Quarterly Performance Report
Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility

Performance Period:

This quarterly performance report is for the period of April 1, 2015 and June 30, 2015 and this report was prepared by the CH2M and SUNY ESF monitoring team.

Facility Performance:

The Harbor Brook CSO 018 Pilot Constructed Wetlands Facility is currently maintained and operated by the construction contractor, Joseph J. Lane Construction, Inc. The facility is primarily operated over OCDWEP's SCADA network, however, periodic local control has been necessary during the ongoing system testing and calibration period. The data presented herein has been collected during the facility start-up phase.

During storm events resulting in flows greater than six (6) CFS in the Rowland Street trunk sewer, CSO is diverted through a grit and floatables removal system. After solids are removed in the grit and floatables system, flow continues into the wetland treatment system. The three (3) wetland cells were operated in series during this performance period. That is, flow from the grit and floatables enters Cell 1, flows into Cell 2, then flows into Cell 3 before being discharged into Harbor Brook. Flows above forty-four (44) CFS in the Rowland Street trunk sewer bypass the treatment facility and discharge directly to Harbor Brook. During this performance period thirteen (13) CSO diversion events occurred (events where CSO flow is diverted through the grit and floatables facility). Of the thirteen (13) CSO diversion events, four (4) CSO discharging events (events flowing through the entire treatment system) occurred resulting in zero (0) CSO bypass events (events bypassing the entire treatment facility). The other nine (9) CSO diversion events were not of sufficient duration and intensity to result in an effluent discharge from the constructed wetlands facility.

During CSO events samples are collected from the influent (Box 2) and the effluent (MH-18, when operating in series) and analyzed in accordance with the SPDES permit. Flows are also monitored at the influent to the wetlands (MH-4A), effluent from the wetlands (MH-18, when in series), and bypass (MH-5A). For this performance period, data from the precipitation gauge at OCDWEP's Metro facility was used through April 30, 2015. Thereafter data from the precipitation gauge at the City of Syracuse's Wadsworth Park within the CSO 018 drainage area was used.

Attachment #A summarizes the flows, rainfall data, and diversion events during this performance period. Influent and effluent (where applicable) sampling results are provided for each CSO diversion events. A detailed description of each of the events is provided below.

Including all events, the estimated volume diverted to the constructed wetlands was 10.84 million gallons and the estimated volume treated by the constructed wetlands and discharged to Harbor Brook for this performance period was 6.99 million gallons. The highest daily rainfall recorded at Metro was 2.69 inches on June 30, 2015.

Event #1 began on April 23, 2015 at 0700. 4.01 million gallons of CSO were diverted to the constructed wetlands and 2.32 million gallons of treated flow was discharged to Harbor Book. Subsequent investigations by OCDWEP confirmed that Event #1 was caused by discharge from uncontrolled stormwater management ponds at the Bellevue Country Club upstream of the facility as there was minimal rainfall during this period (0.14 inches). From April 1, 2015 to April 2, 2015, the OCDWEP rain gauge at Metro experienced a malfunction. Data from the NOAA rain gauge at the Syracuse Hancock Airport was used for this period.

Event #2 began on May 2, 2015 at 1300 and was also caused by discharge from uncontrolled stormwater management ponds at the Bellevue Country Club. 4.13 million gallons of CSO were diverted to the constructed wetlands, and 3.58 million gallons of treated flow was discharged to Harbor Brook. Note that the facility was offline during this period to allow the construction contractor to complete punch list work identified during Event #1. As such, samples were not collected during this event.

Diversions #3 and #4 occurred on May 11, 2015 and May 18, 2015, respectively. Note that the facility was offline during this period to allow the construction contractor to complete punch list work identified during Event #1. As such, samples were not collected during these events.

Diversions #5, #7, #8, #10 and #12 occurred on May 30, June 9, June 11, June 15, and June 21, 2015, respectively. The diversion of CSO flow during these events was less than thirty (30) minutes, and influent samples were not collected as a result. The facility did not discharge treated flow to Harbor Brook during these events.

Diversions #6, #9 and #11 occurred on June 8, June 14, and June 16, 2015, respectively. Influent samples were collected during these events and are reported in Attachment A. The facility did not discharge treated flow to Harbor Brook during these events.

Event #4 occurred on June 28, 2015. 0.19 million gallons of CSO flow were diverted to the constructed wetlands, and 0.56 million gallons of treated flow was discharged to Harbor Brook. Harbor Brook was in a flooded state during this event, and it is assumed that backflow from Harbor Brook into Cell 3 through the emergency overflow spillway caused the increased effluent volume. Influent samples were not able to be collected for this event due to the nature of the storm. There were several short duration diversions that occurred for less than thirty (30) minutes and sampling staff were unable to collect influent samples. Effluent samples were collected and are reported in Attachment A.

The Figure in Attachment B shows the wetlands influent, effluent and bypass volume and precipitation for each of the events.

The Figures in Attachment C show the elevation of water measured in MH-18 (wetlands effluent) during each of the events that resulted in treated effluent discharge to Harbor Brook. The orange line in each figure corresponds to the Event Durations tabulated in Attachment A. Floatables forms for each effluent discharge event are included in Attachment D. Laboratory Data for the samples analyzed is provided in Appendix E and for reference purposes, the facility flow diagrams have been included in Appendix F.

Removal efficiencies for BOD_5, TSS, Settleable Solids, Fecal Coliform, NH_3, and TP are provided in the Table below for Event #1. Removal efficiencies for other events are not calculated due to the lack of influent or effluent samples collected. The average value of the influent and effluent samples collected was used in computing the removal efficiency. Note, as mentioned above, that Event #1 was not a typical CSO event as the majority of the flow during this event came from uncontrolled stormwater ponds at the Bellevue Country Club. CSO events in future quarters will be summarized similar to the table below to analyze the performance of the facility.

Event	**BOD_5**	**TSS**	**Settleable Solids**	**Fecal Coliform**	**NH_3**	**TP**
	mg/L	mg/L	mL/L	#/100 mL	mg/L	mg/L
Event 1 Influent	22	22	0.3	223799	1.69	0.46
Event 1 Effluent	4	14	0.3	2784	0.79	0.09
Event 1 Removal Efficiency	82%	35%	0%	98.9%	53%	80%

On June 30, 2015 a near 25-year storm occurred within the drainage area of the facility. During this event, Harbor Brook was in a flooded state and Cells 2 and 3 were completely submerged. Due to this abnormality, samples were not collected during this event, and flow data is not provided. Minor damage occurred to monitoring equipment during the event and the facility was subsequently taken offline for repairs. It's anticipated that the facility will return to operation early in the third quarter.

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Quarterly Performance Report - Attachment A

Performance Period:	April 1, 2015 - June 30, 2015
Total Number of Discharge Events:	**13**

Note: Influent and effluent samples are collected once every four hours during a CSO event.

					Volume Parameters				Unit Processes Activated?				Discharge to Harbor Brook?	
					Total Precipitation per Event	Wetlands Influent Volume	Wetlands Effluent Volume (Main Outfal 018)	Oveflow Volume (Emergency Bypass 018A)	Grit and Floatables Facility	Cell 1	Cell 2	Cell 3	Yes	No
Units					in	MG	MG	MG						
Sample Type					Recorded	Recorded	Recorded	Recorded						
Event Data	**Diversion Number**	**Event Number**	**Event Date/Start Time**	**Event Duration (hr)**[Θ]										
	1*	1	4/23/2015 7:00	123.5	0.14	4.01	2.32	0.00	Yes	Yes	Yes	Yes	Yes	-
	2[A*]	2	5/2/2015 13:00	78	0.00	4.13	3.58	0.00	Yes	Yes	Yes	Yes	Yes	-
	3[A]	-	5/11/2015	0.00	0.53	0.51	0.00	0.00	Yes	Yes	No	No	-	No
	4[A]	3	5/18/2015 23:25	6.92	1.06	0.73	0.52	0.00	Yes	Yes	Yes	Yes	Yes	-
	5[A]	-	5/30/2015	0.00	0.62	0.52	0.00	0.00	Yes	Yes	No	No	-	No
	6	-	6/8/2015	0.00	0.42	0.29	0.00	0.00	Yes	Yes	No	No	-	No
	7[A]	-	6/9/2015	0.00	0.19	0.04	0.00	0.00	Yes	Yes	No	No	-	No
	8[A]	-	6/11/2015	0.00	0.00	0.05	0.00	0.00	Yes	Yes	No	No	-	No
	9	-	6/14/2015	0.00	0.95	0.04	0.00	0.00	Yes	Yes	No	No	-	No
	10[A]	-	6/15/2015	0.00	0.01	0.01	0.00	0.00	Yes	Yes	No	No	-	No
	11	-	6/16/2015	0.00	0.50	0.32	0.00	0.00	Yes	Yes	No	No	-	No
	12[A]	-	6/21/2015	0.00	0.25	0.01	0.00	0.00	Yes	Yes	No	No	-	No
	13[A]	4	6/28/2015 6:35 [*]	33.83	0.66	0.19	0.56	0.00	Yes	Yes	Yes	Yes	Yes	-
Statistics				**Quarterly Total**	5.33	10.84	6.99	0.00						

[Θ] Event duration is calculated based on when an effluent discharge starts and stops. See figures in Attachment C.

[A] Influent samples were not collected during these events because the influent diversion was less than 30 minutes.

*Events 1 and 2 caused by discharge from Bellevue County Club ponds.

[*] The effluent volume exceeds that of the influent for Event #13; likely due to backflow from Harbor Brook into cell 3.

Wetlands Influent Parameters									
				BOD_5°	TSS°	Settleable Solids	Fecal Coliform*[a]	NH_3°	TP°
Units				mg/L	mg/L	mL/L	#/100 mL	mg/L	mg/L
Sample Type				Composite	Composite	Grab	Grab	Composite	Composite
Number of Samples				9	9	44	43	9	9
Lab Analysis Method				SM 5210 B-01,-11	SM 2540 D-97,-11	SM 2540 F-97,-11	SM 9222 D-97	10-107-6-1-B, J	QuickChem 10-115-01-1-E
	Diversion Number	Event Date/Sample Time	Total Event Duration (hr)						
Event Data	1	4/22/2015 10:55	123.50	20	14	<0.2	350000	1.25	0.40
	1	4/22/2015 14:15				<0.2	106000		
	1	4/22/2015 18:15				0.3	691000		
	1	4/22/2015 22:15				<0.2	240000		
	1	4/23/2015 2:15				<0.2	29000		
	1	4/23/2015 6:15				<0.2	200000		
	1	4/23/2015 10:15		17	13	<0.2	600000	1.35	0.38
	1	4/23/2015 14:15				<0.2	400000		
	1	4/23/2015 18:15				0.3	600000		
	1	4/23/2015 22:15				<0.2	107000		
	1	4/24/2015 2:15				<0.2	124000		
	1	4/24/2015 6:15				<0.2	560000		
	1	4/24/2015 10:15		17	19	<0.2	809000	1.36	0.41
	1	4/24/2015 14:15				<0.2	290000		
	1	4/24/2015 18:15				<0.2	290000		
	1	4/24/2015 22:15				<0.2	240000		
	1	4/25/2015 2:15				<0.2	112000		
	1	4/25/2015 6:15				<0.2	82000		
	1	4/25/2015 10:15		31	38	0.3	340000	2.46	0.61
	1	4/25/2015 14:15				0.5	H[ϕ]		
	1	4/25/2015 18:15				0.5	470000		
	1	4/25/2015 22:15				2.0	210000		
	1	4/26/2015 2:15				0.7	550000		
	1	4/26/2015 6:15				<0.2	26000		
	1	4/26/2015 10:15		26	22	1.0	927000	1.90	0.53
	1	4/26/2015 14:15				<0.2	300000		
	1	4/26/2015 18:15				<0.2	280000		
	1	4/26/2015 22:15				<0.2	260000		
	1	4/27/2015 2:15				<0.2	41000		
	1	4/27/2015 6:15				0.3	145000		
	1	4/27/2015 10:15		22	25	<0.2	430000	1.81	0.47
	1	4/27/2015 14:15				<0.2	72700		
	1	4/27/2015 18:15				<0.2	430000		
	1	4/27/2015 22:15				0.3	350000		
	1	4/28/2015 2:15				<0.2	85600		
	1	4/28/2015 6:15				<0.2	132000		
Averages - Event #1 Influent				22	22	<0.3	223799	1.69	0.46

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Wetlands Influent Parameters									
				BOD_5°	TSS°	Settleable Solids	Fecal Coliform*[a]	NH_3°	TP°
Units				mg/L	mg/L	mL/L	#/100 mL	mg/L	mg/L
Sample Type				Composite	Composite	Grab	Grab	Composite	Composite
Number of Samples				9	9	44	43	9	9
Lab Analysis Method				SM 5210 B-01,-11	SM 2540 D-97,-11	SM 2540 F-97,-11	SM 9222 D-97	10-107-6-1-B, J	QuickChem 10-115-01-1-E
Event Data	Diversion Number	Event Date/Sample Time	Total Event Duration (hr)						
	6	6/8/2015 14:00	0.00	46	86	4.0	1060000	2.82	0.93
	6	6/8/2015 18:28				<0.2	1160000		
	6	6/8/2015 22:00				<0.2	550000		
	6	6/9/2015 2:00				2.0	691000		
	6	6/9/2015 6:00				0.2	340000		
	6	6/9/2015 12:00				2.0	1700000		
Averages - Event #6 Influent				46	86	<1.4	803999	2.82	0.93
Event Data	Diversion Number	Event Date/Sample Time	Total Event Duration (hr)						
	9	6/14/2015 23:55	0.00	32	431	2	460000	1.53	0.97
Averages - Event #9 Influent				32	431	2	460000	1.53	0.97
Event Data	Diversion Number	Event Date/Sample Time	Total Event Duration (hr)						
	11	6/16/2015 11:50	0.00	6	57	<0.2	270000	0.86	0.41
Averages - Event #11 Influent				6	57	<0.2	270000	0.86	0.41
Quarterly Averages[#]				24	78	<0.5	273230	1.70	0.56
Screenings (CY)	April 2015	N/A^							
	May 2015	3.5							
	June 2015	1							

°Composite samples include 6 grab samples taken at 4 hour increments each day (composites on the last day of sampling may include fewer than 6 grab samples).

*Monitoring of parameters marked with asterisk only occurs between April 1 and October 15.

[a]Interim Fecal Coliform Effluent Limit is monitor until April 1, 2016, as per SPDES Permit. Quarterly average is calculated as geometric mean.

[ϕ]The "H" data flag indicates a sample was received or held beyond its acceptable holding time, and its reported results are not used for compliance purposes.

[#]The quarterly average is the average of the data from the quarter, excluding the event averages.

[^]April 2015 screenings data not available.

Wetlands Effluent - Main Outfall CSO 018																	
				BOD_5 °	TSS°	Settleable Solids	Oil & Grease	Floatable Material [ж]	Chlorine (Total Residual)	Mono-Chloramines	Chloramines	Total Dichloramine	Chlorine	Fecal Coliform*[a]	NH_3°	TKN°	TP°	DO
Units				mg/L	mg/L	mL/L	mg/L	days	mg/L	mg/L	mg/L	mg/L	mg/L	#/100 mL	mg/L	mg/L	mg/L	mg/L
Sample Type				Composite	Composite	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Composite	Composite	Composite	Grab
Number of Samples				7	7	39	39	39	39	39	39	39	39	39	7	7	7	23
Lab Analysis Method				SM 5210 B-01,-11	SM 2540 D-97,-11	SM 2540 F-97,-11	EPA 1999 (1664-A)	Field	Field	Field	Field	Field	Field	SM 9222 D-97	QuikChem 10-107-6-1-B, J	QuikChem 10-107-06-2	QuikChem 10-115-01-1-E	Field
	Event Number	Event Date/Sample Time	Event Duration															
Event Data	1	4/23/15 7:00	123.50	7	36	0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	19800	0.48	2.00	0.15	~
	1	4/23/15 10:55				<0.2	<5	Present -suds/ foam, visible oil film, food packaging, beverage container	<0.10	0.00	0.00	0.00	0.00	17900				~
	1	4/23/2015 14:55				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	8010				~
	1	4/23/2015 19:00				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	19800				~
	1	4/23/2015 23:00				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	10900				~
	1	4/24/2015 3:00				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	10200				~
	1	4/24/2015 6:55		4	9	<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	12800	0.86	2.00	0.10	~
	1	4/24/2015 11:00				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	20000				~
	1	4/24/2015 14:55				<0.2	<4	Absent	<0.10	0.05	0.17	0.12	0.23	9090				~
	1	4/24/2015 18:55				<0.2	<5	Absent	<0.10	0.04	0.07	0.03	0.08	7740				~
	1	4/24/2015 22:55				<0.2	<4	Absent	<0.10	0.01	0.02	0.01	0.03	9990				~
	1	4/25/2015 2:55				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	6210				~
	1	4/25/2015 6:55		<3	9	<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	8460	0.72	1.70	0.07	~
	1	4/25/2015 11:00				0.3	<4	Absent	<0.10	0.00	0.00	0.00	0.00	5200				~
	1	4/25/2015 15:15				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	4300				~
	1	4/25/2015 19:00				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	6000				~
	1	4/25/2015 22:45				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	4100				~
	1	4/26/2015 2:45				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	5600				~
	1	4/26/2015 6:55		<3	12	<0.2	<5	Absent	<0.10	0.00	0.00	0.00	0.06	3000	0.81	1.90	0.07	~
	1	4/26/2015 10:55				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	1530				N/A[ψ]
	1	4/26/2015 14:55				<0.2	<4	Absent	<0.10	0.04	0.06	0.02	0.07	450				~
	1	4/26/2015 18:55				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	810				~
	1	4/26/2015 22:55				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	810				~
	1	4/27/2015 2:55				0.8	<4	Absent	<0.10	0.00	0.00	0.00	0.00	450				~
	1	4/27/2015 6:55		3	9	<0.2	<4	Present- Oil Film	<0.10	0.00	0.00	0.00	0.00	450	0.83	1.60	0.06	~
	1	4/27/2015 10:55				1.3	<4	Present- Oil Film	<0.10	0.06	0.03	0.00	0.07	450				~
	1	4/27/2015 14:55				<0.2	<4	Present- Oil Film	<0.10	0.05	0.06	0.01	0.10	270				~
	1	4/27/2015 18:55				<0.2	<5	Absent	<0.10	0.02	0.06	0.04	0.08	<100				~
	1	4/27/2015 22:55				<0.2	<4	Present- Suds/ Foam	<0.10	0.03	0.08	0.05	0.10	540				~
	1	4/28/2015 2:55				<0.2	<4	Present- Oil Film	<0.10	0.00	0.00	0.00	0.00	211				~
	1	4/28/2015 6:55		4	10	<0.2	<4	Present- Suds/ Foam	<0.10	0.00	0.00	0.00	0.00	255	1.01	1.70	0.11	~
	1	4/28/2015 10:55				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	10700				~
	1	4/28/2015 14:55				<0.2	<4	Present- Street Litter	<0.10	0.00	0.00	0.00	0.00	2500				~
Averages - Event #1 Effluent				<4	14	<0.3	<4	3[Δ]	<0.10	0.01	0.02	0.01	0.02	<2784	0.79	1.82	0.09	~
	Event Number	Event Date/Sample Time	Event Duration															
Event Data	4	6/28/2015 10:15	33.83	5	11	<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	360000	0.75	1.50	0.27	5.20
	4	6/28/2015 14:15				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	149000				4.09
	4	6/28/2015 18:15				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	64000				4.63
	4	6/28/2015 22:15				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	12100				~
	4	6/29/2015 2:15				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	13000				4.20
	4	6/29/2015 6:15				<0.2	<4	Absent	<0.10	0.00	0.00	0.00	0.00	9730				4.06
Averages - Event #13 Effluent				5	11	<0.2	<4	0[Δ]	<0.10	0.00	0.00	0.00	0.00	41695	0.75	1.50	0.27	4.06 ⊀
Quarterly Averages[#]				<4	14	<0.3	<4	3[Δ]	<0.10	0.01	0.01	0.01	0.02	<4222	0.78	1.77	0.12	4.06 ⊀

° Composite samples include 6 grab samples taken at 4 hour increments each day (composites on the last day of sampling may include fewer than 6 grab samples).

[ж] A floatable material description form is attached for each effluent sample.

*Monitoring of parameters marked with asterisk only occurs between April 1 and October 15.

[a]Interim Fecal Coliform Effluent Limit is monitor until April 1, 2016, as per SPDES Permit. Quarterly average is calculated as geometric mean.

~Post calibration of the YSI Sonde was not performed in accordance with OCWEP Standard Operating Procedures. Therefore, DO values are not reported.

[ψ] N/A indicates the sample was not collected.

⊀ Value is the minimum DO observed for the event.

[#]The quarterly average is the average of the data from the quarter, excluding the event averages.

[Δ] Number of days in which at least one floatable was observed.

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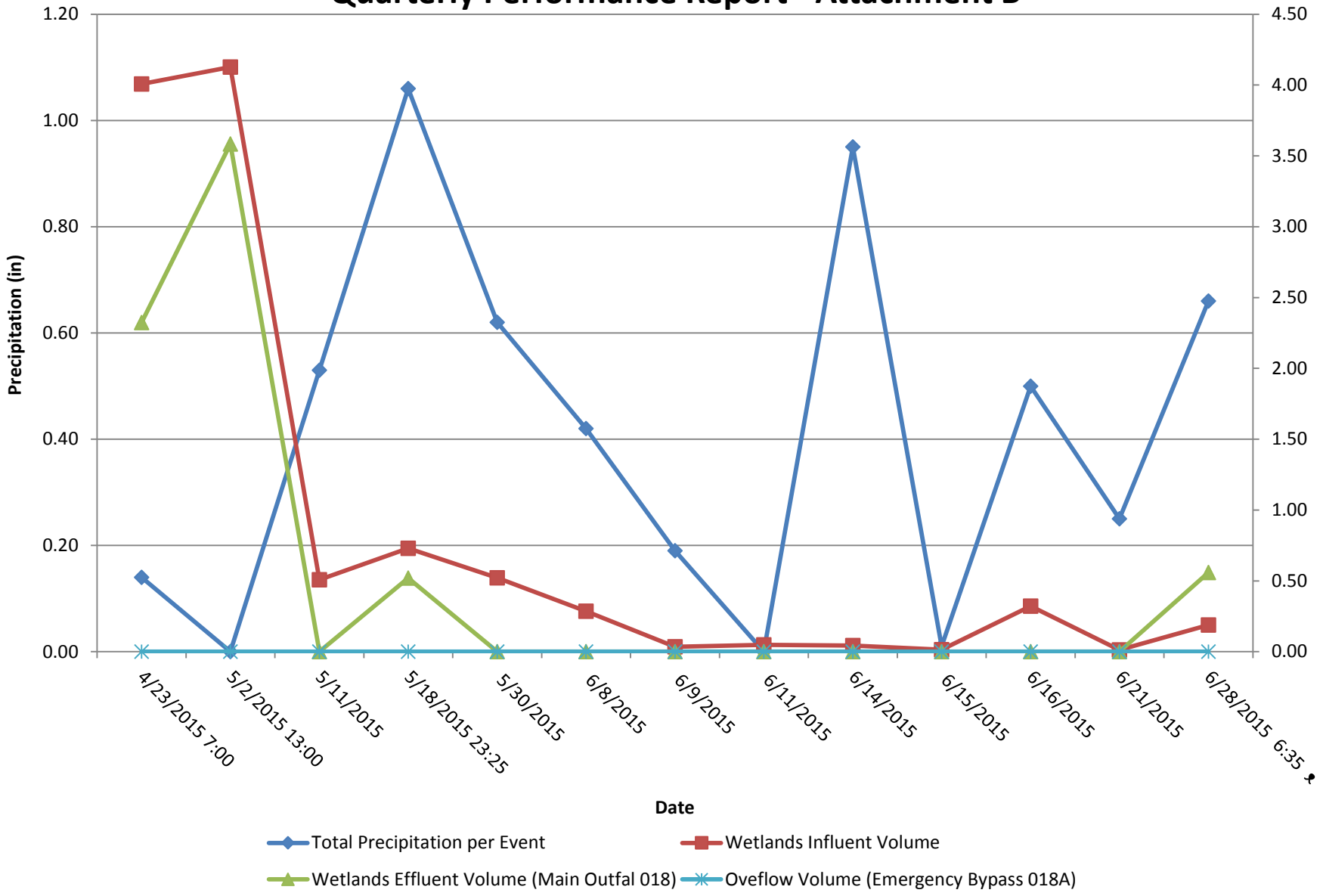
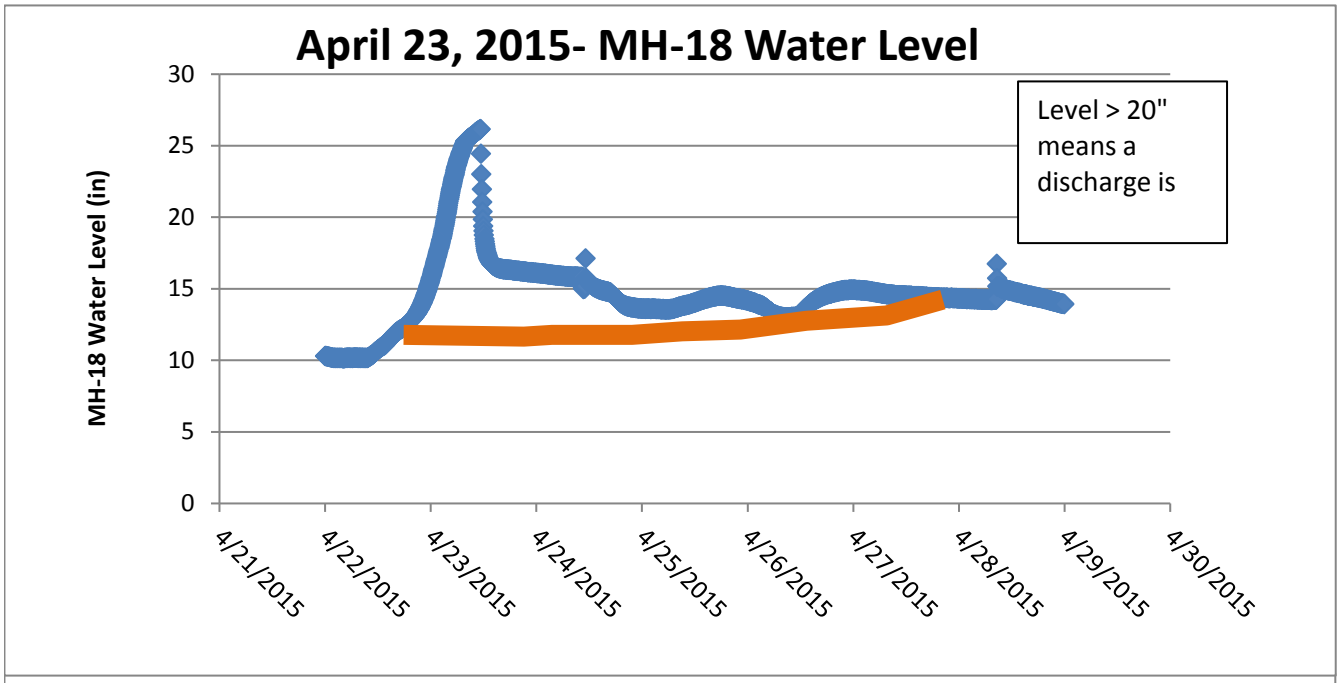
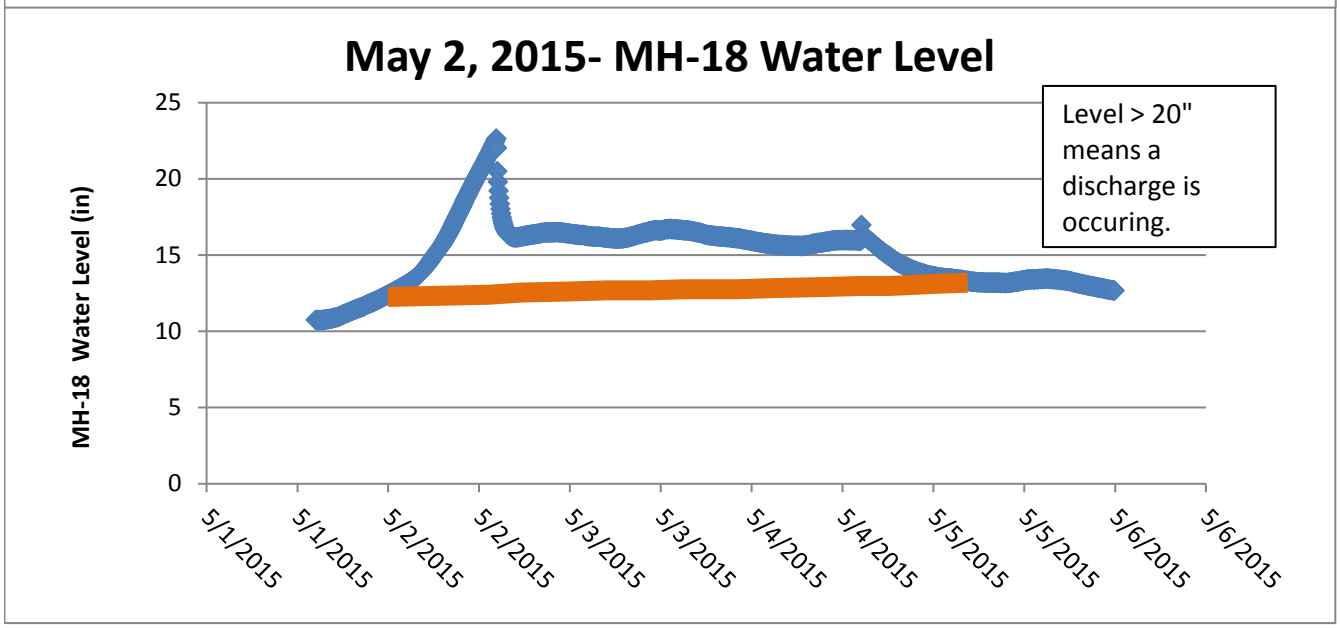
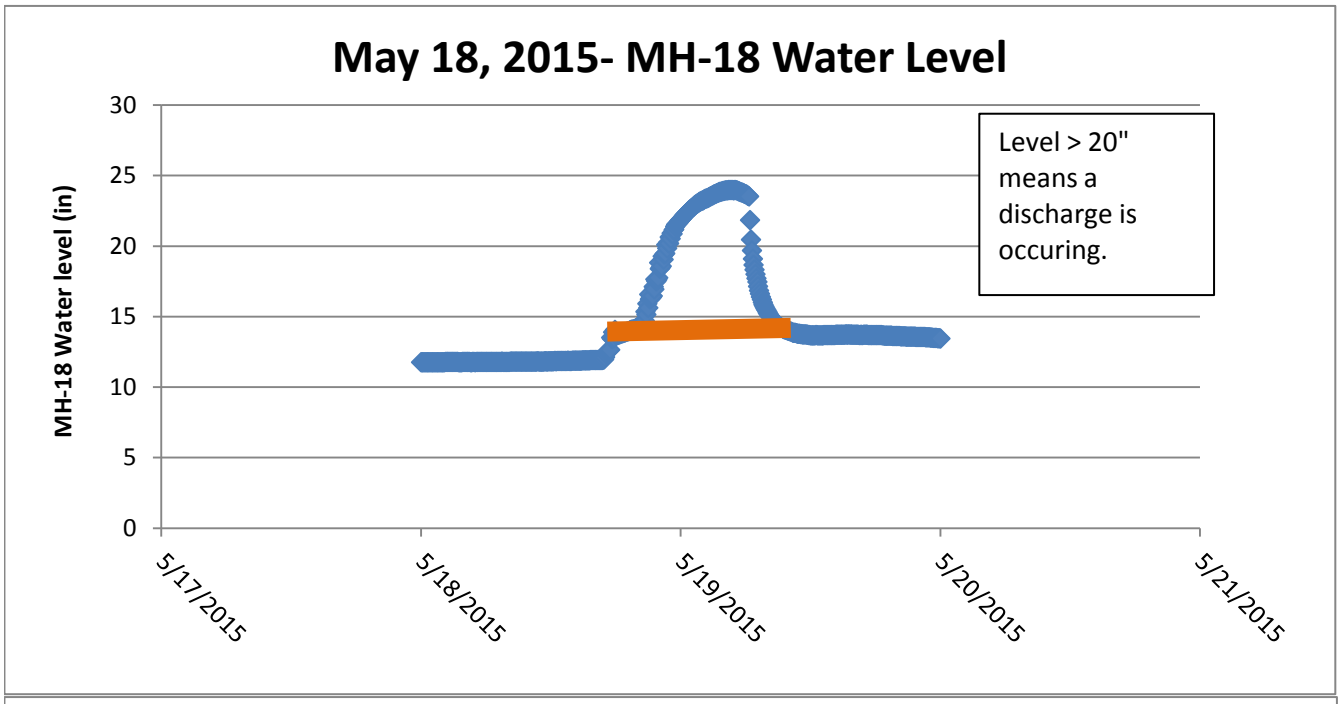
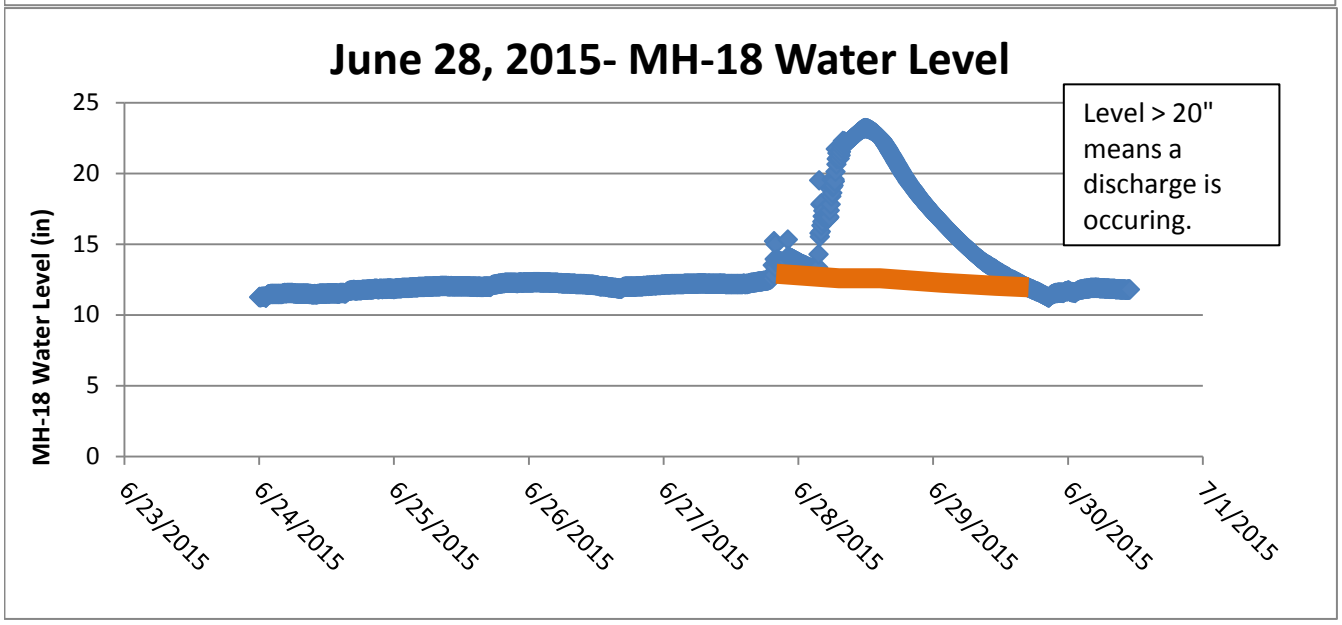



April 23, 2015- MH-18 Water Level
MH-18 Water Level (in)
30
25
20
15
10
5
0
4/21/2015
4/22/2015
4/23/2015
4/24/2015
4/25/2015
4/26/2015
4/27/2015
4/28/2015
4/29/2015
4/30/2015
Level > 20" means a discharge is


May 2, 2015- MH-18 Water Level
MH-18 Water Level (in)
25
20
15
10
5
0
5/1/2015
5/1/2015
5/2/2015
5/2/2015
5/3/2015
5/3/2015
5/4/2015
5/4/2015
5/5/2015
5/5/2015
5/6/2015
5/6/2015
Level > 20" means a discharge is occuring.


