotal		$1,437,200					$127,000	**$1,564,000**
	Mobilization/Demobilization									
	TOTAL			$1,437,000					$127,000	**$1,560,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Fine Screen - Flow/Load Scenario 3, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
MBR Fine Screen Bldg	1792	SF	$260	$465,920						$465,920
Civil										
Excavation	701	CY	$30	$21,040						$21,040
Crushed Stone Bedding	73	CY	$60	$4,382						$4,380
Backfill (on-site material)	303	CY	$30	$9,093						$9,090
Hauling	398	CY	$30	$11,947						$11,950
Piles	1409	LF	$40	$56,343						$56,340
Sheet Piling	6150	SF	$10	$61,500						$61,500
Concrete										
Equip Pads	2	CY	$1,000	$2,000						$2,000
Slab Concrete	146	CY	$800	$116,859						$116,860
Wall Concrete	98	CY	$1,000	$97,778						$97,780
Elevated Slab	73	CY	$1,000	$73,037						$73,040
Equipment										
Three (3) Rotating Drum 2-mm Fine Screens	1	LS	$737,500	$737,500					$147,500	$885,000
Misc Equip	1	LS	$75,000	$75,000						$75,000
- screenings containers										
- hoisting equip or similar										
Piping/valve allowance	1	LS	$100,000	$100,000						$100,000
Misc. Metals										
Stairs	16	EA	$560	$8,960						$8,960
Handrail	100	FT	$150	$15,000						$15,000
Grating	400	SF	$90	$36,000						$36,000
	General Conditions									
		Subtotal		$1,892,400					147500	**$2,040,000**
		Taxes		$0		$0			$0	
		Overhead								
		Profit								
		Subtotal		$1,892,400					$147,500	**$2,040,000**
	Mobilization/Demobilization									
	TOTAL			$1,892,000					$148,000	**$2,040,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Pump Station - Flow/Load Scenario 1, Alt.1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Civil										
Excavation	1334	CY	$30	$40,009						$40,010
Crushed Stone Bedding	26	CY	$60	$1,564						$1,560
Backfill (on-site material)	1023	CY	$30	$30,676						$30,680
Hauling	311	CY	$30	$9,333						$9,330
Piles	429	LF	$40	$17,143						$17,140
Concrete										
Slab Concrete	52	CY	$800	$41,719						$41,720
Wall Concrete	52	CY	$1,000	$51,852						$51,850
Baffle Wall Concrete	11	CY	$1,000	$10,667						$10,670
Elevated Slab	26	CY	$1,000	$26,074						$26,070
Pump Pads	2	CY	$800	$1,600						$1,600
Equipment										
PUMPS	4	EA	$75,000	$300,000					$60,000	$360,000
- VFDs										
- Controls										
Piping/valve allowance	1	LS	$75,000	$75,000						$75,000
Misc. Metals										
Stairs	4	EA	$560	$2,240						$2,240
Handrail	40	FT	$150	$6,000						$6,000
General Conditions										
Subtotal				$613,900						**$614,000**
Taxes				$0		$0				
Overhead										
Profit										
Subtotal				$613,900						**$614,000**
Mobilization/Demobilization										
TOTAL				$614,000						**$614,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Influent PS - Flow/Load Scenario 3, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Civil										
Excavation	1695	CY	$30	$50,836						$50,840
Crushed Stone Bedding	40	CY	$60	$2,427						$2,430
Backfill (on-site material)	1197	CY	$30	$35,902						$35,900
Hauling	498	CY	$30	$14,933						$14,930
Piles	686	LF	$40	$27,429						$27,430
Concrete										
Slab Concrete	81	CY	$800	$64,711						$64,710
Wall Concrete	66	CY	$1,000	$66,370						$66,370
Baffle Wall Concrete	11	CY	$1,000	$10,667						$10,670
Elevated Slab	36	CY	$1,000	$35,556						$35,560
Pump Pads	4	CY	$800	$3,200						$3,200
Equipment										
PUMPS	4	EA	$125,000	$500,000					$100,000	$600,000
- VFDs										
- Controls										
Piping/valve allowance	1	LS	$100,000	$100,000						$100,000
Misc. Metals										
Stairs	4	EA	$560	$2,240						$2,240
Handrail	40	FT	$150	$6,000						$6,000
		General Conditions								
		Subtotal		$920,300					100000	**$1,020,000**
		Taxes		$0		$0			$0	
		Overhead								
		Profit								
		Subtotal		$920,300					$100,000	**$1,020,000**
	Mobilization/Demobilization									
	TOTAL			$920,000					$100,000	**$1,020,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**New Aeration (MBR) Tanks - Flow/Load Scenario 1, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Wall Concrete	462	CY	$1,000	$461,852						$461,850
Slab Concrete	737	CY	$800	$589,867						$589,870
Civil										
Excavation	7024	CY	$30	$210,727						$210,730
Crushed Stone Bedding	369	CY	$19	$7,005						$7,000
Backfill (on-site material)	1631	CY	$30	$48,941						$48,940
Hauling	5393	CY	$50	$269,643						$269,640
Piles	7110	LF	$40	$284,400						$284,400
Sheet Piling	1769	SF	$30	$53,070						$53,070
Equipment										
Aeration Diffusers	1	LS	$236,500	$236,500					$236,500	$473,000
Piping/valve allowance	1	LS	$150,000	$150,000						$150,000
Misc. Metals										
Handrails	494	LF	$150	$74,100						$74,100
Stairs	8	EA	$560	$4,480						$4,480
Aluminum Grating	1592	SF	$90	$143,280						$143,280
Weirs	61	LF	$200	$12,200						$12,200
	General Conditions									
		Subtotal		$2,546,100					$236,500	**$2,783,000**
		Taxes		$0		$0			$0	
		Overhead								
		Profit								
		Subtotal		$2,546,100					$236,500	**$2,783,000**
	Mobilization/Demobilization									
	TOTAL			$2,546,000					$237,000	**$2,780,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**New Aeration (MBR) Tanks - Flow/Load Scenario 3, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Wall Concrete	519	CY	$1,000	$518,519						$518,520
Slab Concrete	778	CY	$800	$622,459						$622,460
Civil										
Excavation	10780	CY	$30	$323,400						$323,400
Crushed Stone Bedding	389	CY	$19	$7,392						$7,390
Backfill (on-site material)	3002	CY	$30	$90,067						$90,070
Hauling	7778	CY	$50	$388,889						$388,890
Piles	7503	LF	$40	$300,114						$300,110
Sheet Piling	2000	SF	$30	$60,000						$60,000
Equipment										
Aeration Diffusers	1	LS	$299,000	$299,000					$299,000	$598,000
Piping/valve allowance	1	LS	$200,000	$200,000						$200,000
Misc. Metals										
Handrails	1100	LF	$150	$165,000						$165,000
Stairs	16	EA	$560	$8,960						$8,960
Aluminum Grating	2200	SF	$90	$198,000						$198,000
Weirs	50	LF	$200	$10,000						$10,000
	General Conditions									
		Subtotal		$3,191,800		$0			$299,000	**$3,491,000**
		Taxes		$0		$0			$0	
		Overhead								
		Profit								
		Subtotal		$3,191,800					$299,000	**$3,491,000**
	Mobilization/Demobilization									
	TOTAL			$3,192,000					$299,000	**$3,490,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**New Aeration Tanks (Conv) - Flow/Load Scenario 3, Alts. 2&4**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Wall Concrete	427	CY	$1,000	$427,407						$427,410
Slab Concrete	1206	CY	$800	$964,741						$964,740
Civil										
Excavation	10257	CY	$30	$307,722						$307,720
Crushed Stone Bedding	603	CY	$19	$11,456						$11,460
Backfill (on-site material)	1905	CY	$30	$57,162						$57,160
Hauling	8352	CY	$50	$417,600						$417,600
Piles	11629	LF	$40	$465,143						$465,140
Sheet Piling	6291	SF	$30	$188,730						$188,730
Equipment										
Aeration Diffusers	1	LS	$200,000	$200,000					$200,000	$400,000
48" Slide Gates	2	EA	$20,000	$40,000					$20,000	$60,000
Piping/valve allowance	1	LS	$200,000	$200,000						$200,000
Misc. Metals										
Handrails	936	LF	$150	$140,400						$140,400
Grating	1872	LF	$90	$168,480						$168,480
Stairs	16	EA	$560	$8,960						$8,960
Weirs	144	LF	$200	$28,800						$28,800
	General Conditions									
	Subtotal			$3,626,600					$220,000	**$3,847,000**
	Taxes			$0	**0%**	$0			$0	
	Overhead									
	Profit									
	Subtotal			$3,626,600					$220,000	**$3,847,000**
	Mobilization/Demobilization									
	TOTAL			$3,627,000					$220,000	**$3,850,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**New HPO Tanks -Flow/Load Scenario 3, Alts. 3&5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Wall Concrete	214	CY	$1,000	$213,704						$213,700
Slab Concrete	603	CY	$800	$482,370						$482,370
Elevated Slab Concrete (Cover)	288		$1,000	$288,000						$288,000
Civil										
Excavation	5378	CY	$30	$161,337						$161,340
Crushed Stone Bedding	301	CY	$19	$5,728						$5,730
Backfill (on-site material)	1202	CY	$30	$36,057						$36,060
Hauling	4176	CY	$50	$208,800						$208,800
Piles	5814	LF	$40	$232,571						$232,570
Sheet Piling	6291	SF	$30	$188,730						$188,730
Equipment										
HPO Equipment	1	LS	$1,000,000	$1,000,000					$200,000	$1,200,000
36" Slide Gates	1	EA	$10,000	$10,000					$5,000	$15,000
Piping/valve allowance	1	LS	$100,000	$100,000						$100,000
Misc. Metals										
Handrails	360	LF	$150	$54,000						$54,000
Stairs	8	EA	$560	$4,480						$4,480
Weirs	72	LF	$200	$14,400						$14,400
	General Conditions									
		Subtotal		$3,000,200					$205,000	**$3,205,000**
		Taxes		$0	**0%**	$0			$0	
		Overhead								
		Profit								
		Subtotal		$3,000,200					$205,000	**$3,205,000**
	Mobilization/Demobilization									
	TOTAL			$3,000,000					$205,000	**$3,210,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Tanks - Flow/Load Scenario 1, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Wall Concrete	221	CY	$1,000	$221,000						$221,000
Slab Concrete	369	CY	$800	$294,933						$294,930
Civil										
Excavation	3329	CY	$30	$99,882						$99,880
Crushed Stone Bedding	184	CY	$19	$3,502						$3,500
Backfill (on-site material)	894	CY	$30	$26,818						$26,820
Hauling	2435	CY	$50	$121,774						$121,770
Piles	3555	LF	$40	$142,200						$142,200
Sheet Piling	1586	SF	$30	$47,580						$47,580
Equipment										
MBR Equipment	1	LS	$4,464,000	$4,464,000					$1,339,200	$5,803,000
Misc Equipment	1	LS	$150,000	$150,000						$150,000
- Hoisting Equipment										
- Scum Handling System										
Piping/valve allowance	1	LS	$200,000	$200,000						$200,000
Misc. Metals										
Handrails	539	LF	$150	$80,850						$80,850
Stairs	8	EA	$560	$4,480						$4,480
Aluminum Grating	1592	SF	$90	$143,280						$143,280
Weirs	61	LF	$200	$12,200						$12,200
	General Conditions									
	Subtotal			$6,012,500		$0			$1,339,200	**$7,352,000**
	Taxes			$0					$0	
	Overhead									
	Profit									
	Subtotal			$6,012,500					$1,339,200	**$7,352,000**
	Mobilization/Demobilization									
	TOTAL			$6,013,000					$1,339,000	**$7,350,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Tanks - Flow/Load Scenario 3, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Wall Concrete	280	CY	$1,000	$280,222						$280,220
Slab Concrete	529	CY	$800	$422,993						$422,990
Civil										
Excavation	4566	CY	$30	$136,982						$136,980
Crushed Stone Bedding	264	CY	$19	$5,023						$5,020
Backfill (on-site material)	1038	CY	$30	$31,142						$31,140
Hauling	3528	CY	$50	$176,400						$176,400
Piles	5099	LF	$40	$203,943						$203,940
Sheet Piling	2184	SF	$30	$65,520						$65,520
Equipment										
MBR Equipment	1	LS	$5,956,667	$5,956,667					$1,787,000	$7,744,000
Misc Equipment	1	LS	$250,000	$250,000						$250,000
- Hoisting Equipment										
- Scum Handling System										
Piping/valve allowance	1	LS	$250,000	$250,000						$250,000
Misc. Metals										
Handrails	554	LF	$150	$83,100						$83,100
Stairs	8	EA	$560	$4,480						$4,480
Aluminum Grating	1960	SF	$90	$176,400						$176,400
Weirs	84	LF	$200	$16,800						$16,800
	General Conditions									
		Subtotal		$8,059,700					$1,787,000	**$9,847,000**
		Taxes		$0		$0			$0	
		Overhead								
		Profit								
		Subtotal		$8,059,700					$1,787,000	**$9,847,000**
	Mobilization/Demobilization									
	TOTAL			$8,060,000					$1,787,000	**$9,850,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Process Building - Flow/Load Scenario 1, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
MBR Eqipt Bldg	3355	SF	$260	$872,300						$872,300
Concrete										
Slab Concrete	266	CY	$800	$212,800						$212,800
Civil										
Excavation	2757	CY	$30	$82,709						$82,710
Crushed Stone Bedding	133	CY	$19	$2,527						$2,530
Backfill (on-site material)	1017	CY	$30	$30,520						$30,520
Hauling	1740	CY	$50	$86,981						$86,980
Piles	2565	LF	$40	$102,600						$102,600
Sheet Piling	2340	SF	$30	$70,200						$70,200
Equipment										
Aeraation Blowers	1	LS	$236,500	$236,500					$118,250	$355,000
MBR Equipment	1	LS	$2,232,000	$2,232,000					$669,600	$2,902,000
- Permeate Pumps										
- MBR Air Scour Blowers										
- Backpulse System										
- RAS Pumps										
- Chemical Systems										
- Controls										
Piping/valve allowance	1	LS	$400,000	$400,000						$400,000
Misc. Metals										
Handrails		LF	$150							
Stairs	8	EA	$560	$4,480						$4,480
Aluminum Grating		SF	$90							
	General Conditions									
	Subtotal			$4,333,600					$787,900	**$5,122,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$4,333,600					$787,900	**$5,122,000**
	Mobilization/Demobilization									
	TOTAL			$4,334,000					$788,000	**$5,120,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Process Building - Flow/Load Scenario 3, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
MBR Eqipt Bldg	4510	SF	$260	$1,172,600						$1,172,600
Concrete										
Slab Concrete	355	CY	$800	$283,733						$283,730
Civil										
Excavation	3487	CY	$30	$104,596						$104,600
Crushed Stone Bedding	177	CY	$19	$3,369						$3,370
Backfill (on-site material)	1148	CY	$30	$34,440						$34,440
Hauling	2339	CY	$50	$116,926						$116,930
Piles	3420	LF	$40	$136,800						$136,800
Sheet Piling	2340	SF	$30	$70,200						$70,200
Equipment										
Aeraation Blowers	1	LS	$299,000	$299,000					$149,500	$449,000
MBR Equipment	1	LS	$2,978,333	$2,978,333					$893,500	$3,872,000
- Permeate Pumps	1	LS								
- MBR Air Scour Blowers										
- Backpulse System										
- RAS Pumps										
- Chemical Systems										
- Controls										
Piping/valve allowance	1	LS	$500,000	$500,000						$500,000
Misc. Metals										
Handrails		LF	$150							
Stairs	8	EA	$560	$4,480						$4,480
Aluminum Grating		SF	$90							
	General Conditions									
	Subtotal			$5,704,500					$1,043,000	**$6,748,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$5,704,500					$1,043,000	**$6,748,000**
	Mobilization/Demobilization									
	TOTAL			$5,705,000					$1,043,000	**$6,750,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Dist Box - Flow/Load Scenario 1, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Civil										
Excavation	190	CY	$30	$5,693						$5,690
Crushed Stone Bedding	19	CY	$60	$1,120						$1,120
Backfill (on-site material)		CY	$30							
Hauling	190	CY	$30	$5,693						$5,690
Piles	360	LF	$40	$14,400						$14,400
Sheet Piling		SF	$10							
Concrete										
Slab Concrete	37	CY	$800	$29,867						$29,870
Wall Concrete	41	CY	$1,000	$40,556						$40,560
Elevated Slab		CY	$1,000							
Equipment										
36" Slide Gate (MBR Isolation)	8	EA	$15,000	$120,000					$36,000	$156,000
Piping/valve allowance		LS								
Misc. Metals										
Stairs	10	EA	$560	$5,600						$5,600
Handrail	134	FT	$150	$20,100						$20,100
Grating	366	SF	$90	$32,940						$32,940
General Conditions										
Subtotal				$276,000		$0			36000	**$312,000**
Taxes				$0					$0	
Overhead										
Profit										
Subtotal				$276,000					$36,000	**$312,000**
Mobilization/Demobilization										
TOTAL				$276,000					$36,000	**$310,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBR Distribution Box - Flow/Load Scenario 3, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Civil										
Excavation	336	CY	$30	$10,080						$10,080
Crushed Stone Bedding	30	CY	$60	$1,822						$1,820
Backfill (on-site material)		CY	$30							
Hauling	336	CY	$30	$10,080						$10,080
Piles	463	LF	$40	$18,514						$18,510
Sheet Piling		SF	$10							
Concrete										
Slab Concrete	61	CY	$800	$48,593						$48,590
Wall Concrete	54	CY	$1,000	$53,889						$53,890
Equipment										
48" Slide Gate (MBR Isolation)	8	EA	$20,000	$160,000					$48,000	$208,000
Piping/valve allowance		LS								
Misc. Metals										
Stairs	10	EA	$560	$5,600						$5,600
Handrail	178	FT	$150	$26,700						$26,700
Grating	648	SF	$90	$58,320						$58,320
General Conditions										
Subtotal				$393,600					48000	**$442,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$393,600					$48,000	**$442,000**
Mobilization/Demobilization										
TOTAL				$394,000					$48,000	**$440,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**102' Secondary Clarifiers - Flow/Load Scenario 1, Alts. 2-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Unit Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Clarifier Concrete - Slab	1924	CY	$800	$1,539,380						$1,539,380
Clarifier Concrete - Wall	867	CY	$1,200	$1,040,495						$1,040,500
Civil										
Total Excavation	21828	CY	$30	$654,826						$654,830
Backfill (on-site material)	7396	CY	$30	$221,875						$221,870
Hauling (on-site)	14432	CY	$30	$432,951						$432,950
Crushed Stone Bedding	962	CY	$60	$57,727						$57,730
Piles	6809	LF	$35	$238,329						$238,330
Sheet Piling	6900	SF	$30	$207,000						$207,000
Equipment										
Clarifier Equipment	3	LS	$260,850	$782,550					$234,765	$1,017,320
Piping/Valve Allowance	3	LS	$100,000	$300,000						$300,000
Misc. Metals										
Stair treads	20	EA	$560	$11,200						$11,200
Handrail	326	FT	$150	$48,900						$48,900
Grating	612	FT	$90	$55,080						$55,080
	General Conditions									
	Subtotal			$5,590,300					$234,800	**$5,825,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$5,590,300					$234,800	**$5,825,000**
	Mobilization/Demobilization									
	TOTAL			$5,590,000					$235,000	**$5,830,000**

Summary of Conceptual Cost Estimates

ALT SC 3 New 110-ft Clarifiers

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study	**Computed By:**	SMB/JDG
Location:	Clay, NY	**Checked By:**	JDG
Owner:	Onondaga County Department of Water Environment Protection	**Design Status of Est.:**	Facility Plan
Description:	**110' Secondary Clarifiers - Flow/Load Scenario 3, Alts. 2-5**	**Project No:**	11214118

