

EcoLogic Memorandum

TO: Onondaga County Department of Water Environment Protection
FROM: Liz Moran and Kerry Thurston
RE: Data quality review, 2009 AMP Data
DATE: FINAL April 23, 2010

1. Summary

A review of the 2009 analytical data was completed, using the Onondaga database (Onondaga.mdb) obtained from the County on February 16, 2010. Major findings are as follows.

1. Rinsate and field blanks

The laboratory qualified samples for possible blank contamination for SRP and TP (eight lake samples collected 11/03/2009), and TKN (five lake samples collected 05/05/2009).

2. Field duplicates

Fifty-one field duplicate RPDs exceeded 20% and the absolute difference between the sample and duplicate results exceeded 2x the MRL ([Attachment 2](#)).

3. Charge Balance summary

The laboratory verified the major cations and anions for nine samples where charge balance exceeded 20%; high solids were cited as the source of interference in the balance calculation for most of the samples.

4. Database non-detects check

A number of sample results reported as non-detect do not match the published MRL for the 2009 AMP. The laboratory reviewed sample results identified in Attachment 3 for possible data entry errors in reporting results less than the MRL and corrected discrepancies.

5. Verify parameters for limnological reasonableness

The laboratory created a new flag “x” to indicate, “Sample result failed the criteria for limnological reasonableness”. There were 15 comparisons that failed the limnological reasonableness screening criteria, and these results were verified by the laboratory.

- *The laboratory will flag TKN-F with new “x” flag for samples 2909569, 2912609, 2912604, 2906649, 2909570, and 2909571.*
- *Results for SRP, TDP, and TP were rejected for samples 2910649 and 2912601.*
- *Results for SRP and TDP were rejected for samples 2910634 and 2910650.*
- *Results for NH₃-N and TKN were rejected for sample 2906244.*
- *Results for BOD₅ and CBOD₅ for samples 2908738 and 2908602 need further discussion.*

6. Review for outliers

- *The laboratory reviewed and elevated fecal coliform bacteria results from Ninemile Creek (sample numbers 2905764 and 2911046).*
- *The laboratory reviewed the unusually high analytical result for TDS (sample number 2908535), which was not in agreement with the associated TSS result. The laboratory confirmed a typographic error and corrected the value.*

7. Ultra low-level mercury results

The laboratory will add a sample remark to total mercury results from samples collected on 4/21 to indicate possible equipment contamination based on the equipment blank concentrations.

The following action items are recommended:

- **ACTION:** This issue of field duplicates exceeding QC criteria should be further evaluated with the sampling team.
- **ACTION:** To facilitate QC review, in the future please include “V” qualified results with the database.
- **ACTION:** After the review, there were still 10 samples for which missing data (TDP and NH3-N) had not been resolved.
- **ACTION:** The BOD5/CBOD5 results that did not meet limnological reasonableness criteria require further discussion.
- **ACTION:** Where the analytical results for parameters that are used to calculate other results – such as ORG-N or Hardness – are qualified “V”, the calculated results should also be qualified “V”.
- **ACTION:** Verify ORG-N results for samples 2906645, 2913745, and 2910784.

2. Rinsate and field blanks

The AMP calls for preparing rinsate blanks of the cleaned sampling equipment prior to its use. Results of these samples are used to infer whether any field samples are potentially compromised by the presence of contaminants in the sampling equipment.

Screen for analytes of interest

The blanks in the database were screened for detectable concentrations. Seventeen parameters were detected in the blanks:

alkalinity (ALK-T)	total Kjeldahl nitrogen (TKN)
chloride (Cl)	total Kjeldahl nitrogen (TKN-F)
potassium (K)	total inorganic carbon (TIC)
ammonia-N (NH ₃ -N)	total organic carbon (TOC)
mercury, total (Hg)	total organic carbon filtered (TOC-F)
nitrite (NO ₂)	total phosphorus (TP)

soluble reactive phosphorus (SRP)	total solids (TS)
total dissolved phosphorus (TDP)	zinc (Zn)
total dissolved solids (TDS)	

The blank detections for ultra low-level total mercury are discussed in the ultra low-level mercury section of this memorandum. The remaining analytes are presented below.

Compare results of rinsate blanks to MRL by parameter

Measured concentrations were compared to the Minimum Reportable Limit (MRL) as listed in **Attachment 1**. Eight parameters were measured in rinsate blanks solely at concentrations less than or equal to twice the MRL:

Chloride	TKN-F
Potassium	TOC
NH3-N	TOC-F
NO2	Zinc

These parameters were considered present at “trace” concentrations; where blank concentrations were less than two times the MRL, no further action was required.

Five other parameters were detected in blanks at concentrations greater than two times the MRL, and less than five times the MRL:

ALK-T	TKN
TDP	TS
TDS	

Actions taken by the County to reduce detectable alkalinity concentrations in blanks have met with success in 2009. None of the rinsate blanks had alkalinity results greater than five times the MRL, down from 2% in 2008. Detectable concentrations of total alkalinity in the rinsate blanks were first identified in 2005; the laboratory switched from dishwasher to hand-rinsing of the sample bottles to address the issue. In addition, new sampling bottles are now purchased annually. The water supply is also considered a cause of the occasional elevated concentrations of dissolved solids in rinsate blanks; an upgrade in the laboratory water treatment system to reverse osmosis is planned.

The rinsate blank results were also screened against a criterion of 5x the MRL. Three of the 17 parameters had blank concentrations above this value:

SRP
TIC
TP

All three of the detected concentrations greater than 5x the MRL were in the same equipment blank, collected on 11/03/2009. The laboratory verified the SRP and TIC blank results.

Compare results of rinsate blanks to field sample results

The rinsate blank results that were more than 2x the MRL were compared with the concentrations in the associated samples. Where samples results were more than 5x the blank concentrations, no further qualification is necessary (**Table 1**). For example, the detected levels of alkalinity and TDS in the blanks do not affect data usability because ambient concentrations in the Onondaga watershed are substantially higher. Where sample results were less than 5x the concentration in the associated blank, qualification for possible blank contamination is recommended (**Table 2**).

Table 1. Parameters for which field sample concentrations are more than 5x the associated blank concentration – no further qualification required.

Parameter	Blank ID	Source	Date 2009	Conc. (mg/l)	Assoc Sample(s) Conc. Range	Qualifier
ALK-T	2902212	Crk-Blank Churn (Crew A)	02/24	2	230 (1)	none
	2903509	Crk-Blank Churn (Crew A)	03/31	3	160 – 230 (6)	none
	2904132	Crk-Blank Dunker Churn (Crew B)	04/14	2	170 – 280 (9)	none
TDP	2912601	Lake Equip. Blk (Pump)	11/03	0.006	0.042 – 0.048 (8)	none
TDS	2912601	Lake Equip. Blk (Pump)	11/03	49	1,220 – 1,290 (5)	M.I.
	2912925	Crk-Blank Churn (Crew A)	11/12	20	608 – 1,888 (5)	none
TIC	2912601	Lake Equip. Blk (Pump)	11/03	4.25	45.7 – 46.2 (5)	none
TS	2912601	Lake Equip. Blk (Pump)	11/03	42	1,212 – 1,254 (5)	M.I.

M.I. - Matrix interference noted by the laboratory for field samples.

Table 2. Parameters for which field sample concentrations are less than 5x the associated blank concentration.

The laboratory added comments to qualify the results for possible blank contamination as noted below.

Parameter	Blank ID	Source	Date 2009	Conc. (mg/l)	Sample No.	Sample Conc (mg/l)
SRP	2912601	Lake Equip. Blk (Pump)	11/03	0.029	2912602	0.036 a
					2912603	0.035 a
					2912604	0.034 a
					2912605	0.034 a
					2912606	0.034 a
					2912607	0.035 a
					2912608	0.034 a
					2912609	0.035 a
					TKN	2904912
2904915	0.506 b					
2904917	0.466 b					
2904919	0.530 b					
2904920	0.475 b					

Table 2. Parameters for which field sample concentrations are less than 5x the associated blank concentration (continued).

The laboratory added comments to qualify the results for possible blank contamination as noted below.

Parameter	Blank ID	Source	Date 2009	Conc. (mg/l)	Sample No.	Sample Conc (mg/l)
TP	2912601	Lake Equip. Blk (Pump)	11/03	0.028	2912602	0.061 a
					2912603	0.062 a
					2912604	0.061 a
					2912605	0.064 a
					2912606	0.063 a
					2912607	0.064 a
					2912608	0.066 a
					2912609	0.065 a

a - Comment added by laboratory to sample result: "SRP and TP Blank concentration exceeded acceptable limits. Associated sample results <5x blank concentration."
b - Comment added by laboratory to sample result: "TKN Blank concentration exceeded acceptable limits. Associated sample results <5x blank concentration."