May 18, 2015- MH-18 Water Level
MH-18 Water level (in)
30
25
20
15
10
5
0
5/17/2015
5/18/2015
5/19/2015
5/20/2015
5/21/2015
Level > 20" means a discharge is occuring.


June 28, 2015- MH-18 Water Level
MH-18 Water Level (in)
25
20
15
10
5
0
6/23/2015
6/24/2015
6/25/2015
6/26/2015
6/27/2015
6/28/2015
6/29/2015
6/30/2015
7/1/2015
Level > 20" means a discharge is occuring.

Quarterly Performance Report

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility

Performance Period:

This quarterly performance report is for the period of July 1, 2015 through September 30, 2015 and report has been prepared by the CH2M and SUNY ESF monitoring team.

Facility Performance:

The Harbor Brook CSO 018 Pilot Constructed Wetlands Facility is currently maintained and operated by the construction contractor, Joseph J. Lane Construction, Inc. The facility is primarily operated over OCDWEP's SCADA network, however, periodic local control has been necessary during the ongoing system testing and calibration period. The facility was offline from July 1st through July 23rd to repair damage to the flow meters and other electrical equipment from the near 25-year storm (2.5" of rainfall in under 3 hours) event on June 30th. The facility was also offline starting on September 24th due to a failure of the gate unit required to operate the system. It is anticipated that the facility will be returned to operation during the beginning of the fourth quarter. While the facility is offline, the Box 1A gate will be re-calibrated, the MH-3C weir wall will be reinforced, and the washdown sprays in the SanSep units will be re-calibrated so that they automatically operate at the end of storm events.

During storm events resulting in flows greater than six (6) CFS in the Rowland Street trunk sewer, CSO is diverted through a grit and floatables removal system. After solids are removed in the grit and floatables system, flow continues into the wetland treatment system. The three (3) wetland cells continued to be operated in series during this performance period. That is, flow from the grit and floatables enters Cell 1, flows into Cell 2, then flows into Cell 3 before being discharged into Harbor Brook through MH-19. Flows above forty-four (44) CFS in the Rowland Street trunk sewer bypass the treatment facility and discharge directly to Harbor Brook via the Emergency Bypass. When the facility is offline, CSO flow bypasses the grit and floatables facility and wetland cells through MH-5A, MH-15, MH-16, MH-17, and MH-19 before discharging to Harbor Brook. Because of a backflow preventer on the outfall preventing flow from Harbor Brook from backing up into Cell 3, bypassed flow does not immediately discharge to Harbor Brook. The bypass flow in MH-19 backflows into MH-18 and wetland Cell 3 until 20" of pressure difference is achieved across the backflow preventer resulting in a discharge to Harbor Brook. For this reason, not all bypass events result in an effluent discharge.

During this performance period four (4) CSO diversion events occurred (events where CSO flow is diverted through the grit and floatables facility). Of the four CSO diversion events, one (1) resulted in a treated effluent discharge through MH-19 from the constructed wetlands facility (CSO discharge event). Additionally, two (2) emergency bypass events occurred during this performance period.

During CSO diversion and discharge events, samples are collected from the influent (MH-1D) and the effluent (MH-18, when operating in series) and analyzed in accordance with the SPDES permit. Flows are also monitored at the influent to the wetlands (MH-4A), effluent from the wetlands (MH-18, when in series), and bypass (MH-5A). For this performance period, data from the precipitation gauge at the City of Syracuse's Wadsworth Park, owned and operated by OCDWEP, within the CSO 018 drainage area was used.

Attachment #A summarizes the flows, rainfall data, and diversion events during this performance period. No samples were collected during this period as summarized below.

Including all events, the estimated volume diverted to the constructed wetlands was 6.02 million gallons and the estimated volume treated and discharged by the constructed wetlands through MH-19 to Harbor Brook (018) for this performance period was zero gallons. Treated flow was discharged on July 1st, however, due to the flooding damage this flow cannot be quantified. Furthermore, the wetland cells have significant storage capacity (approximately 700,000 gallons at maximum capacity). If CSO diversion events are not of sufficient duration and/or intensity, the capacity at which the treated flow is discharged is not reached and treated CSO discharge does not occur. The water stored within the cells slowly flows into groundwater and is evapotranspired after these short-duration/intensity events occur.

350,000 gallons of untreated flow was discharged through the Emergency Bypass (018A), and the highest daily rainfall recorded at Wadsworth Park was 1.44 inches on September 30, 2015.

Diversion #14 (Event #5) occurred on July 1st, and was a continuation of the 25-year storm event on June 30th. This event was not sampled because of flooding conditions throughout the facility. The flow meter that controls diversion of CSO flow to the grit and floatables facility and wetland cells in MH-3302 was dislodged during this event, causing non-CSO flow to be diverted to the facility As a result, the flow data provided in Attachment A is suspect for this event.

Diversion #15 (Event #6) occurred while the facility was online on July 26th. However, a communications fault prevented notification of the SUNY ESF sampling team and as a result, samples were not collected from the influent or the effluent. The communications fault was immediately repaired once discovered. Further a blockage beneath the Box 1A diversion gate limited the volume of CSO flow that was diverted to the facility. As a result, the discharge volume for this event is reported as overflow volume discharged through Emergency Bypass 018A.

Diversions #16 and #17 occurred on September 9th and September 19th, respectively. The diversion of CSO flow during these events was less than thirty (30) minutes, and influent samples were not collected in accordance with the approved Sampling Plan for this facility. The facility did not discharge treated flow to Harbor Brook during these events.

Event #7 occurred on September 30th. The facility was offline during this period to repair the Box 1A gate valve and MH-3C weir wall. During this event, CSO flow bypassed the grit and floatables facility and wetland cells and discharged directly to Harbor Brook through the Emergency Bypass (018A).

The Figure in Attachment B shows the wetlands influent volume, effluent volume, bypass volume and precipitation for each of the events, and the figures in Attachment C provide the levels measured by the flow meter in MH-19 at the start and stop of each CSO discharge event.

The Figures in Attachment D show the flow diagram and schematics for the constructed wetlands facility.

Screenings were removed from the grit and floatables facility at the end of each month. The volume collected is as follows:

- July 2015: < 1 cubic yard
- August 2015: 2.5 cubic yards
- September 2015: < 1 cubic yard

No removal efficiencies are reported for this quarter due to the lack of sampling at the influent and effluent.

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
2015 3rd Quarter Quarterly Performance Report - Attachment A

Performance Period:	July 1, 2015 - September 30, 2015
Total Number of Discharge Events:	**3**

					Volume Parameters					Unit Processes Activated?				Discharge to Harbor Brook?	
					Total Precipitation per Event	Maximum Precipitation Intensity	MH-4A Wetlands Influent Volume	MH-19 Wetlands Effluent Volume (Main Outfall 018, MH-19 When In Operation)	Overflow Volume (Emergency Bypass 018A, MH-19 When Offline)[$]	Grit and Floatables Facility	Cell 1	Cell 2	Cell 3	Yes	No
Units					in	in/hr	MG	MG	MG						
Sample Type					Recorded	Recorded	Recorded	Recorded	Recorded						
Event Data	**Diversion Number**	**Event Number**	**Event Date/Start Time**	**Event Duration (hr)**											
	14*	5	7/1/2015	UNK	0.24	0.13	5.65	UNK	0.00	Yes	Yes	Yes	Yes	Yes	-
	15`	6	7/26/2015 02:45	4.67	1.08	0.62	0.01	0.00	0.25	Yes	Yes	No	No	Yes	-
	16^	-	9/9/2015	0	0.68	0.42	0.34	0.00	0.00	Yes	Yes	No	No	-	No
	17^	-	9/19/2015	0	0.31	0.29	0.02	0.00	0.00	Yes	Yes	No	No	-	No
		7[#]	9/30/2015 01:35	3.92	2.79~	0.44	0.00	0.00	0.10	No	No	No	No	Yes	-
Statistics				**Quarterly Total**	5.10	-	6.02	0.00	0.35						

[$]When offline, overflow volumes are determined at MH-19 by summing the total flows when the MH-19 pressure sensor records at level of at least 20" (indicating that the backflow preventer is open) and a positive flow rate.

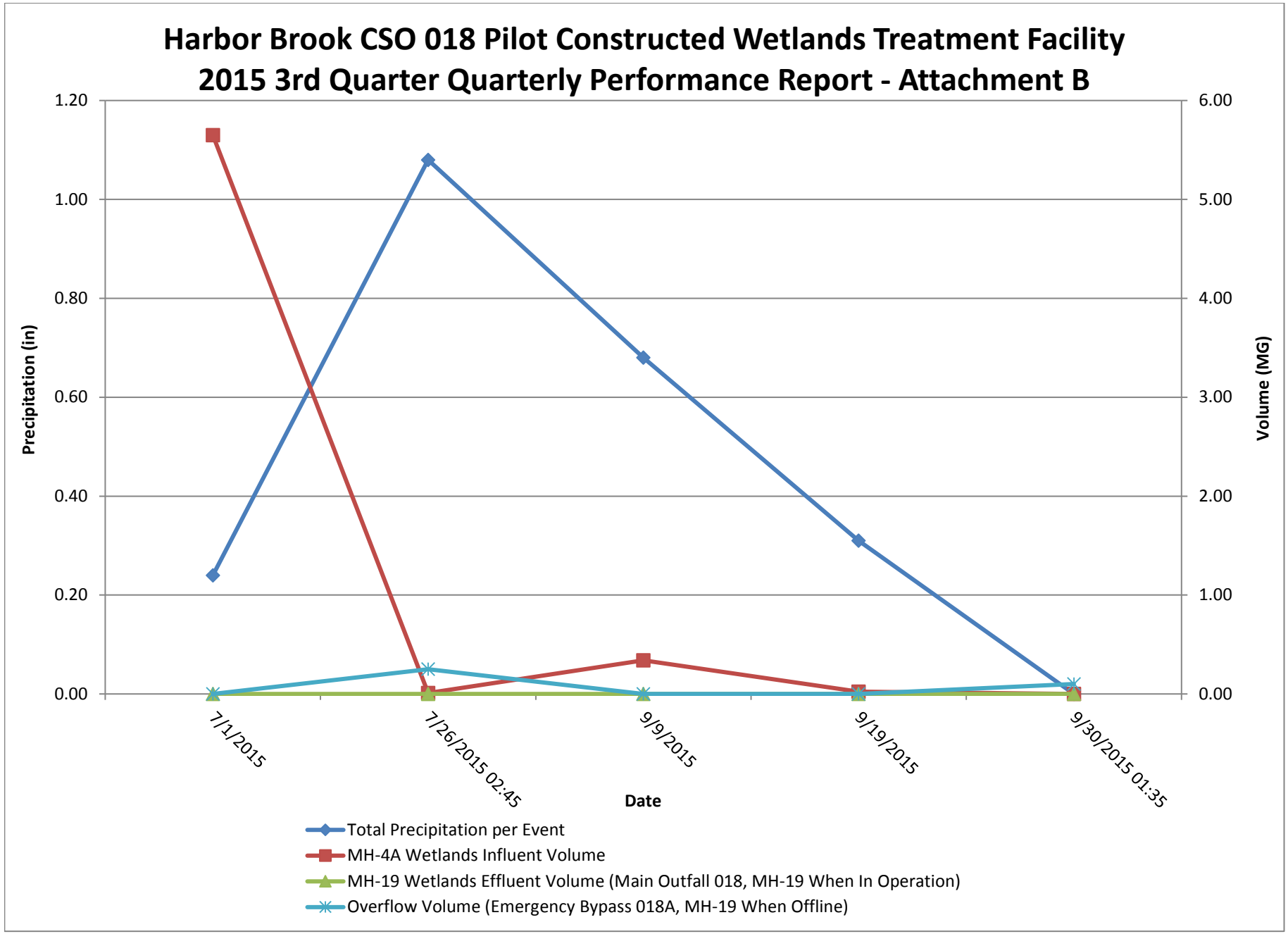
*The 25-yr storm event on June 30, 2015 dislodged the influent flow meter from it's proper installation. As such, the flow data is suspect for this event. Effluent volume and duration are not available due to flooding at the effluent (UNK).

`Due to a communications fault, event notifications were not sent to sampling staff and samples were not collected for this event. The Box 1A gate did not fully close during this event due to a blockage at the bottom of the gate, limiting the CSO flow diverted to the facility.

^Influent samples were not collected during this event because the influent diversion was less than 30 minutes in duration.

[#]The facility was offline during this event and no flow was diverted to the treatment facility. Emergency bypass volume is provided.

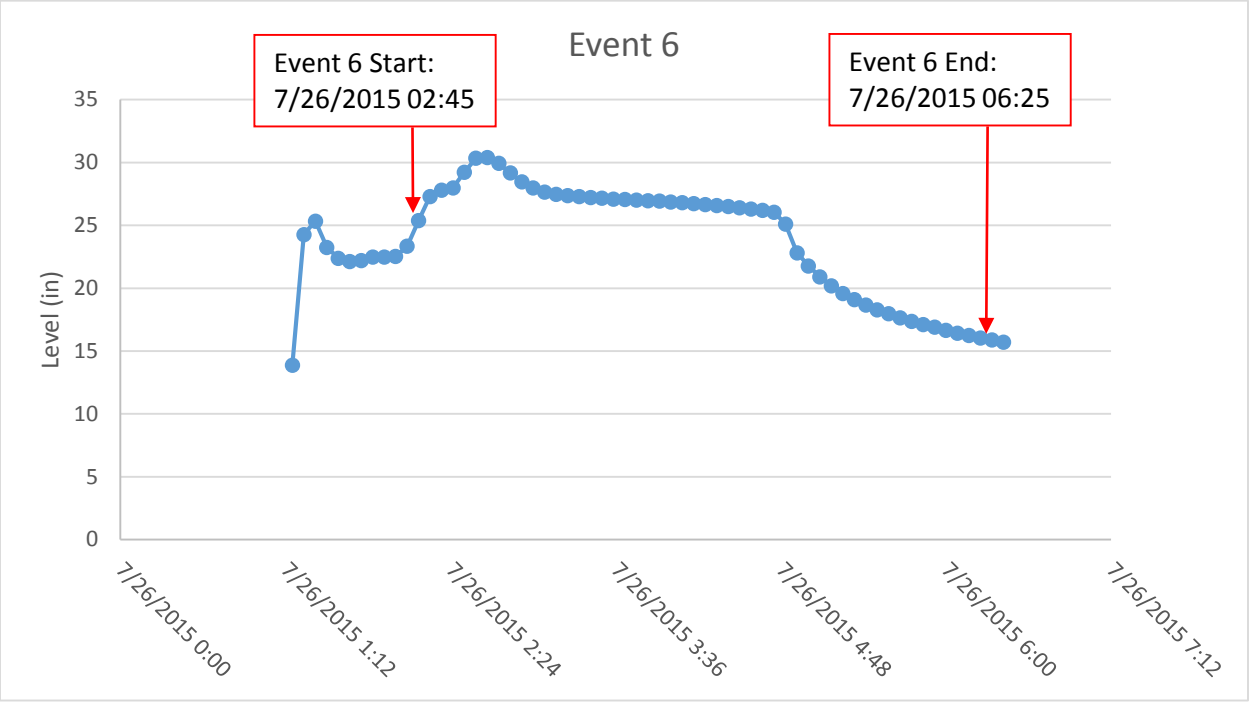
~Total rainfall reported includes both 9/29 and 9/30.

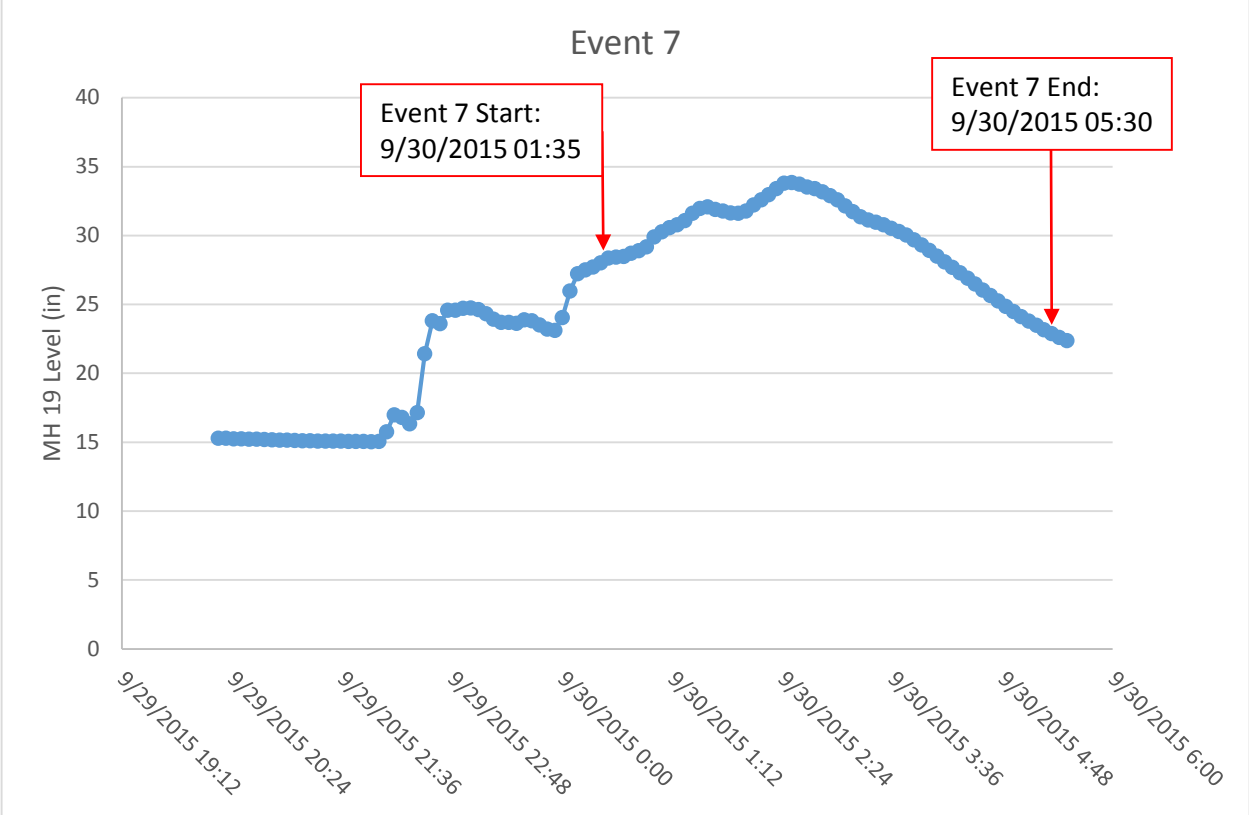

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
2015 3rd Quarter Quarterly Performance Report - Attachment B
Precipitation (in)
Volume (MG)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
7/1/2015
7/26/2015 02:45
9/9/2015
9/19/2015
9/30/2015 01:35
Date
Total Precipitation per Event
MH-4A Wetlands Influent Volume
MH-19 Wetlands Effluent Volume (Main Outfall 018, MH-19 When In Operation)
Overflow Volume (Emergency Bypass 018A, MH-19 When Offline)

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility

2015 3rd Quarter Quarterly Performance Report – Attachment C

Note: Due to flooding throughout the facility and damage to the MH-19 flow meter, during the June 30th storm event, effluent volume and discharge duration are not known for event 5 on July 1st.





Quarterly Performance Report

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility

Quarter:

This quarterly performance report is for the period of October 1, 2015 through December 31, 2015 and this report has been prepared by the CH2M and SUNY ESF monitoring team.

Facility Performance:

The Harbor Brook CSO 018 Pilot Constructed Wetlands Facility is primarily operated over OCDWEP's SCADA network, however, periodic local control has been necessary during the ongoing system testing and calibration period by the construction contractor, Joseph J. Lane Construction, Inc. The facility was offline from September 24, 2015 through November 30, 2015 to recalibrate the Box 1A diversion gate, reinforce the MH-3C weir wall, and update system programming such that the washdown sprays in the SanSep units automatically operate at the end of storm events. The facility was returned to full operation on December 1, 2015.

During storm events resulting in flows greater than six (6) CFS in the Rowland Street trunk sewer, CSO is diverted through a grit and floatables removal system. After solids are removed in the grit and floatables system, flow continues into the wetland treatment system. The three (3) wetland cells continued to be operated in series during this quarter. That is, flow from the grit and floatables enters Cell 1, flows into Cell 2, then flows into Cell 3 before being discharged into Harbor Brook through MH-18 and MH-19. Flows above forty-four (44) CFS in the Rowland Street trunk sewer bypass the treatment facility and discharge directly to Harbor Brook via the Emergency Bypass. When the facility is offline, CSO flow bypasses the grit and floatables facility and wetland cells through MH-5A, MH-15, MH-16, MH-17, and MH-19 before discharging to Harbor Brook. Because of a backflow preventer on the outfall preventing flow from Harbor Brook from backing up into Cell 3, bypassed flow does not immediately discharge to Harbor Brook. The bypass flow in MH-19 backflows into MH-18 and wetland Cell 3 until approximately 20" of pressure difference is achieved across the backflow preventer resulting in a discharge to Harbor Brook. For this reason, not all bypass events result in an effluent discharge.

During this quarter, two (2) CSO diversion events occurred (events where CSO flow is diverted through the grit and floatables facility). Of the two CSO diversion events, none resulted in a treated effluent discharge through MH-19 from the constructed wetlands facility (CSO discharge event).

During CSO diversion and discharge events, samples are collected from the influent (MH-1D) and the effluent (MH-18, when operating in series) and analyzed in accordance with the SPDES permit. Flows are also monitored at the influent to the wetlands (MH-4A), effluent from the wetlands (MH-18, when in series), and bypass (MH-5A). For this quarter, data from the precipitation gauge at the City of Syracuse's Wadsworth Park, owned and operated by OCDWEP, within the CSO 018 drainage area was used.

Attachment #A summarizes the flows, rainfall data, and diversion events during this quarter.

Including both events, the estimated volume diverted to the constructed wetlands was 0.09 million gallons and the estimated volume treated and discharged by the constructed wetlands through MH-19 to Harbor Brook (018) for this quarter was zero gallons. The wetland cells have significant storage capacity (approximately 700,000 gallons at maximum capacity), and if CSO diversion events are not of sufficient duration and/or intensity, the capacity at which the treated flow is discharged is not reached and treated CSO discharge does not occur. The water stored within cells is evapotranspired after short-

duration/intensity events when the temperature is above freezing, and forms ice in the cells when the temperature is below freezing. Furthermore, Cell 3 is unlined, and water within that cell will contribute to local groundwater as it rises and falls during and after rain events.

Event #8 may have occurred on October 9, 2015. Three-quarters of an inch of rainfall was recorded that day, however, the flow meter equipment at the outfall (MH-19) was not in operation due to necessary electrical repairs and upgrades. The overflow volume reported (0.03 MG) is the volume recorded at MH-5A (wetland bypass). In previous quarters, 0.75 inches of rainfall would have resulted in a discharge out the outfall, therefore an Event is being reported for this date, despite the uncertainty.

Diversions #18 and #19 occurred on December 2, 2015 and December 22, 2015, respectively. The diversion of CSO flow during these events was less than thirty (30) minutes, and influent samples were not collected in accordance with the approved Sampling Plan for this facility. The facility did not discharge treated flow to Harbor Brook during these events.

The Figure in Attachment B shows the wetlands influent volume, effluent volume, bypass volume and precipitation for each of the events.

The Figures in Attachment C show the facility diagram and flow diagram schematics for the constructed wetlands facility.

Screenings were removed from the grit and floatables facility at the end of each month. The volume collected is as follows:

- October 2015: < 1 cubic yard
- November 2015: < 1 cubic yard
- December 2015: < 1 cubic yard

No removal efficiencies are reported for this quarter due to the lack of sampling at the influent and effluent.

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
2015 4th Quarter Quarterly Performance Report - Attachment A

Performance Period:	October 1, 2015 - December 31, 2015
Total Number of Discharge Events:	**1***

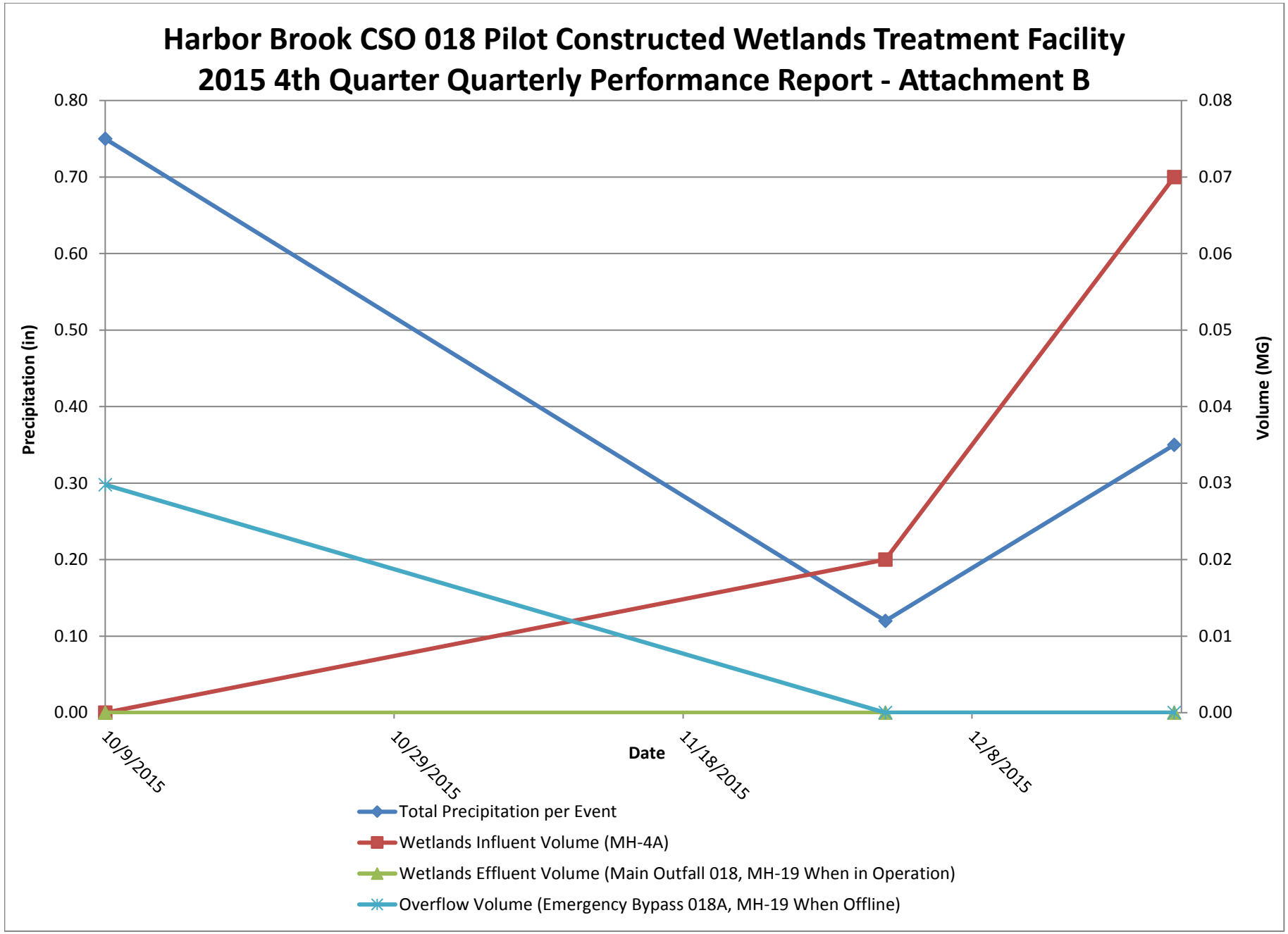
					Volume Parameters					Unit Processes Activated?				Discharge to Harbor Brook?	
					Total Precipitation per Event	Maximum Precipitation Intensity	Wetlands Influent Volume (MH-4A)	Wetlands Effluent Volume (Main Outfall 018, MH-19 When in Operation)	Overflow Volume (Emergency Bypass 018A, MH-19 When Offline)[$]	Grit and Floatables Facility	Cell 1	Cell 2	Cell 3	Yes	No
Units					in	in/hr	MG	MG	MG						
Sample Type					Recorded	Recorded	Recorded	Recorded	Recorded						
Event Data	**Diversion Number**	**Event Number**	**Event Date/Start Time**	**Event Duration (hr)[Θ]**											
	-	8*	10/9/2015	0*	0.75	0.22	0.00	0.00	0.03	No	No	No	No	Yes*	-
	18[#]	-	12/2/2015	0	0.12	0.06	0.02	0.00	0.00	Yes	Yes	No	No	-	No
	19[#]	-	12/22/2015	0	0.35	0.08	0.07	0.00	0.00	Yes	Yes	No	No	-	No
Statistics				**Quarterly Total**	1.22	-	0.09	0.00	0.03						

[Θ] Event duration is calculated based on when an effluent discharge starts and stops.

[#]Influent samples were not collected during these diversions because the influent diversion was less than 30 minutes.