Description	Quantity		Material		Equipment		Labor			Total
	No. Units	Basis	Per Unit	Total	Per Unit	Total	Unit Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Clarifier Concrete - Slab	2971	CY	$800	$2,377,185						$2,377,180
Clarifier Concrete - Wall	1245	CY	$1,200	$1,494,560						$1,494,560
Civil										
Total Excavation	32845	CY	$30	$985,361						$985,360
Backfill (on-site material)	10559	CY	$30	$316,777						$316,780
Hauling (on-site)	22286	CY	$30	$668,583						$668,580
Crushed Stone Bedding	1486	CY	$60	$89,144						$89,140
Piles	7919	LF	$35	$277,180						$277,180
Sheet Piling	24750	SF	$30	$742,500						$742,500
Equipment										
Clarifier Equipment	4	LS	$277,300	$1,109,200					$332,760	$1,441,960
Piping/Valve Allowance	4	LS	$100,000	$400,000						$400,000
Misc. Metals										
Stair treads	27	EA	$560	$15,120						$15,120
Handrail	460	FT	$150	$69,000						$69,000
Grating	1072	FT	$90	$96,480						$96,480
	General Conditions									
	Subtotal			$8,641,100					$332,800	**$8,974,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$8,641,100					$332,800	**$8,974,000**
	Mobilization/Demobilization									
	TOTAL			$8,641,000					$333,000	**$8,970,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Return Sludge Pump Station - Flow/Load Scenario 1, Alts. 2-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Return Pump Station Bldg	1600	SF	$150	$240,000						$240,000
Civil										
Excavation	2225	CY	$30	$66,764						$66,760
Crushed Stone Bedding	65	CY	$60	$3,920						$3,920
Backfill (on-site material)	1396	CY	$30	$41,876						$41,880
Hauling	830	CY	$30	$24,889						$24,890
Piles	1143	LF	$40	$45,714						$45,710
Concrete										
Wall Concrete	83	CY	$1,000	$82,963						$82,960
Slab Concrete	131	CY	$800	$104,533						$104,530
Elevated Slab Concrete (roof)	65	CY	$1,000	$65,333						$65,330
Pump Pads	5	CY	$800	$4,000						$4,000
Equipment										
New RAS Pumps	3	EA	$25,000	$75,000					$37,500	$112,500
New WAS Pumps	2	EA	$25,000	$50,000					$25,000	$75,000
VFD's & CP's	1	LS	$40,000	$40,000					$20,000	$60,000
Sump pump	2	EA	$6,000	$12,000					$2,400	$14,400
Piping/valve allowance	1	LS	$75,000	$75,000						$75,000
Misc. Metals										
Stairs	23	EA	$560	$12,880						$12,880
Handrail	64	FT	$150	$9,550						$9,550
General Conditions										
Subtotal				$954,400					84900	**$1,039,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$954,400					$84,900	**$1,039,000**
Mobilization/Demobilization										
TOTAL				$954,000					$85,000	**$1,040,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Return Sludge Pump Station - Flow/Load Scenario 3, Alts. 2-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Return Pump Station Bldg	1600	SF	$150	$240,000						$240,000
Civil										
Excavation	2472	CY	$30	$74,167						$74,170
Crushed Stone Bedding	65	CY	$60	$3,920						$3,920
Backfill (on-site material)	1583	CY	$30	$47,500						$47,500
Hauling	889	CY	$30	$26,667						$26,670
Piles	1143	LF	$40	$45,714						$45,710
Concrete										
Wall Concrete	83	CY	$1,000	$82,963						$82,960
Slab Concrete	131	CY	$800	$104,533						$104,530
Elevated Slab Concrete (roof)	65	CY	$1,000	$65,333						$65,330
Pump Pads	5	CY	$800	$4,000						$4,000
Equipment										
New RAS Pumps	3	EA	$30,000	$90,000					$27,000	$117,000
New WAS Pumps	2	EA	$30,000	$60,000					$18,000	$78,000
VFD's & CP's	1	LS	$50,000	$50,000					$25,000	$75,000
Sump pump	2	EA	$6,000	$12,000					$2,400	$14,400
Piping/valve allowance	1	LS	$150,000	$150,000						$150,000
Misc. Metals										
Stairs	25	EA	$560	$14,000						$14,000
Handrail	68	FT	$150	$10,250						$10,250
		General Conditions								
		Subtotal		$1,081,000		$0			$72,400	**$1,153,000**
		Taxes		$0					$0	
		Overhead								
		Profit								
		Subtotal		$1,081,000					$72,400	**$1,153,000**
		Mobilization/Demobilization								
		TOTAL		$1,081,000					$72,000	**$1,150,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Secondary Dist Box - Flow/Load Scenarios 1-3, Alts. 2-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	35	CY	$800	$27,733						$27,730
Wall Concrete	39	CY	$1,000	$38,519						$38,520
Civil										
Excavation	964	CY	$30	$28,918						$28,920
Crushed Stone Bedding	17	CY	$60	$1,040						$1,040
Backfill (on-site material)	779	CY	$15	$11,686						$11,690
Hauling	185	CY	$50	$9,244						$9,240
Piles	468	LF	$40	$18,720						$18,720
Equipment										
36" Slide Gate (Clar Isolation)	4	EA	$15,000	$60,000					$30,000	$90,000
Piping/valve allowance	1	LS	$20,000	$20,000						$20,000
Misc. Metals										
Weirs	24	LS	$200	$4,800						$4,800
Handrails	56	LF	$150	$8,400						$8,400
Stairs	6	EA	$560	$3,360						$3,360
Aluminum Grating	96	SF	$90	$8,640						$8,640
SEC DIST CONNECTION PIPE	1	LS	$100,000	$100,000						$100,000
General Conditions										
Subtotal				$341,100		$0			$30,000	**$371,000**
Taxes				$0					$0	
Overhead										
Profit										
Subtotal				$341,100					$30,000	**$371,000**
Mobilization/Demobilization			**5%**	$17,100						
TOTAL				$358,000					$30,000	**$390,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Secondary Dist. Box Feed Pipe - Flow/Load Scenarios 1-3, Alts 2-4**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete		CY	$800							
Wall Concrete		CY	$1,000							
Civil										
Excavation (Dist Boxes)		CY	$40							
Excavation (SQ MH)		CY	$40							
Excavation (Dist Boxes)		CY	$40							
Excavation (30" Pipe)	333	CY	$40	$13,333						$13,330
Crushed Stone Bedding Pipe	93	CY	$60	$5,556						$5,560
Crushed Stone Bedding (SQ MH)		CY	$60							
Crushed Stone Bedding (RND MH)		CY	$60							
Backfill (on-site material)	250	CY	$30	$7,500						$7,500
GEOTEXTILE BEDDING	444	SY	$1	$444						$440
Hauling	-250	CY	$30	($7,500)						($7,500)
Piles (Dist Boxes)		LF	$40							
Equipment										
30" HDPE Pipe	500	LF	$100	$50,000						$50,000
8-ft SQ Manhole		VF	$1,600							
8-ft Dia Manhole (2)	20	VF	$1,200	$24,000						$24,000
Manhole Accessories	2	EA	$1,000	$2,000						$2,000
Slide Gates (2 in 5 MH)		EA	$15,000							
Demolition (cut exist tank)	1	LS	$5,000	$5,000						$5,000
Bypass structure & abandon 42"										
Piping/valve allowance	1	LS								
	General Conditions									
	Subtotal			$100,300						**$100,000**
	Taxes			$0	**0%**	$0		**0%**	$0	
	Overhead									
	Profit									
	Subtotal			$100,300						**$100,000**
	Mobilization/Demobilization									
	TOTAL			$100,000						**$100,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**BAF Complex - Flow/Load Scenario 1 - Alts 2&5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Building over BAF	12960	SF	$150	$1,944,000						$1,944,000
*excludes A.S. Tanks										
Concrete										
Slab Concrete	2896	CY	$800	$2,316,800						$2,316,800
Columns & Beams	235	CY	$1,400	$328,533						$328,530
Elevated Slab (tank top)	724	CY	$1,000	$724,000						$724,000
Wall Concrete	2936	CY	$1,000	$2,936,000						$2,936,000
Civil										
Excavation	3860	CY	$30	$115,813						$115,810
Crushed Stone Bedding	480	CY	$60	$28,800						$28,800
Backfill (on-site material)	964	CY	$30	$28,933						$28,930
Hauling	2896	CY	$50	$144,800						$144,800
Piles		LF	$40							
Equipment										
BAF BIOSTYR System:	1	LS	$4,960,000	$4,960,000					$1,488,000	$6,448,000
Piping & Valve Allowance	1	LS	$496,000	$496,000						$496,000
Misc. Metals										
Handrails	616	LF	$150	$92,400						$92,400
Stairs	103	EA	$560	$57,600						$57,600
Aluminum Grating	1440	SF	$90	$129,600						$129,600
General Conditions										
Subtotal				$14,303,300					$1,488,000	**$15,791,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$14,303,300					$1,488,000	**$15,791,000**
Subtotal				$14,303,300					$1,488,000	**$15,791,000**
Mobilization/Demobilization										
TOTAL				$14,303,000					$1,488,000	**$15,790,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**BAF Complex - Flow/Load Scenario 3, Alts. 2&5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	3996	CY	$800	$3,196,444						$3,196,440
Columns & Beams	545	CY	$1,000	$545,185						$545,190
Elevated Slab (tank top)	999	CY	$1,000	$998,889						$998,890
Wall Concrete	3652	CY	$1,000	$3,651,852						$3,651,850
Architectural										
Building over BAF	17856	SF	$150	$2,678,400						$2,678,400
*excludes A.S. Tanks										
Civil										
Excavation	1479	CY	$30	$44,369						$44,370
Crushed Stone Bedding	661	CY	$60	$39,680						$39,680
Backfill (on-site material)	551	CY	$30	$16,529						$16,530
Hauling	928	CY	$50	$46,400						$46,400
Piles	12843	LF	$40	$513,714						$513,710
Equipment										
BAF BIOSTYR System:	1	LS	$7,490,000	$7,490,000					$1,498,000	$8,988,000
Backwash Pumps	2	EA	$25,000	$50,000					$15,000	$65,000
Piping & Valve Allowance	1	LS	$749,000	$749,000						$749,000
Misc. Metals										
Handrails	544	LF	$150	$81,600						$81,600
Stairs	103	EA	$560	$57,600						$57,600
Aluminum Grating	1152	SF	$90	$103,680						$103,680
General Conditions										
Subtotal				$20,263,300					$1,513,000	**$21,776,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$20,263,300					$1,513,000	**$21,776,000**
Subtotal				$20,263,300					$1,513,000	**$21,776,000**
Mobilization/Demobilization										
TOTAL				$20,263,000					$1,513,000	**$21,780,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBBR Tanks - Flow/Load Scenario 1, Alts. 3&4**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	381	CY	$800	$304,889						#REF!
Wall Concrete	528	CY	$1,000	$528,148						$528,150
Civil										
Excavation	3648	CY	$30	$109,440						$109,440
Crushed Stone Bedding	179	CY	$60	$10,758						$10,760
Backfill (on-site material)	779	CY	$30	$23,378						$23,380
Hauling	2869	CY	$50	$143,437						$143,440
Piles	3675	LF	$40	$147,000						$147,000
Equipment										
AnoxKaldnes MBBR:	1	LS	$1,950,000	$1,950,000					$585,000	$2,535,000
36" Slide Gates	4	EA	$15,000	$60,000					$30,000	$90,000
Piping & Valve Allowance	1	LS	$195,000	$195,000						$195,000
Misc. Metals										
Handrails	616	LF	$150	$92,400						$92,400
Stairs	11	EA	$560	$6,160						$6,160
Aluminum Grating	1428	SF	$90	$128,520						$128,520
Weirs	100	LF	$200	$20,000						$20,000
General Conditions										
Subtotal				$3,719,100					$615,000	**$4,334,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$3,719,100					$615,000	**$4,334,000**
Subtotal				$3,719,100					$615,000	**$4,334,000**
Mobilization/Demobilization										
TOTAL				$3,719,000					$615,000	**$4,330,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBBR Tanks - Scenario 3, Alts, 3&4**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	961	CY	$800	$768,533						$768,530
Wall Concrete	1124	CY	$1,000	$1,124,444						$1,124,440
Civil										
Excavation	8497	CY	$30	$254,898						$254,900
Crushed Stone Bedding	463	CY	$60	$27,807						$27,810
Backfill (on-site material)	1081	CY	$30	$32,444						$32,440
Hauling	7415	CY	$50	$370,756						$370,760
Piles	9264	LF	$40	$370,543						$370,540
Equipment										
AnoxKaldnes MBBR:	1	LS	$4,350,000	$4,350,000					$1,305,000	$5,655,000
48" Slide Gates	5	EA	$20,000	$100,000					$50,000	$150,000
Piping & Valve Allowance	1	LS	$435,000	$435,000						$435,000
Misc. Metals										
Handrails	1054	LF	$150	$158,100						$158,100
Stairs	11	EA	$560	$6,160						$6,160
Aluminum Grating	2632	SF	$90	$236,880						$236,880
Weirs	125	LF	$200	$25,000						$25,000
General Conditions										
Subtotal				$8,260,600					$1,355,000	**$9,616,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$8,260,600					$1,355,000	**$9,616,000**
Subtotal				$8,260,600					$1,355,000	**$9,616,000**
Mobilization/Demobilization										
TOTAL				$8,261,000					$1,355,000	**$9,620,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**BAF Pump Station - Flow/Load Scenario 1, Alts. 2&5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Civil										
Excavation	1334	CY	$30	$40,009						$40,010
Crushed Stone Bedding	26	CY	$60	$1,564						$1,560
Backfill (on-site material)	1023	CY	$30	$30,676						$30,680
Hauling	311	CY	$30	$9,333						$9,330
Piles	429	LF	$40	$17,143						$17,140
Concrete										
Slab Concrete	52	CY	$800	$41,719						$41,720
Wall Concrete	52	CY	$1,000	$51,852						$51,850
Baffle Wall Concrete	11	CY	$1,000	$10,667						$10,670
Elevated Slab	26	CY	$1,000	$26,074						$26,070
Pump Pads	2	CY	$800	$1,600						$1,600
Equipment										
PUMPS	4	EA	$100,000	$400,000					$80,000	$480,000
- VFDs										
- Controls										
Piping/valve allowance	1	LS	$75,000	$75,000						$75,000
Misc. Metals										
Stairs	4	EA	$560	$2,240						$2,240
Handrail	40	FT	$150	$6,000						$6,000
General Conditions										
Subtotal				$713,900						**$714,000**
Taxes				$0		$0				
Overhead										
Profit										
Subtotal				$713,900						**$714,000**
Mobilization/Demobilization										
TOTAL				$714,000						**$714,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**BAF Pump Station - Flow/Load Scenario 3, Alts. 2&5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Civil										
Excavation	1695	CY	$30	$50,836						$50,840
Crushed Stone Bedding	40	CY	$60	$2,427						$2,430
Backfill (on-site material)	1197	CY	$30	$35,902						$35,900
Hauling	498	CY	$30	$14,933						$14,930
Piles	686	LF	$40	$27,429						$27,430
Concrete										
Slab Concrete	81	CY	$800	$64,711						$64,710
Wall Concrete	66	CY	$1,000	$66,370						$66,370
Baffle Wall Concrete	11	CY	$1,000	$10,667						$10,670
Elevated Slab	36	CY	$1,000	$35,556						$35,560
Pump Pads	4	CY	$800	$3,200						$3,200
Equipment										
PUMPS	4	EA	$150,000	$600,000					$120,000	$720,000
- VFDs										
- Controls										
Piping/valve allowance	1	LS	$100,000	$100,000						$100,000
Misc. Metals										
Stairs	4	EA	$560	$2,240						$2,240
Handrail	40	FT	$150	$6,000						$6,000
	General Conditions									
	Subtotal			$1,020,300					120000	**$1,140,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$1,020,300					$120,000	**$1,140,000**
	Mobilization/Demobilization									
	TOTAL			$1,020,000					$120,000	**$1,140,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBBR Blower Building - Flow/Load Scenario 1, Alts. 3&4**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Blower Building	1000	SF	$260	$260,000						$260,000
Civil										
Excavation	519	CY	$30	$15,582						$15,580
Crushed Stone Bedding	42	CY	$60	$2,542						$2,540
Backfill (on-site material)	279	CY	$30	$8,360						$8,360
Hauling	241	CY	$50	$12,037						$12,040
Piles	817	LF	$40	$32,686						$32,690
Concrete										
Footer Walls	21	CY	$1,000.00	$20,741						$20,740
Slab	85	CY	$800.00	$67,793						$67,790
Blower Pads	5	CY	$1,500.00	$7,500						$7,500
Equipment										
Aeration Blowers	5	EA	incl						$50,000	$50,000
Piping/valve allowance	1	LS	$100,000	$100,000						$100,000
General Conditions										
Subtotal				$527,200					50000	**$577,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$527,200					$50,000	**$577,000**
Mobilization/Demobilization										
TOTAL				$527,000					$50,000	**$580,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**MBBR Blower Building - Flow/Load Scenario 3, Alts. 3&4**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Blower Building	1200	SF	$260	$312,000						$312,000
Civil										
Excavation	599	CY	$30	$17,983						$17,980
Crushed Stone Bedding	51	CY	$60	$3,031						$3,030
Backfill (on-site material)	311	CY	$30	$9,317						$9,320
Hauling	289	CY	$50	$14,444						$14,440
Piles	974	LF	$40	$38,971						$38,970
Concrete										
Footer Walls	24	CY	$1,000.00	$23,704						$23,700
Slab	101	CY	$800.00	$80,830						$80,830
Blower Pads	5	CY	$1,500.00	$7,500						$7,500
Equipment										
Aeration Blowers	6	EA	incl						$75,000	$75,000
Piping/valve allowance	1	LS	$100,000	$100,000						$100,000
General Conditions										
Subtotal				$607,800					75000	**$683,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$607,800					$75,000	**$683,000**
Mobilization/Demobilization										
TOTAL				$608,000					$75,000	**$680,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Disc Filter Building - Flow/Load Scenario 1, Alts. 3&4**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	613	CY	$800	$490,667						$490,670
Wall Concrete	96	CY	$1,000	$96,000						$96,000
Architectural										
Building over CLOTH	2720	SF	$260	$707,200						$707,200
*excludes A.S. Tanks										
Civil										
Excavation	270	CY	$30	$8,111						$8,110
Crushed Stone Bedding	101	CY	$60	$6,044						$6,040
Backfill (on-site material)	69	CY	$30	$2,067						$2,070
Hauling	201	CY	$50	$10,074						$10,070
Piles	1971	LF	$40	$78,857						$78,860
Equipment										
Hydrotech Discfilters:	1	LS	$1,650,000	$1,650,000					$495,000	$2,145,000
30" Slide Gates	4	EA	$12,000	$48,000					$14,400	$62,400
Piping & Valve Allowance	1	LS	$75,000	$75,000						$75,000
General Conditions										
Subtotal				$3,172,000		$0			$509,400	**$3,681,000**
Taxes				$0					$0	
Overhead										
Profit										
Subtotal				$3,172,000					$509,400	**$3,681,000**
Subtotal				$3,172,000					$509,400	**$3,681,000**
Mobilization/Demobilization										
TOTAL				$3,172,000					$509,000	**$3,680,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Disc Filter Building - Flow/Load Scenario 3, Alts. 3&4**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	775	CY	$800	$619,733						$619,730
Wall Concrete	110	CY	$1,000	$110,222						$110,220
Architectural										
Building over CLOTH	3444	SF	$260	$895,440						$895,440
*excludes A.S. Tanks										
Civil										
Excavation	335	CY	$30	$10,053						$10,050
Crushed Stone Bedding	128	CY	$60	$7,653						$7,650
Backfill (on-site material)	80	CY	$30	$2,400						$2,400
Hauling	255	CY	$50	$12,756						$12,760
Piles	2490	LF	$40	$99,600						$99,600
Equipment										
Hydrotech Discfilters:	1	LS	$2,250,000	$2,250,000					$675,000	$2,925,000
30" Slide Gates	5	EA	$12,000	$60,000					$18,000	$78,000
Piping & Valve Allowance	1	LS	$100,000	$100,000						$100,000
General Conditions										
Subtotal				$4,167,900		$0			$693,000	**$4,861,000**
Taxes				$0					$0	
Overhead										
Profit										
Subtotal				$4,167,900					$693,000	**$4,861,000**
Subtotal				$4,167,900					$693,000	**$4,861,000**
Mobilization/Demobilization										
TOTAL				$4,168,000					$693,000	**$4,860,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Disc Filter Backwash PS - Flow/Load Scenarios 1-3, Alts. 2-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Civil										
Excavation	701	CY	$30	$21,031						$21,030
Crushed Stone Bedding	5	CY	$60	$320						$320
Backfill (on-site material)	649	CY	$30	$19,476						$19,480
Hauling	52	CY	$50	$2,593						$2,590
Piles	144	LF	$40.0	$5,760						$5,760
Concrete										
Walls	18	CY	$1,000.00	$17,778						$17,780
Slab	11	CY	$800.00	$8,533						$8,530
Fillets	3	CY	$400.00	$1,200						$1,200
Equipment										
New BW Pumps	2	EA	$15,000	$30,000					$15,000	$45,000
VFD's & CP's	1	LS	$10,000	$10,000					$5,000	$15,000
Piping/valve allowance	1	LS	$50,000	$50,000						$50,000
General Conditions										
Subtotal				$166,700					20000	**$187,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$166,700					$20,000	**$187,000**
Mobilization/Demobilization										
TOTAL				$167,000					$20,000	**$190,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Chlorination/Dechlorination Tank - Flow/Load Scenario 3 - Alts 1 - 5**						**Project No:**			11214118
	Quantity		**Material**		**Equipment**		**Labor**			
Description	**No. Units**	**Basis**	**Per Unit**	**Total**	**Per Unit**	**Total**	**Man Hours**	**$/Man Hour**	**Total**	**Total Cost**
Concrete										
Slab Concrete	209	CY	$800	$166,874						$166,870
Wall Concrete	188	CY	$1,000	$188,444						$188,440
Civil										
Excavation	2585	CY	$30	$77,551						$77,550
Crushed Stone Bedding	100	CY	$60	$5,991						$5,990
Backfill (on-site material)	1560	CY	$30	$46,786						$46,790
Hauling	1025	CY	$50	$51,274						$51,270
Piles	1634	LF	$40	$65,371						$65,370
Equipment										
Chlorination Equipment	1	EA	$50,000	$50,000					$25,000	$75,000
Dechlorination Equipment	1	EA	$50,000	$50,000					$25,000	$75,000
Demolition	1	LS	$20,000	$20,000						$20,000
Parshall Flume & Level Sensor	1	LS	$15,000	$15,000					$7,500	$22,500
Piping/valve allowance	1	LS	$50,000	$50,000						$50,000
Misc. Metals										
Handrails	488	LF	$150	$73,200						$73,200
Stairs	14	EA	$560	$7,840						$7,840
General Conditions										
Subtotal				$868,300					$57,500	**$926,000**
Taxes			**Tax-Exempt**	$0	**0%**	$0		**0%**	$0	
Overhead			**10%**	$86,800	**10%**			**10%**	$5,800	
Profit			**10%**	$86,800	**10%**			**10%**	$5,800	
Subtotal				$1,041,900					$69,100	**$1,111,000**
Mobilization/Demobilization			**5%**	$52,100	**5%**			**5%**	$3,500	
TOTAL				$1,094,000					$73,000	**$1,170,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Parallel Lagoon Bypass Pipeline Flow/Load Scenarios 1-3, Alt. 1**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	11	CY	$800	$8,533						$8,530
Wall Concrete	27	CY	$1,000	$26,667						$26,670
Civil										
Excavation (Dist Boxes)	96	CY	$40	$3,840						$3,840
Excavation (SQ MH)	333	CY	$40	$13,333						$13,330
Excavation (Dist Boxes)	262	CY	$40	$10,467						$10,470
Excavation (60" Pipe)	6000	CY	$40	$240,000						$240,000
Crushed Stone Bedding (Dist Boxes)	5	CY	$60	$320						$320
Crushed Stone Bedding (SQ MH)	5	CY	$60	$284						$280
Crushed Stone Bedding (RND MH)	5	CY	$60	$284						$280
Backfill (on-site material)	638	CY	$30	$19,130						$19,130
GEOTEXTILE BEDDING	2400	SY	$1	$2,400						$2,400
Hauling	-542	CY	$30	($16,250)						($16,250)
Piles (Dist Boxes)	103	LF	$40	$4,114						$4,110
Equipment										
60" HDPE Pipe	1800	LF	$225	$405,000						$405,000
8-ft SQ Manhole (5)	20	VF	$1,600	$32,000						$32,000
8-ft Dia Manhole (5)	40	VF	$1,200	$48,000						$48,000
Manhole Accessories	6	EA	$1,000	$6,000						$6,000
Slide Gates (2 in 5 MH)	4	EA	$15,000	$60,000					$30,000	$90,000
Demolition	1	LS	$100,000	$100,000						$100,000
Bypass structure & abandon 42"										
Piping/valve allowance	1	LS								
Misc. Metals										
Handrails		LF	$80							
Stairs		EA	$440							
	General Conditions									
	Subtotal			$964,100					$30,000	**$994,000**
	Taxes			$0		$0		**0%**	$0	
	Overhead									
	Profit									
	Subtotal			$964,100					$30,000	**$994,000**
	Mobilization/Demobilization									
	TOTAL			$964,000					$30,000	**$990,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Parallel Lagoon Bypass Pipeline Flow/Load Scenarios 1-3, Alts 2-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	11	CY	$800	$8,533						$8,530
Wall Concrete	27	CY	$1,000	$26,667						$26,670
Civil										
Excavation (Dist Boxes)	96	CY	$40	$3,840						$3,840
Excavation (SQ MH)	333	CY	$40	$13,333						$13,330
Excavation (Dist Boxes)	262	CY	$40	$10,467						$10,470
Excavation (60" Pipe)	4333	CY	$40	$173,333						$173,330
Crushed Stone Bedding (Dist Boxes)	5	CY	$60	$320						$320
Crushed Stone Bedding (SQ MH)	5	CY	$60	$284						$280
Crushed Stone Bedding (RND MH)	5	CY	$60	$284						$280
Backfill (on-site material)	638	CY	$30	$19,130						$19,130
GEOTEXTILE BEDDING	1733	SY	$1	$1,733						$1,730
Hauling	-542	CY	$30	($16,250)						($16,250)
Piles (Dist Boxes)	103	LF	$40	$4,114						$4,110
Equipment										
60" HDPE Pipe	1300	LF	$225	$292,500						$293,000
8-ft SQ Manhole (5)	20	VF	$1,600	$32,000						$32,000
8-ft Dia Manhole (5)	30	VF	$1,200	$36,000						$36,000
Manhole Accessories	5	EA	$1,000	$5,000						$5,000
Slide Gates (2 in 5 MH)	4	EA	$15,000	$60,000					$30,000	$90,000
Demolition	1	LS	$100,000	$100,000						$100,000
Bypass structure & abandon 42"										
	General Conditions									
	Subtotal			$771,300					$30,000	**$801,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$771,300					$30,000	**$801,000**
	Mobilization/Demobilization									
	TOTAL			$771,000					$30,000	**$800,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Thickened Sludge Blend Tanks - Flow/Load Scenarios 1-3, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Concrete										
Slab Concrete	81	CY	$800	$64,711						$64,710
Wall Concrete	56	CY	$1,000	$56,000						$56,000
Civil										
Excavation	487	CY	$30	$14,620						$14,620
Crushed Stone Bedding	11	CY	$60	$640						$640
Backfill (on-site material)	139	CY	$30	$4,180						$4,180
Hauling	348	CY	$50	$17,400						$17,400
Piles	260	LF	$40	$10,400						$10,400
Equipment										
Mixing Equipment	2	EA	$25,000	$50,000					$25,000	$75,000
Piping/valve allowance	1	LS	$50,000	$50,000						$50,000
Misc. Metals										
Miscellaneous	1	LS	$10,000	$10,000						$10,000
General Conditions										
Subtotal				$278,000					25000	$303,000
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$278,000					$25,000	$303,000
Mobilization/Demobilization										
TOTAL				$278,000					$25,000	**$300,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Biogas Conditioning & Cogen Building - Flow/Load Scenario 3, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Biogas Building	3224	SF	$260	$838,240						$838,240
Concrete										
Slab Concrete	716	CY	$800	$573,156						$573,160
Civil										
Excavation	1467	CY	$30	$44,000						$44,000
Crushed Stone Bedding	161	CY	$60	$9,667						$9,670
Backfill (on-site material)	1133	CY	$30	$34,000						$34,000
Hauling	333	CY	$50	$16,667						$16,670
Piles	2303	LF	$40	$92,114						$92,110
Equipment										
Biogas Conditioning System	1	EA	$408,375	$408,375					$81,675	$490,050
Cogen Recip Eng Systems	2	EA	$315,700	$631,400					$189,420	$820,820
- Engines										
- Heat Exchanger Skids										
- External Radiators										
- Exhaust Piping										
Hydronic System (pumps/piping)	1	LS	$100,000	$100,000						$100,000
Electrical/Utility Tie-in	1	LS	$250,000	$250,000						$250,000
Piping/valve allowance	1	LS	$75,000	$75,000						$75,000
Misc. Metals										
	General Conditions									
	Subtotal			$3,072,600					271100	**$3,344,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$3,072,600					$271,100	**$3,344,000**
	Mobilization/Demobilization									
	TOTAL			$3,073,000					$271,000	**$3,300,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**68' Primary Digesters - Flow/Load Scenario 1, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Unit Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Digester Walls - Insulation & Siding	2	EA	$136,000	$272,000						$272,000
Digester Cover - Insulation & Paint	2	EA	$184,960	$369,920						$369,920
Concrete										
Digester Concrete - Slab	754	CY	$800	$603,186						$603,190
Digester Concrete - Wall	1043	CY	$1,200	$1,251,052						$1,251,050
Civil										
Total Excavation	3471	CY	$30	$104,118						$104,120
Backfill (on-site material)	1209	CY	$30	$36,259						$36,260
Hauling (on-site)	2262	CY	$30	$67,858						$67,860
Crushed Stone Bedding	302	CY	$60	$18,096						$18,100
Piles	6658	LF	$35	$233,033						$233,030
Sheet Piling		SF	$30							
Equipment										
Digester Covers	2	EA	$427,091	$854,182					$427,091	$1,281,270
Pumped Mixing Systems	2	EA	$150,000	$300,000					$150,000	$450,000
Gas Safety Equipment	2	EA	$30,000	$60,000					$30,000	$90,000
Piping/Valve Allowance (2 Digesters)	1	LS	$400,000	$400,000						$400,000
Misc. Metals										
Hand Rails	427	LF	$150	$64,088						$64,090
Stair treads	94	EA	$440	$41,360						$41,360
Grating	673	SF	$90	$60,560						$60,560
	General Conditions									
	Subtotal			$4,735,700					$607,100	**$5,343,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$4,735,700					$607,100	**$5,343,000**
	Mobilization/Demobilization									
	TOTAL			$4,736,000					$607,000	**$5,340,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**80' Primary Digesters - Flow/Load Scenario 3, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Unit Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Digester Walls - Insulation & Siding	2	EA	$160,000	$320,000						$320,000
Digester Cover - Insulation & Paint	2	EA	$256,000	$512,000						$512,000
Concrete										
Digester Concrete - Slab	1026	CY	$800	$821,003						$821,000
Digester Concrete - Wall	1221	CY	$1,200	$1,465,518						$1,465,520
Civil										
Total Excavation	4471	CY	$30	$134,120						$134,120
Backfill (on-site material)	1392	CY	$30	$41,757						$41,760
Hauling (on-site)	3079	CY	$30	$92,363						$92,360
Crushed Stone Bedding	411	CY	$60	$24,630						$24,630
Piles	9215	LF	$35	$322,537						$322,540
Sheet Piling		SF	$30							
Equipment										
Digester Covers	2	EA	$591,130	$1,182,259					$591,130	$1,773,390
Pumped Mixing Systems	2	EA	$195,918	$391,837					$195,918	$587,760
Gas Safety Equipment	2	EA	$40,000	$80,000					$24,000	$104,000
Piping/Valve Allowance (2 Digesters)	1	LS	$500,000	$500,000						$500,000
Misc. Metals										
Handrails	503	LF	$150	$75,398						$75,400
Stair treads	94	EA	$440	$41,360						$41,360
Grating	786	SF	$90	$70,738						$70,740
	General Conditions									
	Subtotal			$6,075,500					$811,000	**$6,887,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$6,075,500					$811,000	**$6,887,000**
	Mobilization/Demobilization									
	TOTAL			$6,076,000					$811,000	**$6,890,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**68' Secondary Digester - Flow/Load Scenario 1, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Unit Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Digester Wall Insulation & Siding	1	EA	$136,000	$136,000						$136,000
Digester Coatings (insulation & paint)	1	EA	$184,960	$184,960						$184,960
Concrete										
Digester Concrete - Slab	377	CY	$800	$301,593						$301,590
Digester Concrete - Wall	521	CY	$1,200	$625,526						$625,530
Civil										
Total Excavation	1735	CY	$30	$52,059						$52,060
Backfill (on-site material)	604	CY	$30	$18,130						$18,130
Hauling (on-site)	1131	CY	$30	$33,929						$33,930
Crushed Stone Bedding	151	CY	$60	$9,048						$9,050
Piles	3329	LF	$35	$116,516						$116,520
Sheet Piling		SF	$30							
Equipment										
Digester Covers	1	EA	$506,550	$506,550					$253,275	$759,820
Pumped Mixing Systems	1	EA	$150,000	$150,000					$75,000	$225,000
Gas Safety Equipment	1	EA	$30,000	$30,000					$15,000	$45,000
Piping/Valve Allowance (2 Digesters)	1	LS	$250,000	$250,000						$250,000
Misc. Metals										
Hand Rails	214	LF	$150	$32,044						$32,040
Stair treads	47	EA	$440	$20,680						$20,680
Grating	673	SF	$90	$60,560						$60,560
	General Conditions									
	Subtotal			$2,527,600					$343,300	**$2,871,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$2,527,600					$343,300	**$2,871,000**
	Mobilization/Demobilization									
	TOTAL			$2,528,000					$343,000	**$2,870,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**80' Secondary Digester - Flow/Load Scenario 3, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Unit Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Digester Wall Insulation & Siding	1	EA	$160,000	$160,000						$160,000
Digester Coatings (insulation & paint)	1	EA	$256,000	$256,000						$256,000
Concrete										
Digester Concrete - Slab	513	CY	$800	$410,501						$410,500
Digester Concrete - Wall	611	CY	$1,200	$732,759						$732,760
Civil										
Total Excavation	2235	CY	$30	$67,060						$67,060
Backfill (on-site material)	696	CY	$30	$20,879						$20,880
Hauling (on-site)	1539	CY	$30	$46,181						$46,180
Crushed Stone Bedding	205	CY	$60	$12,315						$12,320
Piles	4608	LF	$35	$161,268						$161,270
Sheet Piling		SF	$30							
Equipment										
Digester Covers	1	EA	$701,107	$701,107					$350,554	$1,051,660
Pumped Mixing Systems	1	EA	$195,918	$195,918					$97,959	$293,880
Gas Safety Equipment	1	EA	$40,000	$40,000					$20,000	$60,000
Piping/Valve Allowance (2 Digesters)	1	LS	$250,000	$250,000						$250,000
Misc. Metals										
Hand Rails	251	LF	$150	$37,699						$37,700
Stair treads	47	EA	$440	$20,680						$20,680
Grating	786	SF	$90	$70,738						$70,740
	General Conditions									
	Subtotal			$3,183,100					$468,500	**$3,652,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$3,183,100					$468,500	**$3,652,000**
	Mobilization/Demobilization									
	TOTAL			$3,183,000					$469,000	**$3,650,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**3 Story Digester Complex - Flow/Load Scenario 3, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Digester Building	3300	SF	$670	$2,211,000						$2,211,000
Concrete										
Slab Concrete	262	CY	$800	$209,422						$209,420
Elevated Slab Concrete	299	CY	$1,000	$298,519						$298,520
Wall Concrete	102	CY	$1,000	$102,222						$102,220
Civil										
Excavation	982	CY	$30	$29,467						$29,470
Crushed Stone Bedding	161	CY	$60	$9,667						$9,670
Backfill (on-site material)	402	CY	$30	$12,067						$12,070
Hauling	580	CY	$50	$29,000						$29,000
Piles	2524	LF	$40	$100,971						$100,970
Equipment										
Sludge Grinding/Pumping	1	LS	$973,610	$973,610					$32,782	$1,006,390
Sludge Heating & Recirc	3	LS	$199,500	$598,500					$179,550	$778,050
Waste gas flare system	1	LS	$71,000	$71,000					$35,500	$106,500
Rotary Drum WAS Thickeners	2	EA	$200,000	$400,000					$120,000	$520,000
Polymer Feed System (tote-based)	1	LS	$50,000	$50,000					$25,000	$75,000
Piping/valve allowance	1	LS	$500,000	$500,000						$500,000
Misc. Metals										
Handrails	156	LF	$150	$23,400						$23,400
Stairs	67	EA	$560	$37,520						$37,520
Aluminum Grating	300	SF	$90	$27,000						$27,000
	General Conditions									
	Subtotal			$5,683,400					392800	**$6,076,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$5,683,400					$392,800	**$6,076,000**
	Mobilization/Demobilization		**5%**	$284,200						
	TOTAL			$5,968,000					$393,000	**$6,400,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Solids Processing Building - Flow/Load Scenario 3, Alts. 1-5**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Architectural										
Solids Building	4800	SF	$520	$2,496,000						$2,496,000
Concrete										
Slab Concrete	1129	CY	$800	$903,467						$903,470
Civil										
Excavation	1369	CY	$30	$41,067						$41,070
Crushed Stone Bedding	161	CY	$60	$9,667						$9,670
Backfill (on-site material)	644	CY	$30	$19,317						$19,320
Hauling	725	CY	$50	$36,250						$36,250
Piles	3630	LF	$40	$145,200						$145,200
Equipment										
BFP Dewatering Equip	1	LS	$820,500	$820,500					$246,150	$1,066,650
- (2) 2-meter BFPs										
- Control Panels										
- Washwater Booster Pumps										
Dewatered Sludge Conveyor System	1	LS	$100,000	$100,000					$50,000	$150,000
Polymer Feed System	1	LS	$50,000	$50,000					$15,000	$65,000
Polymer Storage	1	LS	$100,000	$100,000					$50,000	$150,000
Piping/valve allowance	1	LS	$100,000	$100,000						$100,000
Misc. Metals										
Handrails	61	LF	$150	$9,100						$9,100
Stairs	26	EA	$560	$14,560						$14,560
Aluminum Grating	400	SF	$90	$36,000						$36,000
	General Conditions									
	Subtotal			$4,881,100					361200	**$5,242,000**
	Taxes			$0		$0			$0	
	Overhead									
	Profit									
	Subtotal			$4,881,100					$361,200	**$5,242,000**
	Mobilization/Demobilization									
	TOTAL			$4,881,000					$361,000	**$5,200,000**