3. Field duplicates

As outlined in the SOP for the completing the data quality review, field blanks are screened using a two step process.

- (1) identify all with Relative Percent Difference (RPD) greater than 20%
- (2) Calculate: is the absolute value of the difference greater than 2x the MRL? If so, investigate. If not, no further action.

Field duplicates were evaluated using RPD of the results and the absolute difference of the sample and duplicate results. RPD greater than 20% are considered outside of quality control limits. In some cases, the RPD are greater than 20% because concentrations are at or near the detection level for some parameters; therefore, field duplicates with RPD greater than 20% were also evaluated for absolute difference greater than 2x the MRL. Where the absolute difference was less than 2x the MRL, no further action was required; where the absolute difference was greater than 2x the MRL, additional investigation was warranted.

For 2009, 135 duplicate results had RPDs greater than 20%; of those, 51 also had absolute difference values greater than 2x MRL; the analytes with number of samples meeting this criteria are listed below.

FCOLI (4)	TP (1)
Fe (1)	TSS (6)
NH3-N (2)	Turbidity (2)
SRP (1)	TVS (3)
TDP (2)	Phaeophytin-a (18)
TKN (1)	Chlorophyll-a (10)

Organic nitrogen (ORG-N) results exhibited RPDs >20% (16 occurrences), of which all 16 also exhibited absolute differences more than twice the MRL. Since this parameter is a calculated value, it was not included in further analysis. A list of the field duplicate RPDs exceeding 20% where the absolute difference was also greater than 2x the MRL is included as [Attachment 2](#). This issue should be further evaluated with the sampling team.

4. Charge Balance Summary

The charge balance results were evaluated against an upper limit of 20% for field samples and duplicates from the lake and the tributaries.

	<u>Tributaries</u>	<u>Lake</u>
Average	6.26%	3.79%
Median	4.9%	3.2%
N Exceeds 20%	9	0

The laboratory verified the major cations and anions results for nine samples where charge balance exceeded 20% (**Table 3**). The laboratory noted that several samples had unusually high solids which will interfere with the analytical measurements.

Table 3. 2009 samples where charge balance exceeded 20%.

Sample No.	Source	Date	Charge Balance (%)	TSS (mg/l)
2901633	Crk-Onondaga Creek @ Dorwin Ave.	2/12/2009	23.3 a	266
2901639	Crk-Onondaga Creek @ Adams Street	2/12/2009	26.4 a	253
2902718	Crk-Harbor Brook @ Hiawatha	3/10/2009	21.0 a	12
2902724	Crk-Tributary 5a @ State Fair Blvd	3/10/2009	21.5 a	5
2904134	Crk-Harbor Brook @ Hiawatha	4/14/2009	20.6 a	15
2906334	Crk-Metro Effluent	6/9/2009	21.6 b	<4
2908728	Crk-Onondaga Creek @ Dorwin Ave.	8/10/2009	106 c	1,322
2908730	Crk-Onondaga Creek @ Water Street	8/10/2009	80 c	1,052
2911056	Crk-Bloody Brk @ Onondaga Lake Parkway	9/29/2009	24.0 b	<4

a – Charge Balance was noted as “verified” in the database; attributed to unusually high solids concentration.

b - Charge Balance was noted as “verified” in the database; no cause was identified.

c – Charge Balance was noted as “verified” in the database; sample extremely turbid due to high flow.

5. Database non-detects check

Non-detect data in the database are reported as less than the MRL. As a QC check to identify possible typographic errors, the “less than MRL” values were compared against the published MRL list for the 2009 AMP. The result of this evaluation is reported with respect to three categories: metals, solids, and other parameters (**Attachment 3**).

The laboratory reviewed the individual sample results in **Attachment 3** to verify that the reported non-detect values are correct. The laboratory responded:

“In most instances, where the MRL did not match the published values, analysis was completed by the contract laboratory. The field “Submitter” notes which lab has completed the analysis. MRLs from the contract lab may vary from OCDWEP MRL’s. However, all reporting limits are within SPDES limits as established by OCDWEP. A few instances of non-detect issues could be traced to a modification of the original result and the subsequent change

was not reflected in the column utilized by this memorandum. Any discrepancies have been corrected. A number of MRL differences were determined to be from the analysis of Metro Bypass samples, which historically have been analyzed as an influent stream, due to its nature. One sample, 2913593, had results reversed for Ca and Na and has been corrected and resubmitted.”

In addition, the laboratory provided comments as shown in **Tables 4, 5 and 6**.

- **Metals** – These metals were reported at levels less than the MRL, but the MRL does not match with the published values (**Table 4**). The MRLs for metals varies depending on whether concentration procedures were used. When there are relatively few samples for which the MRL does not match the reported value, this may be an indicator of a data entry error.

Table 4. Comparison of 2009 Metals MRLs with reported non-detects.

Parameter (units)	Reported Result	N Samples	Published MRL	Laboratory response
Ag (mg/l)	<0.001	2	0.0125; 0.01	
As (mg/l)	<0.02	1	0.002	
	<0.01	1	0.002	
Ca (mg/l)	<0.125	4	1	One value was corrected to reflect the MRL.
	<1.25	130	1	
	<4	1	1	
Cd (mg/l)	<0.005	9	0.0008	
	<0.001	1	0.0008	
	<0.002	1	0.0008	
Hg (mg/l)	<0.0002	3	0.00002	
	<0.0004	1	0.00002	
Mg (mg/l)	<0.125	135	0.1	
Ni (mg/l)	<0.0038	93	0.015	
	<0.002	1	0.015	
	<0.01	1	0.015	
Pb (mg/l)	<0.02	8	0.002	
	<0.03	1	0.002	
	<0.001	1	0.002	
Se (mg/l)	<0.005	1	0.002	

Ag = silver; As = arsenic; Ca = calcium; Cd = cadmium; Hg = mercury; Mg = magnesium; Ni = nickel; Pb = lead; Se = selenium

- **Solids** – The MRL for solids is 1 mg/l. Numerous results were reported ranging from <2 to <5 (**Table 5**). Given the high number of sample results with elevated detection levels, it is likely these are not data entry errors.

Table 5. Comparison of 2009 Solids MRLs with reported non-detects.

Parameter (units)	Reported Result	N Samples	Published MRL	Laboratory response
TSS (mg/l)	<2	67	1	As noted in Attachment 1 (2009 MRL Summary), the MRL's for solids reflects that it is volume based and does not have a consistent reporting limit.
	<4	372	1	
	<5	1	1	
VSS (mg/l)	<2	48	1	
	<4	26	1	

TSS = total suspended solids; VSS = volatile suspended solids

- **Other parameters** – Nine other parameters were reported in the database with “less than MRL” values that did not match the published MRLS (Table 6). The number of these samples was generally low, raising the possibility of data entry error.

Table 6. Comparison of 2009 parameters’ MRLs - other than metals and solids - with reported non-detects.

Parameter (units)	Reported Result	N Samples	Published MRL	Laboratory response
CN-T	<0.005	3	0.003	Corrected TKN-F MRL for one sample. All other parameters were from contract lab.
	<0.005	1	0.003	
ECOLI	<5	1	1	
FCOLI-MF	<2	5	1	
	<5	107	1	
	<10	73	1	
	<20	1	1	
K	<0.025	14	0.02	
Na	<1.25	1	3	
	<4	134	3	
NH3-N	<0.03	2	0.01	
Phenol	<0.003	1	0.01	
TKN-F	<0.15001	1	0.15	
TP	<0.05	13	0.003	

CN-T = total cyanide; ECOLI = E. Coliform; FCOLI-MF = fecal coliforms; K = potassium; Na = sodium; NH3-N = Ammonia as N; TKN-F = Total Kjeldahl Nitrogen; TP = total phosphorus

Note: Excluded from this table are two other parameters (CN-A = amendable cyanide; CN-Cl2 = chlorinated cyanide) that are analyzed for SPDES only and not for the AMP.