[$]When offline, overflow volumes are determined at MH-19 by summing the total flows when the MH-19 pressure sensor records at level of at least 20" (indicating that the backflow preventer is open) and a positive flow rate.

*M-19 (outfall) flow meter equipment was down for electrical repairs on October 9, 2015. Volume data recorded at MH-5A (wetland bypass) provided. Exact start time, duration, and overflow volume discharged cannot be determined.


Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
2015 4th Quarter Quarterly Performance Report - Attachment B
Precipitation (in)
Volume (MG)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
10/9/2015
10/29/2015
11/18/2015
12/8/2015
Date
Total Precipitation per Event
Wetlands Influent Volume (MH-4A)
Wetlands Effluent Volume (Main Outfall 018, MH-19 When in Operation)
Overflow Volume (Emergency Bypass 018A, MH-19 When Offline)

Quarterly Performance Report

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility

Quarter:

This quarterly performance report is for the period of January 1, 2016 through March 31, 2016 and this report has been prepared by the CH2M and Fisher Associates monitoring team.

Facility Performance:

The Harbor Brook CSO 018 Pilot Constructed Wetlands Facility is primarily operated over OCDWEP's SCADA network. During this period three flow sensor malfunction periods occurred:

- The facility was offline from the afternoon of March 14, 2016 through the morning of March 31, 2016 to replace the malfunctioning flow sensor in MH-3302 that controls the diversion of CSO to the facility. During this timeframe the facility was operated manually during one rain event on March 28, 2016. No untreated discharges of CSO flow to Harbor Brook occurred during this timeframe.
- The effluent flow sensor on the outfall pipe in MH-19 became unresponsive on February 18, 2016 through the end of the quarter. Because the facility was operated in series during this timeframe, the data from the MH-18 flow sensor was utilized for determination of wetlands effluent volume during this timeframe.
- The influent flow sensor in MH-4A was out of service from February 21, 2016 through February 26, 2016 due to a programming malfunction. Influent volume data to the constructed wetlands facility is not available for this time period.

During storm events resulting in flows greater than six (6) CFS in the Rowland Street trunk sewer, CSO is diverted through a grit and floatables removal system. After solids are removed in the grit and floatables system, flow continues into the wetland treatment system. The three (3) wetland cells continued to be operated in series during this quarter. That is, flow from the grit and floatables enters Cell 1, flows into Cell 2, then flows into Cell 3 before being discharged into Harbor Brook through MH-18 and MH-19. Flows above forty-four (44) CFS in the Rowland Street trunk sewer bypass the treatment facility and discharge directly to Harbor Brook via the Emergency Bypass.

When the facility is offline, CSO flow bypasses the grit and floatables facility and wetland cells through MH-5A, MH-15, MH-16, MH-17, and MH-19 then discharges into Harbor Brook. Because of a backflow preventer on the outfall preventing flow from Harbor Brook from backing up into Cell 3, bypassed flow does not immediately discharge to Harbor Brook. The bypass flow in MH-19 then backflows into MH-18 and wetland Cell 3. When approximately 20" of difference between the elevation in MH-19 and Harbor Brook is achieved across the backflow preventer, discharge to Harbor Brook occurs. For this reason, not all bypass events result in a discharge out the outfall.

During CSO diversion and discharge events, samples are collected from the influent (MH-1D/Box 2) and the effluent (MH-18, when operating in series) and analyzed in accordance with the SPDES permit. Flows are also monitored at the influent to the wetlands (MH-4A), effluent from the wetlands (MH-18, when in series), and bypass (MH-5A).

In March, a calibration issue with the Wadsworth Park rain gauge presented itself. As a result, rain gauge data from Metro is also provided within this quarterly report for comparison purposes. It is anticipated that

the Wadsworth Park rain gauge will be re-calibrated and returned to proper functionality during the second quarter.

During this quarter, sixteen (16) CSO diversion events occurred (events where CSO flow is diverted through the grit and floatables facility). Of the sixteen CSO diversion events, three (3) resulted in a treated effluent discharge through MH-19 from the constructed wetlands facility (CSO discharge event). One large rain event above the design capacity of grit and floatables facility occurred on February 24, 2016, resulting in an emergency bypass around the facility and an untreated, overflow discharge to Harbor Brook.

The wetland cells have approximately 700,000 gallons of storage capacity (at maximum capacity). If CSO diversion events are not of sufficient duration and/or intensity, the capacity at which the treated flow is discharged does not exceed storage capacity and an effluent discharge does not occur. The CSO volume stored within cells is evapotranspired after short-duration/intensity events when the temperature is above freezing, and forms ice in the cells when the temperature is below freezing. Furthermore, Cell 3 is unlined, and water within that cell contributes to local groundwater as it rises and falls during and after rain events.

Attachment A summarizes the flows, rainfall data, diversion events, and lab data collected during this quarter. Per the SPDES permit for this facility, the monitoring of fecal coliforms, total chlorine residual, monochloramines, chloramines, total dichloramine, and chlorine is only required during April 1st through October 15th. Since this performance period was outside of that monitoring period, analysis for these parameters was not completed. Note that the raw lab data is included on the CD with the electronic version of the quarterly performance reports.

The estimated volume diverted to the constructed wetlands was 8.90 million gallons (MG) and the estimated volume treated and discharged by the constructed wetlands through MH-19 to Harbor Brook (018) for this quarter was 1.61 MG. Discharge of 0.25 MG of untreated, emergency bypass CSO occurred during a large rain event above the design capacity of the facility. A summary of each of the influent diversions, effluent discharges, and emergency bypasses is as follows:

- Diversion #1 occurred on January 10, 2016 and resulted in 0.15 MG of CSO flow being diverted to the constructed wetlands facility. A treated effluent discharge to Harbor Brook did not occur. This rain event caused several short duration low flow diversions, and influent samples were not collected and analyzed for this event.
- Diversion #2 occurred on February 3, 2016 and resulted in 0.20 MG of CSO flow being diverted to the constructed wetlands facility. A treated effluent discharge to Harbor Brook did not occur.
- Diversion #3 occurred on February 16, 2016 and resulted in Effluent Event #1. 1.21 million gallons of CSO flow were diverted to the constructed wetlands facility. This diversion resulted in a 15 minute treated effluent discharge from the facility. The diversion lasted a short duration due to Harbor Brook's elevated state limiting the amount of flow that could be discharged from the facility. Because the duration of the discharge was shorter than 30 minutes, effluent samples were not collected.
- Diversion #4 started on February 24, 2016 and resulted in the start of Effluent Event #2. Because of the influent flow sensor malfunction, the volume of flow diverted to the facility during this diversion is unknown. Due to the large size of this rain event, the design capacity of the grit and floatables facility was exceeded for a short duration, and approximately 0.25 MG of untreated, emergency bypass CSO flow was discharged to Harbor Brook. Harbor Brook was elevated due to the rainfall and snowmelt during this event, and back flowed into wetland cell 3. As such, the exact volume of emergency bypass discharge is unknown. The start time of the treated effluent discharge is unknown due to the back flow conditions. Sampling staff began collecting samples of effluent flow after Harbor Brook receded, back flowing ceased, and flooding was no longer present allowing safe access to MH-19 to collect samples.

Effluent Event #2 continued for over 5 days due to the influence of the Bellevue Country Club detention ponds discharging runoff and snowmelt to the 018 Rowland Trunk sewer. Several, separate influent diversions due to the detention ponds discharge volume occurred over the 5 day effluent discharge period (Diversions #5 - #11). In total, 5.57 million gallons of CSO flow was diverted to the constructed wetlands, and 1.23 million gallons of treated effluent discharge to Harbor Brook occurred during this period.

- Diversion #12 occurred on March 10, 2016 and 0.34 MG of CSO flow was diverted to the constructed wetlands facility. A treated effluent discharge to Harbor Brook did not occur.
- Diversion #13 also began on March 10, 2016 and continued for over 3 days due to the influence of the Bellevue Country Club detention ponds. This diversion resulted in Effluent Event #3 which occurred over the duration of nearly 43 hours. In total, 0.87 MG of CSO flow was diverted to the constructed wetlands facility, and 0.30 MG of treated, effluent flow was discharged to Harbor Brook. The duration of the influent diversion was longer than the effluent due to the slow rate of the influent flow. The volume of water diverted to the constructed wetlands was stored within the cells which shortened the effluent discharge.
- Diversion #14 occurred on March 14, 2016 and resulted in 0.10MG of CSO flow being diverted to the constructed wetlands. A treated effluent discharge did not occur.
- Diversion #15 occurred on March 28, 2016 and resulted in 0.09 MG of CSO flow being diverted to the constructed wetlands. A treated discharge did not occur. Between March 14, 2016 and March 31, 2016 the MH-3302 flow sensor that controls the CSO diversion gate in Box 1A malfunctioned. In order to avoid the possibility of an untreated discharge to Harbor Brook, the Box 1A gate was operated manually during this rain event.
- Diversion #16 occurred on March 31, 2016 and resulted in 0.38 MG of CSO flow being diverted to the constructed wetlands. A treated effluent discharge did not occur.

The Figure in Attachment B shows the wetlands influent volume, effluent volume, bypass volume and precipitation for each of the events.

The Figures in Attachment C show the effluent manhole levels for each of the effluent events.

The Figures in Attachment D show the facility diagram and flow diagram schematics for the constructed wetlands facility.

Screenings were removed from the grit and floatables facility at the end of each month. The volume collected is as follows:

- January 2016: 2 cubic yards
- February 2016: 2 cubic yards
- March 2016: 2 cubic yards

As no samples were collected for Event #1, the removal efficiencies were computed for Effluent Events #2 and #3 as follows. The average values of the influent/effluent samples collected were utilized in computing the removal efficiencies. Removal efficiencies for BOD_5, TSS, Settleable Solids, Ammonia, and Total Phosphorus are slightly lower this quarter than past quarters. This can be explained by the colder winter temperatures causing the bacteria within the wetland cells to react slower than during warm temperatures. Additionally, plants (and their associated uptake) are in their dormant phase during the winter months.

	BOD_5	TSS	Settleable Solids	NH_3	TP
Units	mg/L	mg/L	mL/L	mg/L	mg/L
Effluent Event 2 - 2/25/16 - 3/1/16					
Influent average	19.17	38.83	< 0.2	0.95	0.40
Effluent average	< 3.3	< 7.16	< 0.2	0.89	0.11
Percentage reduction	> 83%	> 82%	-	6%	73%
Effluent Event 3 - 3/11/16 - 3/12/16					
Influent average	24	44	< 0.81	1.34	0.60
Effluent average	< 4.5	11	< 0.5	0.96	0.20
Percentage reduction	> 81%	76%	> 38%	28%	66%

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
Quarterly Performance Report - Attachment A

Performance Period:	**January 1, 2016 - March 31, 2016**
Total Number of Discharge Events:	**3**

Note: Influent and effluent samples are collected once every four hours during a CSO event.

					Volume Parameters						Unit Processes Activated?				Discharge to Harbor Brook?
					Total Precipitation per Event (Wadsworth Park)[a]	Total Precipitation per Event (Metro)[a]	Maximum Precipitation Intensity (Wadsworth Park)	Wetlands Influent Volume (MH-4A)	Wetlands Effluent Volume (Main Outfall 018, MH-19 When in Operation)[b]	Overflow Volume (Emergency Bypass 018A, MH-19 When Offline)	Grit and Floatables Facility	Cell 1	Cell 2	Cell 3	
Units					in	in	in/hr	MG	MG	MG					
Sample Type					Recorded	Recorded	Recorded	Recorded	Recorded	Recorded					
	Diversion Number	**Event Number**	**Influent Diversion Start Date and Time**	**Effluent Event Start Date and Time**	**Effluent Event Duration (hr)[c]**										
Event Data	1[d]	-	1/10/2016, 0710	-	0.00	0.21	0.62	0.09	0.15	0.00	0.00	Yes	Yes	No	No	No
	2	-	2/3/2016, 0735	-	0.00	0.18	0.76	0.07	0.20	0.00	0.00	Yes	Yes	No	No	No
	3	1[e]	2/16/2016, 0940	2/16/2016, 2240	0.25	1.38	1.24	0.19	1.21	0.09	0.00	Yes	Yes	Yes	Yes	Yes
	4	2[f]	2/24/2016[g]	2/25/2016, 0325[f]	143.83[f]	0.03	1.22	0.03	Unknown[g]	1.23	0.25[h]	Yes	Yes	Yes	Yes	Yes
	5[f]		2/25/2016[g]			0.00	0.23	0.00	Unknown[g]		0.00	Yes	Yes	Yes	Yes	Yes
	6[f]		2/26/2016, 1230			0.00	0.01	0.00	3.46		0.00	Yes	Yes	Yes	Yes	Yes
	7[f]		2/28/2016, 0755			0.00	0.00	0.00	1.31		0.00	Yes	Yes	Yes	Yes	Yes
	8[f]		2/29/2016, 0615			0.01	0.04	0.01	0.44		0.00	Yes	Yes	Yes	Yes	Yes
	9[fi]		2/29/2016, 1030			0.00	0.04	0.00	0.09		0.00	Yes	Yes	Yes	Yes	Yes
	10[fi]		2/29/2016, 1905			0.00	0.04	0.00	0.08		0.00	Yes	Yes	Yes	Yes	Yes
	11[f]		3/2/2016, 0255			0.05	0.17	0.05	0.19		0.00	Yes	Yes	Yes	Yes	Yes
	12	-	3/10/2016, 0740	-	0.00	0.00	0.70	0.00	0.34	0.00	0.00	Yes	Yes	No	No	No
	13[j]	3[j]	3/10/2016, 1535	3/10/2016, 2045	43.42	0.00	0.70	0.00	0.87	0.30	0.00	Yes	Yes	Yes	Yes	Yes
	14	-	3/14/2016, 0710	-	0.00	0.08	0.39	0.04	0.10	0.00	0.00	Yes	Yes	No	No	No
	15[k]	-	3/28/2016, 0710	-	0.00	0.08	0.38	0.08	0.09	0.00	0.00	Yes	Yes	No	No	No
	16	-	3/31/2016, 0835	-	0.00	0.02	0.06	0.02	0.38	0.00	0.00	Yes	Yes	No	No	No
Statistics	**Quarterly Total**					2.04	6.60	-	8.90	1.61	0.25					

[a] A calibration issue with the Wadsworth Park rain gauge presented itself during March. Metro rain gauge data is provided for comparison until the Wadsworth Park rain gauge is returned to normal operation. Metro rain gauge was out of service from 02/26/2016 - 02/29/2016, Syracuse Hancock Airport NOAA rain gauge data used for that period.

[b] MH-19 flow sensor was out of service from 02/18/2016 through the end of the quarter. Because facility was in series operation, MH-18 flow sensor data was utilized for wetlands effluent volume during this period.

[c] Event duration is calculated based on when an effluent discharge starts and stops.

[d] Influent samples were not collected for Diversion 1 because multiple diversions during this event were shorter than 30 minutes in duration.

[e] Effluent samples were not collected during Event #1 because duration of discharge was shorter than 30 minutes.

[f] Event 2 and Diversions 5-11 due in part to discharge from Bellevue Country Club detention ponds. Exact start time of Event 2 unknown due to back flowing conditions from Harbor Brook into the Wetland Cells. Effluent sampling began when Harbor Brook levels subsided, back flowing ceased, and the area was safe to collect samples.

[g] The influent flow sensor was out of service due to a programming malfunction from 02/21/2016 - 02/26/2016. Influent flow data during this period is unknown.

[h] 0.25 MG bypass flow recorded at MH-5A during 02/24/2016 rain event. Flows exceeded 44cfs (capacity of grit and floatables facility) for a short duration during this event. Because of back flowing conditions from Harbor Brook into Wetland Cells, exact volume of bypass flow discharged to Harbor Brook is unknown.

[i] Duration of influent diversion for Diversions 9 and 10 were shorter than 30 minutes. As a result, influent samples were not collected.

[j] Diversion 13 continued at a very slow rate until 0400 on 03/14/2016 due to influence from the Bellevue Country Club detention ponds. Event 3 ended prior to Diversion 13 ending. The prolonged diversion at a very slow rate did not cause a continued effluent discharge; the flow was stored within the wetland cells.

[k] The Box 1A diversion gate was operated manually during the rain event on March 28th due to a malfunction with the MH-3302 control flow sensor.

Wetlands Influent Parameters								
				BOD_5[a]	TSS[a]	Settleable Solids	NH_3[a]	TP[a]
Units				mg/L	mg/L	mL/L	mg/L	mg/L
Sample Type				Composite	Composite	Grab	Composite	Composite
Number of Samples				17	17	41	17	17
Lab Analysis Method				SM 5210 B-01,-11	SM 2540 D-97,-11	SM 2540 F-97,-11	10-107-6-1-B, J	QuickChem 10-115-01-1-E
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	2	2/3/2016, 0900	0.00	26[K]	145	0.8	1.05	0.700
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	3[b]	2/16/2016, 1100	0.25	39[B1]	198	0.7	1.40	0.832
	3[b]	2/16/2016, 1500		16[B1]	26	< 0.1[U]	0.82	0.301
Averages - Diversion #3				27.5	112	0.7	1.11	0.567
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	4	2/24/2016, 1550	143.83	10[H]	31	<0.2[U]	0.65	0.281
	4	2/24/2016, 2000				0.5		
Averages - Diversion #4				10	31	< 0.4	0.65	0.281
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	5	2/25/2016, 0800	143.83	12[H]	13	<0.2[U]	0.93	0.373
	5	2/25/2016, 1200				<0.2[U]		
Averages - Diversion #5				12	13	< 0.2	0.93	0.373
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	6	2/26/2016, 1240	143.83	16	9	<0.2[U]	0.67	0.237
	6	2/26/2016, 1640				<0.2[U]		
	6	2/26/2016, 2040				<0.2[U]		
	6	2/27/2016, 0440				<0.2[U]		
Averages - Diversion #6				16	9	< 0.2	0.67	0.237
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	7	2/28/2016, 1140	143.83	38	19	0.3	1.20	0.470
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	8	2/29/2016, 0840	143.83	19	17	<0.2[U]	1.26	0.506
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	11	3/2/2016, 0315	143.83	20	144	1.2	0.97	0.549
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	12	3/10/2016, 0810	0.00	68	64	2.0	2.46	1.090
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	13	3/10/2016 1600	43.42	33	133	11	1.05	0.770
	13	3/10/2016 2000				<0.2[U]		
	13	3/11/2016 0000				<0.2[U]		
	13	3/11/2016 0400				<0.2[U]		
	13	3/11/2016 0800				<0.2[U]		
	13	3/11/2016 1200				<0.2[U]		
	13	3/11/2016 1600		20	14	<0.2[U]	1.35	0.489
	13	3/11/2016 2000				<0.2[U]		
	13	3/12/2016 0000				<0.2[U]		
	13	3/12/2016 0400				<0.2[U]		
	13	3/12/2016 0800				<0.2[U]		
	13	3/12/2016 1200				<0.2[U]		
	13	3/12/2016 1600		18	13	<0.2[U]	1.13	0.378
	13	3/12/2016 2000				<0.2[U]		
	13	3/13/2016 0000				<0.2[U]		
	13	3/13/2016 0400				<0.2[U]		
	13	3/13/2016 0800				<0.2[U]		
	13	3/13/2016 1200				2.0		
	13	3/13/2016 1600		25	14	1.1	1.82	0.500
	13	3/13/2016 2000				<0.2[U]		
	13	3/14/2016 0000				<0.2[U]		
	13	3/14/2016 0400				<0.2[U]		
Averages - Diversion #13				24	44	< 0.81	1.34	0.600
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	14	3/14/2016 0800	0.00	37	130	2.5	1.59	1.000
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	15	3/28/2016 0930	0.00	64	75	<0.2[U]	2.30	1.160
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)					
	16	3/31/2016 12000	0.00	29	19	<0.2[U]	1.35	0.526
Quarterly Averages[c]				32	63	< 0.2	1.29	0.598

[a] Composite samples include 6 grab samples taken at 4 hour increments each day (composites on the last day of sampling may include fewer than 6 grab samples).

[b] OCDWEP Lab did not composite samples from Diversion 3.

[c] The quarterly average is the average of the data from the quarter, excluding the event averages.

[K] BOD/CBOD: Glucose/Glutamic acid BOD/CBOD standard was outside the acceptable limits.

[B1] The associated method blank failed due to method specific requirements or the analyte was found in the associated method, field, or equipment blank, as well as in the sample. It indicates possible/probable blank contamination and it may have contributed to the sample result.

[U] Indicates that the reported value is below the (MRL) Method Reporting Limit. Note that possible MRL elevation is dependent upon analyzed mass, volumes, and/or dilution volumes.

[H] Sample received or held beyond the acceptable holding time and the reported result cannot be used for compliance purposes. This code is used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

Wetlands Effluent - Main Outfall CSO 018												
				BOD_5 [a]	TSS[a]	Oil and Grease	Settleable Solids	Floatable Material[b]	NH_3[a]	TKN[a]	TP[a]	DO
Units				mg/L	mg/L	mg/L	mL/L	days	mg/L	mg/L	mg/L	mg/L
Sample Type				Composite	Composite	Grab	Grab	Grab	Composite	Composite	Composite	Grab
Number of Samples				8	8	46	46	46	8	8	8	46
Lab Analysis Method				SM 5210 B-01,-11	SM 2540 D-97,-11	EPA 1999 (1664-A)	SM 2540 F-97,-11	Field	QuikChem 10-107-6-1-B, J	QuikChem 10-107-06-2	QuikChem 10-115-01-1-E	Field
	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)									
Event Data	2	2/25/16 8:10	143.83	3^{B1}	18	9	< 0.2[U]	Present - Street Litter	0.93	1.84	0.15	V
	2	2/25/16 12:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/25/2016 16:10				< 4[U]	< 0.2[U]	Present - Street Litter				V
	2	2/25/2016 20:10				< 3[U]	< 0.2[U]	Absent				V
	2	2/26/2016 0:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/26/2016 4:10				< 3[U]	< 0.2[U]	Absent				V
	2	2/26/2016 8:10		< 3[U]	< 5[U]	< 4[U]	< 0.2[U]	Absent	0.72	1.71	0.09	V
	2	2/26/2016 12:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/26/2016 16:10				< 4[U]	< 0.2[U]	Present				V
	2	2/26/2016 20:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/27/2016 0:40				< 4[U]	< 0.2[U]	Absent				V
	2	2/27/2016 4:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/27/2016 8:10		5	< 5[U]	< 4[U]	< 0.2[U]	Absent	0.73	2.21	0.14	V
	2	2/27/2016 12:10				< 3[U]	< 0.2[U]	Absent				V
	2	2/27/2016 16:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/27/2016 20:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/28/2016 0:10				< 5[U]	< 0.2[U]	Absent				V
	2	2/28/2016 4:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/28/2016 8:10		< 3[U]	< 5[U]	< 4[U]	< 0.2[U]	Absent	0.80	1.85	0.10	V
	2	2/28/2016 12:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/28/2016 16:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/28/2016 20:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/29/2016 0:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/29/2016 4:10				< 5[U]	< 0.2[U]	Absent				V
	2	2/29/2016 8:10		< 3[U]	< 5[U]	< 4[U]	< 0.2[U]	Absent	1.04	1.91	0.08	V
	2	2/29/2016 12:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/29/2016 16:10				< 4[U]	< 0.2[U]	Absent				V
	2	2/29/2016 20:10				< 4	< 0.2[U]	Absent				V
	2	3/1/2016 0:10				5	< 0.2[U]	Present				V
	2	3/1/2016 4:10				5	< 0.2[U]	Absent				V
	2	3/1/2016 8:10		< 3[U]	< 5[U]	4	< 0.2[U]	Absent	1.10	1.88	0.10	V
	2	3/1/2016 12:10				4	< 0.2[U]	Absent				V
	2	3/1/2016 16:10				< 4[U]	< 0.2[U]	Absent				V
	2	3/1/2016 20:00				< 4[U]	< 0.2[U]	Absent				V
	2	3/2/2016 0:10				7	< 0.2[U]	Absent				V

Wetlands Effluent - Main Outfall CSO 018											
				BOD_5 [a]	TSS[a]	Oil and Grease	Settleable Solids	Floatable Material[b]	NH_3[a]	TKN[a]	TP[a]	DO
Units				mg/L	mg/L	mg/L	mL/L	days	mg/L	mg/L	mg/L	mg/L
Sample Type				Composite	Composite	Grab	Grab	Grab	Composite	Composite	Composite	Grab
Number of Samples				8	8	46	46	46	8	8	8	46
Lab Analysis Method				SM 5210 B-01,-11	SM 2540 D-97,-11	EPA 1999 (1664-A)	SM 2540 F-97,-11	Field	QuikChem 10-107-6-1-B, J	QuikChem 10-107-06-2	QuikChem 10-115-01-1-E	Field
Averages - Effluent Event #2				< 3.3	< 7.16	< 4	< 0.2	-	0.89	1.90	0.11	V
	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)									
Event Data	3	3/11/2016 0:10	43.42	< 3[U]	6	< 4[U]	< 0.2[U]	Absent	0.96	1.81	0.11	11.25
	3	3/11/2016 4:10				< 4[U]	< 0.2[U]	Present - Oil Film				16.00
	3	3/11/2016 8:10				< 4[U]	< 0.2[U]	Present - Oil Film				15.79
	3	3/11/2016 12:10				< 4[U]	< 0.2[U]	Present - Oil Film				2.52
	3	3/11/2016 16:10				< 4[U]	< 0.2[U]	Present - Oil Film, Street Litter				7.76
	3	3/11/2016 20:00				< 3[U]	< 0.2[U]	Present - Oil Film, Street Litter				4.42
	3	3/12/2016 0:10		6	15	< 4[U]	< 0.2[U]	Absent	0.96	2.95	0.29	4.94
	3	3/12/2016 4:10				< 4[U]	< 0.2[U]	Absent				8.09
	3	3/12/2016 8:10				< 3[U]	< 0.2[U]	Present - Oil Film				9.01
	3	3/12/2016 12:10				< 4[U]	3.0	Present - Street Litter				4.72
	3	3/12/2016 16:10				< 4[U]	0.5	Absent				3.88
Averages - Effluent Event #3				< 4.5	11	< 4	< 0.5	-	0.96	2.38	0.20	8.03
Quarterly Averages[c]				< 4	8	< 4	< 0.2	-	0.91	2.02	0.13	-

[a] Composite samples include 6 grab samples taken at 4 hour increments each day (composites on the last day of sampling may include fewer than 6 grab samples).

[b] A floatable material description form is attached for each effluent sample.

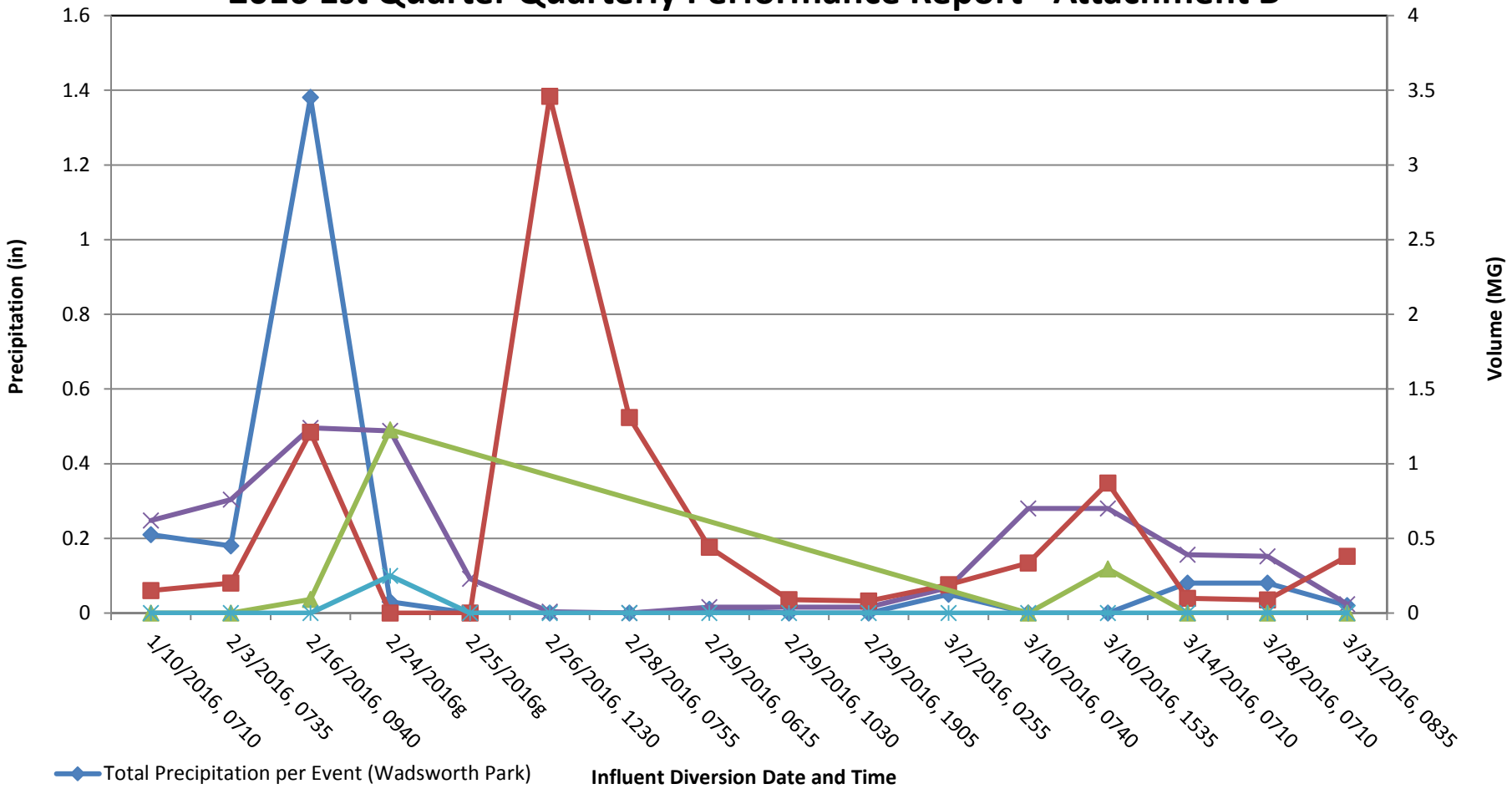
[c] The quarterly average is the average of the data from the quarter, excluding the event averages.

[B1] The associated method blank failed due to method specific requirements or the analyte was found in the associated method, field, or equipment blank, as well as in the sample. It indicates possible/probable blank contamination and it may have contributed to the sample result.

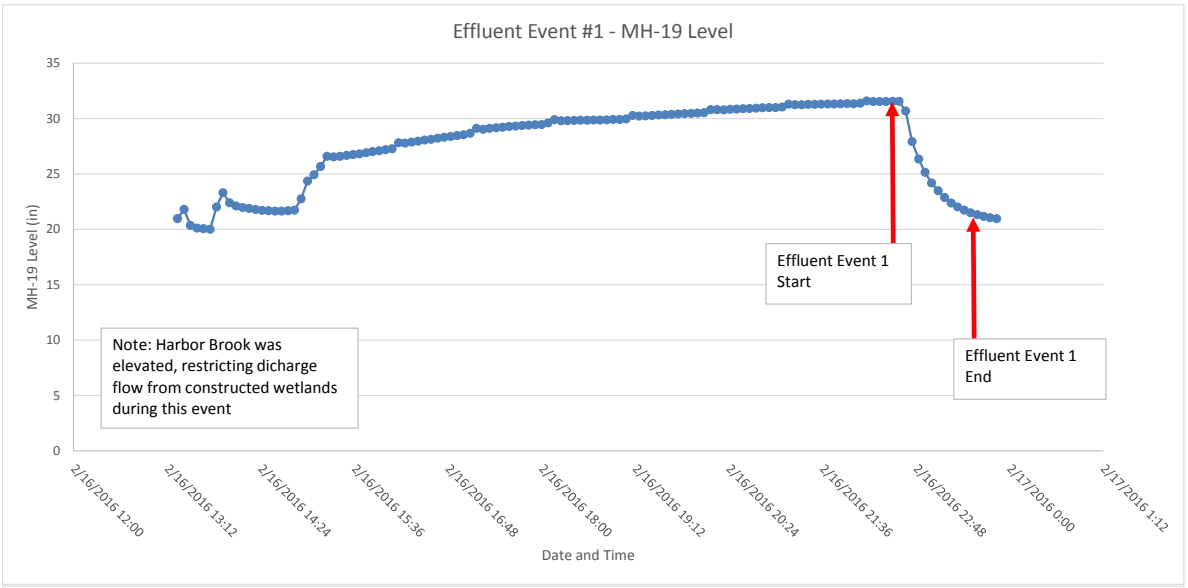
[U] Indicates that the reported value is below the (MRL) Method Reporting Limit. Note that possible MRL elevation is dependent upon analyzed mass, volumes, and/or dilution volumes.