Summary of Conceptual Cost Estimates

Project:	Oak Orchard WPCP Facilities Plan and Feasibility Study						**Computed By:**			SMB/JDG
Location:	Clay, NY						**Checked By:**			JDG
Owner:	Onondaga County Department of Water Environment Protection						**Design Status of Est.:**			Facility Plan
Description:	**Lagoon 1 Fill**						**Project No:**			11214118
	Quantity		Material		Equipment		Labor			
Description	No. Units	Basis	Per Unit	Total	Per Unit	Total	Man Hours	$/Man Hour	Total	Total Cost
Civil										
Excavation	8499	CY	$10	$84,991						$84,990
Geo Bedding Seperation Fabric	14024	SY	$1	$14,024						$14,020
Backfill (off-site material)	74386	CY	$30	$2,231,585						$2,231,580
General Conditions										
Subtotal				$2,330,600						**$2,331,000**
Taxes				$0		$0			$0	
Overhead										
Profit										
Subtotal				$2,330,600						**$2,331,000**
Mobilization/Demobilization										
TOTAL				$2,331,000						**$2,330,000**

OCDWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		2/9/2021	11214118
Client		Date	Job No.
Present Worth Analysis - Flow/Load Scenario 1		MMM/AEJ	JDG
Subject		Comp. By	Checked By

Annual Cost Component [1]	Alternative 1 Membrane Bioreactor (MBR)	Alternative 2 Conventional Activated Sludge & Biological Aerated Filter (BAF)	Alternative 3 High Purity Oxygen Activated Sludge & Moving Bed Biofilm Reactor (MBBR)	Alternative 4 Conventional Activated Sludge & Moving Bed Biofilm Reactor (MBBR)	Alternative 5 High Purity Oxygen Activated Sludge & Biological Aerated Filter (BAF)
Maintenance Costs	$357,000	$245,000	$286,000	$212,000	$319,000
Additional Labor Costs	$510,000	$510,000	$510,000	$510,000	$510,000
Chemical Costs	-$155,000	-$175,000	-$166,000	-$175,000	-$166,000
Power Requirements:	$417,000	$245,000	$265,000	$289,000	$215,000
Dewatered Solids Disposal:	$437,000	$464,000	$448,000	$464,000	$448,000
Annual O&M Cost in Year 2020 Dollars	$1,570,000	$1,290,000	$1,340,000	$1,300,000	$1,330,000
20-Year Present Worth O&M Cost [2]	$30,440,000	$25,010,000	$25,980,000	$25,200,000	$25,790,000
Total Project					
Capital Cost	$121,000,000	$141,000,000	$125,000,000	$120,000,000	$145,000,000
Total 20-Year Present Worth Cost	**$151,000,000**	**$166,000,000**	**$151,000,000**	**$145,000,000**	**$171,000,000**

Notes:

1. Costs are based on a plant design average flow of 6 mgd.
2. Based on a real discount rate of 0.3% per US Office of Management and Budget, Memo M-20-07.

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**HPO & MBBR**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 6 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 510,000	*additional labor cost to operate Scenario 1*

Maint. Costs:

New Equipment:		
Influent Screens and Washing Presses	$631,000	
Grit Rehab	$100,000	
HPO Aeration Equipment	$3,000,000	
HPO Generation Equipment	$1,500,000	
Secondary Clarifier Equipment	$1,100,000	
Return and Waste Sludge Pumps	$250,000	
MBBR System	$1,950,000	
Discfilters	$1,770,000	
Discfilter Backwash Pumping	$30,000	
Chlorination/Dechnlorination Equipment	$100,000	
Total Equipment Cost	$10,431,000	
Maintenance Cost/Year:	**$208,620**	2% of equipment cost
Solids Process Maintenance Cost/Year:	**$77,600**	2% of equipment cost (***from Solids Treat. & Disposal tab***)
Total Maintenance Cost/Year:	**$286,220**	

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	97,627	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$65,410	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	13,668	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$10,114	
Sodium Bisulfite Consumption (gal/yr)	3,471	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$1,145	
Liquid Oxygen Consumption (1,000 CF/yr)	2,164	from historical HPO operational data & evaluations
Liquid Oxygen Cost/Unit (per 1,000 CF):	$4.20	
Annual Chemical Cost:	$9,089	

Power Requirements

Power Requirement (kW-hr)	2,754,708	From electric spreadsheet tab
Power Requirement (kW-hr)	30,958	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$264,638	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	12.62	Based on 23% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$447,707	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$286,220	$286,000
Annual Additional Operation Labor Cost:	$510,000	$510,000
Annual Chemical Cost:	-$165,791	-$166,000
Annual Power Requirements:	$264,638	$265,000
Dewatered Solids Disposal Cost	$447,707	$448,000
Total Annual O & M Cost @ Rated Capacity:	$1,342,774	$1,343,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study	10/6/2020	11214118
Client	*Date*	*Job No.*
Electrical Cost Estimates - HPO & MBBR	MMM	AEJ
Subject	*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 6 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (6.3 mgd)	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	4			-	0.5	0.5	0.3	1.3	24	7	11,731	$1,114
HPO Aerators	1						44.0	44.0	24	7	384,384	$36,516
HPO Generation Equipment	1						53.7	53.7	24	7	468,949	$44,550
Secondary Clarifier Equipment	3			-	1.8	2.0	1.3	4.0	24	7	35,192	$3,343
Return Sludge Pumps	1	2,627	20	50%	26.6		19.8	19.8	24	7	173,114	$16,446
MBBR System	1										1,567,760	$148,937
Discfilter Drives	3				1.4	1.5	1.0	3.0	8	7	8,798	$836
Discfilter Backwash Pumping	1				27.0	30.0	20.1	20.1	8	7	58,654	$5,572
Total Connected Power												
Annual Power Consumption											2,754,708	
Total Annual Power Cost												$261,697

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**HPO & BAF**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 6 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 510,000	*additional labor cost to operate Scenario 1*

Maint. Costs:

New Equipment:		
Influent Screens and Washing Presses	$631,000	
Grit Rehab	$100,000	
HPO Aeration Equipment	$3,000,000	
HPO Generation Equipment	$1,500,000	
Secondary Clarifier Equipment	$1,100,000	
Return and Waste Sludge Pumps	$250,000	
Intermediate Pumping Station	$400,000	
BAF System	$4,960,000	
BAF Backwash Pumping	$50,000	
Chlorination/Dechnlorination Equipment	$100,000	
Total Equipment Cost	$12,091,000	
Maintenance Cost/Year:	**$241,820**	2% of equipment cost
Solids Process Maintenance Cost/Year:	**$77,600**	2% of equipment cost (***from Solids Treat. & Disposal tab***)
Total Maintenance Cost/Year:	**$319,420**	

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	97,627	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$65,410	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	13,668	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$10,114	
Sodium Bisulfite Consumption (gal/yr)	3,471	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$1,145	
Liquid Oxygen Consumption (1,000 CF/yr)	2,164	from historical HPO operational data & evaluations
Liquid Oxygen Cost/Unit (per 1,000 CF):	$4.20	
Annual Chemical Cost:	$9,089	

Power Requirements

Power Requirement (kW-hr)	2,231,854	From electric spreadsheet tab
Power Requirement (kW-hr)	30,958	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$214,967	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	12.62	Based on 23% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$447,707	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$319,420	$319,000
Annual Additional Operation Labor Cost:	$510,000	$510,000
Annual Chemical Cost:	-$165,791	-$166,000
Annual Power Requirements:	$214,967	$215,000
Dewatered Solids Disposal Cost	$447,707	$448,000
Total Annual O & M Cost @ Rated Capacity:	$1,326,302	$1,326,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		10/6/2020	11214118
Client		*Date*	*Job No.*
Electrical Cost Estimates - HPO & BAF		MMM	AEJ
Subject		*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 6 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (6.3 mgd)	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	4			-	0.5	0.5	0.3	1.3	24	7	11,731	$1,114
HPO Aerators	1						44.0	44.0	24	7	384,384	$36,516
HPO Generation Equipment	1						53.7	53.7	24	7	468,949	$44,550
Secondary Clarifier Equipment	3			-	1.8	2.0	1.3	4.0	24	7	35,192	$3,343
Return Sludge Pumps	1	2,627	20	50%	26.6		19.8	19.8	24	7	173,114	$16,446
BAF Influent Pumping	1	5,254	30	70%	56.9		42.5	42.5	24	7	370,958	$35,241
BAF System											655,000	$62,225
BAF Backwash Pumping											86,400	$8,208
Total Connected Power												
Annual Power Consumption											2,231,854	
Total Annual Power Cost												$212,026

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Conventional Activated Sludge & BAF**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 6 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 510,000	*additional labor cost to operate Scenario 1*

Maint. Costs:

New Equipment:		
Influent Screens and Washing Presses	$631,000	
Grit Rehab	$100,000	
Aeration Diffusers	$300,000	
Aeration Blowers	$300,000	
Aeration Control System	$200,000	
Secondary Clarifier Equipment	$1,100,000	
Return and Waste Sludge Pumps	$250,000	
Intermediate Pumping Station	$400,000	
BAF System	$4,960,000	
BAF Backwash Pumping	$50,000	
Chlorination/Dechnlorination Equipment	$100,000	
Total Equipment Cost	$8,391,000	
Maintenance Cost/Year:	**$167,820**	2% of equipment cost
Solids Process Maintenance Cost/Year:	**$77,600**	2% of equipment cost (***from Solids Treat. & Disposal tab***)
Total Maintenance Cost/Year:	**$245,420**	

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	97,627	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$65,410	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	13,668	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$10,114	
Sodium Bisulfite Consumption (gal/yr)	3,471	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$1,145	

Power Requirements

Power Requirement (kW-hr)	2,548,646	From electric spreadsheet tab
Power Requirement (kW-hr)	30,958	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$245,062	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	13.08	Based on 23% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$464,272	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$245,420	$245,000
Annual Additional Operation Labor Cost:	$510,000	$510,000
Annual Chemical Cost:	-$174,880	-$175,000
Annual Power Requirements:	$245,062	$245,000
Dewatered Solids Disposal Cost	$464,272	$464,000
Total Annual O & M Cost @ Rated Capacity:	$1,289,875	$1,290,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study	10/6/2020	11214118
Client	*Date*	*Job No.*
Electrical Cost Estimates - Conventional Activated Sludge & BAF	MMM	
Subject	*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 6 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (6.3 mgd)	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	4			-	0.5	0.5	0.3	1.3	24	7	11,731	$1,114
Aeration Blowers	1			60%	160.1		119.4	119.4	24	7	1,043,488	$99,131
Secondary Clarifier Equipment	3			-	0.9	1.0	0.7	2.0	24	7	17,596	$1,672
Return Sludge Pumps	1	3,941	20	50%	39.8		29.7	29.7	24	7	259,671	$24,669
BAF Influent Pumping	1	5,254	30	70%	56.9		42.5	42.5	24	7	370,958	$35,241
BAF System											655,000	$62,225
BAF Backwash Pumping											86,400	$8,208
Discfilter Drives	3				1.4	1.5	1.0	3.0	8	7	8,798	$836
Discfilter Backwash Pumping	1				22.5	25.0	16.8	16.8	8	7	48,878	$4,643
Total Connected Power												
Annual Power Consumption											2,548,646	
Total Annual Power Cost												$242,121

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Conventional Activated Sludge & MBBR**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 6 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 510,000	*additional labor cost to operate Scenario 1*

Maint. Costs:

New Equipment:		
Influent Screens and Washing Presses	$631,000	
Grit Rehab	$100,000	
Aeration Diffusers	$300,000	
Aeration Blowers	$300,000	
Aeration Control System	$200,000	
Secondary Clarifier Equipment	$1,100,000	
Return and Waste Sludge Pumps	$250,000	
MBBR System	$1,950,000	
Discfilters	$1,770,000	
Discfilter Backwash Pumping	$30,000	
Chlorination/Dechnlorination Equipment	$100,000	
Total Equipment Cost	$6,731,000	
Maintenance Cost/Year:	**$134,620**	2% of equipment cost
Solids Process Maintenance Cost/Year:	**$77,600**	2% of equipment cost (***from Solids Treat. & Disposal tab***)
Total Maintenance Cost/Year:	**$212,220**	

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	97,627	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$65,410	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	13,668	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$10,114	
Sodium Bisulfite Consumption (gal/yr)	3,471	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$1,145	

Power Requirements

Power Requirement (kW-hr)	3,013,823	From electric spreadsheet tab
Power Requirement (kW-hr)	30,958	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$289,254	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	13.08	Based on 23% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$464,272	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$212,220	$212,000
Annual Additional Operation Labor Cost:	$510,000	$510,000
Annual Chemical Cost:	-$174,880	-$175,000
Annual Power Requirements:	$289,254	$289,000
Dewatered Solids Disposal Cost	$464,272	$464,000
Total Annual O & M Cost @ Rated Capacity:	$1,300,866	$1,301,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study	10/6/2020	11214118
Client	*Date*	*Job No.*
Electrical Cost Estimates - Conventional Activated Sludge & MBBR	MMM	AEJ
Subject	*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 6 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (6.3 mgd)	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	4			-	0.5	0.5	0.3	1.3	24	7	11,731	$1,114
Aeration Blowers	1			60%	160.1		119.4	119.4	24	7	1,043,488	$99,131
Secondary Clarifier Equipment	3			-	0.9	1.0	0.7	2.0	24	7	17,596	$1,672
Return Sludge Pumps	1	3,941	20	50%	39.8		29.7	29.7	24	7	259,671	$24,669
MBBR System	1										1,567,760	$148,937
Discfilter Drives	3				1.4	1.5	1.0	3.0	8	7	8,798	$836
Discfilter Backwash Pumping	1				27.0	30.0	20.1	20.1	8	7	58,654	$5,572
Total Connected Power												
Annual Power Consumption											3,013,823	
Total Annual Power Cost												$286,313

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Membrane Bioreactor (MBR)**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 6 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 510,000	*additional labor cost to operate Scenario 1*

Maint. Costs:

New Equipment:		
Influent Screens and Washing Presses	$631,000	
Grit Rehab	$100,000	
Aeration Diffusers		*by SUEZ*
Aeration Blowers		*by SUEZ*
Aeration Control System		*by SUEZ*
Return and Waste Sludge Pumps		*by SUEZ*
Intermediate Pumping Station	$300,000	
Fine screen	$585,000	
MBR System	$3,769,000	*SUEZ*
Chlorination/Dechnlorination Equipment	$100,000	
Total Equipment Cost	$5,485,000	
Maintenance Cost/Year:	**$109,700**	2% of equipment cost
Solids Process Maintenance Cost/Year:	**$77,600**	2% of equipment cost (***from Solids Treat. & Disposal tab***)
No. of membrane modules	**2,928**	
10-Year Membrane Replacement Cost	$3,400,000	
Annualized Membrane Replacement Cost	$170,000	
Total Maintenance Cost/Year:	**$357,300**	

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	97,627	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$65,410	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	used as a settling agent, not needed.
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	13,668	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$10,114	
Sodium Bisulfite Consumption (gal/yr)	3,471	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$1,145	
Citric Acid Consumption (gal/yr)	16,800	*16,800 for MBR per SUEZ*
Citric Acid Cost/Unit (per gal):	$1.20	*refers back to Assumptions tab*
Annual Chemical Cost:	$20,160	

Power Requirements

Power Requirement (kW-hr)	4,359,061	From electric spreadsheet tab
Power Requirement (kW-hr)	30,958	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$417,052	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	12.32	Based on 23% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$437,345	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$357,300	$357,000
Annual Additional Operation Labor Cost:	$510,000	$510,000
Annual Chemical Cost:	-$154,720	-$155,000
Annual Power Requirements:	$417,052	$417,000
Dewatered Solids Disposal Cost	$437,345	$437,000
Total Annual O & M Cost @ Rated Capacity:	$1,566,977	$1,567,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		10/6/2020	11214118
Client		*Date*	*Job No.*
Electrical Cost Estimates - Membrane Bioreactor (MBR)		MMM	
Subject		*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 6 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (6.3 mgd)	Operating Capacity (gpm, per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	5			-	0.5	0.5	0.3	1.7	24	7	14,663	$1,393
Return Sludge Pumps	1	12,510	13	50%	79.1		59.0	59.0	24	7	515,220	$48,946
Intermediate Pumping Station	1	4,170	8	70%	11.3		8.4	8.4	24	7	73,603	$6,992
Fine screen	1				2.7	3.0	2.0	2.0	24	7	17,596	$1,672
Backpulse Pumps	1			-		50.0	37.3	37.3	24	7	325,853	$30,956
Permeate Pumps	8			-							165,000	$15,675
Membrane Blowers	8			-							1,168,000	$110,960
Process Blowers	2			-							1,515,000	$143,925
Recirculation Pumps	8			-							512,000	$48,640
Air Compressors	1			-							6,000	$570
Total Connected Power												
Annual Power Consumption											4,359,061	
Total Annual Power Cost												$414,111