6. Verify parameters for limnological reasonableness

Several parameters were evaluated for limnological reasonableness for each sample, using the data from tributaries and the lakes. These evaluations were:

- Phosphorus
 - $SRP \leq TP$: Soluble reactive phosphorus (SRP) should be less than or equal to total phosphorus (TP)
 - $TDP \geq SRP$: Total dissolved phosphorus (TDP) should be greater than or equal to SRP
 - $TDP \leq TP$: TDP should be less than or equal to TP
- Nitrogen

- NH₃-N ≤ TKN: Ammonia as nitrogen (NH₃-N) should be less than or equal to total Kjeldahl nitrogen (TKN)
- NH₃-N ≤ TKN-F: NH₃-N should be less than or equal to filtered TKN
- BOD₅ and CBOD₅
 - BOD₅ ≥ CBOD₅: Biochemical oxygen demand (BOD₅) should be greater than or equal to carbonaceous biochemical oxygen demand (CBOD₅)
- Parameter Correlations
 - TP versus TSS in Onondaga Lake and tributaries
 - TP versus chlorophyll- α in Onondaga Lake

During the course of this evaluation, it was noted that many samples with analytical results for one parameter did not have a corresponding result for another parameter. The laboratory was requested to verify that there are no data missing from the database for the sample list provided. The laboratory responded:

“Attachment 4 has a wide array of samples looking for paired data, such as NH₃ and TKN on the same sample. The vast majority of the samples listed are “storm event” samples which, according to the program design are not analyzed for NH₃-N but are analyzed for TKN. However, there are 5 samples listed that have parameters flagged as being estimates (V) which is the reason that the results are not included (specifically sample #'s 2907463, 2907464, and 2907468 have TDP results flagged). Additionally, sample #'s 2904867 and 2914343 have BOD₅ results which are flagged as V.”

After the review, there were still 10 samples for which missing data (TDP and NH₃-N) had not been resolved ([Attachment 4](#)).

Overall, the parameter comparisons were reasonable, with the exceptions noted in [Tables 7, 8 and 9](#). The laboratory indicated that the results presented in Tables 7, 8 and 9 were verified at the time of analysis, and that a new flag “x” will be created and added by the lab to indicate that the “Sample result failed the criteria for limnological reasonableness.”

Table 7. Limnological reasonableness tests for phosphorus, 2009.

Test	Result	Recommended	Sample Numbers	Laboratory Response
SRP ≤ TP	Two results where SRP ≥ TP. Laboratory verified SRP values.	Reject	2910649 2912601*	Agreed with recommendation
TDP ≥ SRP	Four results where TDP ≤ SRP. Laboratory verified SRP values.	Reject	2910634 2910649 2910650 2912601*	Agreed with recommendation
TDP ≤ TP	Met criteria	No action	--	--

* equipment blank

Table 8. Limnological Reasonableness for nitrogen, 2009.

Test	Result	Recommended	Sample Numbers	Laboratory Response
NH3-N ≤ TKN	One result with NH3-N ≥ TKN. Laboratory verified values, identified nitrate interference.	Reject	2906244	Agreed with recommendation
NH3-N ≤ TKN-F	Six results with NH3-N ≥ TKN-F. Laboratory did not verify values. (see Attachment 5)	Reject	2909569 2912609 2912604 2906649 2909570 2909571	TKN-F is unusually low in all instances; recommend flagging only this parameter with new flag “x”.

Table 9. Limnological reasonableness test for oxygen demand, 2009.

Test	Result	Recommended	Sample Numbers	Laboratory Response
BOD5 ≥ CBOD5	Two results where BOD5 ≤ CBOD5. Laboratory indicated matrix interference.	Reject	2908738 2908602	While results indicate interference, unable to identify which parameter is in question. Need for further discussion.

Comparison of TP versus TSS in the lake and tributaries highlighted a few outlier sample results in the tributaries ([Table 10](#); [Attachment 6](#)) that were associated with relatively high flow.

Table 10. Comparison of TP vs TSS, Onondaga Lake tributaries 2009.

Tributary	Site	Date 2009	TP (mg/l)	TSS (mg/l)	Comments
Onondaga Crk	Dorwin	8/10	1.01	1,322	Daily avg discharge went from 50 cfs on 8/9 to 538 cfs on 8/10
Harbor Brk	Velasko	2/12	0.153	148	Daily avg discharge went from less than 20 cfs prior to 2/11 to 89 cfs on 2/12.
	Hiawatha	2/12	0.165	64	
Ninemile Crk	Rt. 48	2/12	0.245	120	Daily avg discharge went from 392 cfs on 2/11 to 845 cfs on 2/12

7. Review for Outliers

The 2009 AMP data were reviewed for outliers in the tributaries and in the lake. Due to the nature of the data set, this review for outliers was conducted using different methods for tributaries and the lake:

Tributaries: The tributary data are influenced in large part by stream flow. Therefore, the 2009 concentration data for the monitored parameters were compared to the 10-year average (1999-2008) plus two standard deviations. Measurements outside the two standard deviation range were considered outliers. Data from the following sample locations were evaluated:

Tributary	Station
Onondaga Creek	Dorwin and Kirkpatrick
Harbor Brook	Velasko and Hiawatha
Ley Creek	Park St.
Ninemile Creek	Rt. 48
Tributary 5A	Trib5A
East Flume	EFlume

Other tributary sampling locations in 2009, which were not compared to 10-year averages due to shorter periods of record, were:

Tributary	Station	Period of record
Onondaga Creek	Adams St.	2006-2009
	Dickerson St.	2008-2009
	Elmhurst Ave.	2008-2009
	Gibson	2008-2009
	Hitchings Rd. (West Branch)	2008-2009
	Plum St.	2008-2009
	Rt. 20	2006-2009
	Spencer St.	2000-2009
	Tallman Ave.	2008-2009
	Tully Farms Rd. (South)	2008-2009
	Walton St.	2008-2009
	Water St.	2007-2009
	West Genesee St.	2008-2009
	West Kirkpatrick St.	2008-2009
West Onondaga St.	2008-2009	
Harbor Brook	Bellevue Ave.	2008-2009
	Delaware St.	2008-2009
	Fowler H.S.	2008-2009
	Onondaga Rd.	2008-2009
Sawmill Creek	Onondaga Lake Park	2003-2009
Bloody Brook	Onondaga Lake Park	2003-2009

Onondaga Lake: Histograms and temporal plots were constructed for analytical parameters of greatest interest:

- dissolved oxygen (DO)
- chlorophyll- α
- Phaeophytin- α
- Secchi depth
- fecal coliforms (FCOLI)

- E. coli (ECOLI)
- phosphorus (TP, SRP and TDP)
- nitrogen (NH₃-N, nitrate NO₃ and nitrite NO₂).

These parameters were evaluated separately for depths 0-3 meters, 6 meters, and 9-18 meters at both North and South Deep. Data outliers were identified through visual assessment of the plots.

The results of the outlier reviews are discussed below. Note that Bill Walker's outlier screening tool was not used to review for outliers because the screening tool was not updated with 2009 data at the time of this data quality review.

a. Tributaries- Annual

Several parameters were identified with results greater than the defined screening values (10-year average plus two standard deviations). Many of these were found to occur on sample dates with high or low flow (based on preliminary USGS flow data). Three dates were outstanding in terms of the number of exceedances – February 12, August 10 and October 29. Other exceedances are shown in [Attachment 7](#).

- **February 12** was a relatively high daily average flow date for Onondaga Creek, Ninemile Creek, Ley Creek and Harbor Brook. Parameters that exceeded the screening values on this date are listed in [Table 11](#).
- **August 10** was a relatively high flow date for Onondaga Creek, Ninemile Creek, and Harbor Brook. Parameters that exceeded the screening values on this date are listed in [Table 12](#). The County noted that samples collected on this date were influenced by a rainfall total of 1.25 and 1.12 inches on 8/9/09 and 8/10/09, respectively¹.
- **October 29** was a relatively high flow date for Onondaga Creek and Ninemile Creek; flows were coming down from a spike on the 28th at Ley Creek and Harbor Brook. Parameters that exceeded the screening values on this date are listed in [Table 13](#). The County noted that samples collected on this date were influenced by a rainfall total of 1.48 inches².

¹ Rainfall totals recorded from Metro weather station.

² Rainfall totals recorded from Metro weather station.

Table 11. Parameter concentrations exceeding 10-year average plus two standard deviations on February 12, 2009.

Parameter	KIRKPAT	DORWIN*	VELASKO	HIAWATHA	RT48	PARK	TRIB5A	EFLUME
ALK-T (mg/l)							204	
BOD5 (mg/l)					4			
DO (mg/l)			16.95	14.87		14.16	12.75	
Fe (mg/l)		9.58			3.3		7.83	
Mn (mg/l)	0.24						0.225	
NO2 (mg/l)		0.13					0.13	
ORG-N (mg/l)		0.957						
SRP (mg/l)		0.03			0.041			
TKN (mg/l)		1.05						
TP (mg/l)			0.153		0.245			
TSS (mg/l)	218	266			120		202	

*Charge balance at Dorwin exceeded 20% and was attributed to unusually high solids.

Highlighted values exceeded the 10-year average plus 2 std deviations by a subjectively significant amount.

Table 12. Parameter concentrations exceeding 10-year average plus two standard deviations on August 10, 2009 (rainfall totals of 1.25 and 1.12 inches on 8/9/09 and 8/10/09, respectively).