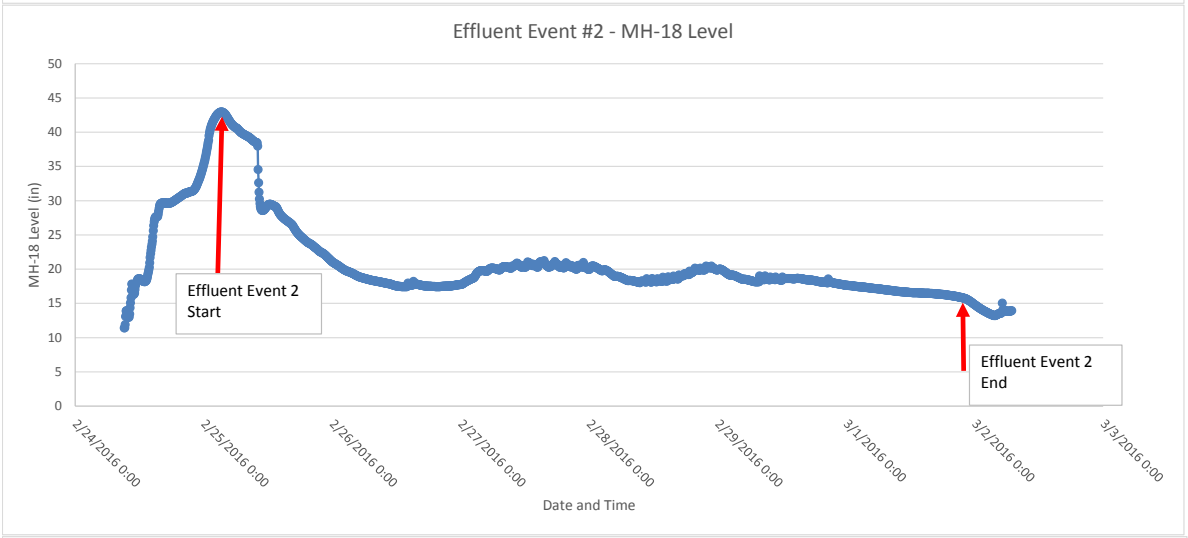
[V] DO value not reported due to variance from quality control or assurance criteria. The LFB, ICV, CCV or LCS solution(s) was outside acceptable limits and cannot be repeated. Refer to sample remarks for case narrative.

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
2016 1st Quarter Quarterly Performance Report - Attachment B



Note: A calibration issue with the Wadsworth Park rain gauge presented itself during March. Metro rain gauge data is provided for comparison until the Wadsworth Park rain gauge is returned to normal operation. Metro rain gauge was out of service from 02/26/2016 - 02/29/2016, Syracuse Hancock


Effluent Event #1 - MH-19 Level
MH-19 Level (in)
35
30
25
20
15
10
5
0
Effluent Event 1 Start
Effluent Event 1 End
Note: Harbor Brook was elevated, restricting dicharge flow from constructed wetlands during this event
2/16/2016 12:00
2/16/2016 13:12
2/16/2016 14:24
2/16/2016 15:36
2/16/2016 16:48
2/16/2016 18:00
2/16/2016 19:12
2/16/2016 20:24
2/16/2016 21:36
2/16/2016 22:48
2/17/2016 0:00
2/17/2016 1:12
Date and Time


Effluent Event #2 - MH-18 Level
MH-18 Level (in)
50
45
40
35
30
25
20
15
10
5
0
Effluent Event 2 Start
Effluent Event 2 End
2/24/2016 0:00
2/25/2016 0:00
2/26/2016 0:00
2/27/2016 0:00
2/28/2016 0:00
2/29/2016 0:00
3/1/2016 0:00
3/2/2016 0:00
3/3/2016 0:00
Date and Time


Effluent Event #3 - MH-18 Level
MH-18 Level (in)
25
20
15
10
5
0
Effluent Event 3 Start
Effluent Event 3 End
3/10/2016 0:00
3/10/2016 12:00
3/11/2016 0:00
3/11/2016 12:00
3/12/2016 0:00
3/12/2016 12:00
3/13/2016 0:00
Date and Time

Attachment D – Facility Diagrams

FLOW DIVERSION STRUCTURE
FLOWS < 6CFS → ALL FLOW TO TRUNK SEWER
FLOWS > 6CFS, BUT < 44CFS → ALL FLOWS DIVERTED TO SANSEP UNITS
FLOWS > 44CFS → OVER FLOW TO TRUNK SEWER

EXISTING 48" RCP
ROWLAND STREET TRUNK

EXISTING 48"
RCP ROWLAND
STREET TRUNK

EXISTING
MANHOLE U15A

EXISTING WEIR
STRUCTURE

36" HDPE

EXISTING 48" SEWER

EXISTING
MANHOLE

BOX 1A
FLOW DIVERSION
STRUCTURE

BOX 1B
FLOW DIVERSION
STRUCTURE

FLOWS UP TO
8 CFS

SANSEP UNIT#1

EXISTING
18" HBIS

SOLIDS STORAGE
STRUCTURE

UNDERFLOW TO
TRUNK SEWER MH3C

FLOWS ABOVE
8 CFS

18" HDPE

EXISTING
MANHOLE
U15

MH-4A
INFLUENT METERING
LOCATION

EXISTING 21" HBIS

SANSEP UNIT#2

48" HDPE

TO WETLAND
FACILITY

EFFLUENT BOX
STRUCTURE (MH-1D)
INFLUENT SAMPLING
LOCATION

LEGEND

COMBINED SEWER

UNDERFLOW TO TRUNK SEWER

TREATED FLOW TO WETLANDS

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202-4253
PH (315) 345-1400 FAX (315) 451-7270
EB 0000072 AA 001992

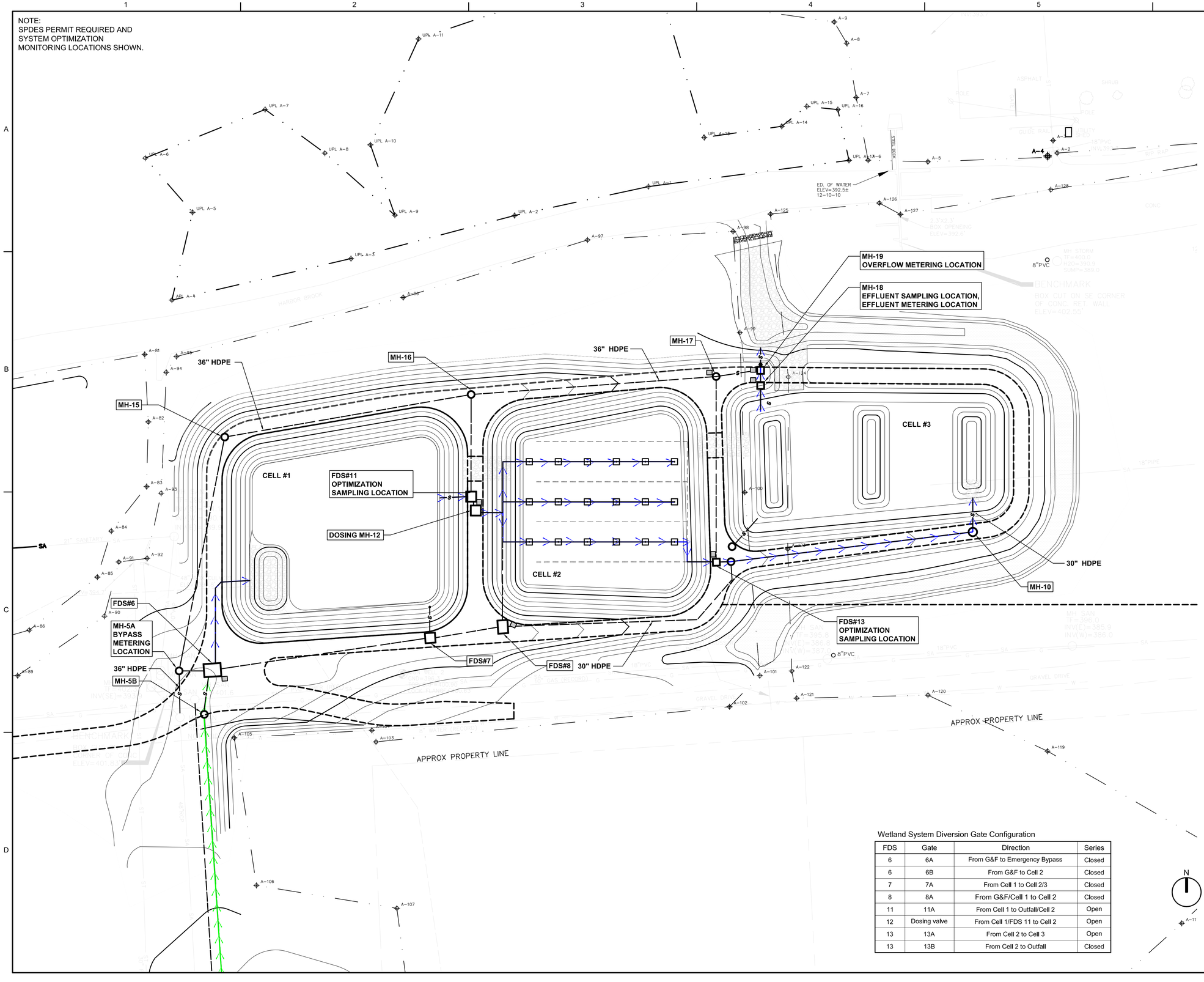
HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

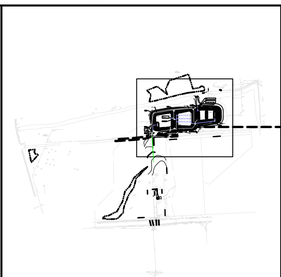
GRIT AND FLOATABLES REMOVAL
FACILITY FLOW DIAGRAM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-1
SHEET	1 of 5

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.





SITE KEY MAP
NOT TO SCALE

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Series
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Closed
7	7A	From Cell 1 to Cell 2/3	Closed
8	8A	From G&F/Cell 1 to Cell 2	Closed
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Open
13	13A	From Cell 2 to Cell 3	Open
13	13B	From Cell 2 to Outfall	Closed

LEGEND

SERIES FLOW PATH

TREATED FLOW
FROM G & F

N

0 30 60 90

SCALE: 1" = 30'

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202-2400
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

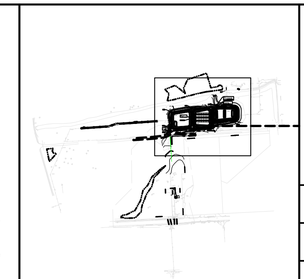
SERIES FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-2
SHEET	2 of 5

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW/ EFFLUENT METERING LOCATION, EFFLUENT SAMPLING LOCATION, DURING STANDARD OPERATING CONDITIONS.

MH-18
CELL #3 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

MH-17

MH-16

MH-15

36" HDPE

36" HDPE

CELL #1

FDS#11
OPTIMIZATION SAMPLING LOCATION. CELL #4 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

DOSING MH-12

CELL #2

CELL #3

30" HDPE

MH-10

FDS#6

MH-5A
BYPASS METERING LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

FDS#13
OPTIMIZATION SAMPLING LOCATION. CELL #2 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

APPROX PROPERTY LINE

APPROX PROPERTY LINE

ED. OF WATER
ELEV=392.5±
12-10-10

8"PVC

8"PVC

MH-STORM
TF=400.0
INV(E)=390.9
SUMP=389.0

2.3'X2.3'
BOX OPENING
ELEV=392.6'

LEGEND

- FLOW PATH
- CELL 2 FLOW PATH
- CELL 3 FLOW PATH
- TREATED FLOW FROM G & F

N

0 30 60 90

SCALE: 1" = 30'

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Parallel
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Open
7	7A	From Cell 1 to Cell 2/3	Closed
8	8A	From G&F/Cell 1 to Cell 2	Open
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Closed
13	13A	From Cell 2 to Cell 3	Closed
13	13B	From Cell 2 to Outfall	Open

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

PARALLEL FLOW DIAGRAM
WETLAND FACILITY

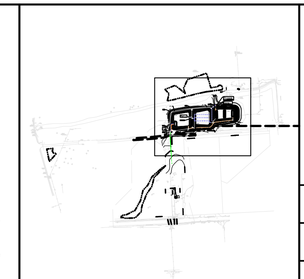
VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-3
SHEET	3 of 5

Flow Diagram Exhibit.dwg 12/9/2014 10:37 AM

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW/ EFFLUENT METERING LOCATION, EFFLUENT SAMPLING LOCATION, DURING STANDARD OPERATING CONDITIONS.

MH-18
CELL #1/2/3 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

36" HDPE

MH-17

MH-16

MH-15

CELL #1

FDS#11
OPTIMIZATION
SAMPLING LOCATION

DOSING MH-12

CELL #2

CELL #3

30" HDPE

MH-10

FDS#13
OPTIMIZATION SAMPLING LOCATION.
CELL #1/2 EFFLUENT SAMPLING
LOCATION DURING BYPASS EVENT.

FDS#6

MH-5A
BYPASS
METERING
LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

APPROX PROPERTY LINE

APPROX PROPERTY LINE

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Series & Parallel
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Closed
7	7A	From Cell 1 to Cell 2/3	Open
8	8A	From G&F/Cell 1 to Cell 2	Closed
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Open
13	13A	From Cell 2 to Cell 3	Closed
13	13B	From Cell 2 to Outfall	Open

LEGEND

CELL 1-2 SERIES FLOW PATH

CELL 1-3 SERIES FLOW PATH

TREATED FLOW FROM G & F

0 30 60 90
SCALE: 1" = 30'

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202-2400
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

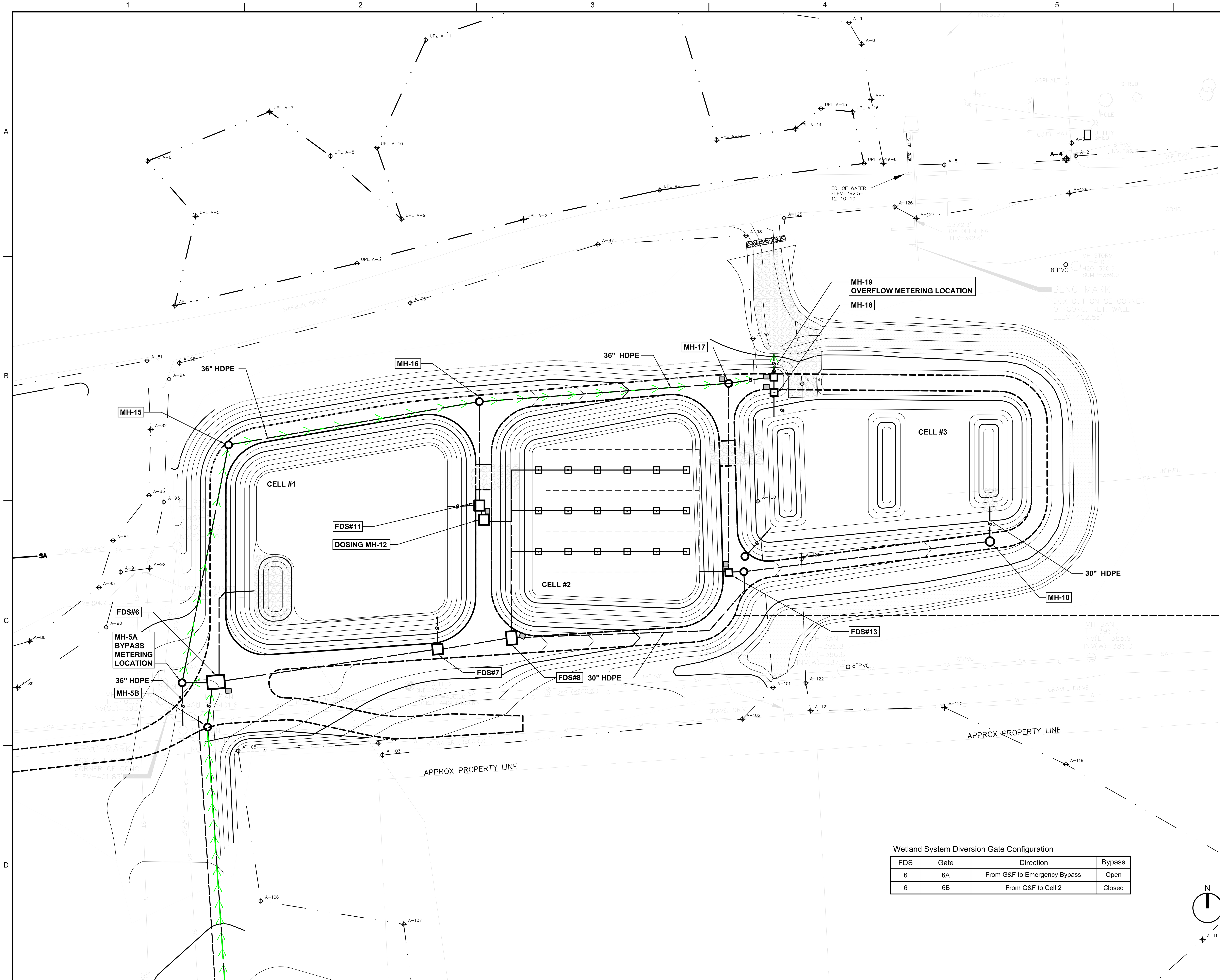
HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

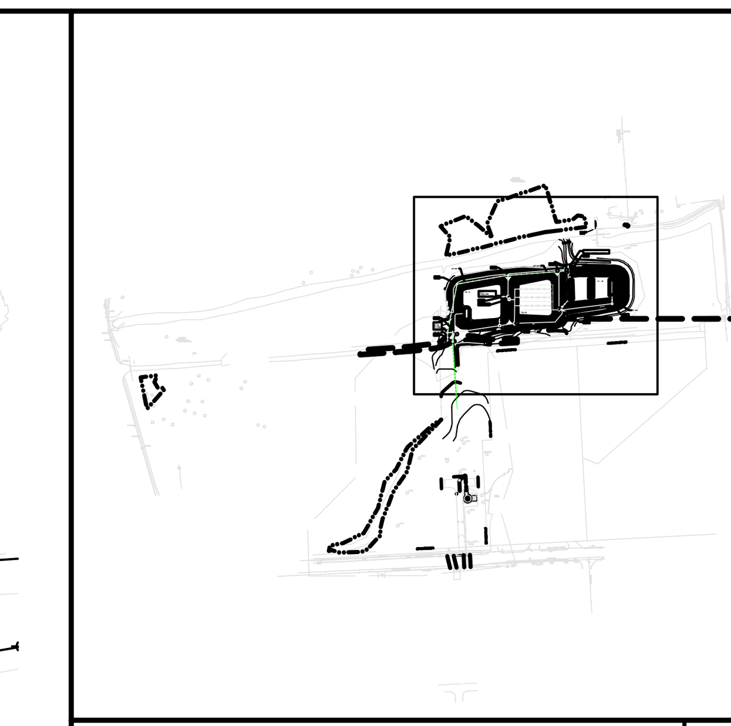
SERIES AND PARALLEL FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-4
SHEET	4 of 5





Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Bypass
6	6A	From G&F to Emergency Bypass	Open
6	6B	From G&F to Cell 2	Closed

LEGEND

BYPASS FLOW PATH

0 30 60 90
SCALE: 1" = 30'

430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

CH2MHILL

BYPASS FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-5
SHEET	5 of 5

HARBOR BROOK

BACKFLOW PREVENTER TO PREVENT BACKFLOW FROM HARBOR BROOK INTO CELL 3. REQUIRES APPROXIMATELY 20" OF PRESSURE TO FULLY OPEN.

OUTFALL 018/018A

MH-17

MH-16

MH-15

MH-19, ISCO 2150 AREA VELOCITY FLOW MODULE FOR EFFLUENT DISCHARGE VOLUME (ONLINE) OR OVERFLOW VOLUME (OFFLINE) FLOW MEASUREMENT. EFFLUENT SAMPLING LOCATION IN SERIES OR PARALLEL OPERATION.

MH-18, ISCO 2150 AREA VELOCITY MODULE FOR CELL 3 DISCHARGE FLOW MEASUREMENT. CELL 3 SAMPLING LOCATION DURING PARALLEL OPERATION.

ISCO SIGNATURE FLOW METER

ISCO 6712FR AUTO SAMPLER

36" WETLAND BYPASS/ EMERGENCY BYPASS **MH-5A** TO **MH-19**

FDS 11, CELL 1 SAMPLING LOCATION DURING PARALLEL OPERATION. LEVEL SENSOR FOR MEASURING CELL 1 LEVEL.

MH-12, DOSING VALVE FOR DOSING CELL 2 WHEN IN SERIES OPERATION.

MH-10

MH-20

MH-9

FDS-13, CELL 2 SAMPLING LOCATION DURING PARALLEL OPERATION. LEVEL SENSOR FOR CONTROLLING GATE FLOW FROM CELL 2 TO CELL 3 IN SERIES OPERATION.

FDS-6, SLIDE GATES FOR SERIES OR PARALLEL OPERATION.

MH-5A, ISCO 2150 AREA VELOCITY MODULE FOR BYPASS FLOW MEASUREMENT.

PANEL B (SEE O&M)

HBIS **MH-U15**

EXISTING 21" HBIS

MH-4B

FDS-8

FDS-7

HBIS **MH-U15A**, CONTAINS WEIR THAT DIVERTS ROWLAND ST. TRUNK SEWER FLOW TO WETLAND BYPASS WHEN HBIS IS AT CAPACITY.

ONONDAGA COUNTY

18" UNDERFLOW TO HBIS

48" INFLUENT TO WETLANDS

ONONDAGA COUNTY

MH-4A, ISCO 2150 AREA VELOCITY MODULE FOR INFLUENT FLOW MEASUREMENT

PANEL A (SEE O&M)

YARD HYDRANT FOR MANUAL CLEANING OF SAN SEP SCREENS.

MH-3C, SOLID STORAGE STRUCTURE STORES SOLIDS UNTIL EVENT ENDS, THEN RELEASES BACK TO HBIS. SLIDE GATE OPERATES IN TANDEM WITH **BOX 1-A** SLIDE GATE.

SS-1, WASH DOWN SPRAYS TRIGGER AUTOMATICALLY AFTER EVENT.

BOX 2/MH-1D, INFLUENT SAMPLING LOCATION.

SS-2, WASH DOWN SPRAYS TRIGGER AUTOMATICALLY AFTER EVENT.

BOX 1B, CONTAINS WEIR FOR FLOW EQUALIZATION BETWEEN **SS-1** AND **SS-2**.

BOX 1A, CONTAINS SLIDE GATE TO DIVERT FLOW DURING RAIN EVENTS.

EXISTING 42" ROWLAND STREET TRUNK SEWER.

WATER METER VAULT.

MH-3302, ISCO LASER FLOW CONTROLS **BOX 1A** GATE.

WEST ONONDAGA STREET

N

0 30 60 90

SCALE: 1" = 30'

430 E. GENESEE STREET, SUITE 203
SYRACUSE, NY 13202
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

CSO 018 WETLAND FACILITY DIAGRAM

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

NO.				
DSGN ZM	DR GH	CHK	APVD	

SHEET C-2001
DWG
PROJ 19217
DATE OCTOBER 2015
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
VERIFY SCALE

005-C-2001A-19217.dwg
1/26/2016 9:50 AM

Quarterly Performance Report

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility

Quarter:

This quarterly performance report is for the period of April 1, 2016 through June 30, 2016 and has been prepared by the CH2M, Onondaga Environmental Institute, and Fisher Associates monitoring team.

Facility Operation:

The Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility is primarily operated over OCDWEP's SCADA Network. During storm events resulting in flows greater than six (6) cubic feet per second (cfs) in the Rowland Street trunk sewer, CSO is diverted through a grit and floatables removal system. After solids are removed in the grit and floatables system, flow continues into the wetland treatment system. The three (3) wetland cells were operated in series during the first two months (April 1 – May 31) of this quarter. That is, flow from the grit and floatables enters Cell 1, flows into Cell 2, and then flows into Cell 3 before being discharged into Harbor Brook through MH-18 and MH-19. Beginning June 1, 2016, the three (3) wetland cells were operated in parallel; whereby, flows from the grit and floatables system entered each cell simultaneously and discharged to Harbor Brook via MH-19. Refer to the Flow Diagrams in Attachment E for a visual representation of the flow paths during the different operating scenarios. Flows above forty-four (44) cfs in the Rowland Street trunk sewer bypass the treatment facility and discharge directly to Harbor Brook via the Emergency Bypass.

When the facility is offline, CSO flow bypasses the grit and floatables facility and wetland cells through MH-5A, MH-15, MH-16, MH-17, and MH-19 then discharges into Harbor Brook. Because of a backflow preventer on the outfall preventing flow from Harbor Brook backing up into Cell 3, bypassed flow does not immediately discharge to Harbor Brook. The bypass flow in MH-19 then backflows into MH-18 and wetland Cell 3. When approximately 20" of difference between the elevation in MH-19 and Harbor Brook is achieved across the backflow preventer, discharge to Harbor Brook begins. For this reason, not all bypass events result in a discharge out the outfall. The occurrence of discharge events is confirmed visually by sampling staff at the start and end of discharge events.

During CSO diversion and discharge events, samples are collected from the influent (MH-1D/Box 2) and the effluent (MH-18 when operating in series; MH-19 when operating in parallel) and analyzed in accordance with the SPDES permit. Flows are also monitored at the influent to the wetlands (MH-4A), effluent from the wetlands (MH-18 when operating in series; MH-19 when operating in parallel), and bypass (MH-5A).

During this quarter, Onondaga County completed the final SCADA interconnection for each of the flow and level sensors at the Facility. This will allow for the generation of notification alarms when discharge out of the effluent occurs; in order to supplement the visual inspection currently being utilized for effluent event determination by sampling staff.

The wetland cells have approximately 700,000 gallons of storage capacity (at maximum capacity). If CSO diversion events are not of sufficient duration and/or intensity, the capacity at which the treated flow is discharged does not exceed storage capacity and an effluent discharge does not occur. The CSO volume stored within cells is evapotranspired after short-duration/intensity events when the temperature is above freezing. Increased vegetative growth during the spring months also contributes to increased rates of evapotranspiration. Furthermore, Cell 3 is unlined, and water within that cell contributes to local groundwater as it rises and falls during and after rain events.

Facility Performance:

During this quarter, nine (9) CSO diversion events occurred (events where CSO flow is diverted through the grit and floatables facility). Of the nine CSO diversion events, two (2) resulted in a treated effluent discharge through MH-19 from the constructed wetlands facility (CSO discharge event). Note that the facility only partially treats CSO flow per the definition of treatment contained in the Federal CSO Control Policy.

Calibration issues with the Wadsworth Park rain gauge persisted from the first quarter. As a result, rain gauge data from Wadsworth Park was not utilized to develop this report. The Metro rain gage was used in place of the Wadsworth Park rain gage to report precipitation totals for events. The Wadsworth Park rain gauge was returned to the manufacturer for repairs and will be reinstalled when repairs are complete.

During the second quarter, two flow sensor malfunction periods occurred:

- The effluent flow sensor on the outfall pipe in MH-19 was out of service from May 3, 2016 to May 11, 2016 due to a sensor malfunction. No effluent events occurred during this timeframe. A new sensor was installed and was fully operational for the remainder of the quarter.
- The MH-18 flow sensor was out of service from May 4, 2016 to June 14, 2016 due to a sensor malfunction. No discharge events from Cell 3 occurred during this timeframe.

Attachment A summarizes the flows, rainfall data, diversion events, and lab data collected during this quarter. Per the SPDES permit for this facility, the monitoring of fecal coliforms, total chlorine residual, monochloramines, chloramines, total dichloramine, and chlorine began on April 1st. Note that the raw lab data is included on the CD with the electronic version of the quarterly performance reports.

The estimated volume diverted to the constructed wetlands was 3.65 million gallons (MG) and the estimated volume treated and discharged by the constructed wetlands through MH-19 to Harbor Brook (018) for this quarter was 1.11 MG. No untreated discharges occurred during this quarter. A summary of each of the influent diversions and effluent discharges, are as follows:

- Diversion #17 occurred on April 1, 2016 and resulted in 0.37 MG of CSO flow being diverted to the constructed wetlands facility, triggering an effluent event. Although 0.31" of rainfall fell on April 1st, Diversion #17 was primarily the result of increased flow being discharged from the Bellevue Country Club detention ponds. The low flow, long duration influent diversion resulted in Effluent Event #4, which began approximately 7.5 hours following the initiation of Diversion #17. The effluent event continued for sixteen (16) hours at a very slow rate and resulted in 0.17 MG of treated effluent discharge to Harbor Brook. The effluent discharge ended approximately three and a half (3.5) hours after the influent diversion ceased.

- Diversion #18 occurred on April 12, 2016 and resulted in 1.71 MG of CSO flow being diverted to the constructed wetland facility, triggering an effluent event. The influent diversion began shortly after midnight, and a total of 0.53" of rainfall occurred between April 11th and April 12th. The influent diversion continued for an extended duration (52 hours) due to increased flow from the Bellevue Country Club detention ponds.

  A treated effluent discharge to Harbor Brook, Effluent Event #5, occurred approximately sixteen (16) hours after the start of the influent diversion and persisted for sixty (60) hours. In total, 0.94 MG of treated effluent discharged to Harbor Brook occurred during this effluent event. The effluent discharge ended approximately twenty (20) hours after the influent diversion ceased.

  During influent diversion sampling at 2:00 pm on 4/12/16, a high chlorine residual value was

detected, which prompted investigative work by Onondaga County and the City of Syracuse for a suspected water main break contributing to the CSO flow. A water main break was not detected and the source of the high chlorine residual was not able to be identified. Floatable material at the effluent was identified two times during the discharge as feminine sanitary items. Floatables description forms are provided in Attachment D.

- Diversion #19 occurred on April 26, 2016 at 7:30 am and resulted in 0.21 MG of CSO flow being diverted to the constructed wetlands facility. A treated effluent discharge to Harbor Brook did not occur. The event lasted less than four (4) hours, and only one sampling round was completed. A treated effluent discharge did not occur. A second diversion occurred later that day (see below).

- Diversion #20 also occurred on April 26, 2016, at 1:30pm, and resulted in 0.18 MG of CSO flow being diverted to the constructed wetlands facility. A treated effluent discharge to Harbor Brook did not occur. The diversion event lasted approximately two (2) hrs, and only one sampling round was completed. A treated effluent discharge did not occur.

- Diversion #21 occurred on May 2, 2016 and resulted in 0.60 MG of CSO flow being diverted to the constructed wetlands facility. Between May 1st and May 2nd 0.80" of rainfall occurred. The high rainfall resulted in increased flows from Bellevue Country Club prolonging the influent diversion. After 24 hours, influent sewer levels and flows appeared stagnant, and upon inspection it was determined the grit and floatable screens were plugged with solids, preventing the flow level from dropping, and ending the influent diversion. The Box 1A gate was manually opened at 9:45am on May 3rd, and sewer flows immediately dropped below 6 cfs indicating that an influent diversion was not occurring. After the event, the grit and floatable screens were manually cleaned.

  Due to the flow sensor malfunctions noted above, the potential occurrence of an effluent discharge was visually monitored throughout and immediately after the influent diversion. Despite the prolonged low flow diversion caused by both the Bellevue Country Club detention ponds and the plugged grit and floatable screens, a treated effluent discharge did not occur as a result of Influent Diversion #21.

  Onondaga County's standard operating procedure for cleaning the grit and floatables screens is to supplement the automatic washdown sprays with manual cleaning after each influent diversion. Prolonged diversions over several days caused by the Bellevue Country Club detention ponds cause the screens to plug quickly, as they are not designed for flow continuing for several days. Onondaga County and CH2M are investigating options to reduce the volume of flow discharging from the Bellevue Country Club detention ponds to the combined sewer system. Total removal of this flow from the combined system is not economically feasible due to the distance of the Country Club to the nearest receiving waterbody, Harbor Brook.

- Diversion #22 began on May 29, 2016 and resulted in 0.01 MG of CSO flow being diverted to the constructed wetlands facility. Due to a communication error with the County's SCADA system, sampling staff were not notified that a diversion occurred, and samples were not collected. The low volume of discharge to the wetland cells did not initiate an effluent event. The SCADA communication error was corrected the following week.

- Diversion #23 began on June 5, 2016 at 6:15 am and resulted in 0.13 MG of CSO flow being diverted to the constructed wetlands facility. The event lasted less than two (2) hours, and only one sampling round was completed. A treated effluent discharge to Harbor Brook did not occur. A second diversion occurred later that day (see below).

- Diversion #24 also occurred on June 5, 2016, at 3:40pm, and resulted in 0.20 MG of CSO flow being diverted to the constructed wetlands. A treated effluent discharge did not occur. The event lasted less than four (4) hours, and only one sampling round was completed.