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	JDG
Location:	Clay, New York	**Checked By:**	
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Solids Treatment & Disposal**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow and loading conditions after upgrade

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ -	*covered elsewhere*

Maint. Costs:

New Equipment:		
Blend Tank Mixers	$50,000	
Biogas Conditioning System	$410,000	
Cogeneration Units	$300,000	
Primary Digester Pumped Mixing	$300,000	
Secondary Digester Pumped Mixing	$150,000	
Gas Safety Equpment	$90,000	*for all 3 digesters*
Waste Gas Flare	$70,000	
Sludge Pumping/Grinding	$780,000	
Sludge Heating & Recirc	$480,000	
Rotary Drum Thickeners	$320,000	
Polymer Feed System	$50,000	
Belt Filter Press Units	$660,000	
Dewatered Sludge Conveyor System	$100,000	
Polymer Storage & Feed System	$120,000	
Total Equipment Cost	$3,880,000	
Maintenance Cost/Year:	**$77,600**	2% of equipment cost

Total Maintenance Cost/Year:	**$77,600**

Chemical Costs:

Power Requirements

Power Requirement (kW-hr)	30,958	From electric spreadsheet tab
Annual	$2,941	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$77,600	$78,000
Annual Additional Operation Labor Cost:	$0	$0
Annual Chemical Cost:	$0	$0
Annual Power Requirements:	$2,941	$3,000
Total Annual O & M Cost @ Rated Capacity:	$80,541	$81,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		2/9/2021	11214118
Client		*Date*	*Job No.*
Electrical Cost Estimates - Solids Treatment and Disposal		JDG	
Subject		*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at design average flow and loading conditions

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average conditions	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Blend Tank Mixers	2	-	-	-	4.0	5.0	3.0	6.0	10	5	15,517	$1,474
Primary Digester Mixing	2	-	-	-	40.0	50.0	29.8	59.7	24	7	521,364	$49,530
Secondary Digester Mixing	1	-	-	-	40.0	50.0	29.8	29.8	2	7	21,724	$2,064
Sludge Pumping												
- Digester Feed Pumps	1	90	100	50%	4.6	10.0	3.4	3.4	10	5	8,825	$838
- Sludge Transfer Pumps	1	90	40	50%	1.8	10.0	1.4	1.4	10	5	3,530	$335
- Dewatering Feed Pumps	1	90	100	50%	4.6	10.0	3.4	3.4	10	5	8,825	$838
- Mech Thickener Feed Pumps	1	700	60	65%	16.3	20.0	12.2	12.2	10	5	31,680	$3,010
Sludge Grinders	4	-	-	-	4.0	5.0	3.0	11.9	10	5	31,034	$2,948
Sludge Heater Recirc Pump	2	240	20	70%	1.7	5.0	1.3	2.6	24	7	22,593	$2,146
Rotary Drum Thickeners	2	-	-	-	6.0	7.5	4.5	9.0	10	5	23,275	$2,211
Belt Filter Presses	2	-	-	-	8.0	10.0	6.0	11.9	10	5	31,034	$2,948
Dewatered Sludge Conveyor	1	NA			4.0	5.0	3.0	3.0	8	7	8,689	$825
Biogas Conditioning System	1	100 scfm	-	-	-	-	16.0	16.0	22.8	7	132,787	$12,615
Cogeneration System	1	100 kW					-100.0	-100.0	22.8	7	-829,920	-$78,842
Total Connected Power												
Annual Power Consumption											30,958	
Total Annual Power Cost												$2,941

OCDWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		2/9/2021	11214118
Client		Date	Job No.
Present Worth Analysis - Flow/Load Scenario 2		JDG	
Subject		Comp. By	Checked By

Annual Cost Component [1]	Alternative 1 Membrane Bioreactor (MBR)	Alternative 2 Conventional Activated Sludge & Biological Aerated Filter (BAF)	Alternative 3 High Purity Oxygen Activated Sludge & Moving Bed Biofilm Reactor (MBBR)	Alternative 4 Conventional Activated Sludge & Moving Bed Biofilm Reactor (MBBR)	Alternative 5 High Purity Oxygen Activated Sludge & Biological Aerated Filter (BAF)
Maintenance Costs [2]	$433,000	$338,000	$392,000	$287,000	$443,000
Additional Labor Costs [2]	$2,100,000	$2,100,000	$2,100,000	$2,100,000	$2,100,000
Chemical Costs [2]	-$72,000	-$89,000	-$73,000	-$89,000	-$73,000
Power Requirements [2]	$813,000	$390,000	$394,000	$435,000	$356,000
Dewatered Solids Disposal [2]	$575,000	$553,000	$568,000	$553,000	$568,000
Annual O&M Cost in Year 2020 Dollars [2]	$3,850,000	$3,290,000	$3,380,000	$3,290,000	$3,390,000
20-Year Present Worth O&M Cost [3]	$74,630,000	$63,780,000	$65,520,000	$63,780,000	$65,720,000
Total Project					
Capital Cost	$157,000,000	$198,000,000	$177,000,000	$166,000,000	$211,000,000
Total 20-Year Present Worth Cost	**$232,000,000**	**$262,000,000**	**$243,000,000**	**$230,000,000**	**$277,000,000**

Notes:

1. Costs are based on a plant design average flow of 12 mgd.
2. Costs estimated as 85% of the costs developed for Flow/Load Scenario 3. Details for Scenario 3 O&M costs are included with Scenario 3.
3. Based on a real discount rate of 0.3% per US Office of Management and Budget, Memo M-20-07.

OCDWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		2/9/2021	11214118
Client		Date	Job No.
Present Worth Analysis - Flow/Load Scenario 3		MMM/AEJ	JDG
Subject		Comp. By	Checked By

Annual Cost Component [1]	Alternative 1 Membrane Bioreactor (MBR)	Alternative 2 Conventional Activated Sludge & Biological Aerated Filter (BAF)	Alternative 3 High Purity Oxygen Activated Sludge & Moving Bed Biofilm Reactor (MBBR)	Alternative 4 Conventional Activated Sludge & Moving Bed Biofilm Reactor (MBBR)	Alternative 5 High Purity Oxygen Activated Sludge & Biological Aerated Filter (BAF)
Maintenance Costs	$509,000	$398,000	$461,000	$338,000	$521,000
Additional Labor Costs	$2,475,000	$2,475,000	$2,475,000	$2,475,000	$2,475,000
Chemical Costs	-$40,000	-$60,000	-$42,000	-$60,000	-$42,000
Power Requirements:	$956,000	$459,000	$464,000	$512,000	$419,000
Dewatered Solids Disposal:	$677,000	$650,000	$668,000	$650,000	$668,000
Annual O&M Cost in Year 2020 Dollars	$4,580,000	$3,930,000	$4,030,000	$3,920,000	$4,050,000
20-Year Present Worth O&M Cost [2]	$88,780,000	$76,180,000	$78,120,000	$75,990,000	$78,510,000
Total Project					
Capital Cost	$166,000,000	$212,000,000	$192,000,000	$180,000,000	$225,000,000
Total 20-Year Present Worth Cost	**$255,000,000**	**$288,000,000**	**$270,000,000**	**$256,000,000**	**$304,000,000**

Notes:

1. Costs are based on a plant design average flow of 16 mgd.
2. Based on a real discount rate of 0.3% per US Office of Management and Budget, Memo M-20-07.

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Flow/Load Scenario 3 - HPO & MBBR**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 16 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 2,475,000	*additional labor cost to operate Scenario 3*

Maint. Costs:

New Equipment:	
Influent Screens and Washing Presses	$631,000
Grit Removal	$940,000
Primary Clarifier Equipment	$150,000
HPO Aeration Equipment	$4,000,000
HPO Generation Equipment	$3,193,030
Secondary Clarifier Equipment	$1,500,000
Return and Waste Sludge Pumps	$360,000
MBBR System	$4,885,000
Discfilters	$2,500,000
Discfilter Backwash Pumping	$30,000
Chlorination/Dechnlorination Equipment	$100,000
Total Equipment Cost	$18,289,030
Maintenance Cost/Year:	**$365,781** 2% of equipment cost
Solids Process Maintenance Cost/Year:	**$94,800** 2% of equipment cost (***from Solids Treat. & Disposal tab***)
Total Maintenance Cost/Year:	**$460,581**

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	244,068	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$163,525	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	34,169	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$25,285	
Sodium Bisulfite Consumption (gal/yr)	8,678	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$2,864	
Liquid Oxygen Consumption (1,000 CF/yr)	4,328	from historical HPO operational data & evaluations
Liquid Oxygen Cost/Unit (per 1,000 CF):	$4.20	
Annual Chemical Cost:	$18,178	

Power Requirements

Power Requirement (kW-hr)	5,054,320	From electric spreadsheet tab
Power Requirement (kW-hr)	-87,466	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$471,851	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	18.82	Based on 23% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$667,999	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$460,581	$461,000
Annual Additional Operation Labor Cost:	$2,475,000	$2,475,000
Annual Chemical Cost:	-$41,698	-$42,000
Annual Power Cost:	$463,542	$464,000
Dewatered Solids Disposal Cost	$667,999	$668,000
Total Annual O & M Cost @ Rated Capacity:	$4,025,424	$4,025,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study	10/6/2020	11214118
Client	*Date*	*Job No.*
Electrical Cost Estimates - HPO & MBBR (Flow/Load Scenario 3)	MMM	AEJ
Subject	*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 16 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (16 mgd)	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	5			-	0.5	0.5	0.3	1.7	24	7	14,663	$1,393
HPO Aerators	1						66.0	66.0	24	7	576,576	$54,775
HPO Generation Equipment	1						92.0	92.0	24	7	803,712	$76,353
Secondary Clarifier Equipment	4			-	2.7	3.0	2.0	8.1	24	7	70,384	$6,686
Return Sludge Pumps	1	5,560	20	70%	40.2		30.0	30.0	24	7	261,699	$24,861
MBBR System	1										3,210,775	$305,024
Discfilter Drives	4				1.4	1.5	1.0	4.0	8	7	11,731	$1,114
Discfilter Backwash Pumping	1				27.0	30.0	20.1	20.1	8	7	58,654	$5,572
Total Connected Power												
Annual Power Consumption											5,054,320	
Total Annual Power Cost												$480,160

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Flow/Load Scenario 3 - HPO & BAF**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 16 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 2,475,000	*additional labor cost to operate Scenario 3*

Maint. Costs:

New Equipment:	
Influent Screens and Washing Presses	$631,000
Grit Removal	$940,000
Primary Clarifier Equipment	$150,000
HPO Aeration Equipment	$4,000,000
HPO Generation Equipment	$3,193,030
Secondary Clarifier Equipment	$1,500,000
Return and Waste Sludge Pumps	$360,000
Intermediate Pumping Station	$600,000
BAF System	$7,490,000
Discfilters	$2,275,000
BAF Backwash Pumping	$50,000
Chlorination/Dechnlorination Equipment	$100,000
Total Equipment Cost	$21,289,030
Maintenance Cost/Year:	**$425,781** 2% of equipment cost
Solids Process Maintenance Cost/Year:	**$94,800** 2% of equipment cost (***from Solids Treat. & Disposal tab***)
Total Maintenance Cost/Year:	**$520,581**

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	244,068	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*coagulant cost needed, add cost to "Assumptions" tab when received*
Annual Chemical Cost:	$163,525	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	34,169	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$25,285	
Sodium Bisulfite Consumption (gal/yr)	8,678	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$2,864	
Liquid Oxygen Consumption (1,000 CF/yr)	4,328	from historical HPO operational data & evaluations
Liquid Oxygen Cost/Unit (per 1,000 CF):	$4.20	
Annual Chemical Cost:	$18,178	

Power Requirements

Power Requirement (kW-hr)	4,502,565	From electric spreadsheet tab
Power Requirement (kW-hr)	-87,466	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$419,434	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	18.82	Based on 23% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$667,999	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$520,581	$521,000
Annual Additional Operation Labor Cost:	$2,475,000	$2,475,000
Annual Chemical Cost:	-$41,698	-$42,000
Annual Power Requirements:	$419,434	$419,000
Dewatered Solids Disposal Cost	$667,999	$668,000
Total Annual O & M Cost @ Rated Capacity:	$4,041,317	$4,041,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		10/6/2020	11214118
Client		*Date*	*Job No.*
Electrical Cost Estimates - HPO & BAF (Flow/Load Scenario 3)		MMM	AEJ
Subject		*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 16 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (16 mgd)	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	5			-	0.5	0.5	0.3	1.7	24	7	14,663	$1,393
HPO Aerators	1						66.0	66.0	24	7	576,576	$54,775
HPO Generation Equipment	1						92.0	92.0	24	7	803,712	$76,353
Secondary Clarifier Equipment	4			-	2.7	3.0	2.0	8.1	24	7	70,384	$6,686
Return Sludge Pumps	1	5,560	20	70%	40.2		30.0	30.0	24	7	261,699	$24,861
BAF Influent Pumping	1	11,120	40	70%	160.6		119.8	119.8	24	7	1,046,796	$99,446
BAF System	1										1,453,000	$138,035
BAF Backwash Pumping	1										169,000	$16,055
Discfilter Drives	4				1.4	1.5	1.0	4.0	8	7	11,731	$1,114
Discfilter Backwash Pumping	1				22.5	25.0	16.8	16.8	8	7	48,878	$4,643
Total Connected Power												
Annual Power Consumption											4,502,565	
Total Annual Power Cost												$427,744

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Flow/Load Scenario 3 - Conventional Activated Sludge & BAF**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 16 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 2,475,000	*additional labor cost to operate Scenario 3*

Maint. Costs:

New Equipment:		
Influent Screens and Washing Presses	$631,000	
Grit Removal	$940,000	
Primary Clarifier Equipment	$150,000	Based on Old Oak Orchard Project
Aeration Diffusers	$400,000	Based on quotes from other projects
Aeration Blowers	$400,000	Based on quotes from other projects
Aeration Control System	$250,000	
Secondary Clarifier Equipment	$1,500,000	
Return and Waste Sludge Pumps	$360,000	
Intermediate Pumping Station	$600,000	
BAF System	$7,490,000	
Discfilters	$2,275,000	
BAF Backwash Pumping	$50,000	
Chlorination/Dechnlorination Equipment	$100,000	
Total Equipment Cost	$15,146,000	
Maintenance Cost/Year:	**$302,920**	2% of equipment cost
Solids Process Maintenance Cost/Year:	**$94,800**	2% of equipment cost (***from Solids Treat. & Disposal tab***)
Total Maintenance Cost/Year:	**$397,720**	

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	244,068	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$163,525	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	34,169	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$25,285	
Sodium Bisulfite Consumption (gal/yr)	8,678	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$2,864	

Power Requirements

Power Requirement (kW-hr)	4,922,707	From electric spreadsheet tab
Power Requirement (kW-hr)	-87,466	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$459,348	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	18.32	Based on 22% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$650,031	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$397,720	$398,000
Annual Additional Operation Labor Cost:	$2,475,000	$2,475,000
Annual Chemical Cost:	-$59,875	-$60,000
Annual Power Requirements:	$459,348	$459,000
Dewatered Solids Disposal Cost	$650,031	$650,000
Total Annual O & M Cost @ Rated Capacity:	$3,922,224	$3,922,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		10/6/2020	11214118
Client		*Date*	*Job No.*
Electrical Cost Estimates - Conventional Activated Sludge & BAF (Flow/Load Scenario 3)		MMM	
Subject		*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 4.3 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (16 mgd)	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	5			-	0.5	0.5	0.3	1.7	24	7	14,663	$1,393
Aeration Blowers	1			60%	256.2		191.1	191.1	24	7	1,669,581	$158,610
Secondary Clarifier Equipment	4			-	2.7	3.0	2.0	8.1	24	7	70,384	$6,686
Return Sludge Pumps	1	8,340	20	70%	60.2		44.9	44.9	24	7	392,548	$37,292
BAF Influent Pumping	1	11,120	40	70%	160.6		119.8	119.8	24	7	1,046,796	$99,446
BAF System	1										1,453,000	$138,035
BAF Backwash Pumping	1										169,000	$16,055
Discfilter Drives	4				1.4	1.5	1.0	4.0	8	7	11,731	$1,114
Discfilter Backwash Pumping	1				22.5	25.0	16.8	16.8	8	7	48,878	$4,643
Total Connected Power												
Annual Power Consumption											4,922,707	
Total Annual Power Cost												$467,657

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Flow/Load Scenario 3 - Conventional Activated Sludge & MBBR**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 16 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 2,475,000	*additional labor cost to operate Scenario 3*

Maint. Costs:

New Equipment:	
Influent Screens and Washing Presses	$631,000
Grit Removal	$940,000
Primary Clarifier Equipment	$150,000
Aeration Diffusers	$400,000
Aeration Blowers	$400,000
Aeration Control System	$250,000
Secondary Clarifier Equipment	$1,500,000
Return and Waste Sludge Pumps	$360,000
MBBR System	$4,885,000
Discfilters	$2,500,000
Discfilter Backwash Pumping	$30,000
Chlorination/Dechnlorination Equipment	$100,000
Total Equipment Cost	$12,146,000
Maintenance Cost/Year:	**$242,920** 2% of equipment cost
Solids Process Maintenance Cost/Year:	**$94,800** 2% of equipment cost (***from Solids Treat. & Disposal tab***)
Total Maintenance Cost/Year:	**$337,720**

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	244,068	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$163,525	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	34,169	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$25,285	
Sodium Bisulfite Consumption (gal/yr)	8,678	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$2,864	

Power Requirements

Power Requirement (kW-hr)	5,474,462	From electric spreadsheet tab
Power Requirement (kW-hr)	-87,466	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$511,765	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	18.32	Based on 22% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$650,031	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$337,720	$338,000
Annual Additional Operation Labor Cost:	$2,475,000	$2,475,000
Annual Chemical Cost:	-$59,875	-$60,000
Annual Power Requirements:	$511,765	$512,000
Dewatered Solids Disposal Cost	$650,031	$650,000
Total Annual O & M Cost @ Rated Capacity:	$3,914,640	$3,915,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		10/6/2020	11214118
Client		*Date*	*Job No.*
Electrical Cost Estimates - Conventional Activated Sludge & MBBR (Flow/Load Scenario 3)		MMM	AEJ
Subject		*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 16 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (16 mgd)	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	5			-	0.5	0.5	0.3	1.7	24	7	14,663	$1,393
Aeration Blowers	1				256.2		191.1	191.1	24	7	1,669,581	$158,610
Secondary Clarifier Equipment	4			-	2.7	3.0	2.0	8.1	24	7	70,384	$6,686
Return Sludge Pumps	1	8,340	20	70%	60.2		44.9	44.9	24	7	392,548	$37,292
MBBR System	1										3,210,775	$305,024
Discfilter Drives	4				1.4	1.5	1.0	4.0	8	7	11,731	$1,114
Discfilter Backwash Pumping	1				27.0	30.0	20.1	20.1	8	7	58,654	$5,572
Total Connected Power												
Annual Power Consumption											5,474,462	
Total Annual Power Cost												$520,074

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	MMM
Location:	Clay, New York	**Checked By:**	AEJ
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Flow/Load Scenario 3 - Membrane Bioreactor (MBR)**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow of 16 mgd after upgrade is completed.

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ 2,475,000	*additional labor cost to operate Scenario 3*

Maint. Costs:

New Equipment:		
Influent Screens and Washing Presses	$631,000	
Grit Removal	$940,000	
Primary Clarifier Equipment	$150,000	
Aeration Diffusers		*by SUEZ*
Aeration Blowers		*by SUEZ*
Aeration Control System		*by SUEZ*
Return and Waste Sludge Pumps	$150,000	
Intermediate Pumping Station	$500,000	
Fine Screen	$737,500	
MBR System	$4,233,000	*SUEZ*
Chlorination/Dechnlorination Equipment	$100,000	
Total Equipment Cost	$7,441,500	
Maintenance Cost/Year:	**$148,830**	2% of equipment cost
Solids Process Maintenance Cost/Year:	**$94,800**	2% of equipment cost (***from Solids Treat. & Disposal tab***)
No. of membrane modules	**4,608**	
10-Year Membrane Replacement Cost	$5,300,000	
Annualized Membrane Replacement Cost	$265,000	
Total Maintenance Cost/Year:	**$508,630**	

Chemical Costs:

Coagulant Usage/Day (gal/day):		
Coagulant Usage/Yr (gal/yr):	244,068	scale 2019 total based on average daily flow
Chemical Cost/Unit:	$0.67	*per County Records*
Annual Chemical Cost:	$163,525	
Polymer Usage/Day (lbs/day):		
Polymer Usage/Yr (lbs/yr):	-215,000	polymer used as settling aid - will not be needed.
Chemical Cost/Unit:	$1.17	*per County Records*
Annual Chemical Cost:	-$251,550	
Sodium Hypochrloite Consumption (gal/yr)	34,169	scale 2019 total based on average daily flow
Sodium Hypochrloite Cost/Unit (per gal):	$0.74	*per County Records*
Annual Chemical Cost:	$25,285	
Sodium Bisulfite Consumption (gal/yr)	8,678	scale 2019 total based on average daily flow
Sodium Bisulfite Cost/Unit (per gal):	$0.33	*per County Records*
Annual Chemical Cost:	$2,864	
Citric Acid Consumption (gal/yr)	16,800	*16,800 for MBR per SUEZ*
Citric Acid Cost/Unit (per gal):	$1.20	
Annual Chemical Cost:	$20,160	

Power Requirements

Power Requirement (kW-hr)	10,152,126	From electric spreadsheet tab
Power Requirement (kW-hr)	-87,466	From electric spreadsheet tab (***from Solids Treat. & Disposal tab***)
Annual	$956,143	

Dewatered Solids Disposal Costs

Dewatered Solids (wet tons/day)	19.07	Based on 22% Dry Solids
Disposal Costs (per wet ton)	$97.23	From BSK WWTP cost (from County)
Annual	$676,772	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$508,630	$509,000
Annual Additional Operation Labor Cost:	$2,475,000	$2,475,000
Annual Chemical Cost:	-$39,715	-$40,000
Annual Power Requirements:	$956,143	$956,000
Dewatered Solids Disposal Cost	$676,772	$677,000
Total Annual O & M Cost @ Rated Capacity:	$4,576,829	$4,577,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		10/6/2020	11214118
Client		*Date*	*Job No.*
Electrical Cost Estimates - Membrane Bioreactor (Flow/Load Scenario 3)		MMM	
Subject		*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at a design average day flow of 16 mgd

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average flow (16 mgd)	Operating Capacity (gpm, per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Influent Screens and Washing Presses	1			-	9.5	10.5	7.0	7.0	16	7	41,057	$3,900
Grit Removal	1	200	30	65%	2.3		1.7	1.7	8	7	5,069	$482
Primary Clarifiers	5			-	0.5	0.5	0.3	1.7	24	7	14,663	$1,393
Conv HPO Tank Mixer/Aerators	12				13.5		10.1	121.2	24	7	1,058,771	$100,583
Aeration Blowers	1	2,500	5	70%	78.0		58.2	58.2	24	7	508,192	$48,278
Return Sludge Pumps	1	33,360	13	50%	210.8		157.3	157.3	24	7	1,373,919	$130,522
Intermediate Pumping Station	1	11,120	8	70%	30.1		22.5	22.5	24	7	196,274	$18,646
Fine Screen	1				4.5	5.0	3.4	3.4	24	7	29,327	$2,786
Backpulse Pumps	1			-		50.0	37.3	37.3	24	7	325,853	$30,956
Permeate Pumps	8			-							408,000	$38,760
Membrane Blowers	8			-							1,754,000	$166,630
Process Blowers	2			-							3,066,000	$291,270
Recirculation Pumps	8			-							1,365,000	$129,675
Air Compressors	1			-							6,000	$570
Total Connected Power												
Annual Power Consumption											10,152,126	
Total Annual Power Cost												$964,452

ENGINEER'S ESTIMATE OF PROBABLE OPERATIONS AND MAINTENANCE COST

Project:	Oak Orchard WPCP Facilities Plan & Feasibility Study	**Computed By:**	JDG
Location:	Clay, New York	**Checked By:**	
Owner:	Onondaga County DWEP	**Design Status of Est.:**	Conceptual
Description:	**Flow/Load Scenario 3 - Solids Treatment & Disposal**	**Project No:**	11214118

Objective: Calculate Annual O&M Cost at design average flow and loading conditions after upgrade

Assumptions: Electrical Cost per KWH: $0.095 Estimated Electrical Cost

Additional Labor Costs:

Operations Labor Costs:	$ -	*covered elsewhere*

Maint. Costs:

New Equipment:		
Blend Tank Mixers	$50,000	
Biogas Conditioning System	$410,000	
Cogeneration Units	$400,000	
Primary Digester Pumped Mixing	$400,000	
Secondary Digester Pumped Mixing	$200,000	
Gas Safety Equpment	$120,000	
Waste Gas Flare	$70,000	
Sludge Pumping/Grinding	$970,000	
Sludge Heating & Recirc	$600,000	
Rotary Drum Thickeners	$400,000	
Polymer Feed System	$50,000	
Belt Filter Press Units	$820,000	
Dewatered Sludge Conveyor System	$100,000	
Polymer Storage & Feed System	$150,000	
Total Equipment Cost	$4,740,000	
Maintenance Cost/Year:	**$94,800**	2% of equipment cost
Total Maintenance Cost/Year:	**$94,800**	

Chemical Costs:

Power Requirements

Power Requirement (kW-hr)	-87,466	From electric spreadsheet tab
Annual	-$8,309	

Annual Cost Summary:

		Rounded
Annual Maintenance Cost:	$94,800	$95,000
Annual Additional Operation Labor Cost:	$0	$0
Annual Chemical Cost:	$0	$0
Annual Power Requirements:	-$8,309	-$8,000
Total Annual O & M Cost @ Rated Capacity:	$86,491	$86,000

Qualifications:

These costs are not all inclusive and are to be used for comparison of alternatives only.