Parameter	KIRKPAT	DORWIN*	VELASKO	HIAWATHA	RT48	PARK	TRIB5A	EFLUME
BOD5 (mg/l)		4						
Ca (mg/l)		121						
FCOLI-MF (count/100)		6000						
Fe (mg/l)		37.3						
Hardness (mg/l)		437						
Mn (mg/l)		1.23						
ORG-N (mg/l)		2.91						
TKN (mg/l)		2.96						
TOC (mg/l)		6.39						

Table 12. Parameter concentrations exceeding 10-year average plus two standard deviations on August 10, 2009 (rainfall totals of 1.25 and 1.12 inches on 8/9/09 and 8/10/09, respectively).

Parameter	KIRKPAT	DORWIN*	VELASKO	HIAWATHA	RT48	PARK	TRIB5A	EFLUME
TOC-F (mg/l)		6.26						
TP (mg/l)		1.01						
TSS (mg/l)		1,322						

*Charge balance at Dorwin exceeded 20%; the laboratory verified the charge balance.
 Highlighted values exceeded the 10-year average plus 2 std deviations by a subjectively significant amount.

Table 13. Parameter concentrations exceeding 10-year average plus two standard deviations on October 29, 2009 (rainfall total of 1.48 inches).

Parameter	KIRKPAT	DORWIN	VELASKO	HIAWATHA	RT48	PARK	TRIB5A	EFLUME
ALK-T (mg/l)							200	
BOD5 (mg/l)		4			4			
FCOLI-MF (count/100)		4600			5100			
SRP (mg/l)		0.019						
TIC (mg/l)							52.2	
TOC (mg/l)	6.23	6.41						
TOC-F (mg/l)	6.22	6.36			6.2			
TP (mg/l)					0.159			

Also, on two occasions, high fecal coliform bacteria were measured at Ninemile Creek Rt 48 that were not associated with high flows. The laboratory reviewed these results and verified the high fecal coliform counts.

- **May 27** – Fecal coliform bacteria measured at Route 48 (at 5,000 count/100 ml) exceeded the ten-year-plus-2-standard-deviations level (3,403 count/100 ml) in sample number 2905764. The County noted rainfall of 0.15 inches on 5/26/09.³
- **Sept 29** – Fecal coliform bacteria measured at Route 48 (at 4,700 count/100 ml) exceeded the ten-year-plus-2-standard-deviations level (3,403 count/100 ml) in

³ Rainfall totals recorded from Metro weather station.

sample number 2911046. The County noted rainfall amounts for the period leading up to September 29 as follows:

- 9/26 - 0.35 inches
- 9/27 - 0.73 inches
- 9/28 - 0.09 inches
- 9/29 - 0.30 inches

On one occasion, an unusually high TDS value was measured where TSS was low. On August 6, the daily average flow on Ley Creek was low, comparable to the period three days before, and three days after. TDS measured at Park Street (21,224 mg/l) exceeded the ten-year-plus-2-standard-deviations level (1,837 mg/l). TSS measured on this date at Park Street was at 10 mg/l. The laboratory reviewed this TDS result (sample number 2908535) and found the value had been entered incorrectly; the result has been corrected.

b. *Onondaga Lake North and South basins (Attachment 8)*

- Bacteria: relatively high concentrations for routine samples as noted in **Table 14**. These higher concentrations occurred one day after a high-flow event on Onondaga Creek. The elevated bacteria results are presumably a consequence of storm water and/or CSO runoff.

Table 14. Bacteria outliers, Onondaga Lake 2009.

Date 2009	Site	Sample Number	Fecal Coliform (count/100 ml)	<i>E. Coli</i> (count/100 ml)
08/11	0m North	2908799	>1200	219
10/08	0m South	2911379	191	236
10/26	0m South	2912257	220	326

- Chlorophyll- α : one value outside of the group for Phaeophytin- α at South Deep (Oct 13) 3.68 mg/m³, sample number 2911604.
- Dissolved Oxygen: Nothing unusual noted. Fall turnover occurred between September 22 and October 8.
- Phosphorus (TP, SRP, TDP): Typical annual pattern
- Nitrogen (NH₃-N, NO₂, NO₃, TKN): One NO₂ result (6/29 at 0.279 mg/l) from South LWL appears elevated relative to other data (sample number 2907204), may be related to experimental dosing of lake water with CaNO₃, and/or in-lake N transformations

8. Ultra low-level mercury results

The County subcontracts ultra low-level mercury and methyl mercury analyses. In 2009, samples were collected on four dates – April 21, June 29, August 25, and October 8 - and analyzed by Frontier Geosciences, Inc. (FGS).

Some of the samples submitted in 2009 were rejected for quality control issues related to sample shipping and handling. These results are shown in the ONONDAGA.MDB database

with the SRESULT of “TNP”, indicating samples were submitted but the test was not performed (**Table 15**).

Table 15. Summary of analytical results for ultra low-level mercury in Onondaga Lake, 2009
(units in ng/L)

SOURCE	4/21/2009		6/29/2009		8/25/2009		10/8/2009	
	Hg	Hg (methyl)	Hg	Hg (methyl)	Hg	Hg (methyl)	Hg	Hg (methyl)
Lake South Station:								
3m	2.31	TNP	3.25	0.085	TNP	TNP	7.02	0.325
18m	2.82	TNP	3.27	<0.05 U	TNP	TNP	12.6	0.491
18m Duplicate	2.66	TNP	3.35	<0.05 U	TNP	TNP	12.4	0.396
Lake North Station:								
3m	2.5	TNP	1.95	0.063	TNP	TNP	2.71	0.616
18m	2.82	TNP	2.15	<0.05 U	TNP	TNP	4.4	4.44
Equipment/Field Blanks:								
Teflon Dunker-Glass	0.63	TNP	<0.50 U	<0.05 U	TNP	TNP	<0.50 U	<0.05 U
Teflon Dunker	<0.50 U	TNP	<0.50 U	<0.05 U	TNP	TNP	<0.50 U	<0.05 U
Reason for TNP	na	Samples arrived at 6.3°C; DWEP cancelled analyses.	na	na	Samples received past hold time		na	na

TNP = Test Not Performed
na = not applicable
U = Analyte included in analysis but not detected

Unlike the other analytical data in the database, ultra low-level mercury data reports from FGS were received and reviewed for data usability for:

- Complete and accurate Chains of Custody
- Holding times
- Instrument calibration (blanks, spikes, and duplicates)

Review of the ultra low-level total and methyl mercury analytical data identified several areas where quality control criteria were not met (**Table 16**). Detailed discussion of these quality control issues is provided in the sections following.

Table 16. Summary of quality control issues identified with 2009 ultra low-level total mercury and methyl mercury analyses.

Data Review Elements	Sample Date	04/21	06/29	08/25	10/08
	Sample Receipt		▲	✓	▲
Holding Time		✓	✓	▲	✓
Matrix Duplicates/Triplicates		✓	✓	TNP	✓
Matrix Spike/Matrix Spike Duplicate Recovery and RPD		✓	✓	TNP	✓
Laboratory Control Sample/Laboratory Control Sample Duplicate Recovery and RPD		✓	✓	TNP	✓

Table 16. Summary of quality control issues identified with 2009 ultra low-level total mercury and methyl mercury analyses.

Data Review Elements	Sample Date	04/21	06/29	08/25	10/08
	Preparation Blanks		▲	▲	TNP
Initial and Continuing Calibration Blanks		▲	▲	TNP	▲
Initial and Continuing Calibration Verification		✓	✓	TNP	✓
Method Detection Limits (MDLs) and Practical Quantitation Limits (PQLs)		✓	✓	TNP	✓
Equipment and Field Blanks		✗	✓	TNP	✓

✓ - Quality control criteria met
 ▲ - Possible issue identified; no action required.
 ✗ - Quality control criteria not met; action required.
 TNP - Test Not Performed

a. *Sample Receipt*

Overall, samples were received in good condition. However, samples collected on 4/21 were received at the laboratory on 4/22 with a cooler temperature more than 4°C (6.3°C). In the Case Narrative, FGS notes that the client "...requested to cancel the MHg [methyl mercury] analysis." Janaki Suryadevara verified that the analysis of Methyl Mercury was canceled for the 4/21/09 samples due to cooler temp exceeding 4°C.

b. *Holding Times*

Overall, holding times were met. However, samples collected on 8/25 were received past the holding time, and consequently the samples were not analyzed.

c. *Preparation Blanks*

While generally reported as non-detect, the laboratory did provide some qualifiers to the total mercury preparation blanks (**Table 17**). These do not affect the usability of the data.

Table 17. Preparation Blanks qualifier summary for total mercury.