- Diversion #25 occurred on June 11, 2016 and resulted in 0.24 MG of CSO flow being diverted to the constructed wetlands. The event lasted less than fifty (50) minutes and was over before sampling staff arrived. Therefore, samples were not collected for analysis.

Screenings were removed from the grit and floatables facility at the end of each month. The volume collected is as follows:

- April 2016: 1 cubic yard
- May 2016: 1 cubic yard
- June 2016: 1 cubic yard

Water Quality Removal Efficiencies

Pollutant removal efficiencies were estimated for Effluent Events 4 and 5, which occurred as a result of Diversion Events 17 and 18, respectively. The average values of the influent and effluent samples were utilized in order to calculate removal efficiencies during each event. Removal efficiencies were generally higher in the second quarter than the first of 2016. This is attributed to seasonal changes within the wetland cells, including vegetation growth, increased temperatures, and increased bacterial uptake. During both events, removal efficiencies for fecal coliform (F. coli) were highest among the measured parameters, showing a 98% and 97% reduction for events 4 and 5, respectively (Table 1).

During Effluent Event 4, Biological Oxygen Demand (BOD_5), Total Suspended Solids (TSS), Ammonia (NH_3), and Total Phosphorus (TP) were reduced by more than 80%. Measured values for Total Chlorine (Cl_2) and Settleable Solids were generally below detectable levels during most sampling rounds. As a result, precise removal efficiencies could not be calculated. Reductions in Cl_2 and Settleable Solids levels, however, were estimated to be > 17% and > 57%, respectively.

Reductions in fecal coliform levels between influent and effluent samples during Event 5 were nearly identical to reductions observed during Event 4 (97% and 98%, respectively; Table 1). Event 5 saw a chlorine residual removal efficiency of approximately 9%, the lowest removal efficiency of the measured parameters (Table 1). Despite the seemingly low removal efficiency, chlorine residual values were almost always below (excluding one influent sampling round) detectable limits (< 0.10 mg/L) during influent and effluent events, and therefore relatively unchanged when averaging values. BOD_5 and concentrations were reduced by 70% between influent and effluent discharges during Event 5. Nutrient concentrations of NH_3-N and TP were reduced by 48% and 23%, respectively, 9% during Event 5. Similarly, the concentration of TSS was reduced by 36% between influent and effluent discharges (Table 1). Settleable solids showed a negative removal efficiency (i.e., average values increased between influent and effluent events) during Event 5. The substantial increase in Settleable Solids is solely due to the effluent sample collected at 2225 on 4/14/16, which had a concentration of 30 mL/L; the highest of all the collected samples and significantly higher than the only other two samples that had detectable concentrations (0.4 mL/L on 4/13/16 at 1425 and 6.0 mL/L on 4/14/16 at 1825) (Table 1). Based on data collected throughout the initial monitoring period, it appears that the 30 mL/L value is an outlier.

Removal efficiencies for the quarter were higher during Effluent Event 4 than Event 5. For the quarter, average influent concentrations of fecal coliform, BOD_5, TSS, NH_3, and TP were substantially higher than effluent concentrations during Event 4.

The continuation of influent-effluent events 17-4 (starting 4/1/16) and influent-effluent events 18-5 (starting 4/12/16) long after rainfall stopped (≥ 20 hours) indicates that flows from a source other than the rain water/snow melt contributed to the prolonged discharge of low quality, high contaminant influent into the wetlands. The Bellevue Country Club ponds have been previously identified as a substantial source of flow to the CSO 018 sewershed, particularly during spring months when the ground is saturated and the ponds exceed their storage capacity. The absence of rainfall after the first diversion sampling rounds for both events indicates the effect of the Bellevue Country Club flow on the water quality discharging from the facility during dry weather.

Per the SPDES Permit, dissolved oxygen levels were monitored during each sampling round at both influent and effluent locations. During effluent event monitoring, dissolved oxygen levels were taken from MH-18 for both events. The average dissolved oxygen level was 4.72 mg/L during Effluent Event 4 and 6.28 during Effluent Event 5.

Table 1. Removal efficiencies for water quality parameters measured for Quarter 2 Effluent Events

	F. coli	Cl_2 Residual-Field	BOD_5	TSS	Settleable Solids	NH_3-N	TP
Units	cfu/100 mL	mg/L	mg/L	mg/L	mL/L	mg/L	mg/L
Effluent Event #4 - 4/1/16 - 4/2/16							
Influent average	380,174	< 0.12	26.50	50.50	< 0.70	1.90	0.69
Effluent average	8,643	< 0.1	3.00	8.00	< 0.30	0.32	0.10
Percentage reduction	**98%**	**> 17%**	**89%**	**84%**	**> 57%**	**83%**	**85%**
Effluent Event #5 - 4/12/16 - 4/14/16							
Influent average	235,423	< 0.11	21.33	18.33	< 0.67	1.29	0.45
Effluent average	5,902	< 0.10	6.50	11.67	< 2.67	0.67	0.35
Percentage reduction	**97%**	**> 9%**	**70%**	**36%**	**> -299%**	**48%**	**23%**

List of Attachments

- Attachment B: Figure showing the wetlands influent volume, effluent volume, bypass volume and precipitation for each of the events.
- Attachment C: Figure showing the effluent manhole levels for each of the effluent events.
- Attachment D: Floatables description forms for floatables identified during effluent events.
- Attachment E: Facility diagram and flow diagram schematics for the constructed wetlands facility.

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
Quarterly Performance Report - Attachment A

Performance Period:	**April 1, 2016 - June 30, 2016**
Total Number of Discharge Events:	**2**

Note: Influent and effluent samples are collected once every four hours during a CSO event.

						Precipitation Data		Volume Data			Unit Processes Activated?				
						Total Precipitation per Event (Metro)[a]	Maximum Precipitation Intensity (Metro)	Wetlands Influent Volume (MH-4A)	Wetlands Effluent Volume (Main Outfall 018, MH-19 When in Operation)	Overflow Volume (Emergency Bypass 018A, MH-19 When Offline)	Grit and Floatables Facility	Cell 1	Cell 2	Cell 3	Discharge to Harbor Brook?
Units						in	in/hr	MG	MG	MG					
Sample Type						Recorded	Recorded	Recorded	Recorded	Recorded					
	Diversion Number	**Effluent Event Number**	**Influent Diversion Start Date and Time**	**Effluent Event Start Date and Time**	**Effluent Event Duration (hr)[b]**										
Event Data	17	4	04/01/16, 0640	04/01/16, 1610	16.00	0.31	0.17	0.37	0.17	–	Yes	Yes	Yes	Yes	Yes
	18	5	04/12/16, 0025	04/12/16, 1825	60.00	0.53[c]	0.08	1.71	0.94	–	Yes	Yes	Yes	Yes	Yes
	19	–	04/26/16, 0540	–	0.00	0.40	0.08	0.21	–	–	Yes	Yes	No	No	No
	20	–	04/26/16, 1115	–	0.00	0.17	0.15	0.18	–	–	Yes	Yes	No	No	No
	21[d]	–	05/02/16, 0745	–	0.00	0.80[e]	0.27	0.60	–	–	Yes	Yes	Yes	Yes	No
	22[f]	–	05/29/16, 1645	–	0.00	0.60	0.52	0.01	–	–	Yes	Yes	No	No	No
	23	–	06/05/16, 0415	–	0.00	0.29	0.19	0.13	–	–	Yes	Yes	Yes	Yes	No
	24	–	06/05/16, 1425	–	0.00	0.31	0.20	0.20	–	–	Yes	Yes	Yes	Yes	No
	25[g]	–	06/11/16, 0815	–	0.00	0.49	0.47	0.24	–	–	Yes	Yes	No	No	No
Statistics	**Quarterly Total**					3.90	–	3.65	1.11	–					

[a] The Wadsworth Park rain gage was not operational during Q2 events due to a calibration issue. Therefore, the Metro rain gage was used for all events. The Wadsworth rain gauge was returned to the manufacturer for repairs, and will be reinstalled upon return

[b] Event duration is calculated based on when an effluent discharge starts and stops.

[c] Diversion #18 started just after midnight, the total precipitation includes 4/11/16 rainfall.

[d] The prolonged diversion on 5/2/16 was caused by the grit and floatable screens being plugged with solids, preventing the flow level from dropping, and ending the influent diversion. The Box 1A gate was manually opened at 9:45am on May 3rd, and sewer flows immediately dropped below 6 cfs indicating that an influent diversion was not occurring.

[e] Due to consistent rainfall through the late evening hours of 5/1/16 and early evening hours of 5/2/16, total precipation for Diversion #21 includes 5/1/16 and 5/2/16 rainfall.

[f] Due to a communication error with the County's SCADA system, sampling staff were not notified that Diversion 22 occurred, and samples were not collected. The communication error was immediately corrected the following week.

[g] Event 25 was less than 30 minutes and ended before the sampling crew arrived to the site.

Wetlands Influent Parameters									
				F. coli	Cl_2 Residual	BOD_5[a]	TSS[a]	Settleable Solids	NH_3-N[a]	TP[a]
Units				cfu/100 mL	mg/L	mg/L	mg/L	mL/L	mg/L	mg/L
Sample Type				Grab	Grab	Composite	Composite	Grab	Composite	Composite
Number of Samples				33	33	11	11	33	11	11
Lab Analysis Method				9222 D-97	Field	SM 5210 B-01,-11	SM 2540 D-97,-11	SM 2540 F-97,-11	10-107-6-1-B, J	QuickChem 10-115-01-1-E
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	17	04/01/16, 0830	16.00	882,000	< 0.10[U]	30	76	3.5	1.65	0.704
	17	04/01/16, 1140		200,000	< 0.10[U]			0.3		
	17	04/01/16, 1540		320,000	< 0.10[U]			< 0.2[U]		
	17	04/01/16, 1940		200,000	< 0.10[U]			< 0.2[U]		
	17	04/01/16, 2340		260,000	< 0.10[U]			< 0.2[U]		
	17	04/02/16, 0340		90,100	< 0.10[U]			< 0.2[U]		
	17	04/02/16, 0740		3,300,000	< 0.10[U]	23	25	< 0.2[U]	2.15	0.674
	17	04/02/16, 1140		500,000	0.25			0.50		
Averages - Diversion #17				380,174	**< 0.12**	**26.5**	**50.5**	**< 0.7**	**1.90**	**0.69**
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	18	04/12/16, 0200	60.00	360,000	< 0.10[U]	34	36	6.8	1.29	0.579
	18	04/12/16, 0600		90,100	< 0.10[U]			< 0.2[U]		
	18	04/12/16, 1000		654,000	< 0.10[U]			< 0.2[U]		
	18	04/12/16, 1400		122,000	0.17			< 0.2[U]		
	18	04/12/16, 1800		470,000	< 0.10[U]			< 0.2[U]		
	18	04/12/16, 2200		320,000	< 0.10[U]			< 0.2[U]		
	18	04/13/16, 0200		115,000	< 0.10[U]	20	12	< 0.2[U]	1.51	0.468
	18	04/13/16, 0600		90,900	< 0.10[U]			< 0.2[U]		
	18	04/13/16, 1000		430,000	< 0.10[U]			< 0.2[U]		
	18	04/13/16, 1400		350,000	< 0.10[U]			< 0.2[U]		
	18	04/13/16, 1800		280,000	< 0.10[U]			< 0.2[U]		
	18	04/13/16, 2200		320,000	< 0.10[U]			< 0.2[U]		
	18	04/14/16, 0200		122,000	< 0.10[U]	10	7	< 0.2[U]	1.08	0.296
	18	04/14/16, 0600		240,000	< 0.10[U]			< 0.2[U]		
Averages - Diversion #18				235,423	**< 0.11**	**21.33**	**18.33**	**< 0.67**	**1.29**	**0.448**
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	19	04/26/16, 0730	0.00	480,000	< 0.10[U]	62	95	2.00	2.82	1.330
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	20	04/26/16, 1330	0.00	290,000	< 0.10[U]	34	45	0.70	1.10	0.521
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	21	05/02/16, 0945	0.00	520,000	< 0.10[U]	42	78	< 0.2[U]	1.63	0.780
	21	05/02/16, 1345		490,000	< 0.10[U]			< 0.2[U]		
	21	05/02/16, 1745		540,000	< 0.10[U]			< 0.2[U]		
	21	05/02/16, 2145		440,000	< 0.10[U]			< 0.2[U]		
	21	05/03/16, 0145		200,000	< 0.10[U]			< 0.2[U]		
	21	05/03/16, 0545		77,500	< 0.10[U]			< 0.2[U]		
	21	05/03/16, 0945		1,290,000	< 0.10[U]	35	19	< 0.2[U]	4.33	1.090
Averages - Diversion #21				**383,073**	**< 0.10[U]**	**38.50**	**48.50**	**< 0.2**	**2.98**	**0.935**
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	22	05/29/16, 1625	0.00	–	–	–	–	–	–	–
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	23	06/05/16, 0615	0.00	340,000	< 0.10[U]	20	27	< 0.2[U]	2.15	0.707
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	24	06/05/16, 1540	0.00	636,000	< 0.10[U]	46	39	0.30	1.79	0.729
Event Data	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
	25	06/11/16, 0815	0.00	–	–	–	–	–	–	–
Quarterly Averages[b]				**314,189**	**< 0.11**	**32.36**	**41.73**	**< 1.00**	**1.95**	**0.716**

[a] Composite samples include a maximum 6 grab samples taken at 4 hour increments each day (composites on the last day of sampling may include fewer than 6 grab samples).

[b] The quarterly average is the average of the data from the quarter, excluding the event averages. Geometric mean used to calculate Fecal Coliform averages.

[U] Indicates that the reported value is below the (MRL) Method Reporting Limit. Note that possible MRL elevation is dependent upon analyzed mass, volumes, and/or dilution volumes.

Wetlands Effluent - Main Outfall CSO 018																	
				F. coli	Cl_2 Residual	Total chlorine	Chloramines	Monochloramine	Total dichloramine	BOD_5 [a]	TSS[a]	Oil and Grease	Settleable Solids	Floatable Material[b]	NH_3-N[a]	TKN[a]	TP[a]	DO
Units				cfu/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mL/L	days	mg/L	mg/L	mg/L	mg/L
Sample Type				Grab	Grab	Grab	Grab	Grab	Grab	Composite	Composite	Grab	Grab	Grab	Composite	Composite	Composite	Grab
Number of Samples				20	20	20	20	20	20	4	4	20	20	20	4	4	4	20
Lab Analysis Method				9222 D-97	Field	Field	Field	Field	Field	SM 5210 B-01,-11	SM 2540 D-97,-11	EPA 1999 (1664-A)	SM 2540 F-97,-11	Field	QuikChem 10-107-6-1-B, J	QuikChem 10-107-06-2	QuikChem 10-115-01-1-E	Field
Event Data	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)															
	4	04/01/16, 1610	16.00	20,000	< 0.10[U]	0.00	0.00	0.00	0.00	3	8	< 4[U]	< 0.2[U]	Absent	0.32	1.26	0.10	4.04
	4	04/01/16, 2010		8,380	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Absent				5.68
	4	04/02/16, 0010		6,850	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	0.2	Absent				6.17
	4	04/02/16, 0410		7,120	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	0.7	Absent				4.11
	4	04/02/16, 0810		5,900	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	0.3	Absent				3.60
Averages - Effluent Event #4				**8,643**	**< 0.10[U]**	**0.00**	**0.00**	**0.00**	**0.00**	**3**	**8**	**< 4[U]**	**< 0.3**	**-**	**0.32**	**1.26**	**0.1**	**4.72**
Event Data	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)															
	5	04/12/16, 1825	60.00	2,300	< 0.10[U]	0.00	0.00	0.00	0.00	3	19	< 4[U]	< 0.2[U]	Absent	0.168	0.894	0.114	7.02
	5	04/12/16, 2225		3,000	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Absent				9.38
	5	04/13/16, 0225		3,200	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Absent				8.60
	5	04/13/16, 0625		7,750	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Absent				7.46
	5	04/13/16, 1025		7,570	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Absent				6.37
	5	04/13/16, 1425		2,900	< 0.10[U]	0.09	0.04	0.04	0.00			< 3[U]	0.4	Absent				6.41
	5	04/13/16, 1825		5,800	< 0.10[U]	0.09	0.00	0.04	0.00	< 3[U]	6	< 3[U]	< 0.2[U]	Absent	0.661	1.650	0.112	7.92
	5	04/13/16, 2225		8,180	< 0.10[U]	0.00	0.00	0.00	0.00			< 3[U]	< 0.2[U]	Absent				6.94
	5	04/14/16, 0225		10,900	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Absent				6.33
	5	04/14/16, 0625		16,400	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Absent				4.42
	5	04/14/16, 1025		8,290	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Present[b]				3.98
	5	04/14/16, 1425		4,300	< 0.10[U]	0.20	0.12	0.12	0.00			< 4[U]	< 0.2[U]	Present[b]				4.68
	5	04/14/16, 1825		6,000	< 0.10[U]	0.00	0.00	0.00	0.00	10	10	< 4[U]	6.0	Absent	1.190	5.890	0.810	6.32
	5	04/14/16, 2225		7,660	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	30.0	Absent				5.50
	5	04/15/16, 0225		7,030	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	0.4	Absent				2.89
Averages - Effluent Event #5				**5,902**	**< 0.10[U]**	**0.025**	**0.011**	**0.013**	**0.000**	**6.50**	**11.67**	**< 4[U]**	**< 2.76**	**-**	**0.673**	**2.811**	**0.345**	**6.28**
Quarterly Averages[c]				**6,492**	**< 0.10[U]**	**0.019**	**0.008**	**0.010**	**0.000**	**5.33**	**10.75**	**< 4[U]**	**< 2.0**	**-**	**0.585**	**2.424**	**0.284**	**6.14**

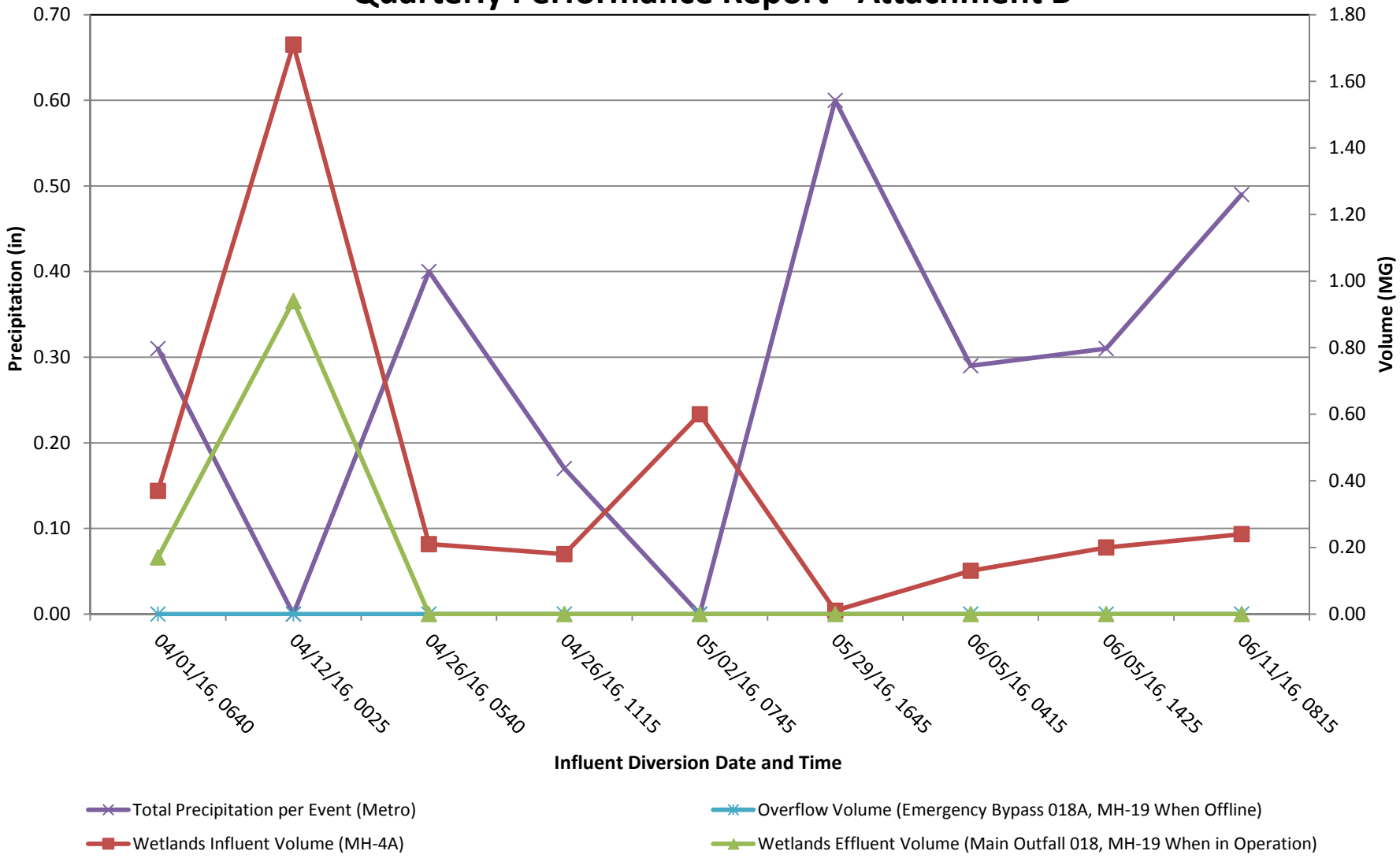
[a] Composite samples include a maximum of 6 grab samples taken at 4 hour increments each day (composites on the last day of sampling may include fewer than 6 grab samples).

[b] Floatable material descriptions are included as Attachment D for each effluent sample.

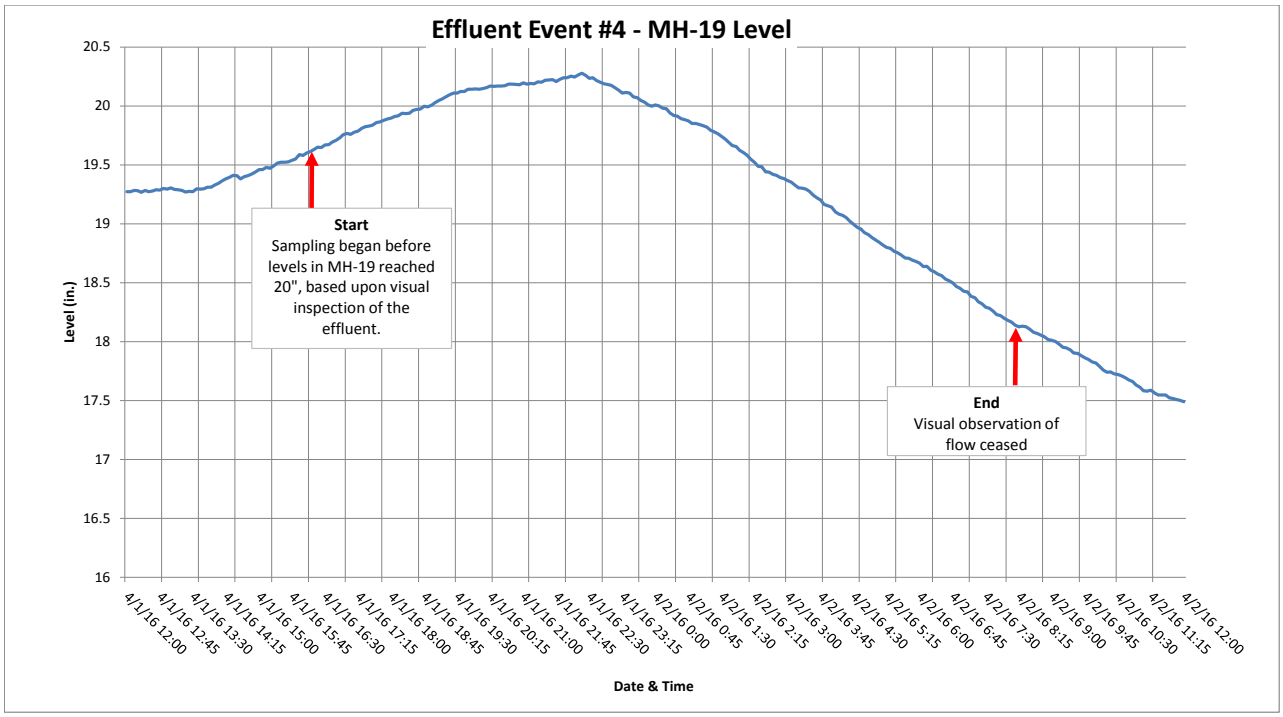
[c] The quarterly average is the average of the data from the quarter, excluding the event averages. Geometric mean used to calculate fecal coliform averages.

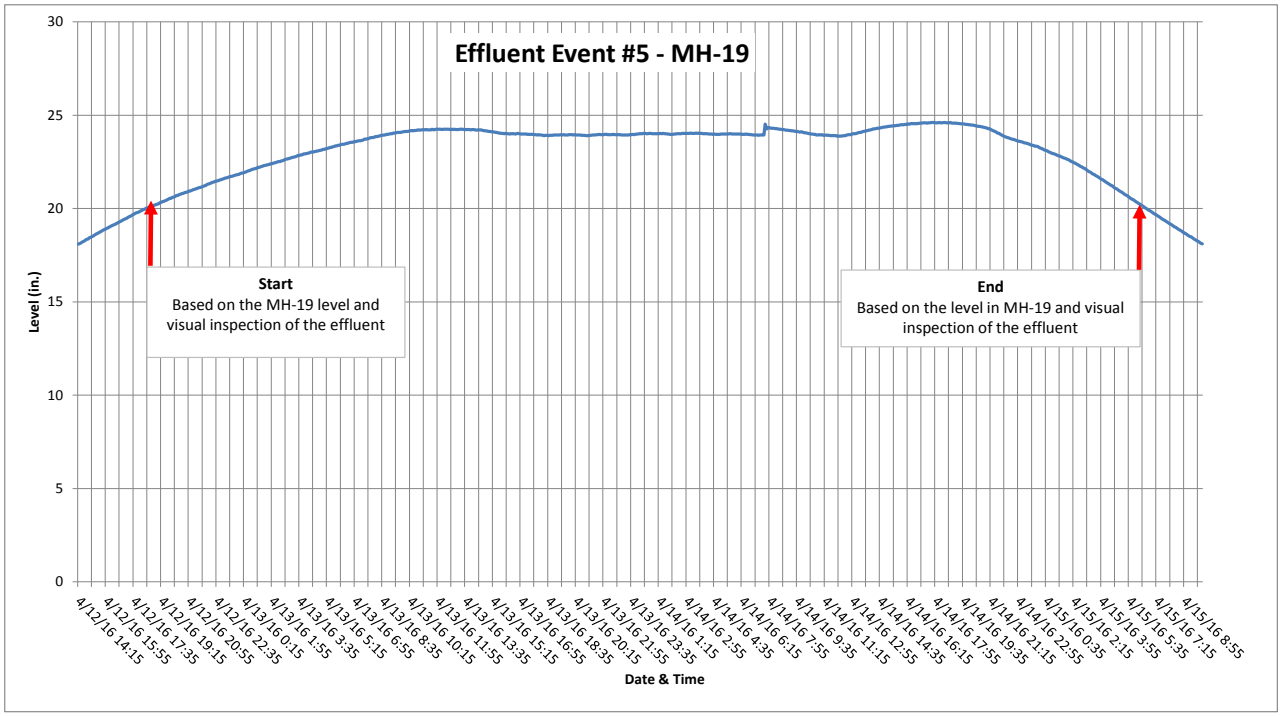
[U] Indicates that the reported value is below the (MRL) Method Reporting Limit. Note that possible MRL elevation is dependent upon analyzed mass, volumes, and/or dilution volumes.

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
Quarterly Performance Report - Attachment B



*The MH-18 flow sensor was out service from 5/4/16 - 6/14/16.