Onondaga County DWEP - Oak Orchard WPCP Facilities Plan & Feasibility Study		2/9/2021	11214118
Client		*Date*	*Job No.*
Electrical Cost Estimates - Solids Treatment and Disposal		JDG	
Subject		*Comp. By*	*Chkd By*

ELECTRICAL USAGE

Objective:
Determine the power usage at design average flow and loading conditions

Design Criteria:
Design criteria for piece of equipment is summarized in the table below.
Some power usage supplied by vendors as noted

For Pumps:
Pump horsepower determined with the following equation unless specified by a proposal:
HP = Q(gpm) x THD (ft) / 3956 x (eff%)

Power Cost ($/kW/hr) **$0.095** - Estimated

Equipment	Units Operating at average conditions	Operating Capacity (per unit)	Operating TDH or Discharge Pressure	Efficiency @ Operating Duty Point	Total Brake Horsepower	Total Nameplate Horsepower	Input Power per Unit Average Conditions (kW)	Total Input Power Average Conditions (kW)	Hours of Operation per Day	Days of Operation Per Week	Power Consumed per Year kW*hr	Power Cost per Year
Blend Tank Mixers	2	-	-	-	4.0	5.0	3.0	6.0	10	5	15,517	$1,474
Primary Digester Mixing	2	-	-	-	60.0	75.0	44.8	89.5	24	7	782,047	$74,294
Secondary Digester Mixing	1	-	-	-	60.0	75.0	44.8	44.8	2	7	32,585	$3,096
Sludge Pumping												
- Digester Feed Pumps	1	120	100	50%	6.1	10.0	4.5	4.5	10	5	11,767	$1,118
- Sludge Transfer Pumps	1	120	40	50%	2.4	10.0	1.8	1.8	10	5	4,707	$447
- Dewatering Feed Pumps	1	120	100	50%	6.1	10.0	4.5	4.5	10	5	11,767	$1,118
- Mech Thickener Feed Pumps	1	800	60	65%	18.7	20.0	13.9	13.9	10	5	36,206	$3,440
Sludge Grinders	4	-	-	-	4.0	5.0	3.0	11.9	10	5	31,034	$2,948
Sludge Heater Recirc Pump	2	300	20	70%	2.2	5.0	1.6	3.2	24	7	28,241	$2,683
Rotary Drum Thickeners	2	-	-	-	8.0	10.0	6.0	11.9	10	5	31,034	$2,948
Belt Filter Presses	2	-	-	-	8.0	10.0	6.0	11.9	10	5	31,034	$2,948
Dewatered Sludge Conveyor	1	NA			4.0	5.0	3.0	3.0	8	7	8,689	$825
Biogas Conditioning System	1	100 scfm	-	-	-	-	16.0	16.0	22.8	7	132,787	$12,615
Cogeneration System	1	180 kW					-150.0	-150.0	22.8	7	-1,244,880	-$118,264
Total Connected Power												
Annual Power Consumption											-87,466	
Total Annual Power Cost												-$8,309



about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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APPENDIX O

SEPTEMBER 2022 OAK ORCHARD WWTP FACILITY PLAN AND FEASIBILITY STUDY SITE SELECTION CONCEPTUAL TREATMENT APPROACH MEMORANDUM

Memorandum

September 20, 2022

To	Shannon Harty, PE, Commissioner Onondaga County Department of Water Environment Protection		
Copy to	David Snyder, PE, Deputy Commissioner, OCDWEP Jason Greene, PE, Project Manager, GHD		
From	Christopher Martin, PE, Project Director	**Tel**	+1 716 856 2142
Subject	Oak Orchard WWTP Facility Plan and Feasibility Study Site Selection Conceptual Treatment Approach	**Project no.**	11214118

1. Introduction

GHD Consulting Services Inc. (GHD) completed the final report for the Oak Orchard Wastewater Treatment Plant (WWTP) Facility Plan and Feasibility Study in February 2021 for the Onondaga County Department of Water Environment Protection (OCDWEP). The focus of this report was to develop treatment recommendations and associated life-cycle costs to support projected 20-year residential and commercial growth in the WWTP's service area, as well as acceptance of up to 10 million gallons per day (mgd) of industrial process wastewater generated from a potential high-technology manufacturer (plus corresponding supply chain or other industry flows) located at the White Pine Commercial Park (Site). The industrial process water from the White Pine site was conservatively assumed to be generated from a semi-conductor manufacturer. The loadings estimated in this report were based on a literature review, because water quality from the potential tenant(s) were not available at the time of the evaluation. Because this type of process wastewater can vary widely depending upon the type of semi-conductor and the manufacturer, a key recommendation included confirming the water quality, flow and schedule requirements, as well as the pretreatment being performed by the manufacturer.

OCDWEP requested that GHD provide additional unanticipated engineering services after completing the evaluation to support initial coordination with the New York State Department of Environmental Conservation (NYSDEC) and to conduct conceptual evaluations of wastewater treatment needs based on information provided by a potential semi-conductor manufacturer under the effort known as Project Yankee. This memorandum provides a summary of key results from these additional services.

2. Accelerated Schedule Assessment

Under this task, GHD reviewed the implementation schedule presented in the Facility Plan and Feasibility Study and identified opportunities to accelerate so that design and construction of the upgrades recommended in the report (see Figure 1) could be ready to accept wastewater flow from a high-technology manufacturer within three years using a Design-Bid-Build approach. This effort was summarized in a memorandum to Frank Mento of OCDWEP, dated April 7, 2021. The memorandum included key assumptions, preliminary tasks for consideration, and considerations for consultant team selection, design, regulatory engagement, bid/award,

and construction. The memorandum also included high-level considerations should OCDWEP choose to pursue an alternative delivery approach.

3. NYSDEC Coordination Efforts

Coordination with the NYSDEC was initiated to inform the agency of the efforts to secure a high-technology manufacturer at the White Pine site and advise them that this would impact the Oak Orchard WWTP, as well as to discuss the process for regulatory approvals and modifications to the plant's State Pollutant Discharge Elimination System (SPDES) Permit. This effort commenced with a presentation by OCDWEP and GHD to NYSDEC Region 7. The presentation provided an overview of the project including need, projected loadings, approach to discharge requirements, an outline of the alternative evaluations, the recommended alternative, and anticipated schedule. Based on this meeting, it was agreed that a follow-up meeting would be held with NYSDEC, including personnel within their central permitting division.

The follow-up meeting with NYSDEC included a detailed presentation of the Oak Orchard WWTP Facility Plan and Feasibility Study. In addition to presenting report details and recommendations, GHD provided information on the proposed membrane bioreactor (MBR) process and existing facilities, as well as a detailed preliminary implementation schedule that included regulatory review milestones and when an updated SPDES Permit would be needed. Key outcomes from that meeting were summarized in an email from Monica Moss (NYSDEC) dated June 17, 2021, and included the following:

– A recommendation that OCDWEP initiate discussions with the United States Environmental Protection Agency (USEPA).
– NYSDEC's concerns with high-technology process wastewater based on experience at Saratoga County, including consideration for separation of process and sanitary waste streams.
– The process required to modify the SPDES Permit.
– The NYSDEC would be willing to provide input on potential effluent limits (non-binding) if OCDWEP can provide information of receiving stream dilution ratios based on CORMIX modeling.
– The NYSDEC will work with OCDWEP to facilitate review schedules to extent allowable by availability of personnel.
– Incorporation of State Environmental Quality Review (SEQR) and air permitting requirements into the project.

Pursuant to the meetings with the NYSDEC, OCDWEP commissioned GHD to complete a CORMIX modeling effort to estimate the future dilution ratio of the discharges from the Oak Orchard WWTP into the Oneida River. CORMIX is a computer simulation package for the analysis, prediction, and design of aqueous toxic or conventional pollutant discharges into diverse waterbodies.

The CORMIX Modeling Report (February 2022) presented the methodology and results for an assimilative capacity analysis of Oak Orchard WWTP effluent discharges into the Oneida River based on updated 10-year, seven-day average (7Q10) flow rates and the proposed maximum monthly discharge of 21.1 mgd. This flow was projected in the Facility Plan and Feasibility Study to accommodate 10 mgd of high-technology industry wastewater and associated supply chain industry, along with future residential and commercial development within the Oak Orchard WWTP service area. The NYSDEC was consulted during development of the model to verify the assumptions made.

The analysis included a comparison of ideal mixing ratios and mixing ratios calculated by CORMIX. The evaluated maximum monthly flow (21.1 mgd) is approximately double the existing rated plant flow capacity (10 mgd). The ideal mixing ratio for the proposed discharge was estimated to be approximately 8:1 to 10:1, depending upon the season (winter or summer). For reference, the existing SPDES Permit is based on a dilution ratio of 10:1. The CORMIX analysis indicated that the actual mixing ratio for a discharge of 21.1 mgd would be approximately 2:1 to 3:1. In addition, the mixing was found to be relatively poor, and the discharge plume would interact with the near edge of the river.

The outfall design was reviewed as part of the evaluation. It was determined that the diffuser ports are relatively large, which results in a discharge velocity below 2 ft/s, which negatively impacts dilution. Modifications to the outfall to reduce the number of diffuser ports by half and ensuring the ports are oriented horizontally would increase the mixing ratios to approximately 8:1 to 14:1, which are similar to the ideal mixing ratios. These changes would result in the effluent mixing across the width of the river with minimal edge interaction. A key recommendation from the CORMIX report was for OCDWEP to perform an outfall inspection to verify diffuser layout, size, and orientation.

A third meeting was initiated with the NYSDEC to present the results of the CORMIX evaluation and discuss potential preliminary effluent limits for an expanded treatment plant. While the NYSDEC appeared to agree with assumptions made for the model, they indicated a need to verify the outfall details before accepting the model results and confirming dilution ratios. Further, the NYSDEC indicated they would defer to the conservative for unknown/unconfirmed items. The NYSDEC provided guidance on calculating preliminary limits for the effluent once more information is known on the flow and water quality parameters.

It is critical to note that all discussions and correspondence with the NYSDEC to date have involved only the recommendations from the original Facility Plan and Feasibility Study. No discussion of the flows and water quality information from Project Yankee has occurred.

4. Project Yankee Assistance

4.1 Initial High-Level Analysis

In August 2021, OCDWEP requested that GHD conduct a high-level evaluation of the potential feasibility of the Oak Orchard WWTP handling up to a 29.3 mgd of industrial wastewater flow from the White Pine site; thereby, resulting in a total plant capacity of 39.3 mgd. No water quality data were available at the time. The evaluation considered four scenarios estimating the level of treatment that would need to be achieved to discharge treated effluent at two different outfall locations (current – Oneida River, alternative – Oswego River), with a focus on carbonaceous biochemical oxygen demand (cBOD), ultimate oxygen demand (UOD), ammonia, and Total Kjeldahl Nitrogen (TKN). It was specifically noted that the analysis did not address potential concerns associated with total dissolved solids (TDS); GHD indicated there would likely be a threshold flow rate under which TDS would need to be addressed, thus requiring consideration of advanced treatment such as reverse osmosis (RO).

Based on initial information furnished by the industry, flows were projected to increase steadily from 0.3 mgd in 2023 to 29.3 mgd in 2031. It was noted that projected flow and loading requirements over this length of time can change dramatically before 100 percent industry build-out is achieved due to economic conditions, demand, ownership direction, etc. However, Onondaga County would need to make a commitment to construct the infrastructure to support this industry. Subsequent changes in flow needs and loads may create challenges to operate the Oak Orchard WWTP and maintain compliance based on projections made several years prior. Therefore, a phased approach was recommended to provide the time OCDWEP needs to design and construct treatment facilities, as well as provide the flexibility to adapt as flow and load projections change. This phased approach is expected to entail use of the existing plant, expanding the existing plant, and construction of a new plant.

At this time, GHD assumed the existing WWTP would be able to handle the industry's 2023/24 flows (1.8 mgd), and possibly some of the 2025 industry flow (4.9 mgd). However, a headworks analysis is required to verify treatment capability. It was noted that the industry's water quality would be substantially different than typical municipal wastewater. Adding too much industrial flow would negatively impact plant operation. The following conceptual three-phase approach was developed based on the high-level analysis:

– Phase 1: The existing plant would receive 2023/24 industry flows (1.8 mgd) and possibly some 2025 flows.
– Phase 2: Expand the existing Oak Orchard WWTP to a rated capacity of 22.5 mgd to handle industry flows until 2027. This was based on the assumption that a 50:50 split of municipal and industrial flow could be handled by the upgraded WWTP. It was recommended that TDS and other parameters be evaluated once water quality data were available to confirm a 50:50 split is feasible.
– Phase 3: Conservatively assumed that TDS would need to be addressed for the remaining industrial flows. This would be addressed using a RO plant to remove the dissolved solids prior to discharge. The resulting brine from the RO process would be treated using a zero liquid discharge (ZLD) process. The brine disposal option of deep well injection was mentioned but would require extensive evaluation of area geology and NYSDEC approval.

4.2 Second Project Yankee Analysis

OCDWEP received preliminary water quality information and updated flow information from the potential industry in October 2021, which allowed for a refined analysis of treatment needs for Project Yankee, including the development of capital and operating and maintenance (O&M) costs. Another key element introduced at this time was the amount of potable water that could be delivered to the White Pine site by the Onondaga County Water Authority (OCWA). At full build-out, the manufacturer presented a need for 24.4 mgd, while OCWA indicated that between 9 and 12 mgd of potable water could be provided without significant capital improvement to the water treatment plant and transmission system. Because RO was already being considered as part of the Oak Orchard WWTP upgrades, it was suggested that RO effluent could be pumped back to the White Pine site as reclaimed water to supplement the potable water supply.

The refined analysis led to the development of a two-phased conceptual approach for addressing industrial flows from Project Yankee, as well as projected growth for the Oak Orchard WWTP.

– Phase 1: Shown schematically in Figure 2, Phase 1 would handle flows through 2026 and involve upgrading the existing treatment plant to 14.1 mgd. Improvements would involve expanding the headworks, adding a new primary clarifier, a high purity oxygen train and two new rectangular clarifiers, constructing disk filters, upgrading disinfection, and installing solids handling facilities (anaerobic digesters, dewatering and biogas utilization).
– Phase 2 (Full Build-out): Shown schematically in Figure 3, the separate domestic (3.0 mgd) and process (14.9 mgd) flows would be conveyed to the Oak Orchard WWTP. The domestic wastewater would be treated by the municipal plant upgraded under Phase 1. The industrial process wastewater would be treated by a new plant specifically designed to address industrial flows and generate up to 15.4 mgd of reclaimed water. The purified reclaimed water would be pumped back to the White Pine site and be combined with approximately 9 mgd of potable water supplied by OCWA to meet the process flow needs of Project Yankee. An outlet to the Oneida River from the industrial plant would also be provided in the event that not all the effluent is required by the manufacturer. It is noteworthy that the industrial treatment system would be designed to be constructed in four separate modules (3.8 mgd/module) to match the growth at the White Pine site. This allows optimization of expenditures until plant capacity is needed.

Figure 4 shows a schematic of the combined operation of the municipal and industrial plants, and Figure 5 schematically shows the anticipated elements and chemical requirements for the industrial plant. Preliminary process selection, sizing, and O&M requirements were estimated based on an EVS:Water software simulation using the data provided by the industry. Conceptual capital and O&M cost investments from 2025 through 2034 for the municipal plant upgrades and new industrial plant are summarized in Table 1. The estimated chemical use and solids generation for the two plants are summarized in Tables 2 and 3, respectively. Key assumptions in development of these conceptual costs include:

– Cost in 2020 dollars – no escalation for inflation has been made.
– Estimate +/- 40 percent accuracy.
– O&M costs from initial start-up to full build-out increase linearly with RO plant capacity.
– 93 percent of the wastewater flow from the industry goes to the industrial plant. The remaining goes to the municipal plant.
– Treatment system based on information provided to date to meet anticipated SPDES Permit limits and industry-stated reclaimed water quality objectives.
– A preliminary model was developed to assess Industrial WWTP and ZLD performance potential, chemical requirements, and power demand.
– No assessment was made to determine if additional pre-treatment by the industry would result in a lower net cost to Project Yankee. We recommend a collaborative approach with the industry to determine the most cost-effective balance of pre-treatment and industrial WWTP process scheme.
– Costs conservatively assume that deep well discharge is not permittable; thus, requiring ZLD of RO brine.
– There are key wastewater quality parameters and NYSDEC-provided effluent limits needed to provide a more complete analysis and conceptual cost estimate.
– Reducing the influent concentration of ammonia, silica, IPA, TDS, and sulfates would result in lower capital and operating costs.
– The Municipal WWTP will have an average daily flow of 10 mgd.
– UV will be used in place of chlorination/dechlorination.
– Information developed in the Oak Orchard WWTP Facility Plan and Feasibility Study was used to develop O&M costs for labor, maintenance, as well as the Municipal WWTP expansion, and the Industrial WWTP MBR, lime softening and solids treatment systems.

4.3 Third Project Yankee Analysis

OCDWEP requested a review of the results from the Second Project Yankee Analysis to identify opportunities to reduce capital and O&M costs. GHD recommended establishing a pre-treatment limit of 15 milligrams per liter (mg/L) for Silica and 20 mg/L for Calcium, which could result in significant cost reductions. Silica impacts RO recovery and typically requires a lime softening system (at pH 11+) to remove the contaminant. Establishing a pre-treatment limit for silica would eliminate the need to provide lime softening, while increasing RO recovery. Calcium can lead to scaling of the MBR, UF and RO processes, and also would typically need lime softening to remove. Figure 6 shows an updated schematic of the combined operation of the municipal and industrial plants, and Figure 7 schematically shows the anticipated elements and chemical requirements for the industrial plant with pre-treatment requirements for Silica and Calcium. Table 4 summarizes the updated capital and O&M costs with pre-treatment limits. The estimated chemical use and solids generation for the two plants with pre-treatment limits are summarized on Tables 5 and 6, respectively. Noted changes from the Second Analysis include the following:

– Lime softening is eliminated; however, chemical precipitation still is anticipated.
– RO recovery would go up to about 90 percent.
– A smaller ZLD system – this reduces the conceptual cost by about $160 million.

– Chemical use, power use, and solids handling (associated with lime softening) decrease significantly. Note the solids from the ZLD does not go down so disposal costs for this process do not change.

The proposed Silica and Calcium limits were submitted to the industry for consideration. Other water quality parameters also of potential concern include organics such as Azoles, sulfate and isopropyl alcohol (IPA). The proposed concentrations of these constituents should be considered when reviewing treatment needs and if pre-treatment would be beneficial. GHD also provided a list of inorganic constituents that would be useful to fully evaluate treatment needs.

4.4 Implementation Considerations

As presented in the Facility Plan and Feasibility Study, further development of the treatment plant modifications involves establishing the timing of development to determine when process flows will begin to the Oak Orchard WWTP and how they will increase as manufacturing expands. This will allow OCDWEP to develop a timeline for encumbering funding for infrastructure needs and requests for proposals for engineering and other services. In addition, knowledge of the industry's pre-treatment and influent water quality characteristics are critical to design of the Oak Orchard WWTP upgrades. Additional considerations for implementing the treatment plant upgrades may include:

– Evaluating opportunities for using reclaimed water for purposes other than semi-conductor process water.
– Establishing regional infrastructure impacts from the industrial development at the White Pine site, and how that may influence WWTP expansion.
– Assessing how increased chemical use at the Oak Orchard WWTP may impact traffic due to chemical deliveries.
– Confirming the most appropriate method for treating and disposing of RO brine while meeting regulatory requirements.
– Determining the needed electrical power requirements for the WWTP upgrades, including providing redundancy needs.
– Determining modifications to the Oak Orchard WWTP Outfall in the Oneida River to optimize dilution ratio of plant discharges.
– Coordinating plant discharge requirements with the NYSDEC to obtain a revised SPDES Permit.

Tables

Table 1
Oak Orchard WWTP
Summary of Estimated O&M and Capital Costs to Treat Semi-Conductor Wastewater - No Pretreatment

Municiapal WWTP Expansion to 14.1 mgd										
	Year									
Annual Cost Component	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**
Maintenance Costs	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000
Additional Labor Costs	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000
Chemical Costs	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000
Power Requirements:	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000
Dewatered Solids Disposal:	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000
Annual O&M Cost in Year 2020 Dollars	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000
Approximated Additional Electrical Demand (kW)	250	250	250	250	250	250	250	250	250	250
Capital Cost Expenditure	$145,000,000									

Industrial WWTP (15.4 mgd)										
	Year									
Annual Cost Component (Average Flow)	**2025**	**2026 (3.8 mgd)**	**2027 (5.9 mgd)**	**2028 (7.6 mgd)**	**2029 (8.6 mgd)**	**2030 (10.4 mgd)**	**2031 (11.4 mgd)**	**2032 (13.2 mgd)**	**2033 (14.2 mgd)**	**2034 (15.4 mgd)**
Maintenance Costs		$380,000	$590,000	$750,000	$850,000	$1,000,000	$1,130,000	$1,310,000	$1,410,000	$1,530,000
Additional Labor Costs		$620,000	$620,000	$620,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000
Chemical Costs		$4,970,000	$7,690,000	$9,980,000	$11,400,000	$13,620,000	$15,030,000	$17,360,000	$18,760,000	$20,200,000
Power Requirements:		$1,000,000	$1,550,000	$2,000,000	$2,250,000	$2,720,000	$2,990,000	$3,460,000	$3,720,000	$4,000,000
Dewatered Solids Disposal:		$1,950,000	$3,000,000	$3,900,000	$4,400,000	$5,300,000	$5,900,000	$6,800,000	$7,300,000	$7,900,000
Annual O&M Cost in Year 2020 Dollars		$8,920,000	$13,450,000	$17,250,000	$20,140,000	$23,880,000	$26,290,000	$30,170,000	$32,430,000	$34,870,000
Approximated Additional Electrical Demand (kW)		1,275	2,100	2,250	3,000	3,700	4,070	4,680	5,060	5,500
Capital Cost Expenditure		$143,000,000			$28,000,000		$79,000,000			$28,000,000

Zero Liquid Discharge System (for 15.4 mgd RO System)										
	Year									
Annual Cost Component (Average RO Flow)	**2025**	**2026 (3.8 mgd)**	**2027 (5.9 mgd)**	**2028 (7.6 mgd)**	**2029 (8.6 mgd)**	**2030 (10.4 mgd)**	**2031 (11.4 mgd)**	**2032 (13.2 mgd)**	**2033 (14.2 mgd)**	**2034 (15.4 mgd)**
Maintenance Costs		$210,000	$320,000	$410,000	$470,000	$570,000	$620,000	$720,000	$770,000	$840,000
Additional Labor Costs		$620,000	$620,000	$620,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000
Chemical Costs		$1,840,000	$2,770,000	$3,560,000	$4,130,000	$4,940,000	$5,400,000	$6,310,000	$6,780,000	$7,350,000
Power Requirements:		$3,200,000	$4,900,000	$6,300,000	$7,200,000	$8,700,000	$9,500,000	$11,000,000	$11,800,000	$12,900,000
Dewatered Solids Disposal:		$2,250,000	$3,500,000	$4,500,000	$5,100,000	$6,200,000	$6,800,000	$7,800,000	$8,400,000	$9,200,000
Annual O&M Cost in Year 2020 Dollars		$8,120,000	$12,110,000	$15,390,000	$18,140,000	$21,650,000	$23,560,000	$27,070,000	$28,990,000	$31,530,000
Approximated Additional Electrical Demand (kW)		4,075	6,200	8,150	8,970	10,900	12,200	13,900	15,000	16,300
Capital Cost Expenditure		$144,000,000			$96,000,000		$144,000,000			$96,000,000