Sample Date	Qualifier	Definitions
4/21	One of four qualified QB-04	<u>QB-04:</u> "The blank was preserved to 2% BrCl rather than 1%. The control limit for blanks preserved to greater than 1% BrCl is the preservation percentage multiplied by the MRL."
6/29	One of five qualified QB-04 One of five qualified QB-08	
10/8	One of four qualified QB-04	<u>QB-08:</u> "The blank was preserved to 100% BrCl rather than 1%. The control limit for blanks preserved to greater than 1% BrCl is the preservation percentage multiplied by the MRL"

d. *Calibration Blanks*

In a few cases, calibration blanks were reported with values less than the MRL but were not flagged “U” to indicate “Analyte included in the analysis, but not detected”. These do not affect the usability of the data (**Table 18**).

Table 18. Calibration blanks summary.

Sample Date	Total Hg			Methyl Hg		
	Blank ID	Found (ng/l)	MRL (ng/l)	Blank ID	Found (ng/l)	MRL (ng/l)
4/22	CCB1	0.001	0.50	--	na	na
	CCB2	0.01	0.50			
6/30	ICB1	0.01	0.50	CCB2	0.009	0.045
	CCB4	0.04	0.50			
10/8	CCB2	0.01	0.50	ICB1	0.002	0.045
				CCB3	0.002	0.045

na = not analyzed.

e. *Equipment Blanks*

There was one detection of total mercury in an equipment blank collected on 4/21.

Sample Date	Blank Sample No.	Total Hg (ng/l)	Associated Sample Nos.	Total Hg (ng/l)
4/21	2904472	0.63	2904473	2.31
			2904474	2.82
			2904475	2.66
			2904476	2.5
			2904477	2.82

The detectable concentrations in the samples associated with this blank are not more than 5x the blank concentration; therefore, the laboratory will add a sample remark to these results to indicate possible blank contamination: “Associated sample results <5x blank concentration.”

9. Summary of Recommended Data Actions

Based on the results of this evaluation, EcoLogic recommends that the following sample results be rejected:

Sample Number	Sample Date 2009	Description	Parameter	Result (mg/l)	Reason
2910649	09/22	Lake 15m North	SRP	0.192 R	Does not meet limnological reasonableness criteria $SRP \leq TP$ and $TDP \geq SRP$. TP appears to be in error. ACTION: 2
			TP	0.029 R	
			TDP	0.156 R	
2912601	11/03	Lake Equip. Blk (Pump)	SRP	0.029 R	Does not meet limnological reasonableness criteria $SRP \leq TP$ and $TDP \geq SRP$. ACTION: 2
			TP	0.028 R	
			TDP	0.006 R	
2910634	09/22	Lake 15m South	SRP	0.250 R	Does not meet limnological reasonableness criterion $TDP \geq SRP$. Results are within method precision. ACTION: 1
			TDP	0.246 R	
2910650	09/22	Lake 18m North	SRP	0.472 R	Does not meet limnological reasonableness criterion $TDP \geq SRP$. Results are within method precision. ACTION: 1
			TDP	0.432 R	
2906244	06/07	Metro Final Effluent	NH3-N	0.623 R	Does not meet limnological reasonableness criterion $NH_3-N \leq TKN$. ACTION: 2
			TKN	0.549 R	

Action 1: data qualified for QC screen
Action 2: Do not use

Attachment 1

Ambient Monitoring Program 2009 Data QC Review
Parameter Minimum Reportable Limits Summary

Attachment 1. Ambient Monitoring Program 2009 - Parameter Minimum Reportable Limits Summary

Parameter	Database parameters - 2009			Analytical Procedures for Water Quality Analyses			
	Code	Units	Method	2008 (Jan-May)		2009 (May-Dec)	
				Method	MRL	Method	MRL
Bio Oxy Demand 5-day	BOD5	mg/L	3	2:(5210)	2	2:(5210 B)	2
Carbon. Bio Oxy Demand 5-day	CBOD5	mg/L	48	2:(5210 B)	2	2:(5210 B)	2
Total Alk as CaCO3	ALK-T	mg/L	37	1:(310.1)	1	2:(5210 B)	1
Total Organic Carbon	TOC	mg/L	140; 146	1:(415.1)	0.5	2:(5310B)	0.5
Total Organic Carbon - Filtered	TOC-F	mg/L	141; 146	1:(415.1)	0.5	2:(5310B)	0.5
Total Inorganic Carbon	TIC	mg/L	146	1:(415.1)	0.5	2:(5310B)	0.5
Total Kjeldahl Nitrogen as N	TKN	mg/L	138	3:(10-107-06-2-D)	0.15	3:(10-107-06-2-D)	0.15
Total Kjeldahl Nitrogen as N, filtered	TKN-F	mg/L	139	3:(10-107-06-2-D)	0.15	3:(10-107-06-2-D)	0.15
Ammonia Nitrogen as N	NH3-N	mg/L	125; 506	2:(4500-NH3-N)	0.01	2:(4500-NH3-N)	0.01
Organic Nitrogen as N	ORG-N	mg/L	447	3:(10-107-06-2-D)	0.01	3:(10-107-06-2-D)	0.01
Nitrate as N	NO3	mg/L	118	3:(10-107-04-1-C)	0.01	3:(10-107-04-1-C)	0.01
Nitrite as N	NO2	mg/L	118	3:(10-107-04-1-C)	0.01	3:(10-107-04-1-C)	0.01
Total Phosphorus -Manual	TP	mg/L	5; 354; 617	1:(365.2)	0.003	2:(4500-P E)	0.003
Total Dissolved Phosphorus	TDP	mg/L	134	1:(365.2)	0.003	2:(4500-P E)	0.003
Soluble Reactive Phosphorus	SRP	mg/L	308	2:(4500-P E)	0.001	2:(4500-P E)	0.001
Silica	SiO2-diss	mg/L	129	1:(370.1)	0.2	2:(4500-Si-D)	0.5
Sulfates	SO4	mg/L	130	1:(375.4)	10	6:(426 C)	10
Sulfide	Sulfide	mg/L	127	1:(376.1)	0.2	1:(376.1)	0.2
Total Solids***	TS	mg/L	143	1:(160.3)	1	2:2450 B)	10.0
Total Volatile Solids	TVS	mg/L	144	1:(160.4)	1	2:(2540 E)	10.0
Total Suspended Solids	TSS	mg/L	4	1:(160.2)	1	2:(2540 D)	1.0
Total Volatile Suspended Solids	VSS	mg/L	38	1:(160.4)	1	2:(2540 E)	1.0
Total Dissolved Solids***	TDS	mg/L	142	1:(160.1)	1	2:(2540 C)	10.0

Attachment 1. Ambient Monitoring Program 2009 - Parameter Minimum Reportable Limits Summary (continued)

Parameter	Database parameters - 2009			Analytical Procedures for Water Quality Analyses			
	Code	Units	Method	2008 (Jan-May)		2009 (May-Dec)	
				Method	MRL	Method	MRL
Arsenic - furnace	As	mg/L	470; 509	4:(200.9)	0.002	4:(200.9)	0.002
Total Cadmium	Cd	mg/L	161; 500; 509	4:(200.9)	0.0008	4:(200.9)	0.0008
Total Calcium	Ca	mg/L	35	1:(215.1)	1	2:(3111B)	1
Total Chromium	Cr	mg/L	161; 356; 509	4:(200.7)	0.010(0.0025)*	4:(200.7)	0.008(0.002)*
Chloride	Chloride	mg/L	68	3:(10-117-07-1-B)	1	3:(10-117-07-1-B)	1
Total Copper	Cu	mg/L	161; 356; 509	4:(200.7)	0.0125(0.0031)*	4:(200.7)	0.01(0.0025)*
Total Cyanide	CN-T	mg/L	73; 75; 399	3:(10-204-00-1-A)	0.003	3:(10-204-00-1-A)	0.003
Total Iron	Fe	mg/L	85	4:(200.7)	0.05	4:(200.7)	0.04
Total Lead - furnace	Pb	mg/L	95; 161; 509	4:(200.9)	0.002	4:(200.9)	0.002
Total Magnesium	Mg	mg/L	88	1:(242.1)	0.1	2:(3111B)	0.1
Total Manganese	Mn	mg/L	89	4:(200.7)	0.025	4:(200.7)	0.02
Total Molybdenum	Mo	mg/L	311	4:(200.9)	0.0200	4:(200.9)	0.0200
Total Mercury (Cold Vapor)	Hg	mg/L	86; 389; 509	1:(245.2)	0.00002	1:(245.2)	0.00002
Total Mercury (low-level)**	Hg	ng/l	393	Contract Lab		Contract Lab	
Methyl Mercury (low-level)**	Hg-methyl	ng/l	295	Contract Lab		Contract Lab	
Selenium - furnace	Se	mg/L	472; 509	4:(200.9)	0.002	4:(200.9)	0.002
Total Sodium	Na	mg/L	92	1:(273.1)	3	2:(3111B)	3
Total Nickel	Ni	mg/L	161; 356; 509	4:(200.7)	0.015(0.00375)*	4:(200.7)	0.015(0.00375)*
Potassium	K	mg/L	87	1:(258.1)	0.02	2:(3111B)	0.02
Total Silver	Ag	mg/L	17; 509	4:(200.7)	0.0125	4:(200.7)	0.01
Total Zinc	Zn	mg/L	161; 356; 509	4:(200.7)	0.025(0.00625)*	4:(200.7)	0.02(0.005)*
Turbidity	Turbidity	NTU	145	2:(2130B)	0.1	2:(2130B)	0.1
Hardness	Hardness	mg/L	238	4:(215.1 & 424.1)	3	4:(215.1 & 424.1)	3
Conductivity - field	COND-field	umHos/cm	286	2:(2510B)	-	2:(2510B)	-
Dissolved Oxygen - field	DO-field	mg/L	286	1:(360.1)	0.1	1:(360.1)	0.1
pH - field	pH-field	Std Units	286	1:(150.1)	-	1:(150.1)	-
Temperature - field	Temp-field	°C	133; 286	1:(170.1)	-	1:(170.1)	-
Phenol	Phenol	mg/L	126; 400	3:(10-210-00-1-A)	0.010	3:(10-210-00-1-A)	0.010