Effluent Event #4 - MH-19 Level
Level (in.)
Date & Time
Start
Sampling began before levels in MH-19 reached 20", based upon visual inspection of the effluent.
End
Visual observation of flow ceased


Effluent Event #5 - MH-19
Level (in.)
Date & Time
Start
Based on the MH-19 level and visual inspection of the effluent
End
Based on the level in MH-19 and visual inspection of the effluent

Attachment D – Floatables Forms

LAB SAMPLE ID#: 2016005462

FLOATABLES DESCRIPTION FORM
ONONDAGA COUNTY
DEPARTMENT OF WATER ENVIRONMENT PROTECTION

DATE: 4/14/16 TIME: 0605
LOCATION / IC Code: CSO 018 Effluent
SNOW MELT (Y/N):
RAIN (Y/N):
Flow at CSO Outfall: Yes/No Flow Description: Trickle/Moderate/Substantial

PHYSICAL INDICATOR

Odor Present: ☐ N/A

DESCRIPTION		
☐ Sewage	☐ Petroleum/Gas	
☐ Sulfide	☐ Laundry	
☐ Rancid/Sour	☐ Other	

Circle Relative Severity Index
(1) Faint
(2) Easily detected
(3) Noticeable from a distance

Color: ☐

DESCRIPTION	
☒ Clear	☐ Gray
☐ Green	☐ Red
☐ Brown	☐ Yellow
	☐ Other

Circle Relative Severity Index
(1) Faint color in sample bottle
(2) Clearly visible in sample bottle
(3) Clearly visible in outfall flow

Turbidity: ☐

Circle Relative Severity Index
(1) Slight cloudiness (2) Cloudy (3) Opaque

Floatables[1]: ☒

TYPE	Count[2]	Approx. Size	Circle Relative Severity Index
☐ 1. Suds/Foam		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 2. Visible Oil Film		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 3. Globules of Grease		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 4. Street litter (i.e., Cigarette butts)		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 5. Food Packaging		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☒ 6. Sanitary Items (i.e., sewage toilet paper, condoms, tampon applicators)	1	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 7. Beverage containers		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 8. Medical Items (i.e., syringes)		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 9. Other		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious

[1] *Floatables: Record Floatables observations during sampling event over a 3-5 minute time duration.*
[2] *Count: Attempt to record count of floatables during the sampling event.*

Photograph Taken: Yes/No

Revision: 10/14/2014 JS

LAB SAMPLE ID#: 2016005463

FLOATABLES DESCRIPTION FORM
ONONDAGA COUNTY
DEPARTMENT OF WATER ENVIRONMENT PROTECTION

DATE: 4/14/16 TIME: 1025
LOCATION / IC Code: CSO 018 Effluent
SNOW MELT (Y/N):
RAIN (Y/N):
Flow at CSO Outfall: Yes/No Flow Description: Trickle/Moderate/Substantial

PHYSICAL INDICATOR

Odor Present: ☐ N/A

DESCRIPTION		
☐ Sewage	☐ Petroleum/Gas	
☐ Sulfide	☐ Laundry	
☐ Rancid/Sour	☐ Other	

Circle Relative Severity Index
(1) Faint
(2) Easily detected
(3) Noticeable from a distance

Color: ☐

DESCRIPTION	
☒ Clear	☐ Gray
☐ Green	☐ Red
☐ Brown	☐ Yellow
	☐ Other

Circle Relative Severity Index
(1) Faint color in sample bottle
(2) Clearly visible in sample bottle
(3) Clearly visible in outfall flow

Turbidity: ☐ Clear

Circle Relative Severity Index
(1) Slight cloudiness (2) Cloudy (3) Opaque

Floatables[1]: ☒ New floatable - different from 0625 event

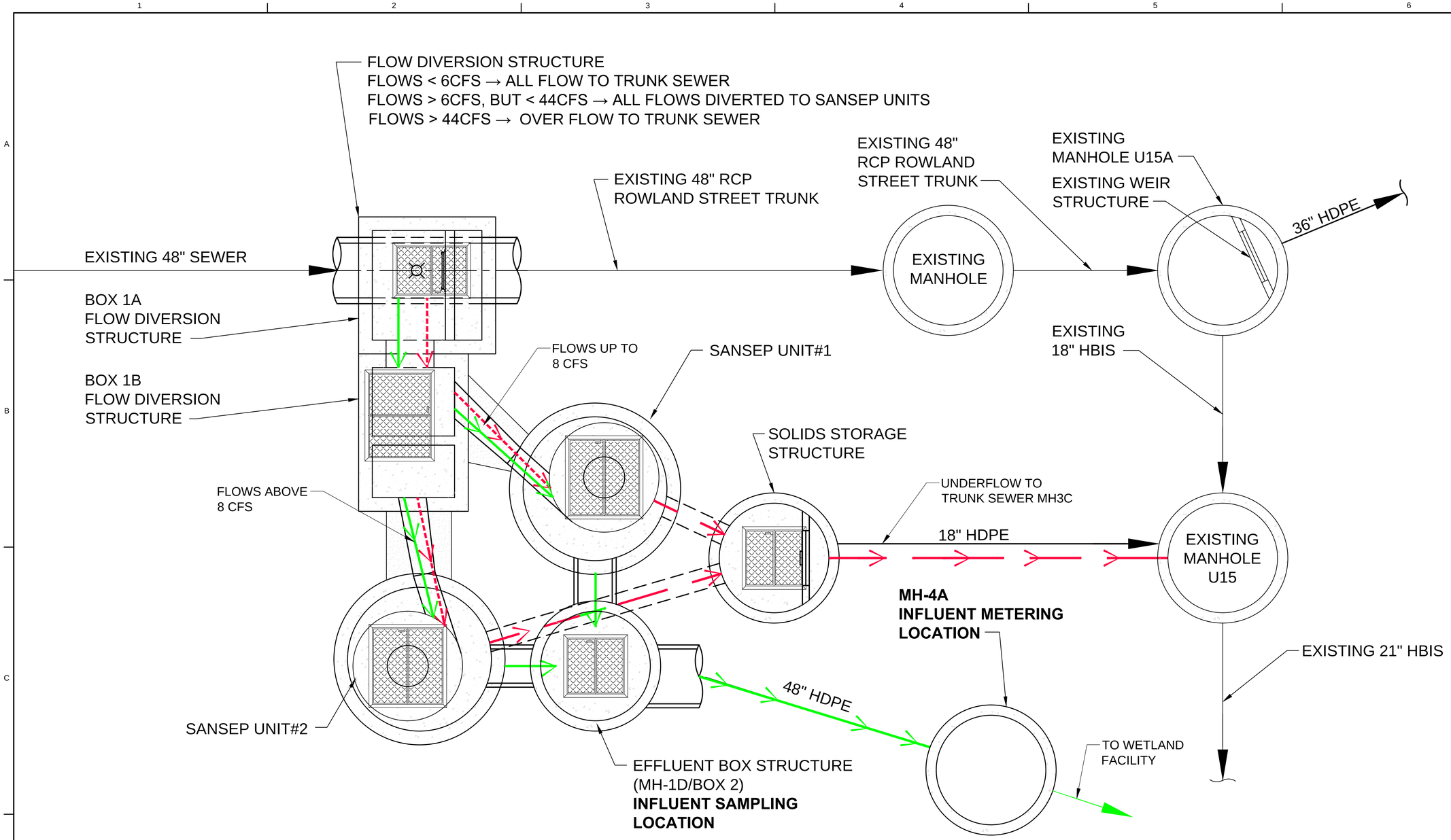
TYPE	Count[2]	Approx. Size	Circle Relative Severity Index
☐ 1. Suds/Foam		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 2. Visible Oil Film		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 3. Globules of Grease		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 4. Street litter (i.e., Cigarette butts)		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 5. Food Packaging		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☒ 6. Sanitary Items (i.e., sewage toilet paper, condoms, tampon applicators)	1	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 7. Beverage containers		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 8. Medical Items (i.e., syringes)		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 9. Other		<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious

[1] *Floatables: Record Floatables observations during sampling event over a 3-5 minute time duration.*
[2] *Count: Attempt to record count of floatables during the sampling event.*

Photograph Taken: Yes/No

Revision: 10/14/2014 JS

Attachment E – Facility Diagrams



LEGEND

COMBINED SEWER

UNDERFLOW TO TRUNK SEWER

TREATED FLOW TO WETLANDS

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	GH	MM

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 FAX (315) 451-7270
EB 0000072 AA 001992

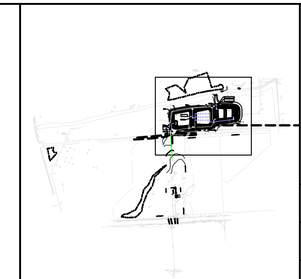
HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

GRIT AND FLOATABLES REMOVAL
FACILITY FLOW DIAGRAM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-1
SHEET	1 of 5

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW METERING LOCATION

MH-18
EFFLUENT SAMPLING LOCATION,
EFFLUENT METERING LOCATION

MH-17

MH-16

MH-15

36" HDPE

36" HDPE

CELL #1

CELL #2

CELL #3

FDS#11
OPTIMIZATION
SAMPLING LOCATION

DOSING MH-12

MH-10

30" HDPE

FDS#13
OPTIMIZATION
SAMPLING LOCATION

FDS#6

MH-5A
BYPASS
METERING
LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

APPROX PROPERTY LINE

APPROX PROPERTY LINE

ED. OF WATER
ELEV=392.5±
12-10-10

HARBOR BROOK

BENCHMARK
BOX CUT ON SE CORNER
OF CONC. RET. WALL
ELEV=402.55'

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Series
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Closed
7	7A	From Cell 1 to Cell 2/3	Closed
8	8A	From G&F/Cell 1 to Cell 2	Closed
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Open
13	13A	From Cell 2 to Cell 3	Open
13	13B	From Cell 2 to Outfall	Closed

LEGEND

SERIES FLOW PATH

TREATED FLOW
FROM G & F

N

0 30 60 90

SCALE: 1" = 30'

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

SERIES FLOW DIAGRAM
WETLAND FACILITY

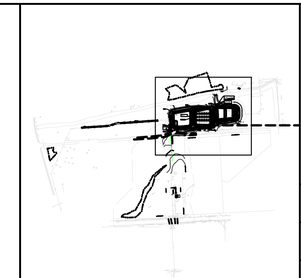
VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-2
SHEET	2 of 5

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW/ EFFLUENT METERING LOCATION, EFFLUENT SAMPLING LOCATION, DURING STANDARD OPERATING CONDITIONS.

MH-18
CELL #1/2/3 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

MH-17

MH-16

MH-15

36" HDPE

36" HDPE

CELL #1

FDS#11
OPTIMIZATION SAMPLING LOCATION. CELL #4 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

CELL #2

CELL #3

DOSING MH-12

FDS#6

MH-5A
BYPASS METERING LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

FDS#13
OPTIMIZATION SAMPLING LOCATION. CELL #2 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

30" HDPE

MH-10

ED. OF WATER
ELEV=392.5±
12-10-10

APPROX PROPERTY LINE

APPROX PROPERTY LINE

LEGEND

- CELL 1 FLOW PATH
- CELL 2 FLOW PATH
- CELL 3 FLOW PATH
- TREATED FLOW FROM G & F

0 30 60 90
SCALE: 1" = 30'

N

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Parallel
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Open
7	7A	From Cell 1 to Cell 2/3	Closed
8	8A	From G&F/Cell 1 to Cell 2	Open
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Closed
13	13A	From Cell 2 to Cell 3	Closed
13	13B	From Cell 2 to Outfall	Open

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

PARALLEL FLOW DIAGRAM
WETLAND FACILITY

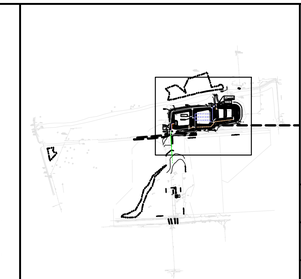
NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-3
SHEET	3 of 5

Flow Diagram Exhibit.dwg 7/14/2016 7:42 AM

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW/ EFFLUENT METERING LOCATION, EFFLUENT SAMPLING LOCATION, DURING STANDARD OPERATING CONDITIONS.

MH-18
CELL #1/2/3 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

MH-17

MH-16

MH-15

36" HDPE

CELL #1

CELL #2

CELL #3

FDS#11
OPTIMIZATION
SAMPLING LOCATION

DOSING MH-12

FDS#6

MH-5A
BYPASS
METERING
LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

30" HDPE

MH-10

FDS#13
OPTIMIZATION SAMPLING LOCATION.
CELL #1/2 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

APPROX PROPERTY LINE

APPROX PROPERTY LINE

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Series & Parallel
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Closed
7	7A	From Cell 1 to Cell 2/3	Open
8	8A	From G&F/Cell 1 to Cell 2	Closed
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Open
13	13A	From Cell 2 to Cell 3	Closed
13	13B	From Cell 2 to Outfall	Open

LEGEND

CELL 1-2 SERIES FLOW PATH

CELL 1-3 SERIES FLOW PATH

TREATED FLOW FROM G & F

0 30 60 90

SCALE: 1" = 30'

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 FAX (315) 451-7270
EB 0000072 AA 001992

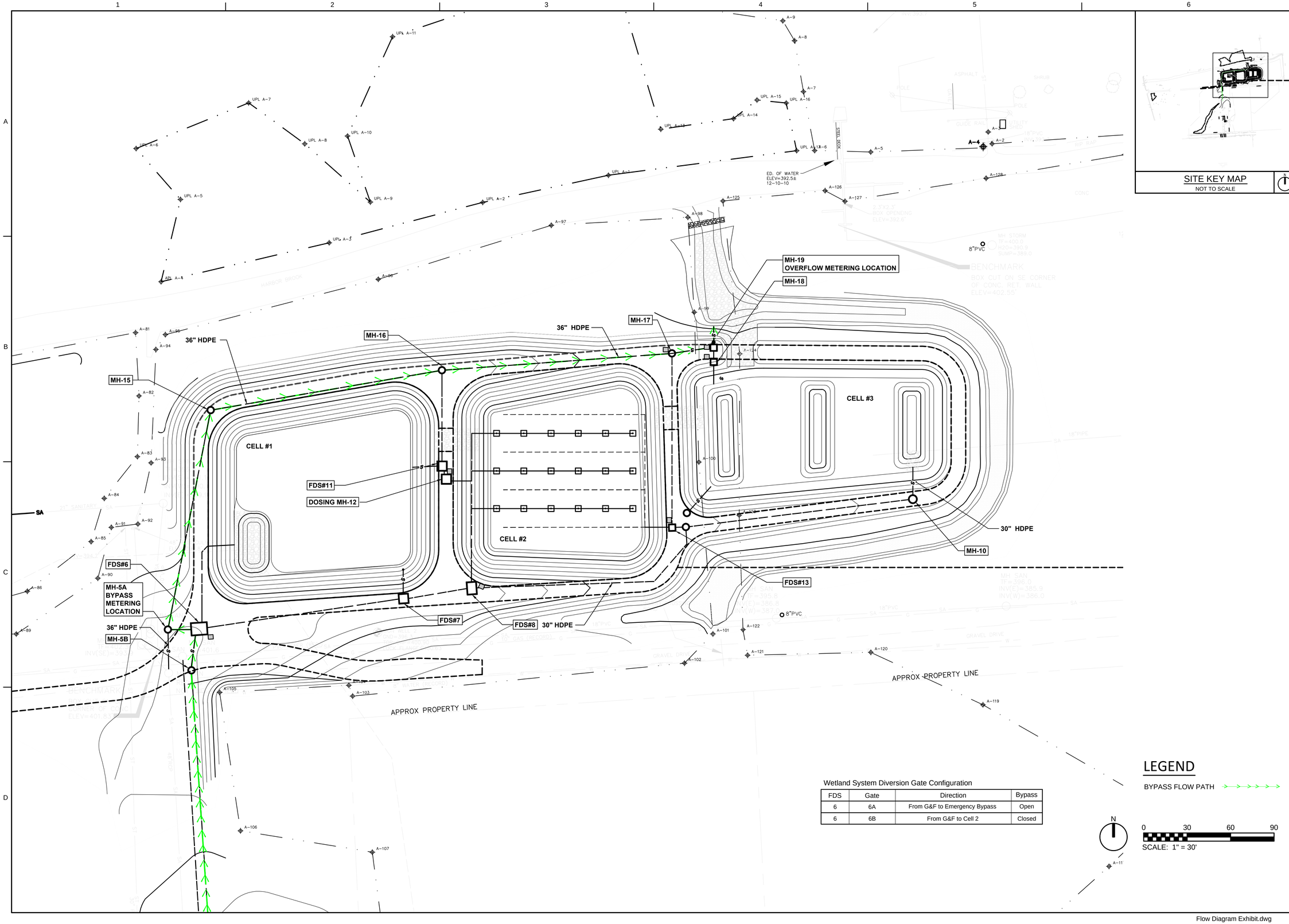
HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

SERIES AND PARALLEL FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-4
SHEET	4 of 5



SITE KEY MAP

NOT TO SCALE

LEGEND

BYPASS FLOW PATH

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Bypass
6	6A	From G&F to Emergency Bypass	Open
6	6B	From G&F to Cell 2	Closed

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.

0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-5
SHEET	5 of 5

BYPASS FLOW DIAGRAM
WETLAND FACILITY

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 FAX (315) 451-7270
EB 0000072 AA 001992

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

HARBOR BROOK

BACKFLOW PREVENTER TO PREVENT BACKFLOW FROM HARBOR BROOK INTO CELL 3. REQUIRES APPROXIMATELY 20" OF PRESSURE TO FULLY OPEN.

OUTFALL 018/018A

MH-17

MH-16

MH-15

MH-19, ISCO 2150 AREA VELOCITY FLOW MODULE FOR EFFLUENT DISCHARGE VOLUME (ONLINE) OR OVERFLOW VOLUME (OFFLINE) FLOW MEASUREMENT. EFFLUENT SAMPLING LOCATION IN SERIES OR PARALLEL OPERATION.

MH-18, ISCO 2150 AREA VELOCITY MODULE FOR CELL 3 DISCHARGE FLOW MEASUREMENT. CELL 3 SAMPLING LOCATION DURING PARALLEL OPERATION.

ISCO SIGNATURE FLOW METER

ISCO 6712FR AUTO SAMPLER

36" WETLAND BYPASS/ EMERGENCY BYPASS **MH-5A** TO **MH-19**

FDS 11, CELL 1 SAMPLING LOCATION DURING PARALLEL OPERATION. LEVEL SENSOR FOR MEASURING CELL 1 LEVEL.

MH-12, DOSING VALVE FOR DOSING CELL 2 WHEN IN SERIES OPERATION.

MH-10

MH-20

MH-9

FDS-13, CELL 2 SAMPLING LOCATION DURING PARALLEL OPERATION. LEVEL SENSOR FOR CONTROLLING GATE FLOW FROM CELL 2 TO CELL 3 IN SERIES OPERATION.

FDS-6, SLIDE GATES FOR SERIES OR PARALLEL OPERATION.

MH-5A, ISCO 2150 AREA VELOCITY MODULE FOR BYPASS FLOW MEASUREMENT.

PANEL B (SEE O&M)

HBIS **MH-U15**

EXISTING 21" HBIS

MH-4B

FDS-8

FDS-7

HBIS **MH-U15A**, CONTAINS WEIR THAT DIVERTS ROWLAND ST. TRUNK SEWER FLOW TO WETLAND BYPASS WHEN HBIS IS AT CAPACITY.

ONONDAGA COUNTY

18" UNDERFLOW TO HBIS

48" INFLUENT TO WETLANDS

ONONDAGA COUNTY

MH-4A, ISCO 2150 AREA VELOCITY MODULE FOR INFLUENT FLOW MEASUREMENT

PANEL A (SEE O&M)

YARD HYDRANT FOR MANUAL CLEANING OF SAN SEP SCREENS.

MH-3C, SOLID STORAGE STRUCTURE STORES SOLIDS UNTIL EVENT ENDS, THEN RELEASES BACK TO HBIS. SLIDE GATE OPERATES IN TANDEM WITH **BOX 1-A** SLIDE GATE.

SS-1, WASH DOWN SPRAYS TRIGGER AUTOMATICALLY AFTER EVENT.

BOX 2/MH-1D, INFLUENT SAMPLING LOCATION.

SS-2, WASH DOWN SPRAYS TRIGGER AUTOMATICALLY AFTER EVENT.

BOX 1B, CONTAINS WEIR FOR FLOW EQUALIZATION BETWEEN **SS-1** AND **SS-2**.

BOX 1A, CONTAINS SLIDE GATE TO DIVERT FLOW DURING RAIN EVENTS.

EXISTING 42" ROWLAND STREET TRUNK SEWER.

WATER METER VAULT.

MH-3302, ISCO LASER FLOW CONTROLS **BOX 1A** GATE.

WEST ONONDAGA STREET

N

0 30 60 90

SCALE: 1" = 30'

005-C-2001A-19217.dwg

1/26/2016 9:50 AM

SHEET C-2001

DWG

PROJ 19217

DATE OCTOBER 2015

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

VERIFY SCALE

ch2m:

430 E. GENESEE STREET, SUITE 203
SYRACUSE, NY 13202
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

CSO 018 WETLAND FACILITY DIAGRAM

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

NO.				
DSGN ZM	DR GH	CHK	APVD	

Quarterly Performance Report

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility

Quarter:

This quarterly performance report is for the period of July 1, 2016 through September 30, 2016 and has been prepared by the CH2M, Onondaga Environmental Institute, and Fisher Associates monitoring team.

Facility Operation:

The Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility is primarily operated over OCDWEP's SCADA Network. During storm events resulting in flows greater than six (6) cubic feet per second (cfs) in the Rowland Street trunk sewer, CSO is diverted through a grit and floatables removal system. After solids are removed in the grit and floatables system, flow continues into the wetland treatment system. The three (3) wetland cells were operated in two different flow scenarios during the third quarter. The wetland cells were in parallel during the first two months (July 1 – August 31) and in series/parallel during the month of September as noted in the Sampling Plan Amendment (Revision 5), dated July 2016. During the parallel flow pattern, flow from the grit and floatables enters each wetland cell simultaneously and discharges to Harbor Brook via MH-19. For the series/parallel scenario, flow from the grit and floatables facility is directed into each wetland cell separately, as well as directed through Cell 1, Cell 2, and lastly Cell 3. Refer to the Flow Diagrams in Attachment E for a visual representation of the flow paths during the different operating scenarios. Flows above forty-four (44) cfs in the Rowland Street trunk sewer bypass the treatment facility and discharge to Harbor Brook via the Emergency Bypass.

When the facility is offline, CSO flow bypasses the grit and floatables facility and wetland cells through MH-5A, MH-15, MH-16, MH-17, and MH-19 then discharges into Harbor Brook. Due to a backflow preventer on the outfall preventing flow from Harbor Brook backing up into Cell 3, bypassed flow does not immediately discharge to Harbor Brook. The bypass flow in MH-19 then backflows into MH-18 and wetland Cell 3.

When approximately 20 inches of difference between the elevation in MH-19 and Harbor Brook is achieved across the backflow preventer, discharge to Harbor Brook begins. For this reason, not all bypass events result in a discharge from the outfall. The occurrence of discharge events is confirmed visually by sampling staff at the start and end of discharge events.

During CSO diversion and discharge events, samples are collected from the influent (MH-1D/Box 2) and the effluent (MH-18 when operating in series; MH-19 when operating in parallel and series/parallel) and analyzed in accordance with the SPDES permit. Flows are also monitored at the influent to the wetlands (MH-4A), effluent from the wetlands (MH-18 when operating in series; MH-19 when operating in parallel and series/parallel), and bypass (MH-5A).

During this quarter, Onondaga County continued to troubleshoot the effluent discharge notification alarm and discovered hardware equipment issues. The hardware is planned to be replaced during the fourth quarter, at which time an effluent discharge alarm will notify sampling staff of the occurrence of a discharge event requiring sampling. Until that time, sampling staff will continue to visually monitor the effluent for confirmation of a discharge event.

The wetland cells have approximately 700,000 gallons of storage capacity (at maximum capacity). If CSO diversion events are not of sufficient duration and/or intensity, the capacity at which the treated flow is

discharged does not exceed storage capacity and an effluent discharge does not occur. The CSO volume stored within cells is evapotranspired after short-duration/intensity events when the temperature is above freezing. Increased vegetative growth during the spring and summer months also contributes to increased rates of evapotranspiration. Furthermore, Cell 3 is unlined, and water within that cell contributes to local groundwater as it rises and falls during and after rain events.

Facility Performance:

During this quarter, eighteen (18) CSO diversion events occurred (events where CSO flow is diverted through the grit and floatables facility). Of the eighteen CSO diversion events, five (5) resulted in a treated effluent discharge through MH-19 from the constructed wetlands facility (CSO discharge event). Note that the facility only partially treats CSO flow per the definition of treatment contained in the Federal CSO Control Policy.

The facility was offline during the weekend of September 16th through 18th due to an issue with the controlling electronics. The issue caused the CSO diversion gate to repeatedly close despite sewer flows being at their normal dry-weather rate. The facility was placed into manual mode (offline) through the weekend and the issue was corrected immediately the following Monday morning (September 19th) by WEP instrumentation and control staff. The facility was returned to operation at this time. Two overflow emergency bypass events occurred during the downtime as reported below (Effluent Events 11 and 12).

The Wadsworth Park rain gauge was offline for repair during much of the third quarter. On August 31st, the repaired rain gauge was installed, calibrated, and put back into service. The Metro rain gage was used to report precipitation totals for events prior the Wadsworth Park rain gauge returning to service.

Attachment A summarizes the flows, rainfall data, diversion events, and lab data collected during this quarter. Per the SPDES permit for this facility, the monitoring of fecal coliforms, total chlorine residual, monochloramines, chloramines, total dichloramine, and chlorine occurs between April 1st and October 15th. *Note that the raw lab data is included on the CD with the electronic version of the quarterly performance reports.*

The estimated volume diverted to the constructed wetlands was 2.19 million gallons (MG) and the estimated volume treated and discharged by the constructed wetlands through MH-19 to Harbor Brook (018) for this quarter was 0.17 MG. The total estimated overflow volume discharged from the facility (018A) during the facility downtime was 0.12 MG. A summary of each of the influent diversions and effluent discharges are as follows:

- Diversion #26 occurred on July 8, 2016 and resulted in 0.26 MG of CSO flow being diverted to the constructed wetlands facility. The influent diversion lasted 50 minutes and ended prior to sampling staff arriving on-site. Therefore, no influent samples were collected. While on site, sampling staff inspected the effluent and confirmed a discharge was not occurring. However, subsequent examination of flow data has indicated that an effluent discharge event did occur after the visual inspection. During Effluent Event #6, a total of 0.07 MG of treated flow was discharged to Harbor Brook during this effluent discharge event.

- Diversion #27 occurred on July 13, 2016 and resulted in 0.01 MG of CSO flow being diverted to the constructed wetland facility. The short duration rainfall resulted in a 30 minute influent diversion that was sampled. A treated effluent discharge to Harbor Brook did not occur.

- Diversion #28 occurred on July 15, 2016 and resulted in 0.05 MG of CSO flow being diverted to the constructed wetlands facility. The influent diversion continued for 50 minutes and a sample was collected. A treated effluent discharge to Harbor Brook did not occur.

- Diversion #29 occurred on July 18, 2016, and resulted in 0.03 MG of CSO flow being diverted to the constructed wetlands facility. The influent diversion lasted for 45 minutes and a sample was collected. A treated effluent discharge to Harbor Brook did not occur.

- Diversion #30 occurred on July 25, 2016 at 10:10 a.m. and resulted in 0.15 MG of CSO flow being diverted to the constructed wetlands facility during a 45 minute period. When sampling staff arrived on site, the influent diversion ended, and samples were not collected. A treated effluent discharge to Harbor Brook did not occur. A second diversion occurred later that day (see below).

- Diversion #31 also occurred on July 25, 2016 at 10:45 p.m. and resulted in an additional 0.05 MG of CSO flow being diverted to the constructed wetlands facility during a 50 minute period and a sample was collected. A treated effluent discharge to Harbor Brook did not occur.

- Diversion #32 began on August 1, 2016 and resulted in 0.11 MG of CSO flow being diverted to the constructed wetlands facility. The influent diversion lasted 50 minutes, and a sample was collected. A treated effluent discharge to Harbor Brook did not occur.

- Diversion #33 occurred on August 6, 2016 and resulted in 0.09 MG of CSO flow being diverted to the constructed wetlands. The influent diversion lasted 35 minutes and ended by the time sampling staff arrived on site. A treated effluent discharge to Harbor Brook did not occur.

- Diversion #34 occurred on August 10, 2016 and resulted in 0.25 MG of CSO flow being diverted to the constructed wetlands. The influent diversion continued for 1 hours and 20 minutes and a sample was collected. The influent diversion resulted in Effluent Event #7. Multiple samples were collected during the effluent discharge based on visual confirmation of flow, however, the flow data during this period is not accurate. The flow meter collected accurate level data, however, the velocity data collected was at a constant, near zero velocity, indicating interference. It is unknown what the exact reason for the interference was, but possible causes include debris from the wetland (i.e. plant leaves, reeds, etc.) or that the flow sensor malfunctioned for a short time period. Visual inspection of effluent flow was present for over 12 hours, far longer than the influent diversion duration. It is possible that groundwater rose significantly due to the rainfall that day and that the high groundwater contributed to the long duration discharge. The effluent flow meter recorded 0.01 MG of discharge, however, based on the prolonged visual inspection of effluent flow, it is expected that the actual discharge volume was significantly higher. The exact discharge volume and duration cannot be determined. Only two effluent samples were collected during this event because the first sample was collected three hours after the start of the discharge was visually confirmed.

- Diversion #35 occurred on August 12, 2016 at 12:55 p.m. and resulted in 0.09 MG of CSO flow being diverted to the constructed wetlands. The event lasted 40 minutes and ended before the sampling crew arrived on-site. A treated effluent discharge to Harbor Brook did not occur. Two more diversion events occurred later that day (see below).

- Diversion #36 also occurred on August 12, 2016 at 4:20 p.m. Mid-influent sample collection, frequent lightning was occurring and sampling staff temporarily suspended sampling until the storm passed. As a result, sample bottles were filled 40 minutes after the influent diversion start time. Another brief storm event occurred mid-sampling after Diversion #36 stopped and resulted in Diversion #37 (see below). A total of 0.13 MG was diverted during Diversions #36 and #37. Effluent Event #8 occurred as a result of Diversions #36 and #37 as described below.

- Diversion #37 also occurred on August 12, 2016. The influent diversion event started at 5:00 p.m.

while the sampling staff were filling sample bottles for Diversion #36. The influent diversion lasted for 15 minutes and no samples were collected as part of Diversion #37. In total, 0.13 MG of CSO flow was diverted to the constructed wetlands during Diversions #36 and #37. Collectively, these events resulted in a discharge event to Harbor Brook. Effluent Event #8 resulted in 45 minutes of treated discharge to Harbor Brook. A total of 0.01 MG was discharged. The level of Harbor Brook increased substantially during this event, preventing a prolonged discharge of flow from the facility. Sampling staff collected an effluent sample, however, subsequent examination of the flow data indicated that the sample was collected after the discharge from the facility had ended. These results are reported in Attachment A as a sample collected from a no discharge event; and the samples are of the trickle of groundwater that continuously flows out the outfall. Effluent samples were not collected during Effluent Event #8.

- Diversion Event #38 occurred on August 13, 2016 at 1:40 p.m. The influent diversion lasted a total of 1 hour and 25 minutes. However flow decreased substantially mid-event, corresponding to a decrease in rainfall intensity. The decrease in flow occurred simultaneous to sampling staff arriving on-site to collect samples, and during that period the low flow was being stored in the grit and floatables facility and not sent to the wetland. The grit and floatables tanks need to fill with water before discharging to the wetland. During periods of low flow, it takes a substantial timeframe for the tanks to fill and discharge. Once rainfall intensity increased again, flow was sent to the wetland. While the CSO flow was being diverted to the wetland facility, sampling staff were checking the outfall for the presence of an effluent discharge. An influent sample was not collected for this event because of this. A short duration (25 minute) effluent discharge event (Effluent Event #9) occurred as a result of influent diversion #38. A total of 0.05 MG was discharged. Per the SPDES permit, because the discharge was for shorter than 30 minutes, an effluent sample was not collected. The added effects of heavy rainfall during this discharge caused the effluent discharge volume (0.05 MG) to be greater than the influent volume (0.02 MG). Two more diversion events also occurred later that day (see below).

- Diversion Event #39 also occurred on August 13, 2016 at 5:15 p.m. and resulted in 0.02 MG of CSO flow being diverted to the constructed wetlands. The event lasted 35 minutes and one sample was collected. The combination of influent diversions #39 and #40 resulted in Effluent Event #10 (see below).

- Diversion Event #40 also occurred on August 13, 2016 at 5:55 p.m. and resulted in 0.29 MG of CSO flow being diverted to the constructed wetlands. One sample was collected. Influent diversions #39 and #40 resulted in Effluent Event #10, which lasted a total of 2 hours and 50 minutes. A total of 0.03 MG of treated effluent was discharged to Harbor Brook. The remainder of the flow diverted to the wetland was stored in the wetland cells and slowly infiltrated into surrounding groundwater over time. One sample was collected during the effluent discharge and another sample was collected thereafter by sampling staff as the end of the effluent discharge event could not be visually confirmed in the field. Subsequent examination of the flow data from this event indicated that the second sample that was collected was collected after the discharge had ended. The results for this no discharge sample are reported in Attachment A.

- Diversion Event #41 occurred on August 16, 2016 and resulted in 0.17 MG of CSO flow being diverted to the constructed wetlands. The influent diversion lasted 1 hour and 5 minutes, and an influent sample was collected. A treated effluent discharge to Harbor Brook did not occur because the level of Harbor Brook increased substantially due to the rainfall preventing flow from discharging from the facility.

- Diversion Event #42 occurred on August 21, 2016 and resulted in 0.24 MG of CSO flow being diverted to the constructed wetlands. The influent diversion lasted 2 hours and an influent sample was collected. A treated effluent discharge to Harbor Brook did not occur because the level of Harbor Brook increased substantially due to the rainfall preventing flow from discharging from the facility.

- Diversion Event #43 occurred on September 8, 2016 and resulted in 0.23 MG of CSO flow being diverted to the constructed wetlands. The diversion event lasted 45 minutes and ended before the sampling team arrived on-site, and an influent sample was not collected. A treated effluent discharge to Harbor Brook did not occur because the level of Harbor Brook increased substantially due to the rainfall preventing flow from discharging from the facility.

- Effluent Events #11 and #12 occurred on September 18, 2016 at 3:20 a.m. and 9:05 p.m. when the facility was offline due to the aforementioned issue with the control electronics. During these events, a total of 0.12 MG of untreated discharge to Harbor Brook occurred via the emergency bypass.

- Sampling staff collected effluent samples on August 16, 2016 and September 8, 2016 at the possibility of an effluent discharge. Subsequent examination of the effluent flow data on these two dates yielded than an effluent discharge from the facility did not occur. The results from these samples are reported in Attachment A without effluent event numbers and as no discharge event samples. The samples are from the trickle of groundwater that continuously flows out the outfall.

Screenings were removed from the grit and floatables facility at the end of each month. The volume collected is as follows:

- July 2016: 0.5 cubic yard
- August 2016: 0.5 cubic yard
- September 2016: 1 cubic yard

Water Quality Removal Efficiencies

Pollutant removal efficiencies were estimated for Effluent Events 7 and 10, which occurred as a result of Diversion Events 34 and 39&40, respectively (Table 1). The average values of the influent and effluent samples were utilized in order to calculate removal efficiencies during each event. The removal efficiencies this quarter are substantially lower than previous quarters. The decreased removal efficiencies are due in part of the nature of summertime storm events; i.e. short duration, heavy rainfall thunderstorms that are not detained within the wetland cells for a substantial time period. However, the main reason for the decreased removal efficiencies is that the wetland cells were operated in parallel and series/parallel modes this quarter. When operating in these modes, the wetland detention time, and therefore treatment time, is significantly reduced because the influent flow is split between the cells. Whereas in series mode, flow first needs to fill Cell 1, then Cell 2, and then Cell 3 before discharging, maximizing detention time and treatment.

During Effluent Event #7, pollutant removal efficiencies were insignificant. Although some concentrations are shown as increasing, the difference in concentrations is within the level of error for each lab analysis method. The primary reason for the minimal removal of each pollutant is that the influent concentrations are very low to begin with. A possible cause of decreased influent pollutant concentrations is the time of day of the event. The event occurred very early in the morning (5:55 a.m.), when sewer flows are lowest. To date, with the exception of fecal coliform, the wetland natural treatment has not decreased the concentrations of these pollutants significantly lower than the values from this event.

Removal efficiencies during Effluent Event #10 were higher, compared to Effluent Event #7. Fecal coliforms

were reduced by 92% and BOD and suspended solid concentrations were reduced by greater than 50%. This is largely due to the fact that the influent concentrations were substantially higher compared to Effluent Event #7, on par with influent values typically seen in past quarters.