Total WWTP Upgrades										
	Year									
Annual Cost Component (Average RO Flow)	**2025**	**2026 (3.8 mgd)**	**2027 (5.9 mgd)**	**2028 (7.6 mgd)**	**2029 (8.6 mgd)**	**2030 (10.4 mgd)**	**2031 (11.4 mgd)**	**2032 (13.2 mgd)**	**2033 (14.2 mgd)**	**2034 (15.4 mgd)**
Municipal WWTP	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000
Industrial WWTP	$0	$8,920,000	$13,450,000	$17,250,000	$20,140,000	$23,880,000	$26,290,000	$30,170,000	$32,430,000	$34,870,000
Zero Liquid Discharge	$0	$8,120,000	$12,110,000	$15,390,000	$18,140,000	$21,650,000	$23,560,000	$27,070,000	$28,990,000	$31,530,000
Annual O&M Cost in Year 2020 Dollars		$18,310,000	$26,830,000	$33,910,000	$39,550,000	$46,800,000	$51,120,000	$58,510,000	$62,690,000	$67,670,000
Approximated Additional Electrical Demand (kW)	250	5,600	8,550	10,650	12,220	14,850	16,520	18,830	20,310	22,050
Capital Cost Expenditure	$145,000,000	$287,000,000	$0	$0	$124,000,000	$0	$223,000,000	$0	$0	$124,000,000

Table 2
Oak Orchard WWTP
Summary of Estimated Chemical Use to Treat Semi-Conductor Wastewater - No Pretreatment

Industrial WWTP (based on lime softening to treat silica followed by reverse osmosis)								
		Chemical						
Year		Sodium Hydroxide	Magnesium Hydroxide	Soda Ash	Sulfuric Acid	Silica Inhibitor	Carbonate Inhibitor	Total Estimated Chemical Cost
2026	Daily Use (lbs/day)	45,400	21,100	7,900	3,700	158	158	
	Daily Use (gal/day)	3,600	2,300		240	8	8	
	Annual Estimated Cost	$3,100,000	$1,040,000	$390,000	$180,000	$130,000	$130,000	$4,970,000
2027	Daily Use (lbs/day)	70,600	32,800	12,300	5,700	246	246	
	Daily Use (gal/day)	5,600	3,600		370	10	10	
	Annual Estimated Cost	$4,800,000	$1,600,000	$610,000	$280,000	$200,000	$200,000	$7,690,000
2028	Daily Use (lbs/day)	90,900	42,300	15,900	7,400	317	317	
	Daily Use (gal/day)	7,200	4,600		480	12	12	
	Annual Estimated Cost	$6,200,000	$2,100,000	$790,000	$370,000	$260,000	$260,000	$9,980,000
2029	Daily Use (lbs/day)	103,000	47,800	18,000	8,300	359	359	
	Daily Use (gal/day)	8,100	5,200		550	14	14	
	Annual Estimated Cost	$7,100,000	$2,400,000	$890,000	$410,000	$300,000	$300,000	$11,400,000
2030	Daily Use (lbs/day)	124,000	57,800	21,700	10,100	434	434	
	Daily Use (gal/day)	9,800	6,300		660	17	17	
	Annual Estimated Cost	$8,500,000	$2,800,000	$1,100,000	$500,000	$360,000	$360,000	$13,620,000
2031	Daily Use (lbs/day)	136,000	63,000	24,000	11,000	475	475	
	Daily Use (gal/day)	10,800	11,600		720	19	19	
	Annual Estimated Cost	$9,400,000	$3,100,000	$1,200,000	$550,000	$390,000	$390,000	$15,030,000
2032	Daily Use (lbs/day)	158,000	73,000	28,000	12,800	550	550	
	Daily Use (gal/day)	12,500	8,000	1,300	840	21	21	
	Annual Estimated Cost	$10,800,000	$3,600,000	$1,400,000	$640,000	$460,000	$460,000	$17,360,000
2033	Daily Use (lbs/day)	170,000	79,000	30,000	13,800	592	592	
	Daily Use (gal/day)	13,400	8,600		900	23	23	
	Annual Estimated Cost	$11,700,000	$3,900,000	$1,500,000	$680,000	$490,000	$490,000	$18,760,000
2034	Daily Use (lbs/day)	184,000	86,000	32,000	15,000	642	642	
	Daily Use (gal/day)	14,500	9,300		980	25	25	
	Annual Estimated Cost	$12,600,000	$4,200,000	$1,600,000	$740,000	$530,000	$530,000	$20,200,000

Zero Liquid Discharge System (based on treating RO brine to permit landfill disposal)								
		Chemical						
Year		Sulfuric Acid	Sodium Hydroxide	Calcium Sulfate				Total Estimated Chemical Cost
2026	Daily Use (lbs/day)	2,900	1,300	32,000				
	Daily Use (gal/day)	190	100	1,300				
	Annual Estimated Cost	$150,000	$90,000	$1,600,000				$1,840,000
2027	Daily Use (lbs/day)	4,600	2,000	49,000				
	Daily Use (gal/day)	300	160	2,000				
	Annual Estimated Cost	$230,000	$140,000	$2,400,000				$2,770,000
2028	Daily Use (lbs/day)	5,900	2,500	63,000				
	Daily Use (gal/day)	390	200	2,600				
	Annual Estimated Cost	$290,000	$170,000	$3,100,000				$3,560,000
2029	Daily Use (lbs/day)	6,700	2,900	71,000				
	Daily Use (gal/day)	440	230	2,900				
	Annual Estimated Cost	$330,000	$200,000	$3,600,000				$4,130,000
2030	Daily Use (lbs/day)	8,100	3,500	87,000				
	Daily Use (gal/day)	530	270	3,500				
	Annual Estimated Cost	$400,000	$240,000	$4,300,000				$4,940,000
2031	Daily Use (lbs/day)	8,700	3,800	95,000				
	Daily Use (gal/day)	580	300	3,900				
	Annual Estimated Cost	$440,000	$260,000	$4,700,000				$5,400,000
2032	Daily Use (lbs/day)	10,300	4,400	110,000				
	Daily Use (gal/day)	670	350	4,600				
	Annual Estimated Cost	$510,000	$300,000	$5,500,000				$6,310,000
2033	Daily Use (lbs/day)	11,000	4,700	118,000				
	Daily Use (gal/day)	720	370	4,800				
	Annual Estimated Cost	$550,000	$330,000	$5,900,000				$6,780,000
2034	Daily Use (lbs/day)	12,100	5,200	129,000				
	Daily Use (gal/day)	790	410	5,200				
	Annual Estimated Cost	$600,000	$350,000	$6,400,000				$7,350,000

Table 3
Oak Orchard WWTP
Summary of Estimated Solids Disposal for Treatment Semi-Conductor Wastewater - No Pre-Treatment

Year		Muncipal WWTP	Industrial WWTP	Zero Liquid Discharge
2026	Dewatered Solids (ton/day)	12	56	65
	Annual Estimated Cost	$420,000	$1,950,000	$2,250,000
2027	Dewatered Solids (ton/day)	12	85	99
	Annual Estimated Cost	$420,000	$3,000,000	$3,500,000
2028	Dewatered Solids (ton/day)	12	109	127
	Annual Estimated Cost	$420,000	$3,900,000	$4,500,000
2029	Dewatered Solids (ton/day)	12	125	143
	Annual Estimated Cost	$420,000	$4,400,000	$5,100,000
2030	Dewatered Solids (ton/day)	12	152	174
	Annual Estimated Cost	$420,000	$5,300,000	$6,200,000
2031	Dewatered Solids (ton/day)	12	165	192
	Annual Estimated Cost	$420,000	$5,900,000	$6,800,000
2032	Dewatered Solids (ton/day)	12	192	221
	Annual Estimated Cost	$420,000	$6,800,000	$7,800,000
2033	Dewatered Solids (ton/day)	12	205	239
	Annual Estimated Cost	$420,000	$7,300,000	$8,400,000
2034	Dewatered Solids (ton/day)	12	223	260
	Annual Estimated Cost	$420,000	$7,900,000	$9,200,000

Table 4
Oak Orchard WWTP
Summary of Estimated O&M and Capital Costs to Treat Semi-Conductor Wastewater
Pre-Treatment Limits for Silica = 15 mg/L and Calcium = 20 mg/L

Municiapal WWTP Expansion to 14.1 mgd										
	Year									
Annual Cost Component	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**
Maintenance Costs	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000
Additional Labor Costs	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000	$510,000
Chemical Costs	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000	-$130,000
Power Requirements:	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000	$190,000
Dewatered Solids Disposal:	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000
Annual O&M Cost in Year 2020 Dollars	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000
Approximated Additional Electrical Demand (kW)	250	250	250	250	250	250	250	250	250	250
Capital Cost Expenditure	$145,000,000									

Industrial WWTP (15.4 mgd)										
	Year									
Annual Cost Component (Average Flow)	**2025**	**2026 (3.8 mgd)**	**2027 (5.9 mgd)**	**2028 (7.6 mgd)**	**2029 (8.6 mgd)**	**2030 (10.4 mgd)**	**2031 (11.4 mgd)**	**2032 (13.2 mgd)**	**2033 (14.2 mgd)**	**2034 (15.4 mgd)**
Maintenance Costs		$380,000	$620,000	$790,000	$900,000	$1,090,000	$1,190,000	$1,380,000	$1,480,000	$1,610,000
Additional Labor Costs		$620,000	$620,000	$620,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000
Chemical Costs		$1,430,000	$2,170,000	$2,780,000	$3,120,000	$3,740,000	$4,110,000	$4,720,000	$5,090,000	$5,500,000
Power Requirements:		$1,180,000	$1,840,000	$2,360,000	$2,680,000	$3,240,000	$3,550,000	$4,110,000	$4,420,000	$4,790,000
Dewatered Solids Disposal:		$240,000	$370,000	$470,000	$540,000	$650,000	$710,000	$820,000	$880,000	$960,000
Annual O&M Cost in Year 2020 Dollars		$3,850,000	$5,620,000	$7,020,000	$8,480,000	$9,960,000	$10,800,000	$12,270,000	$13,110,000	$14,100,000
Approximated Additional Electrical Demand (kW)		1,625	2,500	3,250	3,600	4,400	4,800	5,600	5,060	6,000
Capital Cost Expenditure		$142,000,000			$30,000,000		$80,000,000			$30,000,000

Zero Liquid Discharge System (for 15.4 mgd RO System)										
	Year									
Annual Cost Component (Average RO Flow)	**2025**	**2026 (3.8 mgd)**	**2027 (5.9 mgd)**	**2028 (7.6 mgd)**	**2029 (8.6 mgd)**	**2030 (10.4 mgd)**	**2031 (11.4 mgd)**	**2032 (13.2 mgd)**	**2033 (14.2 mgd)**	**2034 (15.4 mgd)**
Maintenance Costs		$140,000	$220,000	$290,000	$330,000	$400,000	$430,000	$500,000	$540,000	$590,000
Additional Labor Costs		$620,000	$620,000	$620,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000	$1,240,000
Chemical Costs		$2,180,000	$3,370,000	$4,350,000	$4,930,000	$5,960,000	$6,530,000	$7,550,000	$8,130,000	$8,870,000
Power Requirements:		$1,580,000	$2,460,000	$3,170,000	$3,590,000	$4,340,000	$4,750,000	$5,510,000	$5,920,000	$6,460,000
Dewatered Solids Disposal:		$2,250,000	$3,500,000	$4,500,000	$5,100,000	$6,200,000	$6,800,000	$7,800,000	$8,400,000	$9,200,000
Annual O&M Cost in Year 2020 Dollars		$6,770,000	$10,170,000	$12,930,000	$15,190,000	$18,140,000	$19,750,000	$22,600,000	$24,230,000	$26,360,000
Approximated Additional Electrical Demand (kW)		2,050	3,100	4,100	4,500	5,450	6,100	6,950	7,500	8,150
Capital Cost Expenditure		$96,000,000			$64,000,000		$96,000,000			$64,000,000

Total WWTP Upgrades										
	Year									
Annual Cost Component (Average RO Flow)	**2025**	**2026 (3.8 mgd)**	**2027 (5.9 mgd)**	**2028 (7.6 mgd)**	**2029 (8.6 mgd)**	**2030 (10.4 mgd)**	**2031 (11.4 mgd)**	**2032 (13.2 mgd)**	**2033 (14.2 mgd)**	**2034 (15.4 mgd)**
Municipal WWTP	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000	$1,270,000
Industrial WWTP	$0	$3,850,000	$5,620,000	$7,020,000	$8,480,000	$9,960,000	$10,800,000	$12,270,000	$13,110,000	$14,100,000
Zero Liquid Discharge	$0	$6,770,000	$10,170,000	$12,930,000	$15,190,000	$18,140,000	$19,750,000	$22,600,000	$24,230,000	$26,360,000
Annual O&M Cost in Year 2020 Dollars		$11,890,000	$17,060,000	$21,220,000	$24,940,000	$29,370,000	$31,820,000	$36,140,000	$38,610,000	$41,730,000
Approximated Additional Electrical Demand (kW)	250	3,925	5,850	7,600	8,350	10,100	11,150	12,800	12,810	14,400
Capital Cost Expenditure	$145,000,000	$238,000,000	$0	$0	$94,000,000	$0	$176,000,000	$0	$0	$94,000,000

Table 5
Oak Orchard WWTP
Summary of Estimated Chemical Use to Treat Semi-Conductor Wastewater
Pre-Treatment Limits for Silica = 15 mg/L and Calcium = 20 mg/L

Industrial WWTP (based on lime softening to treat silica followed by reverse osmosis)

Year		Chemical						Total Estimated Chemical Cost
		Sodium Hydroxide	Ferric Chloride	Polymer	Citric Acid	Silica Inhibitor	Carbonate Inhibitor	
2026	Daily Use (lbs/day)	3,000	3,000	300	NA	100	100	
	Daily Use (gal/day)	300	300	30	NA	2	2	
	Annual Estimated Cost	$290,000	$800,000	$140,000	$100,000	$50,000	$50,000	$1,430,000
2027	Daily Use (lbs/day)	5,000	5,000	500	NA	100	100	
	Daily Use (gal/day)	400	400	50	NA	4	4	
	Annual Estimated Cost	$450,000	$1,250,000	$210,000	$100,000	$80,000	$80,000	$2,170,000
2028	Daily Use (lbs/day)	6,000	7,000	600	NA	100	100	
	Daily Use (gal/day)	500	600	70	NA	5	5	
	Annual Estimated Cost	$580,000	$1,610,000	$270,000	$100,000	$110,000	$110,000	$2,780,000
2029	Daily Use (lbs/day)	7,000	8,000	700	NA	100	100	
	Daily Use (gal/day)	600	600	80	NA	6	6	
	Annual Estimated Cost	$650,000	$1,820,000	$310,000	$100,000	$120,000	$120,000	$3,120,000
2030	Daily Use (lbs/day)	9,000	9,000	900	NA	200	200	
	Daily Use (gal/day)	700	800	90	NA	7	7	
	Annual Estimated Cost	$790,000	$2,200,000	$370,000	$100,000	$140,000	$140,000	$3,740,000
2031	Daily Use (lbs/day)	10,000	10,000	1,000	NA	200	200	
	Daily Use (gal/day)	800	900	100	NA	7	7	
	Annual Estimated Cost	$870,000	$2,410,000	$410,000	$100,000	$160,000	$160,000	$4,110,000
2032	Daily Use (lbs/day)	11,000	12,000	1,100	NA	200	200	
	Daily Use (gal/day)	900	1,000	120	NA	9	9	
	Annual Estimated Cost	$1,000,000	$2,790,000	$470,000	$100,000	$180,000	$180,000	$4,720,000
2033	Daily Use (lbs/day)	12,000	12,000	1,200	NA	200	200	
	Daily Use (gal/day)	900	1,100	130	NA	9	9	
	Annual Estimated Cost	$1,080,000	$3,000,000	$510,000	$100,000	$200,000	$200,000	$5,090,000
2034	Daily Use (lbs/day)	13,000	14,000	1,300	NA	300	300	
	Daily Use (gal/day)	1,000	1,200	140	NA	10	10	
	Annual Estimated Cost	$1,170,000	$3,260,000	$550,000	$100,000	$210,000	$210,000	$5,500,000

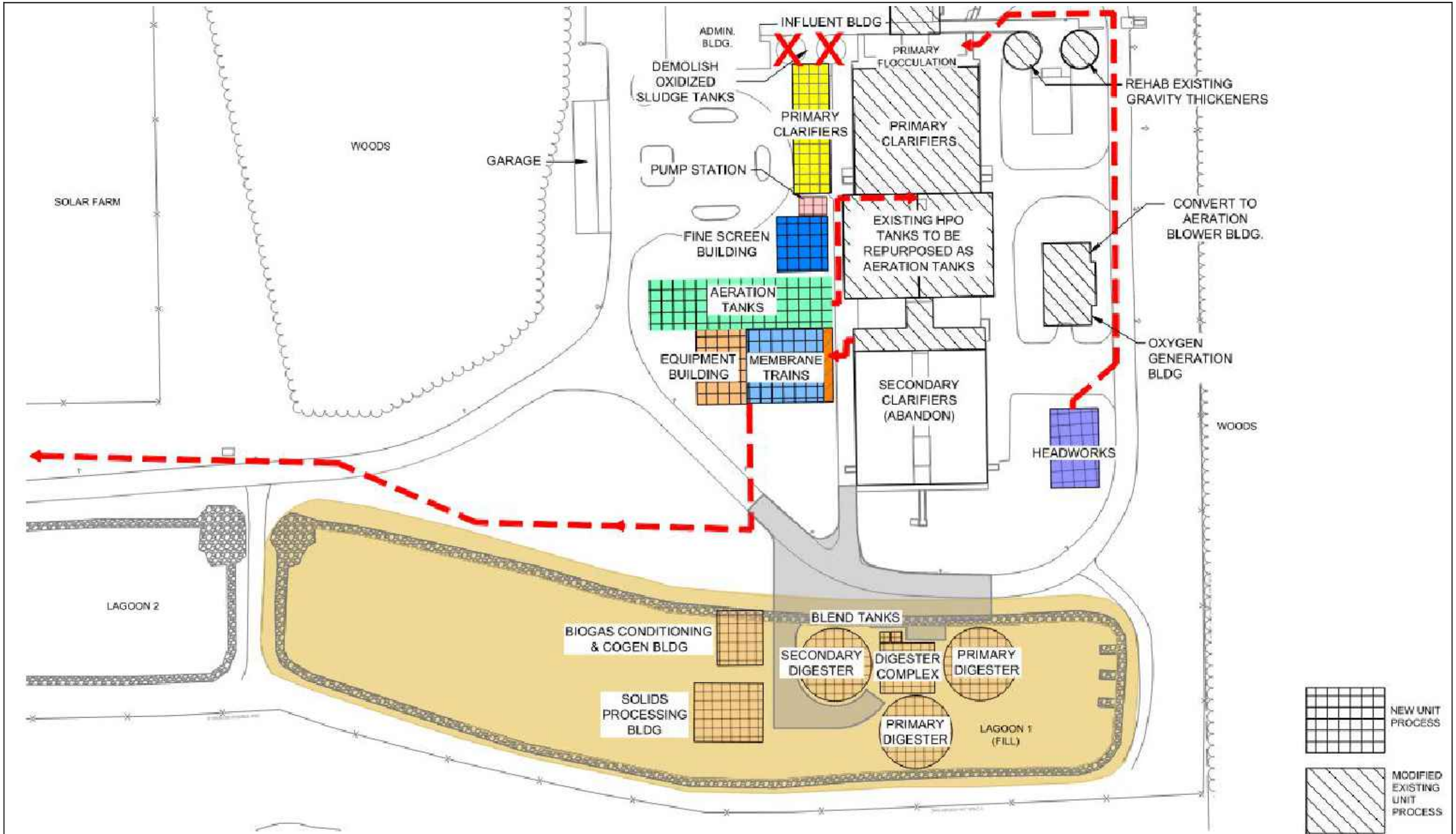
Zero Liquid Discharge System (based on treating RO brine to permit landfill disposal)

Year		Chemical						Total Estimated Chemical Cost
		Sulfuric Acid	Sodium Hydroxide	Calcium Sulfate				
2026	Daily Use (lbs/day)	24,000	1,000	16,000				
	Daily Use (gal/day)	2,000	100	1,000				
	Annual Estimated Cost	$1,310,000	$90,000	$780,000				$2,180,000
2027	Daily Use (lbs/day)	37,000	1,000	24,000				
	Daily Use (gal/day)	2,000	100	1,000				
	Annual Estimated Cost	$2,040,000	$130,000	$1,200,000				$3,370,000
2028	Daily Use (lbs/day)	48,000	2,000	31,000				
	Daily Use (gal/day)	3,000	100	1,000				
	Annual Estimated Cost	$2,630,000	$170,000	$1,550,000				$4,350,000
2029	Daily Use (lbs/day)	54,000	2,000	36,000				
	Daily Use (gal/day)	4,000	200	1,000				
	Annual Estimated Cost	$2,970,000	$200,000	$1,760,000				$4,930,000
2030	Daily Use (lbs/day)	66,000	3,000	43,000				
	Daily Use (gal/day)	4,000	200	2,000				
	Annual Estimated Cost	$3,600,000	$240,000	$2,120,000				$5,960,000
2031	Daily Use (lbs/day)	72,000	3,000	47,000				
	Daily Use (gal/day)	5,000	200	2,000				
	Annual Estimated Cost	$3,940,000	$260,000	$2,330,000				$6,530,000
2032	Daily Use (lbs/day)	83,000	3,000	55,000				
	Daily Use (gal/day)	5,000	300	2,000				
	Annual Estimated Cost	$4,560,000	$300,000	$2,690,000				$7,550,000
2033	Daily Use (lbs/day)	90,000	4,000	59,000				
	Daily Use (gal/day)	6,000	300	2,000				
	Annual Estimated Cost	$4,910,000	$320,000	$2,900,000				$8,130,000
2034	Daily Use (lbs/day)	98,000	4,000	64,000				
	Daily Use (gal/day)	6,000	300	3,000				
	Annual Estimated Cost	$5,360,000	$350,000	$3,160,000				$8,870,000

Table 6
Oak Orchard WWTP
Summary of Estimated Solids Disposal for Treatment Semi-Conductor Wastewater
Pre-Treatment Limits for Silica = 15 mg/L and Calcium = 20 mg/L

Year		Muncipal WWTP	Industrial WWTP	Zero Liquid Discharge
2026	Dewatered Solids (ton/day)	12	7	65
	Annual Estimated Cost	$420,000	$240,000	$2,250,000
2027	Dewatered Solids (ton/day)	12	10	99
	Annual Estimated Cost	$420,000	$370,000	$3,500,000
2028	Dewatered Solids (ton/day)	12	13	127
	Annual Estimated Cost	$420,000	$470,000	$4,500,000
2029	Dewatered Solids (ton/day)	12	15	143
	Annual Estimated Cost	$420,000	$540,000	$5,100,000
2030	Dewatered Solids (ton/day)	12	18	174
	Annual Estimated Cost	$420,000	$650,000	$6,200,000
2031	Dewatered Solids (ton/day)	12	20	192
	Annual Estimated Cost	$420,000	$710,000	$6,800,000
2032	Dewatered Solids (ton/day)	12	23	221
	Annual Estimated Cost	$420,000	$820,000	$7,800,000
2033	Dewatered Solids (ton/day)	12	25	239
	Annual Estimated Cost	$420,000	$880,000	$8,400,000
2034	Dewatered Solids (ton/day)	12	27	260
	Annual Estimated Cost	$420,000	$960,000	$9,200,000

Figures



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OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