Attachment 1. Ambient Monitoring Program 2009 - Parameter Minimum Reportable Limits Summary (continued)

Parameter	Database parameters - 2009			Analytical Procedures for Water Quality Analyses			
	Code	Units	Method	2008 (Jan-May)		2009 (May-Dec)	
				Method	MRL	Method	MRL
Phaeophytin a	Phaeophytin-a	mg/m3	155	2:(10200 H.2)	0.2	2:(10200 H.2)	0.2
Chlorophyll a	Chlorophyll-a	mg/m3	155	2:(10200 H.2)	0.2	2:(10200 H.2)	0.2
E. Coliform	ECOLI	cells/100ml	525	2:(9223 B)	1.0 MPN	2:(9223 B)	1.0 MPN
Fecal Coliform	FCOLI-MF	cells/100ml	80	2:(9222 D)	1	2:(9222 D)	1

Notes:

Methods listed are applicable for all matrices of water, wastewater, and surface waters.

* Indicates method has a lower level of detection due to sample concentration

** Started in August 2000 for all AMP samples.

1: Indicates USEPA Methods for Chemical Analysis of Water and Waste 1979

2: Indicates Standard Methods (18th Edition)

3: Indicates Lachat Instruments QuickChem Methods: Approved for use by USEPA - NYSDOH - ELAP

4: Indicates USEPA "Methods for the Determination of Metals in Environmental Samples" Supplement 1, May 1994

5: USEPA Microbiological Methods Manual 1996

6: Indicates Standard Methods (15th Edition)

*** All MRL's are based upon a sample volume of 1000 mL. Most blanks and samples are run at a smaller sample volume and therefore the MRL would be higher than the stated value. For example, the MRL for TS and TDS at 1000 mL is 1 mg/l, but for sample volume of 100 mL the MRL is 10 mg/l.

Contract Lab - indicates the analyses were conducted by these contract laboratories in 2009 using unidentified method and/or reporting limits:

Frontier Geosciences for low-level mercury

For other analytes - Certified Environmental Services (Jan-Aug) and Life Sciences Laboratories (Sept-Dec).

N/A - Not applicable; MPN - Most Probable Number

Not analyzed as part of the 2009 program: Bio Oxy Demand 10-day (BOD10), Carbon. Bio Oxy Demand 10-day (CBOD10), Particulate Organic Carbon (POC), Total Phosphorus (by method 3:(10-115-01-1-E)), Enterococci (ECOCCL), Total Coliform (TCOLI), Residual chlorine (CL2-Res-field)

Attachment 2

Ambient Monitoring Program 2009 Data QC Review
2009 Samples and Field Duplicates, RPD >20%

Attachment 2. List of 2009 samples and field duplicates with Relative Percent Difference (RPD) exceeding 20% and absolute difference is greater than 2x the MRL. **Recommended Action:** Discuss with sampling team.

Source	Date (2009)	Sample No.	Duplicate No.	Parameter	Units	Sample Conc.	Dup Conc.	RPD	Abs. Diff.	2xMRL
Effluent										
Metro Final Effluent	6/22	2906902	2906903	TDP	mg/L	0.020	0.027	30	0.007	0.006
Metro Final Effluent	8/3	2908420	2908421	TP	mg/L	0.086	0.048	57	0.038	0.006
Metro Final Effluent	9/2	2909965	2910003	NH3-N	mg/L	0.082	0.11	32	0.031	0.02
Lake North										
Lake 6m North	4/9	2903840	2903845	TVS	mg/L	138	112	21	26	2
Lake 6m North	6/16	2906660	2906665	TVS	mg/L	376	228	49	148	20
Lake South										
Lake 6m South	6/16	2906645	2906650	TVS	mg/L	196	254	26	58	20
Lake 6m South	10/8	2911381	2911386	SRP	mg/L	0.017	0.021	21	0.004	0.002
Onondaga Creek										
Crk-Onondaga Creek @ Rt20	4/13	2903779	2903874	FCOLI-MF	count/100	30	10	100	20	2
Crk-Onondaga Creek @ Rt20	5/12	2904286	2904323	FCOLI-MF	count/100	64	80	22	16	2
Crk-Onondaga Creek @ Plum Street	4/13	2903805	2903867	FCOLI-MF	count/100	1700	2360	33	660	2
Crk-Onondaga Creek @ Plum Street	5/12	2904312	2904321	FCOLI-MF	count/100	80	105	27	25	2
Crk-Onondaga Creek @ Dorwin Ave.	8/6	2908542	2908550	TSS	mg/L	12	8.0	40	4.0	2
Trib-Onon Creek @ Hiawatha	8/3	2900511	2900512	TSS	mg/L	15	30	67	15	2
Trib-Onon Creek @ Hiawatha	8/4	2900547	2900548	TDP	mg/L	0.014	0.058	122	0.044	0.006
Trib-Onon Creek @ Hiawatha	8/4	2900547	2900548	TSS	mg/L	12	15	22	3.0	2
Ninemile Creek										
Crk-Nine Mile Creek @ Lakeland Rt 48	4/14	2904139	2904151	TSS	mg/L	12	9.0	29	3.0	2
Sawmill Creek										
Crk-Sawmill Crk @ Onondaga Lake Rec. Trail	9/15	2910363	2910365	Fe	mg/L	0.23	0.41	58	0.19	0.08
Crk-Sawmill Crk @ Onondaga Lake Rec. Trail	9/15	2910363	2910365	TSS	mg/L	4.0	11	93	7.0	2
Crk-Sawmill Crk @ Onondaga Lake Rec. Trail	9/15	2910363	2910365	Turbidity	NTU	6.1	12	65	6.0	0.2
East Flume										
Crk-Allied East Flume-Over Weir	4/28	2904688	2904696	NH3-N	mg/L	0.46	0.60	25	0.13	0.02
Crk-Allied East Flume-Over Weir	4/28	2904688	2904696	TKN	mg/L	1.5	1.9	22	0.37	0.3
Crk-Allied East Flume-Over Weir	4/28	2904688	2904696	TSS	mg/L	15	29	64	14	2
Crk-Allied East Flume-Over Weir	4/28	2904688	2904696	Turbidity	NTU	9.0	12	30	3.2	0.2

Attachment 2. List of 2009 samples and field duplicates with Relative Percent Difference (RPD) exceeding 20% and absolute difference is greater than 2x the MRL. **Recommended Action:** Discuss with sampling team. (continued)