Table 1. Removal efficiencies for water quality parameters measured for Quarter 3 Effluent Events

	F. coli	BOD_5	TSS	Settleable Solids	NH_3-N	TP
Units	CFU/100 mL	mg/L	mg/L	mL/L	mg/L	mg/L
Effluent Event #7 - 8/10/16						
Influent average	360,000	16	32	1.1	0.939	0.408
Effluent average	321,559	23	42	< 0.35	1.01	0.473
Percentage reduction	**11%**	**0%**	**0%**	**> 68%**	**0%**	**0%**
Effluent Event #10 - 8/13/16						
Influent average	4,750,000	24	140	0.45	1.17	0.5
Effluent average	360,000	11	31	< 0.2	1.12	0.628
Percentage reduction	**92%**	**54%**	**78%**	**56%**	**4%**	**0%**

List of Attachments

- Attachment A: Summary of the flows, rainfall data, diversion events, and lab data
- Attachment B: Figure showing the wetlands influent volume, effluent volume, bypass volume and precipitation for each of the events.
- Attachment C: Figure showing the recorded effluent manhole levels and velocities for each of the effluent events.
- Attachment D: Floatables Forms
- Attachment E: Facility diagram and flow diagram schematics for the constructed wetlands facility.

Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
Quarterly Performance Report - Attachment A

Performance Period:	**7/1/2016 - 9/30/2016**
Total Number of Discharge Events:	**7**

Note: Influent and effluent samples are collected once every four hours during a CSO event.

						Precipitation Data		Volume Data			Unit Processes Activated?				
						Total Precipitation per Event (Wadsworth)[a]	Total Precipitation per Event (Metro)	Wetlands Influent Volume (MH-4A)	Wetlands Effluent Volume (Main Outfall 018, MH-19 When in Operation)	Overflow Volume (Emergency Bypass 018A, MH-19 When Offline)	Grit and Floatables Facility	Cell 1	Cell 2	Cell 3	Discharge to Harbor Brook?
Units						in	in	MG	MG	MG					
Sample Type						Recorded	Recorded	Recorded	Recorded	Recorded					
	Diversion Number	**Effluent Event Number**	**Influent Diversion Start Date and Time**	**Effluent Event Start Date and Time**	**Effluent Event Duration (hr)[b]**										
Event Data	26[c]	6[d]	07/08/16, 1630	07/08/16, 1640	1.00	–	0.35	0.26	0.07	–	Yes	Yes	Yes	Yes	Yes
	27	-	07/13/16, 1820	-	-	–	0.07	0.01	–	–	Yes	Yes	Yes	Yes	No
	28	-	07/15/16, 1440	-	-	–	0.11	0.05	–	–	Yes	Yes	Yes	Yes	No
	29	-	07/18/16, 1445	-	-	–	0.16	0.03	–	–	Yes	Yes	Yes	Yes	No
	30[c]	-	07/25/16, 1010	-	-	–	0.49	0.15	–	–	Yes	Yes	Yes	Yes	No
	31	-	07/25/16, 2245	-	-	–	0.30	0.05	–	–	Yes	Yes	Yes	Yes	No
	32	-	08/01/16, 0720	-	-	–	0.47	0.11	–	–	Yes	Yes	Yes	Yes	No
	33[c]	-	08/06/16, 0350	-	-	–	0.08	0.09	–	–	Yes	Yes	Yes	Yes	No
	34	7[e]	08/10/16, 0515	08/10/16, 0555	12.92	–	0.73	0.25	0.01	–	Yes	Yes	Yes	Yes	Yes
	35[c]	-	08/12/16, 1255	-	-	–	0.54	0.09	-	–	Yes	Yes	Yes	Yes	No
	36	8[f]	08/12/16, 1620	08/12/16, 1640	0.75	–		0.13	0.01	–	Yes	Yes	Yes	Yes	Yes
	37[c]		08/12/16, 1700			–				–	Yes	Yes	Yes	Yes	Yes
	38[c]	9[g]	08/13/16, 1340	08/13/16, 1405	0.42	–	0.58	0.02	0.05	–	Yes	Yes	Yes	Yes	Yes
	39	10[h]	08/13/16,1715	08/13/16, 1755	2.83	–		0.02	0.03	–	Yes	Yes	Yes	Yes	Yes
	40		08/13/16, 1755			–		0.29		–	Yes	Yes	Yes	Yes	Yes
	41	-	08/16/16, 1945	-	-	–	0.59	0.17	–	–	Yes	Yes	Yes	Yes	No
	42	-	08/21/16, 1320	-	-	–	0.62	0.24	–	–	Yes	Yes	Yes	Yes	No
	43[c]	-	09/08/16, 1510	-	-	0.56	1.18	0.23	–	–	Yes	Yes	Yes	Yes	No
	-	11[i]		09/18/16, 0320	1.92	0.98	1.01	–	–	0.02	No	No	No	No	Yes
	-	12[i]		09/18/16, 2105	5.00	1.15	1.45	–	–	0.10	No	No	No	No	Yes
Statistics	**Quarterly Total**					**2.69**	**8.73**	**2.19**	**0.17**	**0.12**					

[a] The Wadsworth Park rain gage was not operational during July and August for repairs. Rainfall data from the Metro rain gage is provided during this timeframe.

[b] Event duration is calculated based on when an effluent discharge starts and stops.

[c] Influent Diversion Events 26, 30, 33, 35, 37, 38, and 43 ended prior to sampling staff arriving on site, and samples were not collected.

[d] Effluent samples were not collected during Effluent Discharge Event #6.

[e] Velocity readings from MH-19 flow sensor were inaccurate during Effluent Event #7. Exact discharge volume unknown.

[f] Effluent Discharge Event #8 was the result of flow from Influent Diversions #36 and #37.

[g] Effluent samples were not collected during Effluent Event #9 because the duration of the discharge was shorter than 30 minutes.

[h] Effluent Discharge Event #10 was the result of flow from Influent Diversions #39 and #40.

[i] The facility was offline from September 16th to September 18 due to an issue with the controlling electronics. Overflow volume is reported for discharges to Harbor Brook during Events #11 and #12.

Wetlands Influent Parameters										
				F. coli	Cl_2 Residual	BOD_5[a]	TSS[a]	Settleable Solids	NH_3-N[a]	TP[a]
Units				cfu/100 mL	mg/L	mg/L	mg/L	mL/L	mg/L	mg/L
Sample Type				Grab	Grab	Composite	Composite	Grab	Composite	Composite
Number of Samples				33	33	11	11	33	11	11
Lab Analysis Method				9222 D-97	Field	SM 5210 B-01,-11	SM 2540 D-97,-11	SM 2540 F-97,-11	10-107-6-1-B, J	QuickChem 10-115-01-1-E
	Diversion Number	Event Date/Sample Time	Effluent Event Duration (hr)							
Event Data	27	07/13/16, 1830		2,000,000	< 0.10[U]	70	88	0.5	4.05	1.35
	28	07/15/16, 1500		864,000	< 0.10[U]	95	176	4.0	2.93	2.02
	29	07/18/16, 1530		1,850,000	< 0.10[U]	70	134	1.3	3.55	1.62
	31	07/25/16, 2320		900,000	< 0.10[U]	29	58	0.5	2.17	0.680
	32	08/01/16, 0750		818,000	< 0.10[U]	45	77	3.0	2.66	1.06
	34	08/10/16, 0600	12.92	360,000	< 0.10[U]	16	32	1.1	0.939	0.408
	36	08/12/16, 1700	0.75	782,000	0.22	19	80	0.8	1.07	0.472
	39	08/13/16,1740	2.83	4,500,000	< 0.10[U]	24[c]	140[c]	0.3	1.17[c]	0.500[c]
	40	08/13/16, 1755		5,000,000	< 0.10[U]			0.6		
	41	08/16/16, 2025		4,900,000	0.12	20	149	1.1	0.908	0.677
	42	08/21/16, 1415		510,000	0.20	TNP	TNP	0.5	TNP	TNP
Quarterly Averages[b]				**1,455,386**	**< 0.12**	**43.11**	**103.78**	**1.25**	**2.28**	**0.98**

[a] Composite samples include a maximum 6 grab samples taken at 4 hour increments each day (composites on the last day of sampling may include fewer than 6 grab samples).

[b] The quarterly average is the average of the data from the quarter, excluding the event averages. Geometric mean used to calculate Fecal Coliform averages.

[c] Due to the close diversion start times for events #39 & #40, samples had the same lab delivery receipt time. As a result, samples were mistakenly composited.

[U] Indicates that the reported value is below the (MRL) Method Reporting Limit. Note that possible MRL elevation is dependent upon analyzed mass, volumes, and/or dilution volumes.

TNP = Analytical test not performed

Wetlands Effluent - Main Outfall CSO 018																	
				F. coli	Cl_2 Residual	Total chlorine	Chloramines	Monochloramine	Total dichloramine	BOD_5 [a]	TSS[a]	Oil and Grease	Settleable Solids	Floatable Material	NH_3-N[a]	TKN[a]	TP[a]	DO
Units				cfu/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mL/L	days	mg/L	mg/L	mg/L	mg/L
Sample Type				Grab	Grab	Grab	Grab	Grab	Grab	Composite	Composite	Grab	Grab	Grab	Composite	Composite	Composite	Grab
Number of Samples				3	3	3	3	3	3	2	2	3	3	-	2	2	2	3
Lab Analysis Method				9222 D-97	Field	Field	Field	Field	Field	SM 5210 B-01,-11	SM 2540 D-97,-11	EPA 1999 (1664-A)	SM 2540 F-97,-11	Field	QuikChem 10-107-6-1-B, J	QuikChem 10-107-06-2	QuikChem 10-115-01-1-E	Field
Event Data	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)															
	7	08/10/16, 0845	12.92	220,000	< 0.10[U]	0.00	0.00	0.00	0.00	23	42	5	0.5	Absent	1.01	3.08	0.473	0.34
	7	08/10/16, 1245		470,000	< 0.10[U]	0.00	0.00	0.00	0.00			37	< 0.2[U]	Absent				0.30
Averages - Effluent Event #7				**321,559**	**< 0.10[U]**	**0.00**	**0.00**	**0.00**	**0.00**	**23**	**42**	**21**	**< 0.35**	**-**	**1.01**	**3.08**	**0.473**	**0.32**
Event Data	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)															
	8	08/12/2016, 1740[b]	0.75	800,000	< 0.10[U]	0.00	0.00	0.00	0.00	15	57	< 4	0.2	Absent	1.16	4.49	0.439	0.48
Event Data	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)															
	10	08/13/16, 1820	2.83	360,000	< 0.10[U]	0.00	0.00	0.00	0.00	< 2[U]	31	< 4[U]	< 0.2[U]	Absent	1.12	2.66	0.628	2.16
	10	08/13/16, 2220[c]		230,000	< 0.10[U]	0.00	0.00	0.00	0.00			< 4[U]	< 0.2[U]	Absent				2.87
Averages - Effluent Event #10				**287,750**	**< 0.10[U]**	**0.00**	**0.00**	**0.00**	**0.00**	**< 2**	**31**	**< 4**	**< 0.2**	**-**	**1.12**	**2.66**	**0.628**	**2.52**
Event Data	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)															
	N/A[d]	08/16/2016, 2105	N/A	3,180,000[V]	< 0.10[U]	0.00	0.00	0.00	0.00	28	397	< 4[U,Q]	0.5	Absent	1.19	4.71	0.930	0.52
Event Data	Event Number	Event Date/Sample Time	Effluent Event Duration (hr)															
	N/A[d]	09/08/2016, 1615	N/A	460,000	< 0.10[U]	0.00	0.00	0.00	0.00	29	98	5	0.6	Present[f]	1.74	4.46	0.945	5.61
Quarterly Averages[e]				**333,893**	**< 0.10[U]**	**0.00**	**0.00**	**0.00**	**0.00**	**< 12.5**	**37**	**< 15**	**< 0.3**	**-**	**1.07**	**2.87**	**0.551**	**0.93**

[a] Composite samples include a maximum of 6 grab samples taken at 4 hour increments each day (composites on the last day of sampling may include fewer than 6 grab samples).

[b] 08/12/2016, 1740 sample was collected by Sampling Staff after the effluent discharge had ended, but could not be confirmed in the field. Subsequent examination of flow data indicated that the effluent discharge ended prior to this sample being collected. Results are reported from samples during the no discharge event.

[c] 08/13/2016, 2220 sample was collected by Sampling Staff after the effluent discharge had ended, but could not be confirmed in the field. Subsequent examination of flow data indicated that the effluent discharge ended prior to this sample being collected. Results are reported and composite values include this sample.

[d] Samples collected on 8/16/2016, 2105 and 09/08/2016, 1615 were collected by Sampling Staff as a possible effluent discharge. Subsequent examination of flow data indicated that an effluent discharge did not occur. Results are reported from samples during these no discharge events.

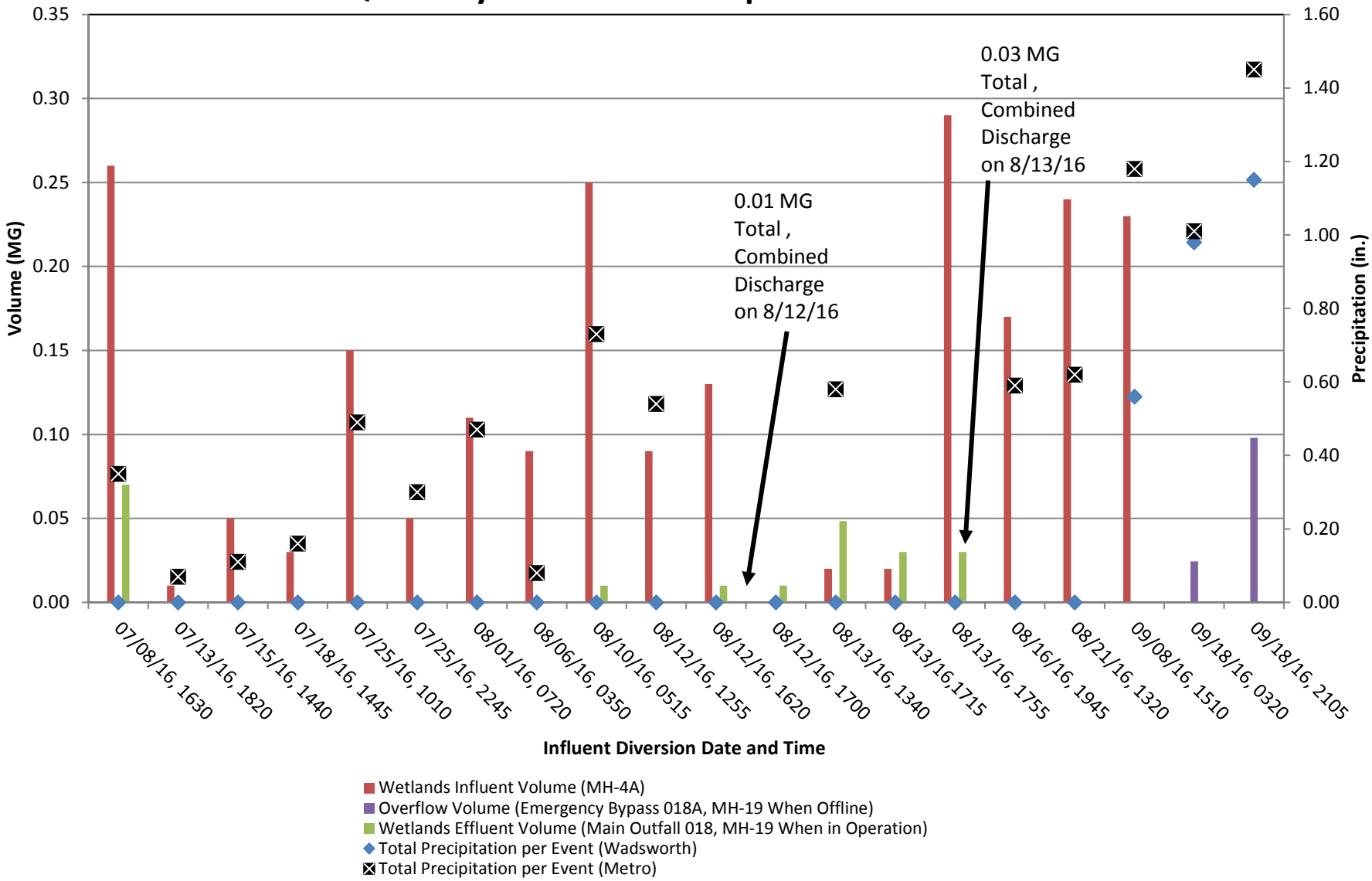
[e] The quarterly average is the average of the data from the quarter, excluding the event averages and excluding samples collected during non-discharge events. Geometric mean used to calculate fecal coliform averages.

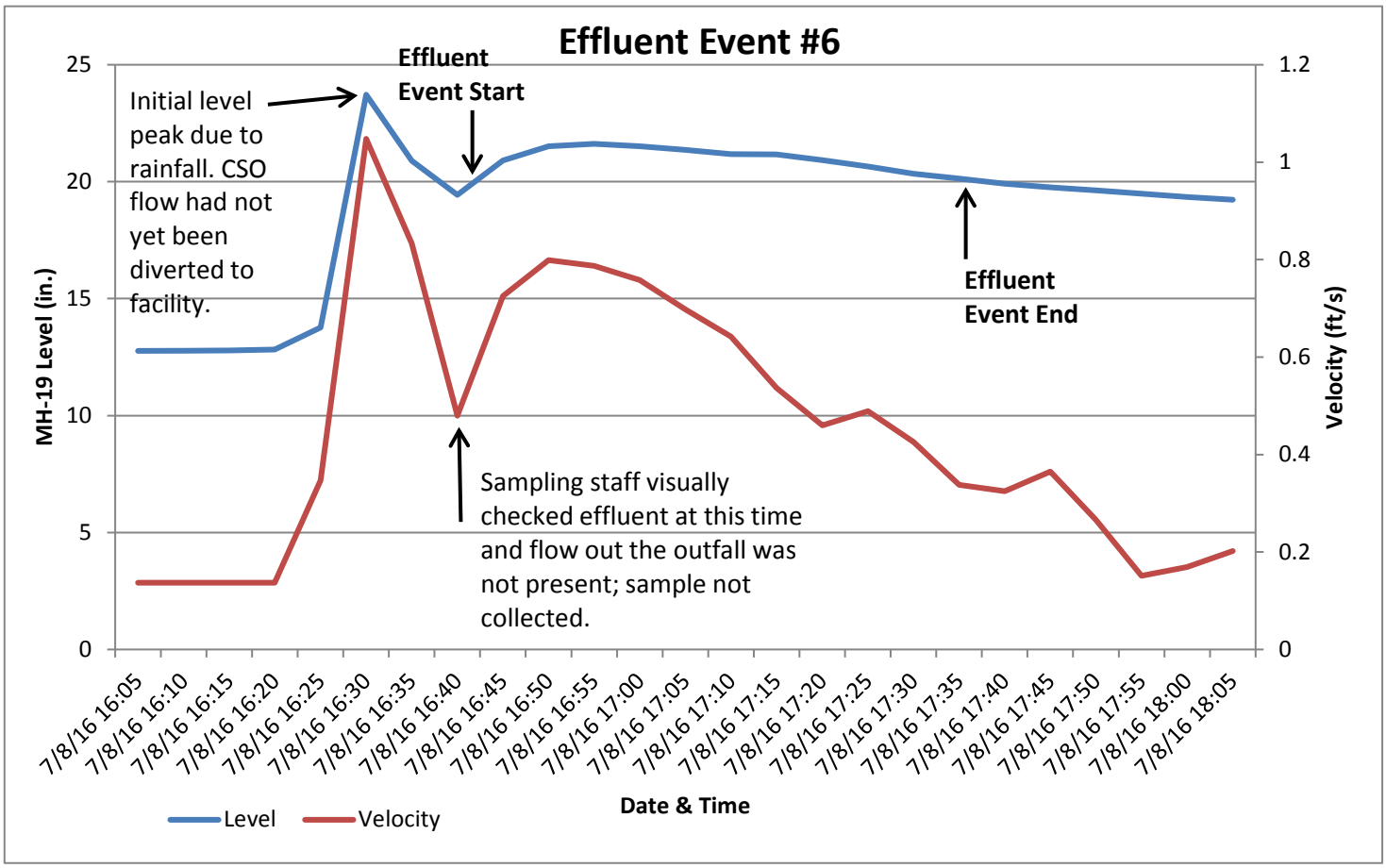
[f] Sanitary item floatables material present during 09/08/2016, 1615 sample. Source of material is not from facility as effluent discharge did not occur on this date. Possible source of material is from Harbor Brook upstream of facility.

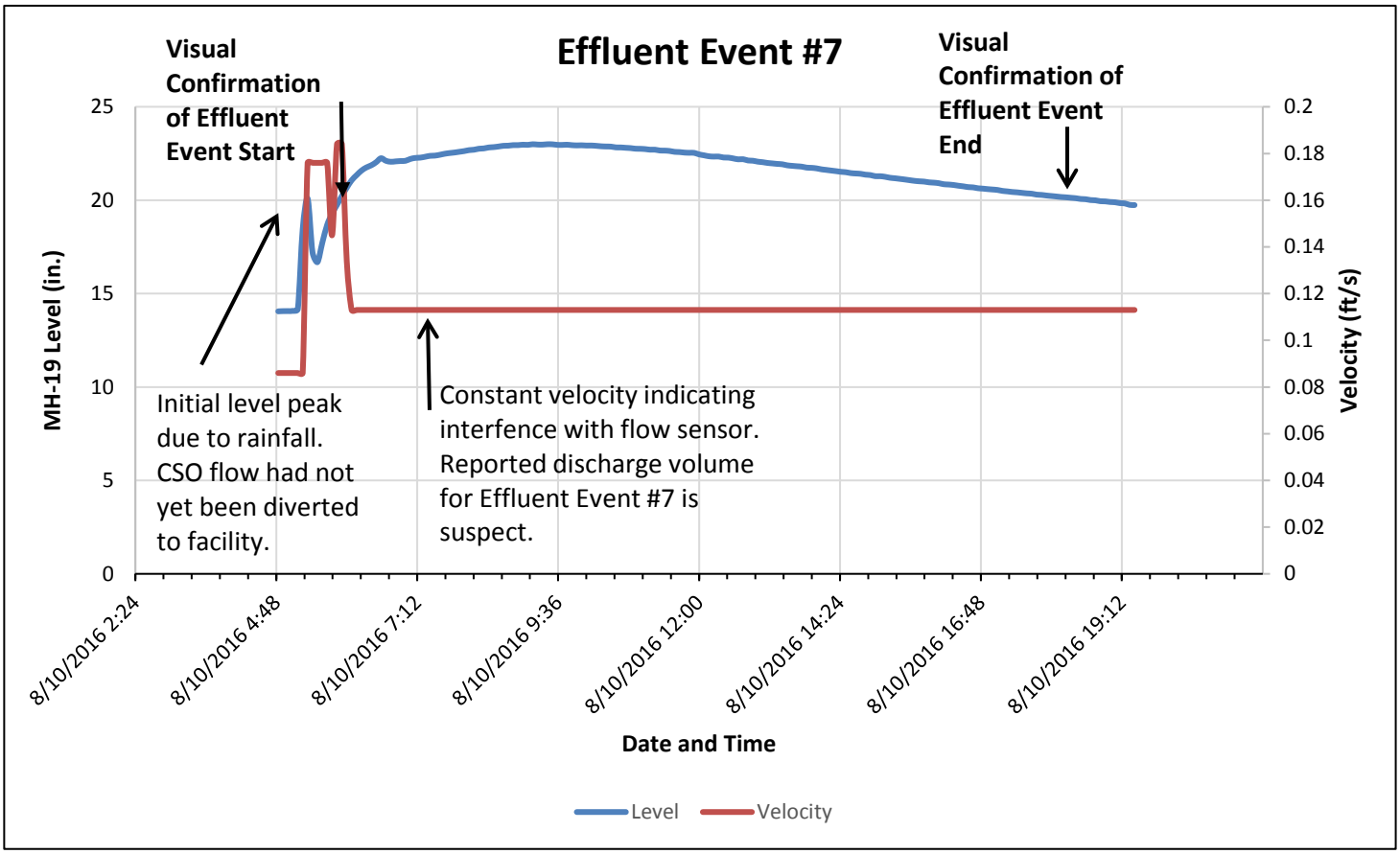
[Q] The laboratory analysis was from an improperly preserved sample. The reported value is considered an estimate and cannot be used for compliance purposes. The sample bottle was stored at an improper cold room temperature, due to equipment failure.

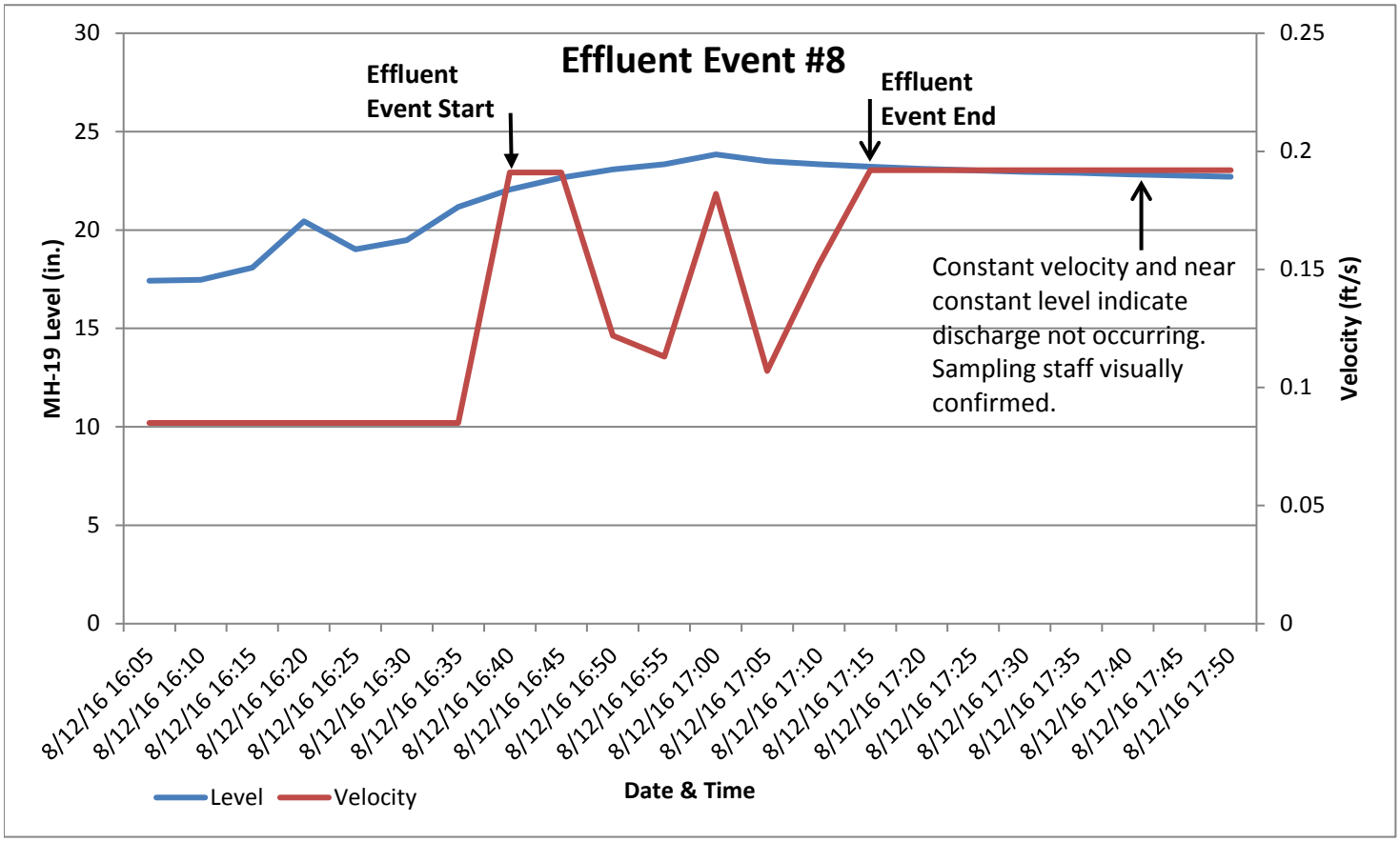
[V] Reported value is considered estimated due to variance from quality control or assurance criteria. The LFB, ICV, CCV, or LCS solution(s) was outside acceptable limits and cannot be repeated.