RECOMMENDED ALTERNATIVE
10 mgd FROM WHITE PINE

Project No. **11214118**
Date **October 22**

Figure 1

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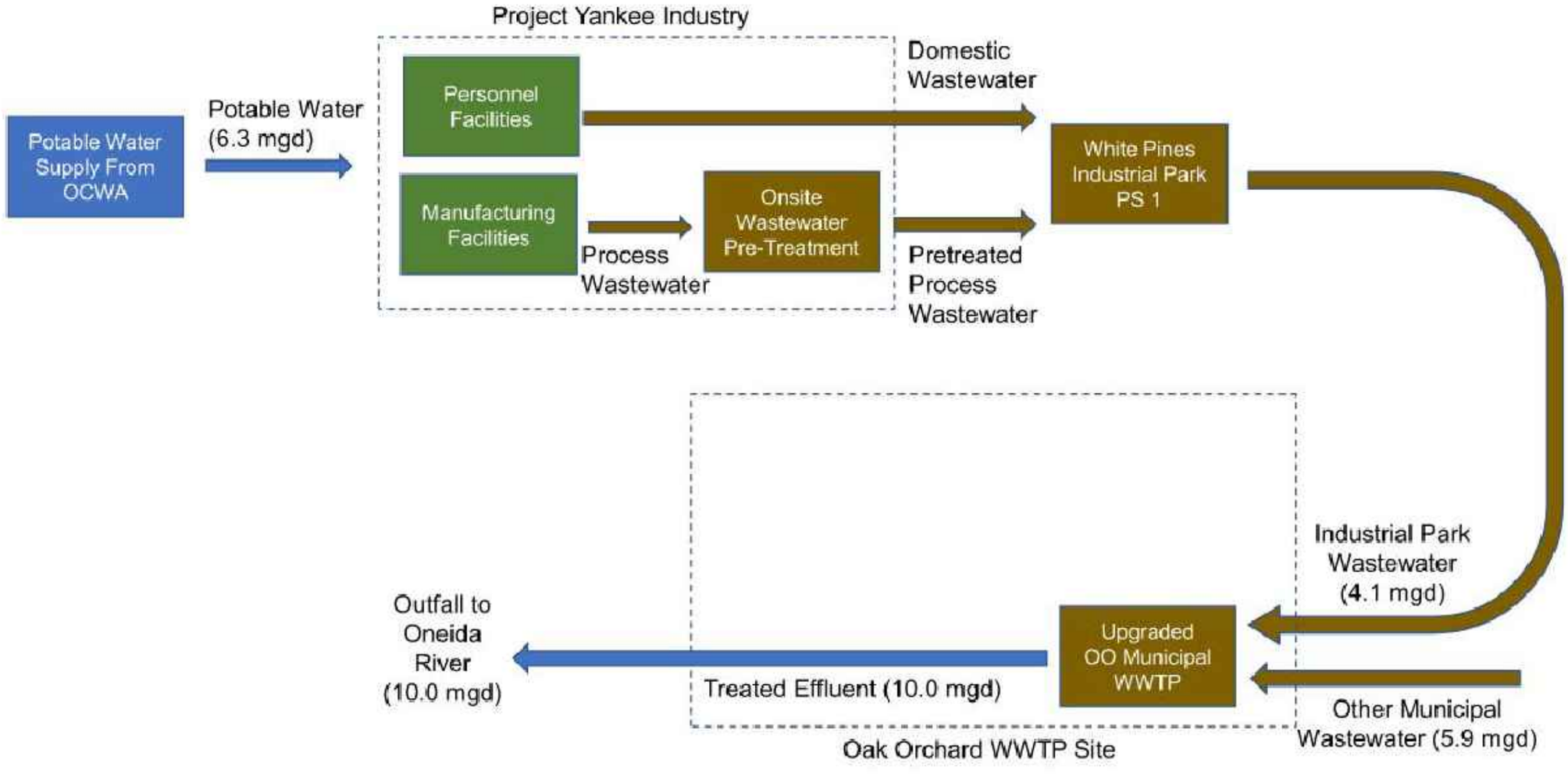
Plot Date: 13 October 2022 4:42 PM

Data Source

PHASE 1 – Through 2026 (Average Daily Flows)



OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

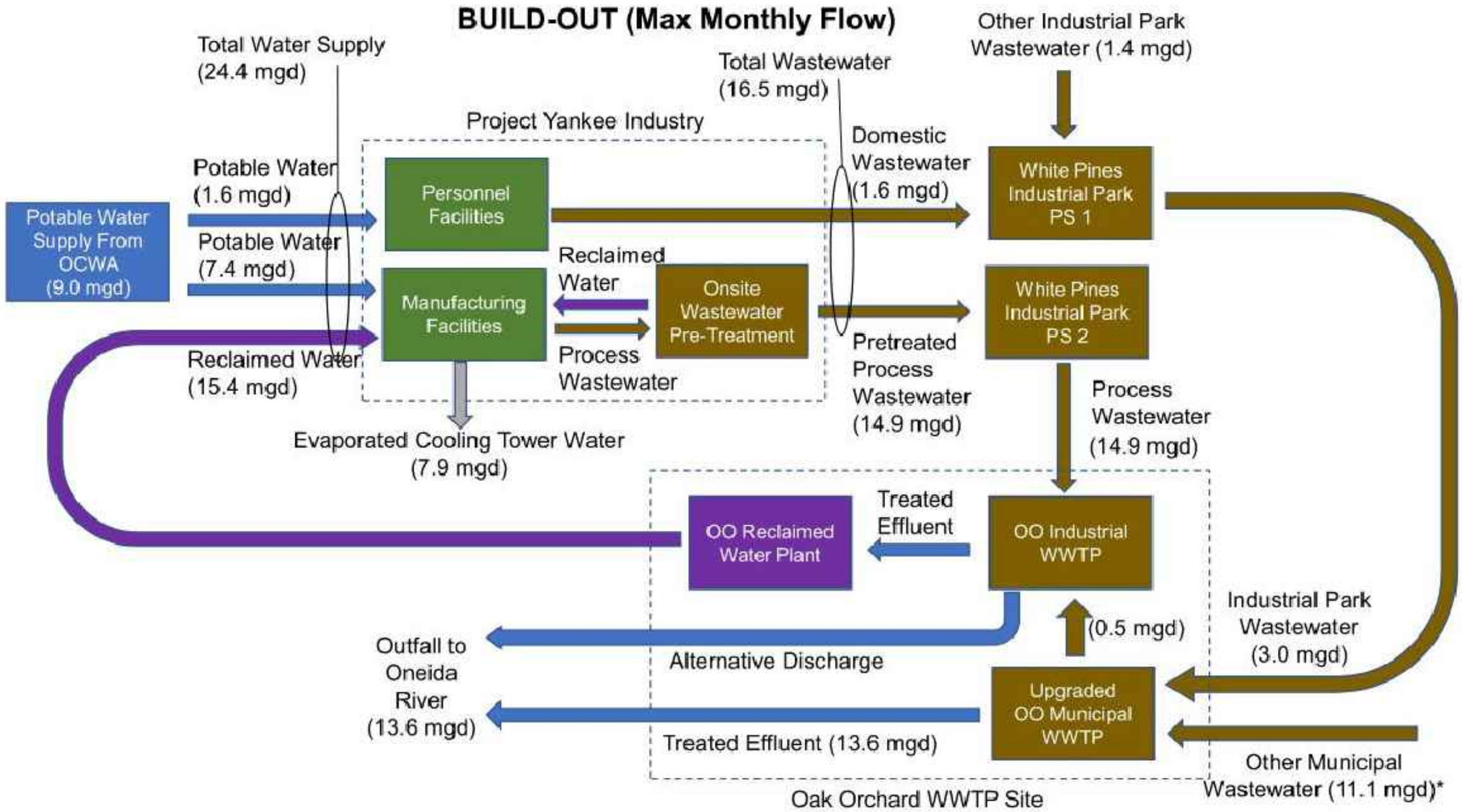
PROJECT YANKEE
PHASE 1 SCHEMATIC FLOW DIAGRAM

Project No. **11214118**
Date **October 22**

Figure 2

Data Source

Filename: \\ghdnet\ghd\US\Cazenovia\Projects\564\11214118\Digital_Design\ACAD 2017\Figures\WEP Oak Orchard Project\11214118-FIG002.dwg
Plot Date: 13 October 2022 4:42 PM



* Includes 2.8 mgd for future residential, commercial and industrial growth

GHD

OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

PROJECT YANKEE
PHASE 2 (AT BUILD-OUT)
SCHEMATIC FLOW DIAGRAM

Project No. **11214118**
Date **October 22**

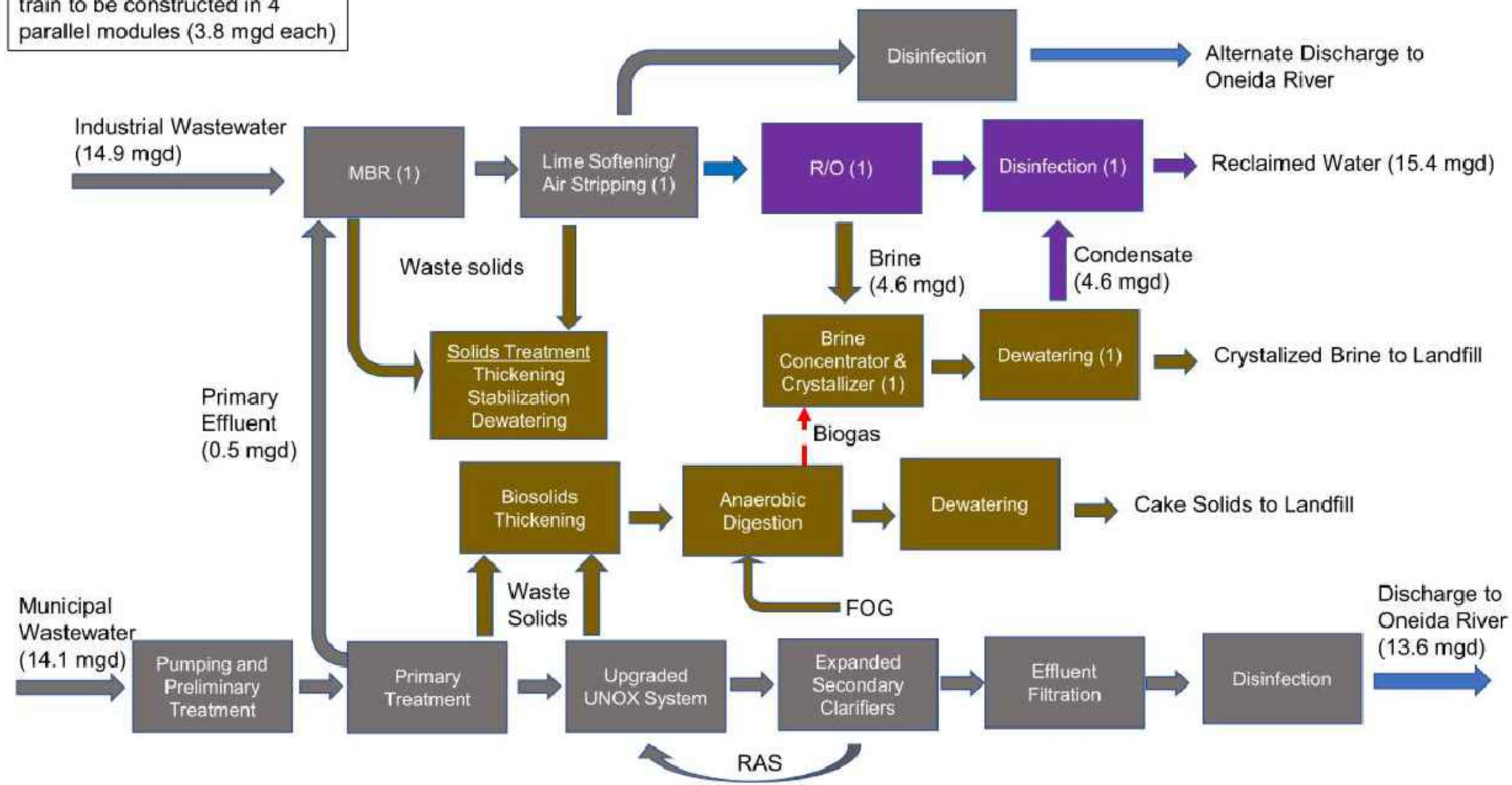
Figure 3

Data Source

Filename: \\ghdnet\ghd\US\Cazenovia\Projects\564\11214118\Digital_Design\ACAD 2017\Figures\WEP Oak Orchard Project\11214118-FIG003.dwg
Plot Date: 13 October 2022 4:42 PM

Note 1. Industrial treatment train to be constructed in 4 parallel modules (3.8 mgd each)

OAK ORCHARD TREATMENT FACILITIES



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OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

PROJECT YANKEE
OAK ORCHARD WWTP PROCESS SCHEMATIC - NO PRE-TREATMENT

Project No. **11214118**
Date **October 22**

Figure 4

Data Source

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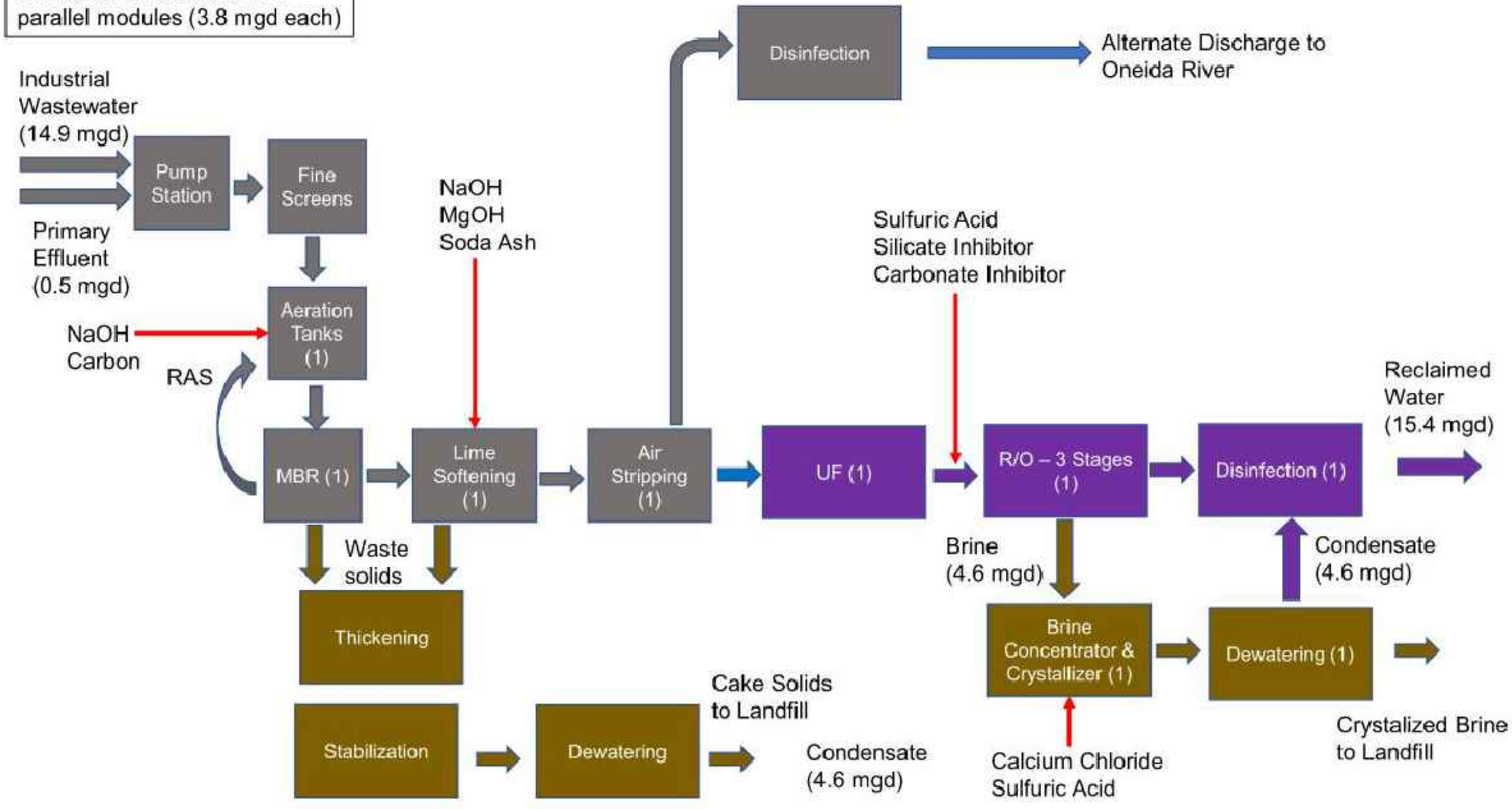
Plot Date: 13 October 2022 4:42 PM

Note 1. Industrial treatment train to be constructed in 4 parallel modules (3.8 mgd each)

OAK ORCHARD INDUSTRIAL WWTP



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OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

PROJECT YANKEE
INDUSTRIAL PLANT PROCESS SCHEMATIC - NO PRE-TREATMENT

Project No. **11214118**
Date **October 22**

Figure 5

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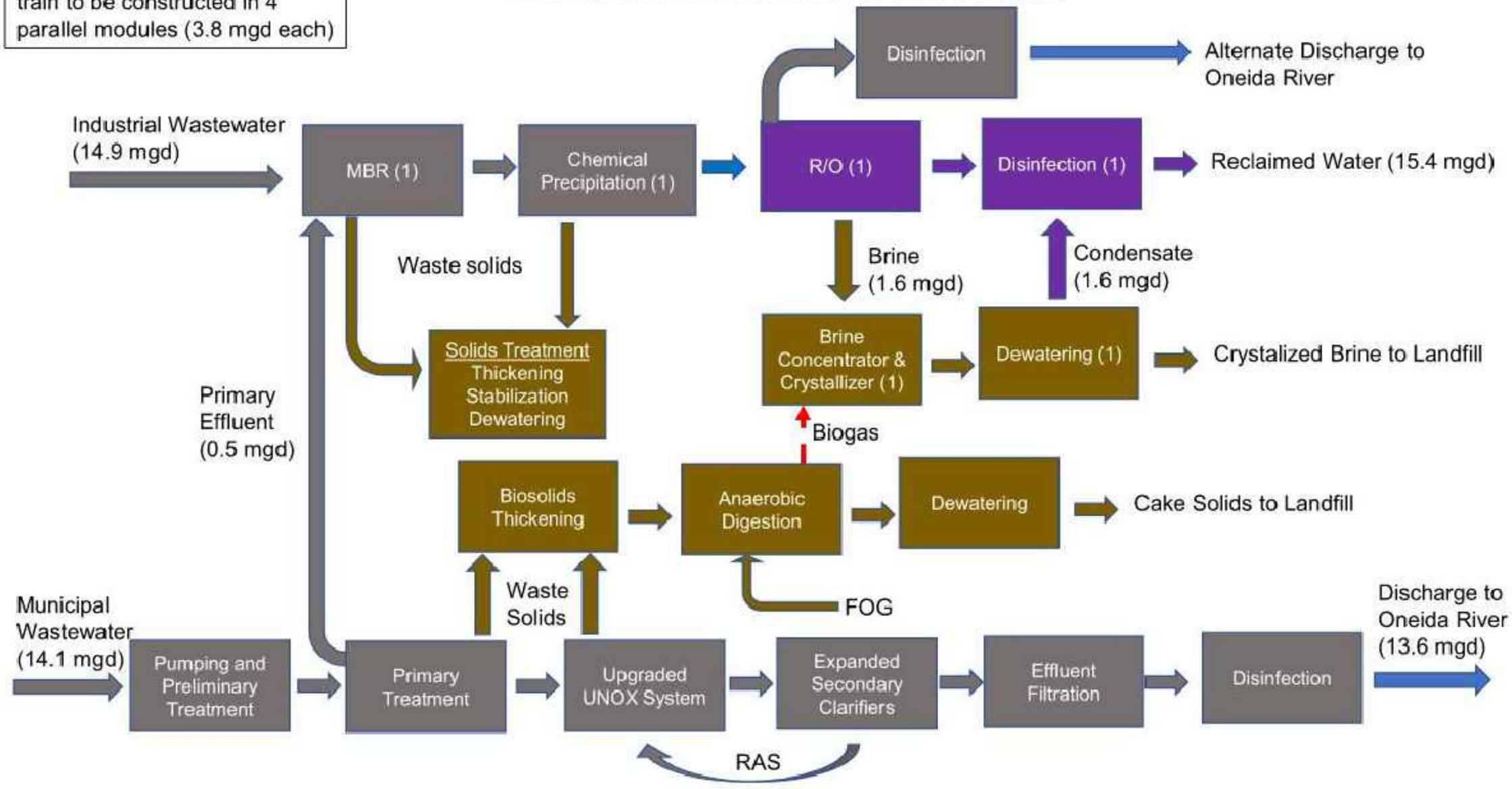
Note 1. Industrial treatment train to be constructed in 4 parallel modules (3.8 mgd each)

OAK ORCHARD TREATMENT FACILITIES



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OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

PROJECT YANKEE
OAK ORCHARD WWTP PROCESS SCHEMATIC - WITH PRE-TREATMENT

Project No. **11214118**
Date **October 22**

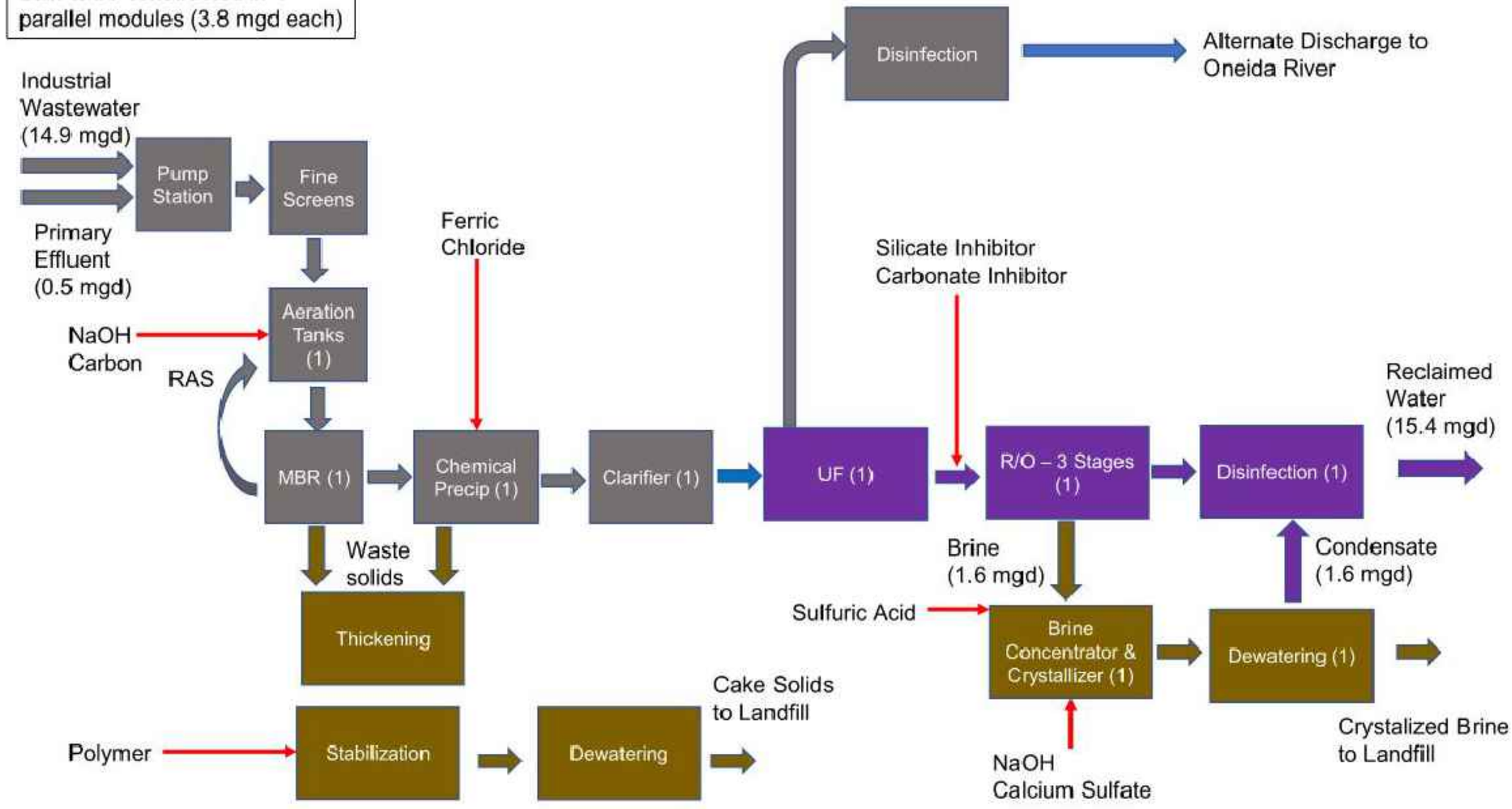
Figure 6

Filename: \\ghdnet\ghd\US\Cazenovia\Projects\564\11214118\Digital_Design\ACAD 2017\Figures\WEP Oak Orchard Project\11214118-FIG006.dwg
Plot Date: 13 October 2022 4:43 PM

Data Source

Note 1. Industrial treatment train to be constructed in 4 parallel modules (3.8 mgd each)

OAK ORCHARD INDUSTRIAL WWTP



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OCDWEP
OAK ORCHARD FACILITIES PLAN & FEASIBILITY STUDY

PROJECT YANKEE
INDUSTRIAL PLANT PROCESS SCHEMATIC - WITH PRE-TREATMENT

Project No. **11214118**
Date **October 22**

Figure 7

Data Source

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Plot Date: 13 October 2022 4:43 PM

APPENDIX P

POWER REDUNDANCY MEMORANDUM

PROJECT MEMORANDUM

ONONDAGA COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Oak Orchard Service Area WWTP Expansion Program

Project No.:	203580
Date:	August 14, 2025
Prepared By:	Jeremy Brehm, PE
Reviewed By:	Scott Davis, PE, Chris Heger, PE
Subject:	Power Redundancy for the OOWWTP Expansion Program

This document is released for the purpose of information exchange review and planning only under the authority of Christopher A. Heger, August 2025, State of New York PE No. 104088.

1.0 INTRODUCTION

Onondaga County Department of Water Environment Protection (WEP) operates the Oak Orchard Wastewater Treatment Plant (OOWWTP) in Clay, New York. WEP is upgrading and expanding OOWWTP to accommodate flow from planned growth in the service area while replacing aging equipment and providing an operator friendly, energy efficient facility. Increased flows will include sanitary flow from the new Micron campus as well as projected residential and commercial growth.