Source	Date (2009)	Sample No.	Duplicate No.	Parameter	Units	Sample Conc.	Dup Conc.	RPD	Abs. Diff.	2xMRL
Lake South										
Lake Tube Composite (South)	3/24	2903262	2903263	Phaeophytin-a	mg/m3	0.69	1.1	48	0.43	0.4
Lake Tube Composite (South)	4/9	2903834	2903835	Phaeophytin-a	mg/m3	<0.2	1.2	144	1.0	0.4
Lake Tube Composite (South)	6/2	2906052	2906053	Phaeophytin-a	mg/m3	1.2	2.1	54	0.91	0.4
Lake Tube Composite (South)	6/16	2906654	2906655	Phaeophytin-a	mg/m3	0.27	1.2	125	0.90	0.4
Lake Tube Composite (South)	8/25	2909576	2909577	Chlorophyll-a	mg/m3	6.9	4.8	36	2.1	0.4
Lake Tube Composite (South)	9/9	2910123	2910124	Phaeophytin-a	mg/m3	1.1	1.6	40	0.53	0.4
Lake Tube Composite (South)	9/22	2910640	2910641	Phaeophytin-a	mg/m3	1.2	0.59	66	0.58	0.4
Lake Tube Composite (South)	10/8	2911390	2911391	Phaeophytin-a	mg/m3	1.0	1.6	42	0.54	0.4
Lake Tube Composite (South)	11/3	2912613	2912614	Phaeophytin-a	mg/m3	1.3	0.75	52	0.53	0.4
Lake Tube Composite (South)	12/1	2913606	2913607	Chlorophyll-a	mg/m3	8.0	14	54	5.9	0.4
Seneca River										
River Buoy #316 Top	7/9	2907473	2907475	Chlorophyll-a	mg/m3	1.6	2.1	29	0.54	0.4
River Buoy #316 Bottom	7/9	2907474	2907476	Chlorophyll-a	mg/m3	2.1	3.7	54	1.6	0.4
River Buoy #316 Bottom	7/9	2907474	2907476	Phaeophytin-a	mg/m3	4.2	3.0	34	1.2	0.4
River Buoy #316 Bottom	7/30	2908341	2908342	Chlorophyll-a	mg/m3	1.1	0.53	68	0.54	0.4
River Buoy #316 Top	7/30	2908339	2908340	Phaeophytin-a	mg/m3	0.53	1.1	68	0.54	0.4
River Buoy #316 Top	8/12	2908844	2908846	Phaeophytin-a	mg/m3	4.4	3.6	21	0.85	0.4
River Buoy #316 Bottom	8/12	2908845	2908847	Phaeophytin-a	mg/m3	6.2	7.6	21	1.5	0.4
River Buoy #316 Top	8/27	2909681	2909680	Chlorophyll-a	mg/m3	5.9	8.0	31	2.1	0.4
River Buoy #316 Bottom	8/27	2909683	2909682	Chlorophyll-a	mg/m3	4.8	3.2	40	1.6	0.4
River Buoy #316 Top	8/27	2909681	2909680	Phaeophytin-a	mg/m3	2.4	0.96	84	1.4	0.4
River Buoy #316 Bottom	8/27	2909683	2909682	Phaeophytin-a	mg/m3	2.3	7.6	107	5.3	0.4
River Buoy #316 Top	9/16	2910434	2910435	Chlorophyll-a	mg/m3	56	28	65	27	0.4
River Buoy #316 Bottom	9/16	2910436	2910437	Chlorophyll-a	mg/m3	25	18	32	6.9	0.4
River Buoy #316 Top	9/16	2910434	2910435	Phaeophytin-a	mg/m3	9.5	2.7	111	6.8	0.4
River Buoy #316 Bottom	9/16	2910436	2910437	Phaeophytin-a	mg/m3	6.3	2.8	78	3.5	0.4
River Buoy #316 Top	9/24	2910774	2910776	Chlorophyll-a	mg/m3	34	26	29	8.6	0.4
River Buoy #316 Top	9/24	2910774	2910776	Phaeophytin-a	mg/m3	2.5	6.5	90	4.1	0.4
River Buoy #316 Bottom	9/24	2910775	2910777	Phaeophytin-a	mg/m3	6.4	9.4	38	3.0	0.4

Attachment 3

Ambient Monitoring Program 2009 Data QC Review
Metals reported at levels less than the published MRL

Attachment 3. These metals were reported at levels less than the MRL, but the MRL does not match with the published values. The MRLs for metals varies depending on whether concentration procedures were used. When there are relatively few samples for which the MRL does not match the reported value, this may be an indicator of a data entry error.

Since there are many records for these three analytes that do not match the published MRL, it is assumed that these reported values are correct:

- Calcium (130 records, reported SRESULT <1.25, MRL = 1)
- Nickel (93 records, reported SRESULT <0.0038, MRL = 0.015)
- Magnesium (135 records, reported SRESULT <0.125, MRL = 0.1)

Recommended ACTION: Review the following data records and verify that the reported RESULT is correct.

OCDWEP Response:

In most instances, where the MRL did not match the published values, analysis was completed by the contract laboratory. The field "Submitter" notes which lab has completed the analysis. MRLs from the contract lab may vary from OCDWEP MRL's. However, all reporting limits are within SPDES limits as established by OCDWEP. A few instances of non-detect issues could be traced to a modification of the original result and the subsequent change was not reflected in the column utilized by this memorandum. Any discrepancies have been corrected. A number of MRL differences were determined to be from the analysis of Metro Bypass samples, which historically have been analyzed as an influent stream, due to it's nature. One sample, 2913593 had results reversed for Ca and Na and has been corrected and resubmitted.

Ag (Silver) - 2 records

SAMPLE_NO	LAB_PARAMETER	LAB_PARAMETER_UNITS	LAB_METHOD_NO	LAB_RESULT	MRL_Jan-May	MRL_May-Dec	MRL_Conc_Proc_JanMay	MRL_Conc_Proc_MayDec
2908770	Ag	mg/L	509	<0.001	0.0125	0.01		
2902635	Ag	mg/L	509	<0.001	0.0125	0.01		

As (Arsenic) - 2 records

SAMPLE_NO	LAB_PARAMETER	LAB_PARAMETER_UNITS	LAB_METHOD_NO	LAB_RESULT	MRL_Jan-May	MRL_May-Dec	MRL_Conc_Proc_JanMay	MRL_Conc_Proc_MayDec
2905959	As	mg/L	470	<0.02	0.002	0.002		
2911636	As	mg/L	509	<0.01	0.002	0.002		

Ca (Calcium) - 5 records

SAMPLE_NO	LAB_PARAMETER	LAB_PARAMETER_UNITS	LAB_METHOD_NO	LAB_RESULT	MRL_Jan-May	MRL_May-Dec	MRL_Conc_Proc_JanMay	MRL_Conc_Proc_MayDec
2914277	Ca	mg/L	35	<0.125	1	1		
2911668	Ca	mg/L	35	<0.125	1	1		
2914278	Ca	mg/L	35	<0.125	1	1		
2911667	Ca	mg/L	35	<0.125	1	1		
2913593	Ca	mg/L	35	<4	1	1		

Cd (Cadmium) - 11 records

SAMPLE_NO	LAB_PARAMETER	LAB_PARAMETER_UNITS	LAB_METHOD_NO	LAB_RESULT	MRL_Jan-May	MRL_May-Dec	MRL_Conc_Proc_JanMay	MRL_Conc_Proc_MayDec
2903289	Cd	mg/L	161	<0.005	0.0008	0.0008		
2900442	Cd	mg/L	161	<0.005	0.0008	0.0008		
2908460	Cd	mg/L	161	<0.005	0.0008	0.0008		
2913446	Cd	mg/L	161	<0.005	0.0008	0.0008		
2911158	Cd	mg/L	161	<0.005	0.0008	0.0008		
2905784	Cd	mg/L	161	<0.005	0.0008	0.0008		
2914384	Cd	mg/L	500	<0.005	0.0008	0.0008		
2914253	Cd	mg/L	500	<0.005	0.0008	0.0008		
2914065	Cd	mg/L	500	<0.005	0.0008	0.0008		
2911636	Cd	mg/L	509	<0.001	0.0008	0.0008		
2908770	Cd	mg/L	509	<0.002	0.0008	0.0008		

Attachment 3 - Metals (continued)

Hg (Mercury) - 4 records

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	MRL_Conc	MRL_Conc
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec	Proc_JanMay Proc_MayDec
2908770	Hg	mg/L	509	<0.0002	0.00002	0.00002	
2911636	Hg	mg/L	509	<0.0002	0.00002	0.00002	
2902635	Hg	mg/L	509	<0.0002	0.00002	0.00002	
2904113	Hg	mg/L	509	<0.0004	0.00002	0.00002	

Ni (Nickel) - 2 records

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	MRL_Conc	MRL_Conc
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec	Proc_JanMay Proc_MayDec
2908770	Ni	mg/L	509	<0.002	0.015	0.015	0.00375 0.00375
2911636	Ni	mg/L	509	<0.01	0.015	0.015	0.00375 0.00375

Pb (Lead) - 10 records

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	MRL_Conc	MRL_Conc
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec	Proc_JanMay Proc_MayDec
2914065	Pb	mg/L	95	<0.02	0.002	0.002	
2914253	Pb	mg/L	95	<0.02	0.002	0.002	
2914384	Pb	mg/L	95	<0.02	0.002	0.002	
2908460	Pb	mg/L	161	<0.02	0.002	0.002	
2911158	Pb	mg/L	161	<0.02	0.002	0.002	
2905784	Pb	mg/L	161	<0.02	0.002	0.002	
2903289	Pb	mg/L	161	<0.02	0.002	0.002	
2913446	Pb	mg/L	161	<0.02	0.002	0.002	
2900442	Pb	mg/L	161	<0.03	0.002	0.002	
2911636	Pb	mg/L	509	<0.001	0.002	0.002	

Se (Selenium) - 1 record

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	MRL_Conc	MRL_Conc
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec	Proc_JanMay Proc_MayDec
2904113	Se	mg/L	509	<0.005	0.002	0.002	

Attachment 3. Other parameters – Nine other parameters were reported in the database with “less than MRL” values that did not match the published MRLs. The number of these samples was generally low, raising the possibility of data entry error. (Note: CN-A and CN-CI2 are excluded here since these are analyzed for SPDES only, not the AMP).