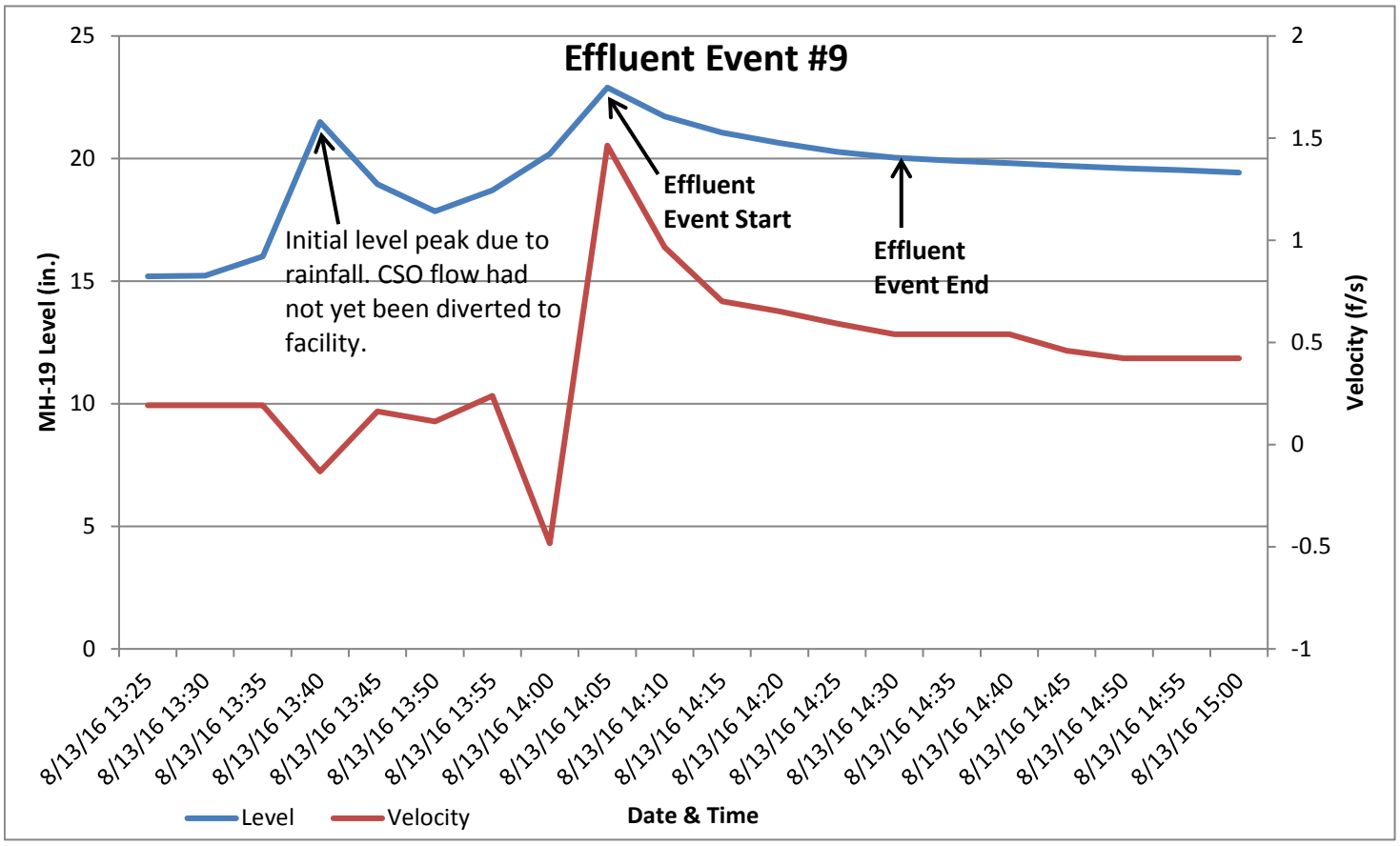
Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility
Quarterly Performance Report - Attachment B

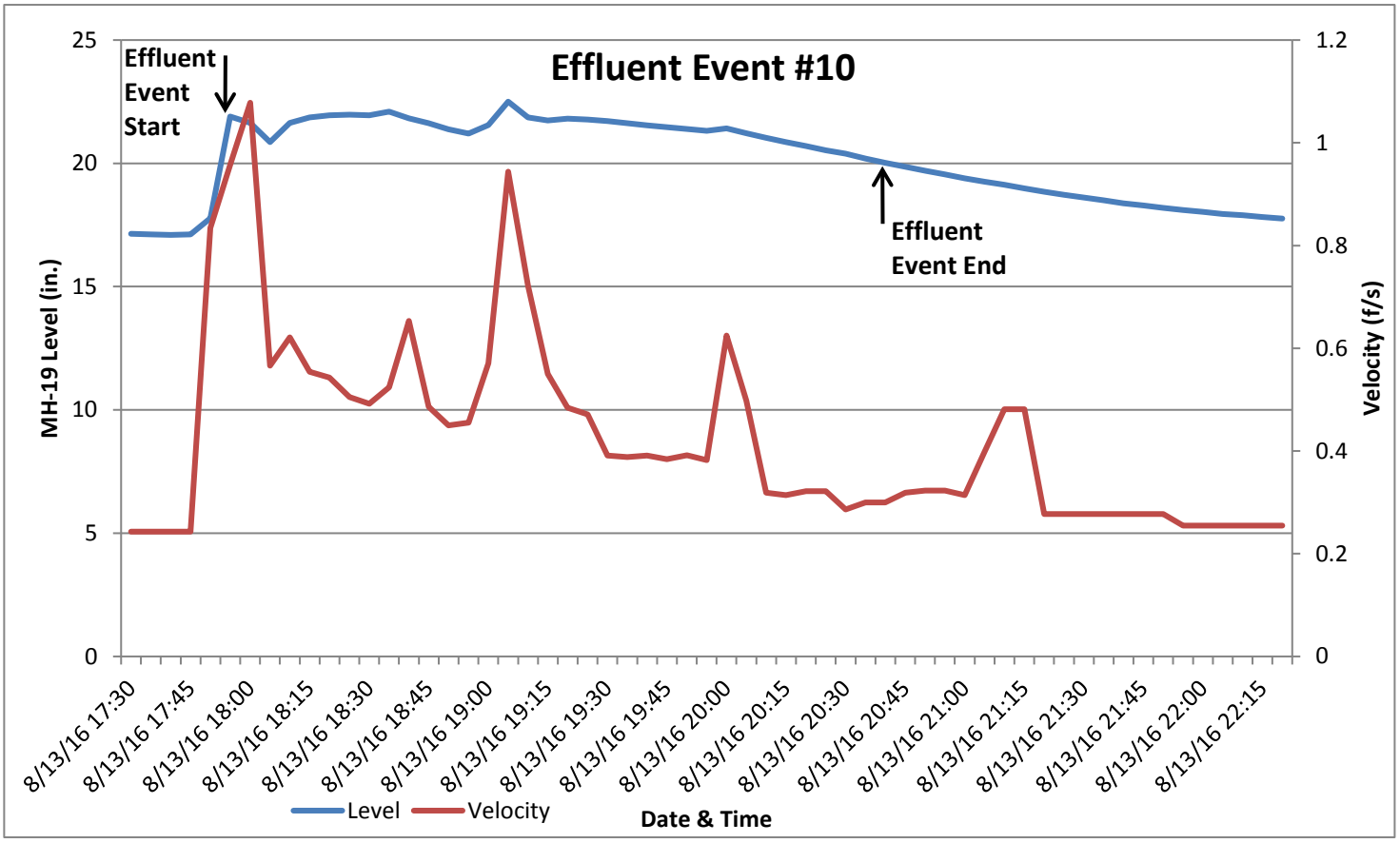



Effluent Event #6
Effluent Event Start
Initial level peak due to rainfall. CSO flow had not yet been diverted to facility.
Effluent Event End
Sampling staff visually checked effluent at this time and flow out the outfall was not present; sample not collected.
MH-19 Level (in.)
Velocity (ft/s)
Date & Time
Level
Velocity


Effluent Event #7
Visual Confirmation of Effluent Event Start
Visual Confirmation of Effluent Event End
Initial level peak due to rainfall. CSO flow had not yet been diverted to facility.
Constant velocity indicating interfence with flow sensor. Reported discharge volume for Effluent Event #7 is suspect.
MH-19 Level (in.)
Velocity (ft/s)
Date and Time
Level
Velocity


Effluent Event #8
Effluent Event Start
Effluent Event End
Constant velocity and near constant level indicate discharge not occurring. Sampling staff visually confirmed.
MH-19 Level (in.)
Velocity (ft/s)
Date & Time
Level
Velocity


Effluent Event #9
Initial level peak due to rainfall. CSO flow had not yet been diverted to facility.
Effluent Event Start
Effluent Event End
MH-19 Level (in.)
Velocity (f/s)
Date & Time
Level
Velocity


Effluent Event #10
Effluent Event Start
Effluent Event End
MH-19 Level (in.)
Velocity (f/s)
Level
Velocity
Date & Time
25
20
15
10
5
0
1.2
1
0.8
0.6
0.4
0.2
0
8/13/16 17:30
8/13/16 17:45
8/13/16 18:00
8/13/16 18:15
8/13/16 18:30
8/13/16 18:45
8/13/16 19:00
8/13/16 19:15
8/13/16 19:30
8/13/16 19:45
8/13/16 20:00
8/13/16 20:15
8/13/16 20:30
8/13/16 20:45
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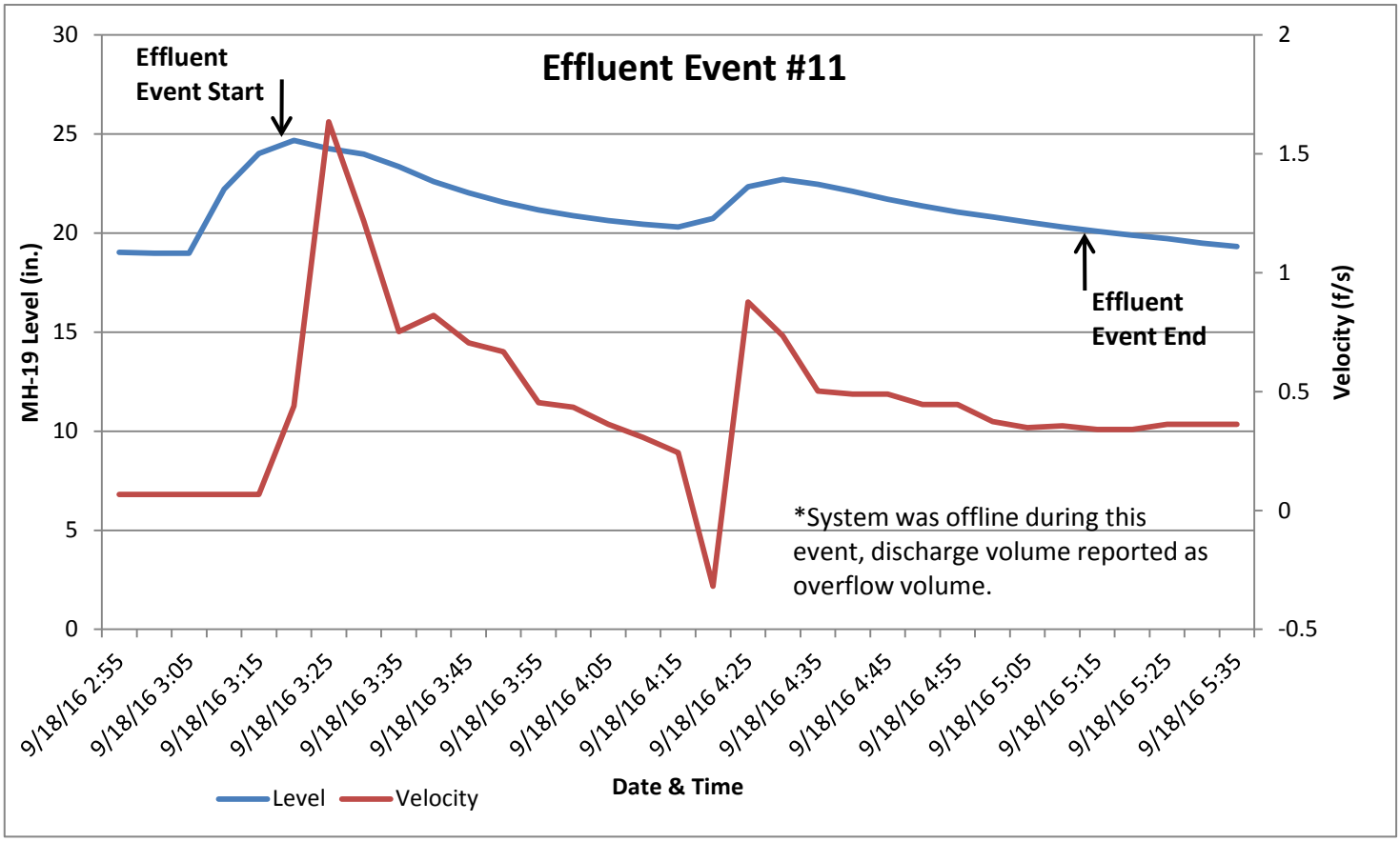
8/13/16 21:45
8/13/16 22:00
8/13/16 22:15


Effluent Event #11
Effluent Event Start
Effluent Event End
*System was offline during this event, discharge volume reported as overflow volume.
MH-19 Level (in.)
Velocity (f/s)
Level
Velocity
Date & Time
30
25
20
15
10
5
0
2
1.5
1
0.5
0
-0.5
9/18/16 2:55
9/18/16 3:05
9/18/16 3:15
9/18/16 3:25
9/18/16 3:35
9/18/16 3:45
9/18/16 3:55
9/18/16 4:05
9/18/16 4:15
9/18/16 4:25
9/18/16 4:35
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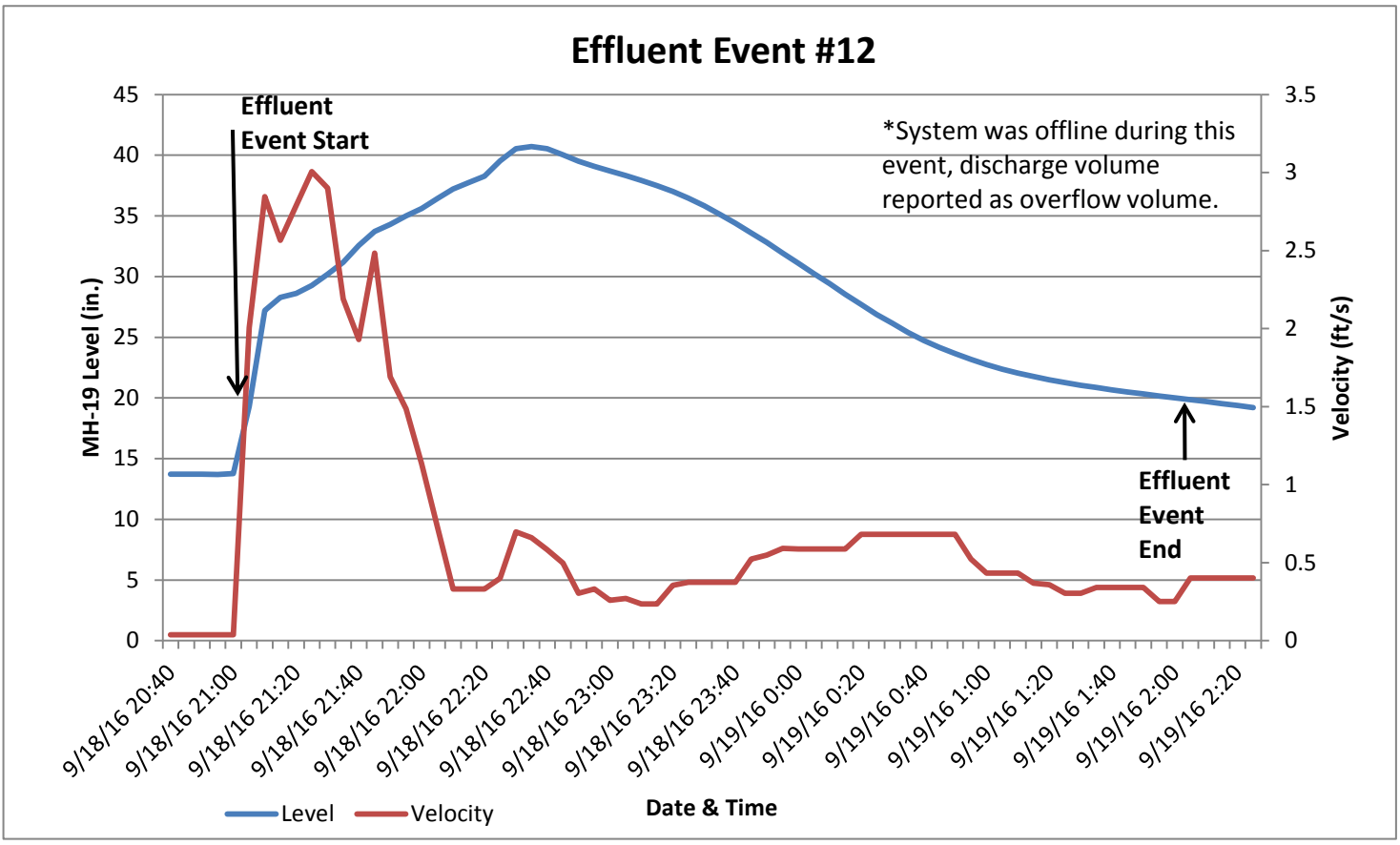
9/18/16 5:15
9/18/16 5:25
9/18/16 5:35


Effluent Event #12
Effluent
Event Start
*System was offline during this event, discharge volume reported as overflow volume.
Effluent
Event
End
MH-19 Level (in.)
Velocity (ft/s)
Date & Time
Level
Velocity
45
40
35
30
25
20
15
10
5
0
3.5
3
2.5
2
1.5
1
0.5
0
9/18/16 20:40
9/18/16 21:00
9/18/16 21:20
9/18/16 21:40
9/18/16 22:00
9/18/16 22:20
9/18/16 22:40
9/18/16 23:00
9/18/16 23:20
9/18/16 23:40
9/19/16 0:00
9/19/16 0:20
9/19/16 0:40
9/19/16 1:00
9/19/16 1:20
9/19/16 1:40
9/19/16 2:00
9/19/16 2:20

Attachment D – Floatables Forms

LAB SAMPLE ID#: 2016005643

FLOATABLES DESCRIPTION FORM
ONONDAGA COUNTY
DEPARTMENT OF WATER ENVIRONMENT PROTECTION

DATE: 9/8/16 TIME: 1615
LOCATION / IC Code: 1514 - Wetland Effluent
SNOW MELT (Y/N): _____
RAIN (Y/N): _____
Flow at CSO Outfall: Yes/No Flow Description: Trickle/Moderate/Substantial

PHYSICAL INDICATOR

	DESCRIPTION		Circle Relative Severity Index
Odor Present: N/A ☐	☐ Sewage	☐ Petroleum/Gas	(1) Faint
	☐ Sulfide	☐ Laundry	(2) Easily detected
	☐ Rancid/Sour	☐ Other _____	(3) Noticeable from a distance

	DESCRIPTION		Circle Relative Severity Index
Color: ☐	☐ Clear	☐ Gray	(1) Faint color in sample bottle
	☐ Green	☐ Red	(2) Clearly visible in sample bottle
	☒ Brown	☐ Yellow	(3) Clearly visible in outfall flow
		☐ Other _____	

	Circle Relative Severity Index
Turbidity: ☐	(1) Slight cloudiness (2) Cloudy (3) Opaque

Floatables[1]: ☐

TYPE	Count[2]	Approx. Size	Circle Relative Severity Index
☐ 1. Suds/Foam	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 2. Visible Oil Film	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 3. Globules of Grease	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 4. Street litter (i.e., Cigarette butts)	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 5. Food Packaging	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☒ 6. Sanitary Items (i.e., sewage toilet paper, condoms, tampon applicators)	1	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 7. Beverage containers	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 8. Medical Items (i.e., syringes)	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 9. Other	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious

[1] *Floatables: Record Floatables observations during sampling event over a 3-5 minute time duration.*
[2] *Count: Attempt to record count of floatables during the sampling event.*

Photograph Taken: Yes/No

Revision: 10/14/2014 JS

Attachment E – Facility and Flow Diagrams

HARBOR BROOK

BACKFLOW PREVENTER TO PREVENT BACKFLOW FROM HARBOR BROOK INTO CELL 3. REQUIRES APPROXIMATELY 20" OF PRESSURE TO FULLY OPEN.

OUTFALL 018/018A

MH-17

MH-16

MH-15

MH-19, ISCO 2150 AREA VELOCITY FLOW MODULE FOR EFFLUENT DISCHARGE VOLUME (ONLINE) OR OVERFLOW VOLUME (OFFLINE) FLOW MEASUREMENT. EFFLUENT SAMPLING LOCATION IN SERIES OR PARALLEL OPERATION.

MH-18, ISCO 2150 AREA VELOCITY MODULE FOR CELL 3 DISCHARGE FLOW MEASUREMENT. CELL 3 SAMPLING LOCATION DURING PARALLEL OPERATION.

ISCO SIGNATURE FLOW METER

ISCO 6712FR AUTO SAMPLER

36" WETLAND BYPASS/ EMERGENCY BYPASS **MH-5A** TO **MH-19**

FDS 11, CELL 1 SAMPLING LOCATION DURING PARALLEL OPERATION. LEVEL SENSOR FOR MEASURING CELL 1 LEVEL.

MH-12, DOSING VALVE FOR DOSING CELL 2 WHEN IN SERIES OPERATION.

MH-10

MH-20

MH-9

FDS-13, CELL 2 SAMPLING LOCATION DURING PARALLEL OPERATION. LEVEL SENSOR FOR CONTROLLING GATE FLOW FROM CELL 2 TO CELL 3 IN SERIES OPERATION.

FDS-6, SLIDE GATES FOR SERIES OR PARALLEL OPERATION.

MH-5A, ISCO 2150 AREA VELOCITY MODULE FOR BYPASS FLOW MEASUREMENT.

PANEL B (SEE O&M)

HBIS **MH-U15**

EXISTING 21" HBIS

MH-4B

FDS-8

FDS-7

HBIS **MH-U15A**, CONTAINS WEIR THAT DIVERTS ROWLAND ST. TRUNK SEWER FLOW TO WETLAND BYPASS WHEN HBIS IS AT CAPACITY.

ONONDAGA COUNTY

18" UNDERFLOW TO HBIS

48" INFLUENT TO WETLANDS

ONONDAGA COUNTY

MH-4A, ISCO 2150 AREA VELOCITY MODULE FOR INFLUENT FLOW MEASUREMENT

PANEL A (SEE O&M)

YARD HYDRANT FOR MANUAL CLEANING OF SAN SEP SCREENS.

MH-3C, SOLID STORAGE STRUCTURE STORES SOLIDS UNTIL EVENT ENDS, THEN RELEASES BACK TO HBIS. SLIDE GATE OPERATES IN TANDEM WITH **BOX 1-A** SLIDE GATE.

SS-1, WASH DOWN SPRAYS TRIGGER AUTOMATICALLY AFTER EVENT.

BOX 2/MH-1D, INFLUENT SAMPLING LOCATION.

SS-2, WASH DOWN SPRAYS TRIGGER AUTOMATICALLY AFTER EVENT.

BOX 1B, CONTAINS WEIR FOR FLOW EQUALIZATION BETWEEN **SS-1** AND **SS-2**.

BOX 1A, CONTAINS SLIDE GATE TO DIVERT FLOW DURING RAIN EVENTS.

EXISTING 42" ROWLAND STREET TRUNK SEWER.

WATER METER VAULT.

MH-3302, ISCO LASER FLOW CONTROLS **BOX 1A** GATE.

WEST ONONDAGA STREET

N

0 30 60 90

SCALE: 1" = 30'

430 E. GENESEE STREET, SUITE 203
SYRACUSE, NY 13202
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EB 0000072 AA 001992

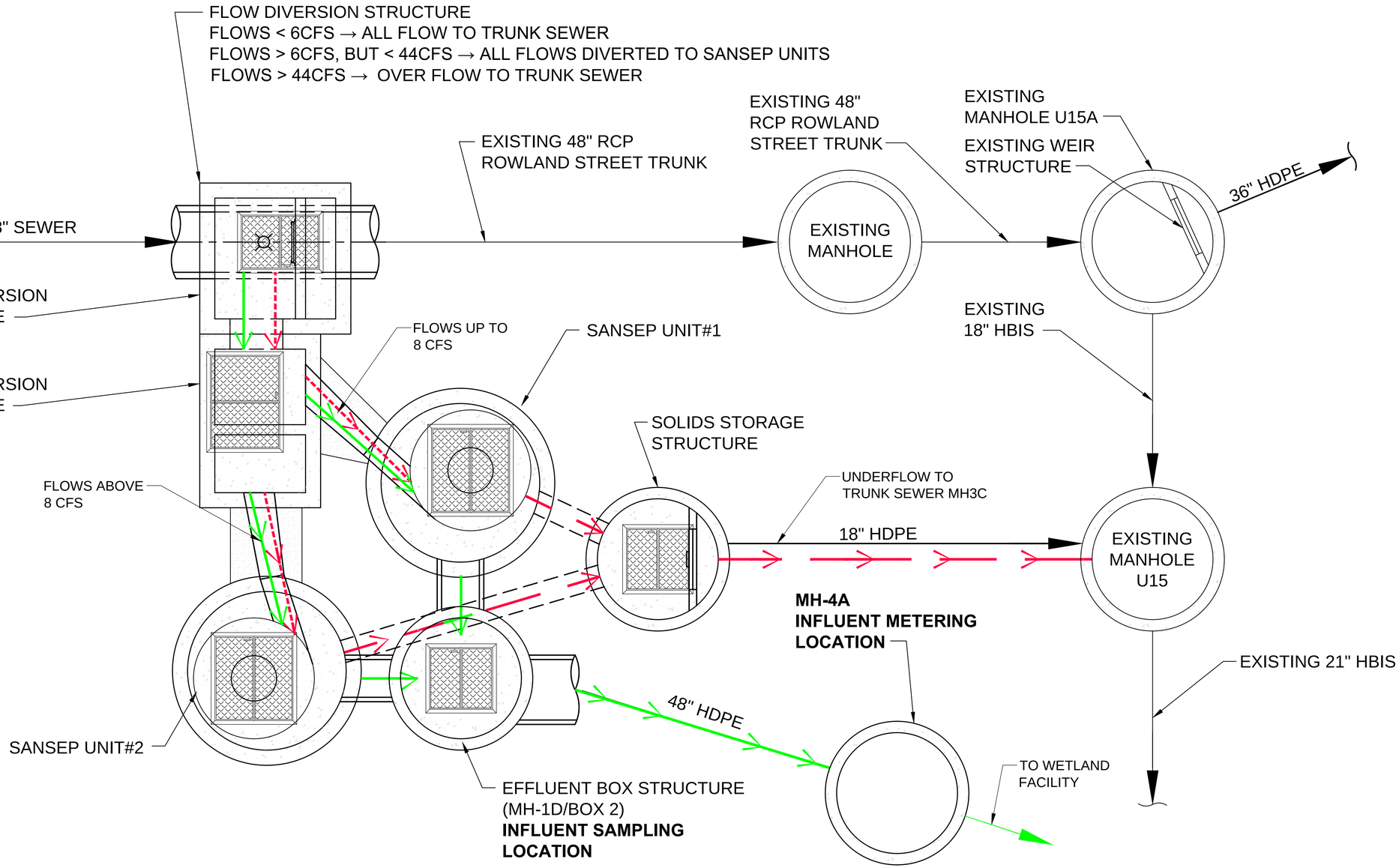
CSO 018 WETLAND FACILITY DIAGRAM

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

NO.				
DSGN ZM	DR GH	CHK	APVD	

SHEET C-2001
DWG
PROJ 19217
DATE OCTOBER 2015
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
VERIFY SCALE

005-C-2001A-19217.dwg
1/26/2016 9:50 AM



LEGEND

COMBINED SEWER

UNDERFLOW TO TRUNK SEWER

TREATED FLOW TO WETLANDS

NO.	DSGN	DR	CHK	APVD	MM
0	ZM	GH	MM	MM	

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HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

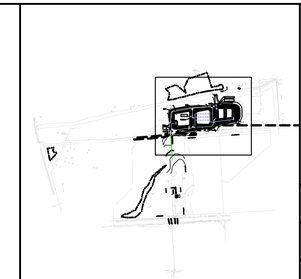
CH2MHILL

GRIT AND FLOATABLES REMOVAL
FACILITY FLOW DIAGRAM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-1
SHEET	1 of 5

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW METERING LOCATION

MH-18
EFFLUENT SAMPLING LOCATION,
EFFLUENT METERING LOCATION

MH-17

MH-16

MH-15

36" HDPE

36" HDPE

CELL #1

CELL #2

CELL #3

FDS#11
OPTIMIZATION
SAMPLING LOCATION

DOSING MH-12

30" HDPE

MH-10

FDS#13
OPTIMIZATION
SAMPLING LOCATION

FDS#6

MH-5A
BYPASS
METERING
LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

APPROX PROPERTY LINE

APPROX PROPERTY LINE

ED. OF WATER
ELEV=392.5±
12-10-10

HARBOR BROOK

BENCHMARK
BOX CUT ON SE CORNER
OF CONC. RET. WALL
ELEV=402.55'

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Series
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Closed
7	7A	From Cell 1 to Cell 2/3	Closed
8	8A	From G&F/Cell 1 to Cell 2	Closed
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Open
13	13A	From Cell 2 to Cell 3	Open
13	13B	From Cell 2 to Outfall	Closed

LEGEND

SERIES FLOW PATH

TREATED FLOW
FROM G & F

N

0 30 60 90

SCALE: 1" = 30'

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HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

SERIES FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE

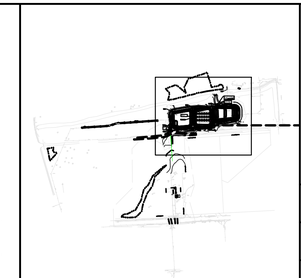
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-2
SHEET	2 of 5

Flow Diagram Exhibit.dwg

7/14/2016 7:38 AM

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW/ EFFLUENT METERING LOCATION, EFFLUENT SAMPLING LOCATION, DURING STANDARD OPERATING CONDITIONS.

MH-18
CELL #1/2/3 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

MH-17

MH-16

MH-15

36" HDPE

36" HDPE

CELL #1

FDS#11
OPTIMIZATION SAMPLING LOCATION. CELL #4 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

CELL #2

CELL #3

DOSING MH-12

FDS#6

MH-5A
BYPASS METERING LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

FDS#13
OPTIMIZATION SAMPLING LOCATION. CELL #2 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

30" HDPE

MH-10

ED. OF WATER
ELEV=392.5±
12-10-10

MH-STORM
TF=400.0
INV(E)=390.5
SUMP=389.0

APPROX PROPERTY LINE

APPROX PROPERTY LINE

LEGEND

- CELL 1 FLOW PATH
- CELL 2 FLOW PATH
- CELL 3 FLOW PATH
- TREATED FLOW FROM G & F

0 30 60 90
SCALE: 1" = 30'

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Parallel
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Open
7	7A	From Cell 1 to Cell 2/3	Closed
8	8A	From G&F/Cell 1 to Cell 2	Open
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Closed
13	13A	From Cell 2 to Cell 3	Closed
13	13B	From Cell 2 to Outfall	Open

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CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

PARALLEL FLOW DIAGRAM
WETLAND FACILITY

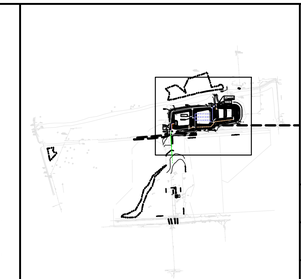
NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-3
SHEET	3 of 5

Flow Diagram Exhibit.dwg 7/14/2016 7:42 AM

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW/ EFFLUENT METERING LOCATION, EFFLUENT SAMPLING LOCATION, DURING STANDARD OPERATING CONDITIONS.

MH-18
CELL #1/2/3 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

MH-17

MH-16

36" HDPE

MH-15

CELL #1

FDS#11
OPTIMIZATION
SAMPLING LOCATION

DOSING MH-12

CELL #2

CELL #3

30" HDPE

MH-10

FDS#13
OPTIMIZATION SAMPLING LOCATION.
CELL #1/2 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

FDS#6

MH-5A
BYPASS
METERING
LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

APPROX PROPERTY LINE

APPROX PROPERTY LINE

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Series & Parallel
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Closed
7	7A	From Cell 1 to Cell 2/3	Open
8	8A	From G&F/Cell 1 to Cell 2	Closed
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Open
13	13A	From Cell 2 to Cell 3	Closed
13	13B	From Cell 2 to Outfall	Open

LEGEND

CELL 1-2 SERIES FLOW PATH

CELL 1-3 SERIES FLOW PATH

TREATED FLOW FROM G & F

0 30 60 90

SCALE: 1" = 30'

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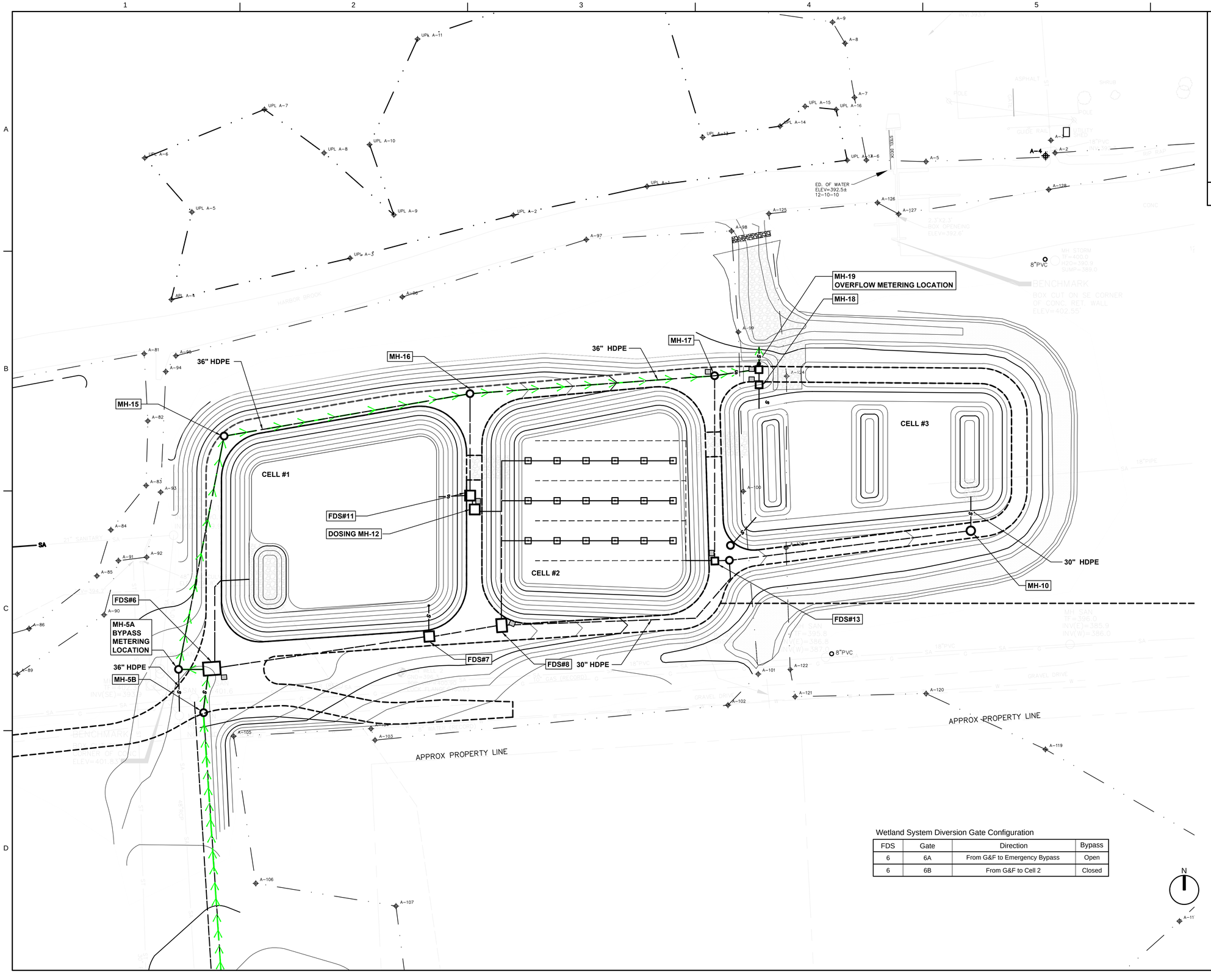
ONONDAGA COUNTY, NEW YORK

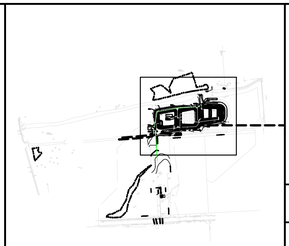
SERIES AND PARALLEL FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-4
SHEET	4 of 5





SITE KEY MAP
NOT TO SCALE

LEGEND

BYPASS FLOW PATH

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Bypass
6	6A	From G&F to Emergency Bypass	Open
6	6B	From G&F to Cell 2	Closed

N

0 30 60 90

SCALE: 1" = 30'

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BYPASS FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2016
PROJ	381098
DWG	FD-5
SHEET	5 of 5