The upgraded OOWWTP will serve not only the Oak Orchard service area but will also provide regional biosolids treatment and generate reclaimed water for use by Micron and other industrial users. A new pump station and force main will be constructed to convey reclaimed water to end users.

A dedicated industrial WWTP (IWWTP) will be constructed on the OOWWTP site for treatment of fabrication process wastewater from Micron semi-conductor manufacturing activities.

1.1 Power Demand for Expanded OOWWTP Site

The upgrades at OOWWTP, including the addition of the dedicated IWWTP, will result in significant increased power demand for the site. Micron will be constructing their fabrication facilities (fabs) in two phases. Phase 1 will include construction of fabs 1 and 2, with phase 2 including fabrication of fabs 3 and 4. Both Micron's wastewater volumes and recycled water demand will increase as additional fabs are brought online, causing the electrical demand at the OOWWTP site to increase over each phase. Micron has committed to construction of Fabs 1 and 2 under phase 1, but has not provided an anticipated schedule for construction of Fabs 3 and 4 under phase 2. Based on the size of the anticipated demand, the existing service voltage of 13.2 kV is insufficient, so National Grid has indicated that new 115kV feed(s) will need to be brought into the OOWWTP site to serve the expected load.
A summary of the power demand for the combined OOWWTP and IWWTP over the two phases of Micron's construction is provided below in

Table 1.

Table 1 OOWWTP and IWWTP Expansion Power Summary by Phase

Project	Phase 1: Fabs 1 and 2 Estimated Connected Load	Phase 2: Fabs 3 and 4 Estimated Connected Load	Total Combined Phase 1 and 2
OOWWTP Expansion Program	10.47 MW	2.98 MW	13.45 MW
IWWTP	29.70 MW	29.70 MW	59.4 MW
TOTAL	**40.17 MW**	**32.68 MW**	**72.85 MW**

Notes:
Abbreviations: MW – mega watt
(1) IWWTP loads provided by Brown and Caldwell.
(2) These loads are estimated based on basis of design assumptions. Final design consultants will be responsible for confirming design loads during the detailed design phase.
(3) Assumed power factor of 0.85.

1.2 Historical Power Resiliency

In general, the plant has indicated that their existing 13.2 kV service has been historically reliable, with only minor outages experienced over the last few years.

With this in mind, in May 2025, a significant power outage occurred at the Wastewater Treatment Plant (WWTP) due to an incident involving a third-party contractor. During routine operations, the contractor inadvertently made contact with an overhead power line using heavy equipment. This contact caused one of the utility poles to break, which in turn pulled wiring from an adjacent pole. The resulting damage disrupted the electrical supply to the WWTP, leading to a complete loss of power at the facility.

This event highlighted a critical vulnerability in the plant's electrical infrastructure: the absence of redundant power systems and a plant-wide backup generator. Without these safeguards, the facility was unable to maintain operations during the outage.

1.3 Power Redundancy Requirement

As a publicly owned treatment works (POTW), New York State Department of Environmental Conservation (DEC) requires OOWWTP to have redundant power sources. This is based on the Ten State Standards: Recommended Standards for Wastewater Facilities. Under Section 56.1 of the Ten State Standards, WWTPs are required to provide "an alternate source of electric power or pumping capability to allow continuity of operation during power failures" with one suggested method of alternate power sources being "the connection of at least two independent power sources such as substations able to supply power without interruption."

OOWWTP does not require main sewage pumping, as sanitary flow is conveyed to the site via forcemain from offsite pumping stations. As such, alternate pumping capability is not required. Even though the Ten State Standards only requires redundant power for pumping or other specific critical processes. Redundant power is recommended to supply the entirety of the OOWWTP Expansion loads, as well as the IWWTP loads due to the criticality of both treatment trains to meet/exceed the standard.

Given the large demand at OOWWTP, onsite power generators would be an impractical redundant power solution. Space on the site and natural gas are both limited for the area, making physical siting of standby power generators or diesel fuel storage unfeasible . Additionally, WEP has an operational preference to avoid on-site emergency power generators when possible. Based on these drivers, the proposed approach for meeting power redundancy requirements is to incorporate a fully redundant utility service.

2.0 PROPOSED REDUNDANT UTILITY POWER SUPPLY

National Grid is proposing to provide two independent overhead 115 kV lines to serve the new OOWWTP and IWWTP anticipated loads in order to meet the redundant supply requirements for Phase 1, and ultimately the buildout of Phase 2.

The figure below represents National Grid's conceptual plan to provide power to the OOWWTP from the National Grid System:

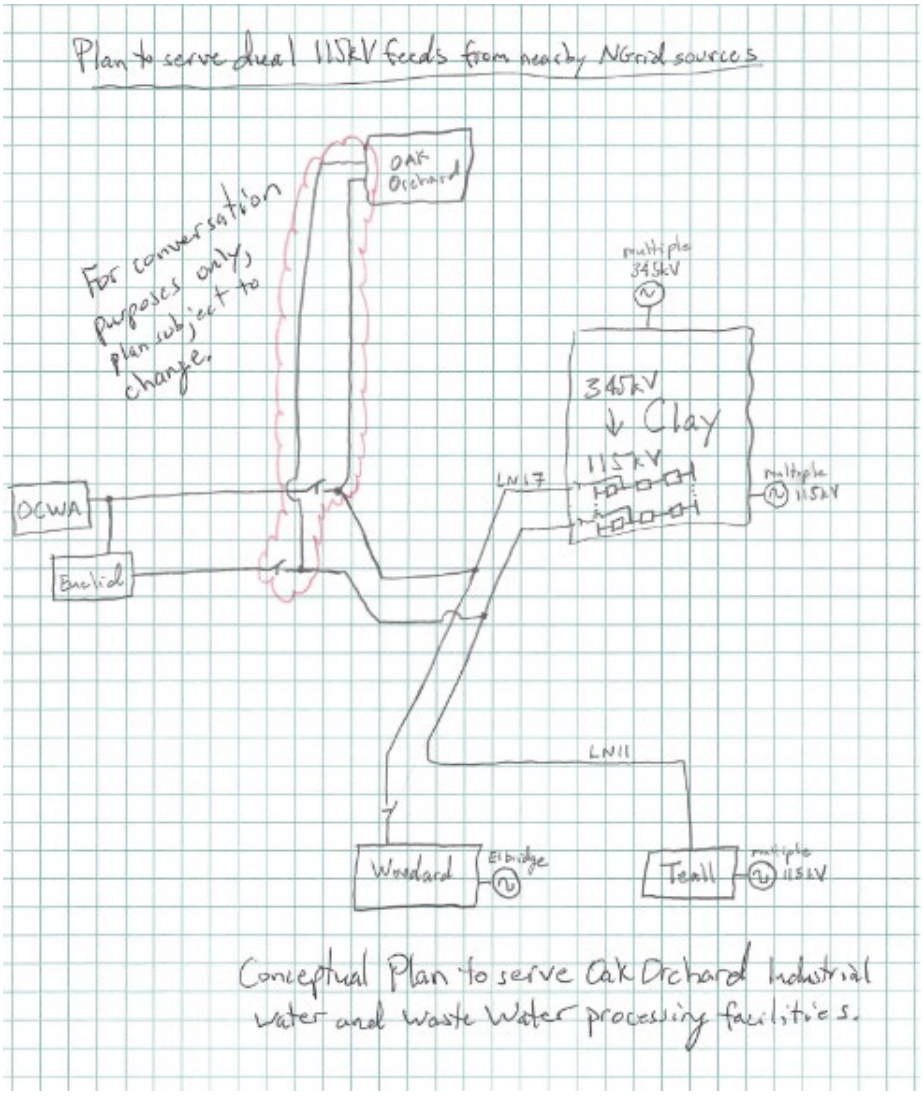


Figure 1 National Grid System Conceptual Sketch

Source: provided by Jeffrey Meloling, National Grid, June 10, 2025.

The proposed 115 kV distribution system provides these benefits.

The design proposes two independent overhead power feeds supplied via separate pole structures, ensuring that a single incident will not simultaneously impact both lines.

- Clay Substation (located southwest of the intersection of Caughdenoy and Verplank Roads) represents the primary source of power for the dual feed system to OOWWTP. Although it is a single substation, it qualifies as meeting the redundancy requirements noted in the Recommended Standards for Wastewater Facilities due to the following criteria:
  - Power to Clay is provided via NYPA (Niagara Falls hydroelectric power generation), Nine Mile Point (Oswego nuclear power generation), and Rochester nuclear power generation.
  - The switching system at Clay includes a "breaker and a half" connection that automatically switches power on outages.
  - In addition to 115 kV power, there are additional 345 kV sources that can transform power to 115 kV in the event of outages or maintenance.
  - Historically, Clay substation has maintained power during past blackouts, including the widespread blackout on August 14, 2003 throughout the Northeast and Canada. Clay maintained power during this blackout because of the additional redundancy offered by NYPA power.
  - In addition to Clay Substation, "Line 11" and "Line 17" contain the ability to provide power to OOWWTP from Woodward, Teall, OCWA, and Euclid substations as shown in the figure above, which provides additional redundancy to the plant:
    - According to National Grid, "Line 11" was on 99.9845 percent of the last 14 years and "Line 17" was 99.991 percent. Neither was out of service at the same time in the last 14 years, with neither line out of service even in the same year.
    - National Grid proposes to provide a manual switching system to allow power to be completely fed from "Line 17" or "Line 11." This manual switching would be performed by National Grid Utility linemen with an approximate response time of 1 hour, depending on the issue.

Finally, with National Grid providing utilization voltage at 115 kV, Oak Orchard is responsible to design and provide a receiving substation to step the voltage down for utilization at the plant. It is crucial that the substation design complies with the redundancy requirements noted in the Recommended Standards for Wastewater Facilities, which can be summarized as follows:

- Adequate separation and mitigation techniques should be designed between the two receiving transformers such that a significant failure of one transformer (such as a fire) will not affect the other transformer.
- There should be adequate isolation of the receiving bus structure and equipment such that any scenarios that could take one of the power sources offline will not affect the other power source (for example, a lightning strike to one of the transmission sides should not affect the other redundant side).
- The Oak Orchard receiving substation should be designed with additional redundancy from failure such as a "sectionalized bus" or "main and transfer" scheme. This redundancy should be maintained throughout the electrical distribution system through design of a loop or double-fed radial system that feeds main-tie-main equipment at the 480V level. It would be WEP's responsibility to maintain that additional redundancy.

- Maintenance and access to the substation should be considered, as an outage to one side of the substation would necessitate that the other redundant side stay energized and be available to support the entire load of the plant.
- The protection scheme for the substation should utilize redundant equipment so failure of a single relay, PT's, etc. will not result in loss of power to one side of the power system or the other.

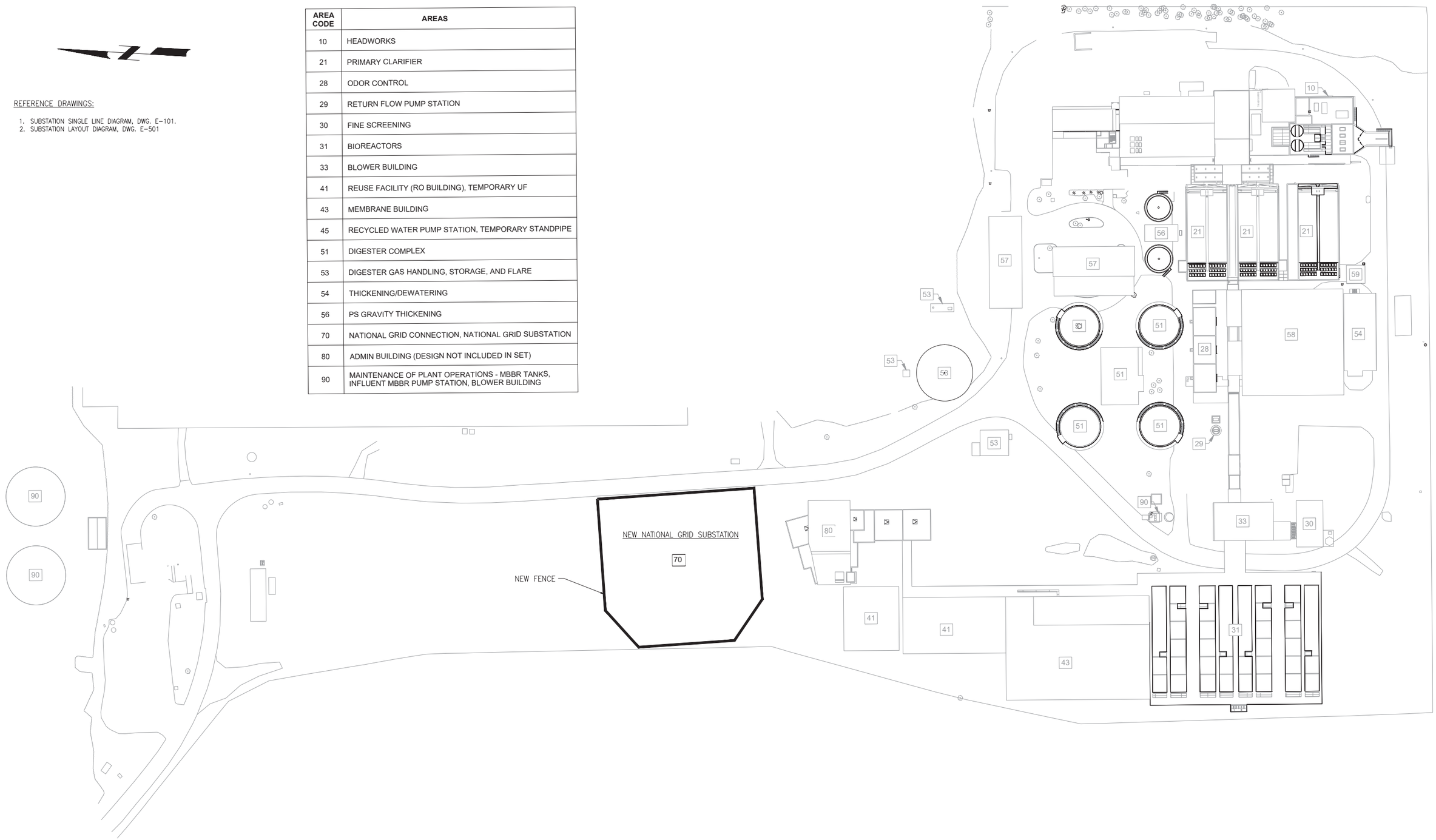
APPENDIX Q

POWER RECEIVING SUBSTATION 30 PERCENT DESIGN

REFERENCE DRAWINGS:

1. SUBSTATION SINGLE LINE DIAGRAM, DWG. E-101.
2. SUBSTATION LAYOUT DIAGRAM, DWG. E-501

AREA CODE	AREAS
10	HEADWORKS
21	PRIMARY CLARIFIER
28	ODOR CONTROL
29	RETURN FLOW PUMP STATION
30	FINE SCREENING
31	BIOREACTORS
33	BLOWER BUILDING
41	REUSE FACILITY (RO BUILDING), TEMPORARY UF
43	MEMBRANE BUILDING
45	RECYCLED WATER PUMP STATION, TEMPORARY STANDPIPE
51	DIGESTER COMPLEX
53	DIGESTER GAS HANDLING, STORAGE, AND FLARE
54	THICKENING/DEWATERING
56	PS GRAVITY THICKENING
70	NATIONAL GRID CONNECTION, NATIONAL GRID SUBSTATION
80	ADMIN BUILDING (DESIGN NOT INCLUDED IN SET)
90	MAINTENANCE OF PLANT OPERATIONS - MBBR TANKS, INFLUENT MBBR PUMP STATION, BLOWER BUILDING



REV	DATE	BY	DESCRIPTION
PA	08/22/2025	ZA	ISSUED FOR REVIEW

NOT FOR CONSTRUCTION

DESIGNED MB
DRAWN ZA
CHECKED SK
DATE 08/22/2025

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Onondaga County Department of WATER ENVIRONMENT PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

GENERAL

SITE PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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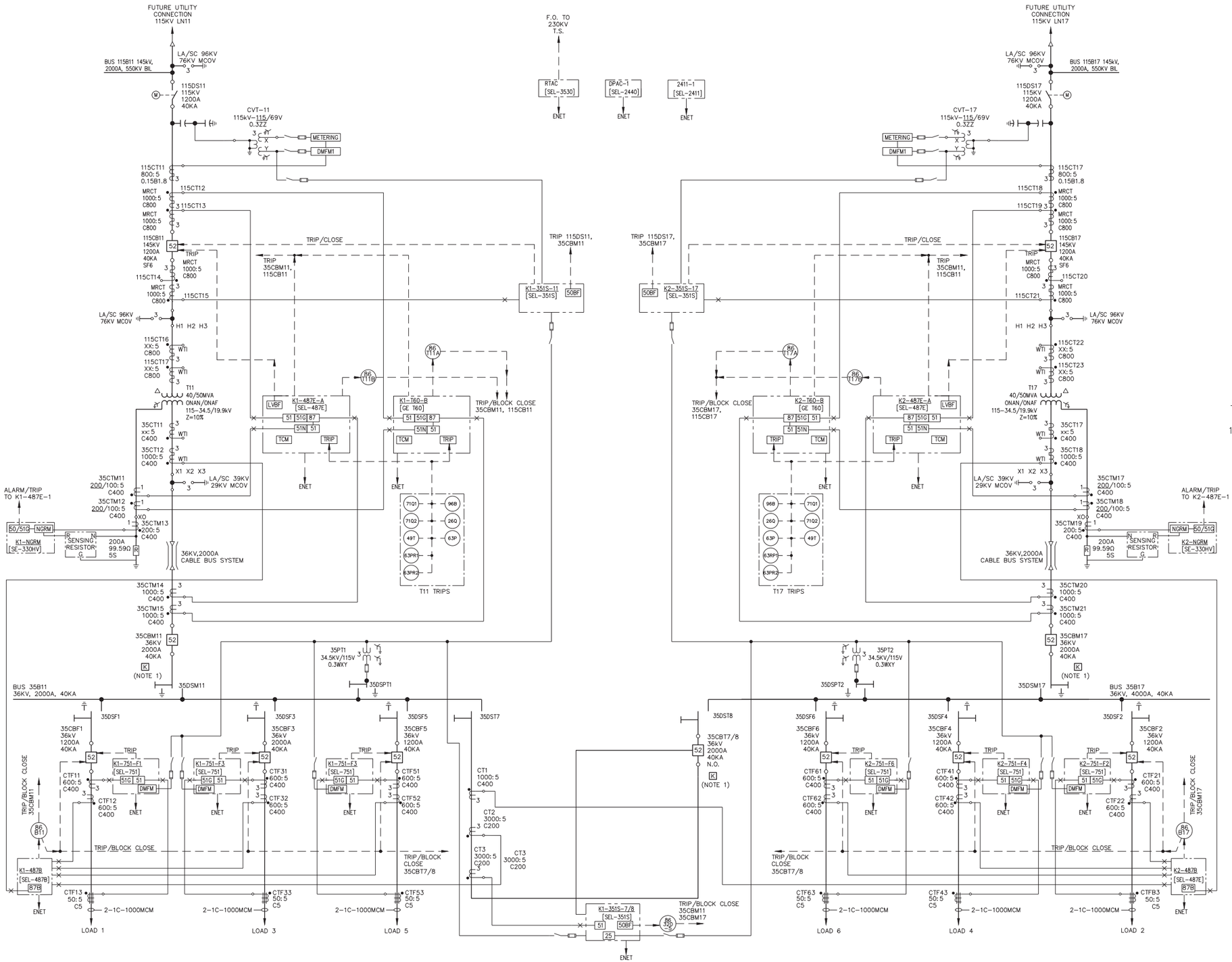

NOTES

1. STATUS CONTACT OF 35CBM11, 35CBM17 AND 35CBT7/8 WILL BE MONITORED BY DPAC-1, AND WILL BE INTERLOCKED TO PREVENT LN11 AND LN17 FROM PARALLELING.

REV	DATE	BY	DESCRIPTION
PA	08/22/2025	ZA	ISSUED FOR REVIEW

NOT FOR CONSTRUCTION

DESIGNED MB | DRAWN ZA | CHECKED SK | DATE 08/22/2025

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OOWWTP EXPANSION PROGRAM - MAINTENANCE OF PLANT OPERATION PROJECT

GENERAL

SINGLE LINE DIAGRAM

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 102766

DRAWING NO. E-101

SHEET NO. 1 OF 1

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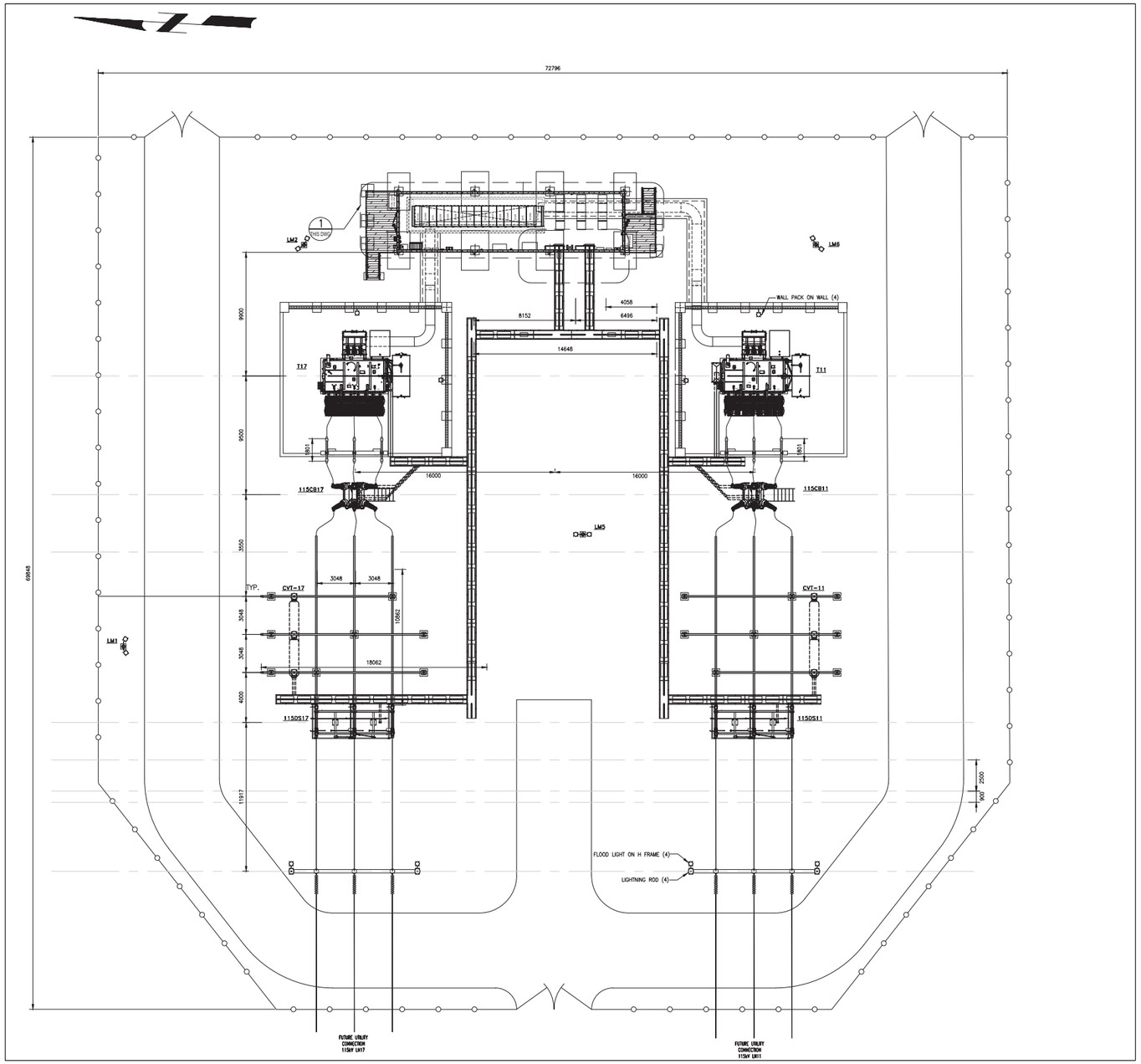

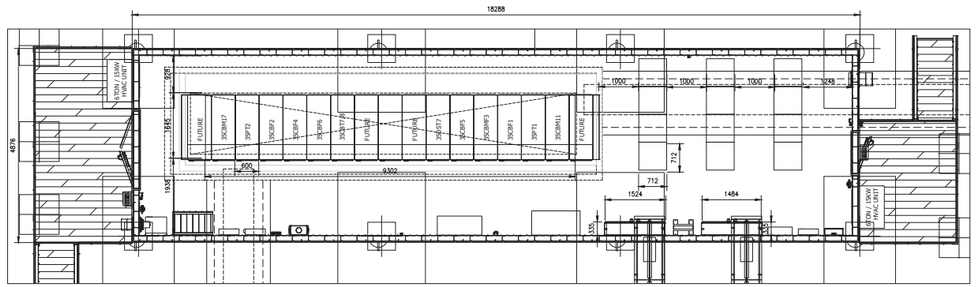
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