Since there are many records for these three analytes that do not match the published MRL, it is assumed that these reported values are correct:

- Fecal Coliform (170 records, reported SRESULT <5, MRL = 1)
- Fecal Coliform (73 records, reported SRESULT <10, MRL = 1)
- Sodium (134 records, reported SRESULT <4, MRL = 3)

Recommended ACTION: Review the following data records and verify that the reported RESULT is correct.

OCDWEP Response:

Corrected TKN-F MRL for one sample. All other parameters were from contract lab.

CN-T (Total Cyanide) - 4 records

SAMPLE_ NO	LAB_ PARAMETER	LAB_ PARAMETER_UNITS	LAB_ METHOD_NO	RESULT	MRL_	MRL_
					Jan-May	May-Dec
2902635	CN-T	mg/L	399	<0.005	0.003	0.003
2904113	CN-T	mg/L	399	<0.005	0.003	0.003
2908770	CN-T	mg/L	399	<0.005	0.003	0.003
2911636	CN-T	mg/L	665	<0.005	0.003	0.003

ECOLI (E. Coli) - 1 record

SAMPLE_ NO	LAB_ PARAMETER	LAB_ PARAMETER_UNITS	LAB_ METHOD_NO	RESULT	MRL_	MRL_
					Jan-May	May-Dec
2904447	ECOLI	count/100	525	<5	1	1

FCOLI-MF (Fecal coliforms) - 6 records

SAMPLE_ NO	LAB_ PARAMETER	LAB_ PARAMETER_UNITS	LAB_ METHOD_NO	RESULT	MRL_	MRL_
					Jan-May	May-Dec
2903949	FCOLI-MF	count/100	80	<2	1	1
2903883	FCOLI-MF	count/100	80	<2	1	1
2903879	FCOLI-MF	count/100	80	<2	1	1
2903878	FCOLI-MF	count/100	80	<2	1	1
2908950	FCOLI-MF	count/100	80	<2	1	1
2901829	FCOLI-MF	count/100	80	<20	1	1

K (Potassium) - 14 records

SAMPLE_ NO	LAB_ PARAMETER	LAB_ PARAMETER_UNITS	LAB_ METHOD_NO	RESULT	MRL_	MRL_
					Jan-May	May-Dec
2910627	K	mg/L	87	<0.025	0.02	0.02
2912925	K	mg/L	87	<0.025	0.02	0.02
2912926	K	mg/L	87	<0.025	0.02	0.02
2912927	K	mg/L	87	<0.025	0.02	0.02
2910347	K	mg/L	87	<0.025	0.02	0.02
2913137	K	mg/L	87	<0.025	0.02	0.02
2903509	K	mg/L	87	<0.025	0.02	0.02
2910345	K	mg/L	87	<0.025	0.02	0.02
2906641	K	mg/L	87	<0.025	0.02	0.02
2906323	K	mg/L	87	<0.025	0.02	0.02
2903510	K	mg/L	87	<0.025	0.02	0.02
2903375	K	mg/L	87	<0.025	0.02	0.02
2906322	K	mg/L	87	<0.025	0.02	0.02
2910346	K	mg/L	87	<0.025	0.02	0.02

Attachment 3 - Other Parameters (continued)

Na (Sodium) - 1 record

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec
2913593	Na	mg/L	92	<1.25	3	3

NH3-N (Ammonia as N) - 2 records

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec
2910063	NH3-N	mg/L	125	<0.03	0.01	0.01
2910057	NH3-N	mg/L	125	<0.03	0.01	0.01

Phenol - 1 record

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec
2911636	Phenol	mg/L	666	<0.003	0.01	

TKN-F (Total Kjeldahl Nitrogen) - 1 record

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec
2907189	TKN-F	mg/L	139	<0.15001	0.15	0.15

TP (Total Phosphorus (Manual)) - 13 records

SAMPLE_	LAB_	LAB_	LAB_	MRL_	MRL_	
NO	PARAMETER	PARAMETER_UNITS	METHOD_NO	RESULT	Jan-May	May-Dec
2900407	TP	mg/L	617	<0.05	0.003	0.003
2900402	TP	mg/L	617	<0.05	0.003	0.003
2901137	TP	mg/L	617	<0.05	0.003	0.003
2900976	TP	mg/L	617	<0.05	0.003	0.003
2900971	TP	mg/L	617	<0.05	0.003	0.003
2900781	TP	mg/L	617	<0.05	0.003	0.003
2900089	TP	mg/L	617	<0.05	0.003	0.003
2900039	TP	mg/L	617	<0.05	0.003	0.003
2900034	TP	mg/L	617	<0.05	0.003	0.003
2900029	TP	mg/L	617	<0.05	0.003	0.003
2900011	TP	mg/L	617	<0.05	0.003	0.003
2900370	TP	mg/L	617	<0.05	0.003	0.003
2900819	TP	mg/L	617	<0.05	0.003	0.003

Attachment 4

Ambient Monitoring Program 2009 Data QC Review
Unpaired sample results from limnological reasonableness analysis

Attachment 4: Unpaired sample results from limnological reasonableness analysis.

Sample No.	Source	Category	Start Date	Issue	Response
2900457	Trib-Onon Creek @ Hiawatha	Storm Event Creek	8/2/2009	Missing TDP results	
2903542	Crk-Onondaga Creek @ Rt20	Onondaga Creeks	3/31/2009	Missing TDP results	
2906394	Crk-Onondaga Creek @ Rt20	Onondaga Creeks	6/9/2009	Missing TDP results	
2910430	Crk-Onondaga Creek @ Rt20	Onondaga Creeks	9/15/2009	Missing TDP results	
2913112	Crk-Onondaga Creek @ Rt20	Onondaga Creeks	11/12/2009	Missing TDP results	
2903543	Crk-Onondaga Creek @ Spencer St	Onondaga Creeks	3/31/2009	Missing TDP results	
2906395	Crk-Onondaga Creek @ Spencer St	Onondaga Creeks	6/9/2009	Missing TDP results	
2910431	Crk-Onondaga Creek @ Spencer St	Onondaga Creeks	9/15/2009	Missing TDP results	
2913111	Crk-Onondaga Creek @ Spencer St	Onondaga Creeks	11/12/2009	Missing TDP results	
2904142	Crk-Harbor Brook @ Velasko Road	Onondaga Creeks	4/14/2009	Missing NH3-N results	

Attachment 5

Ambient Monitoring Program 2009 Data QC Review
Missing database flags that TKN-F is less than NH3-N

Attachment 5. No laboratory comments in the database for these samples to flag that TKN-F is less than NH3-N**Recommended ACTION: Laboratory to verify results.****OCDWEP Response:**

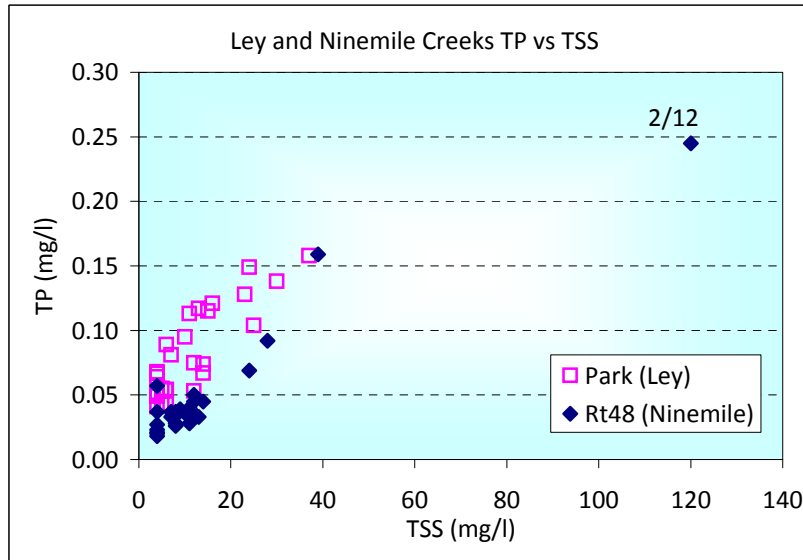
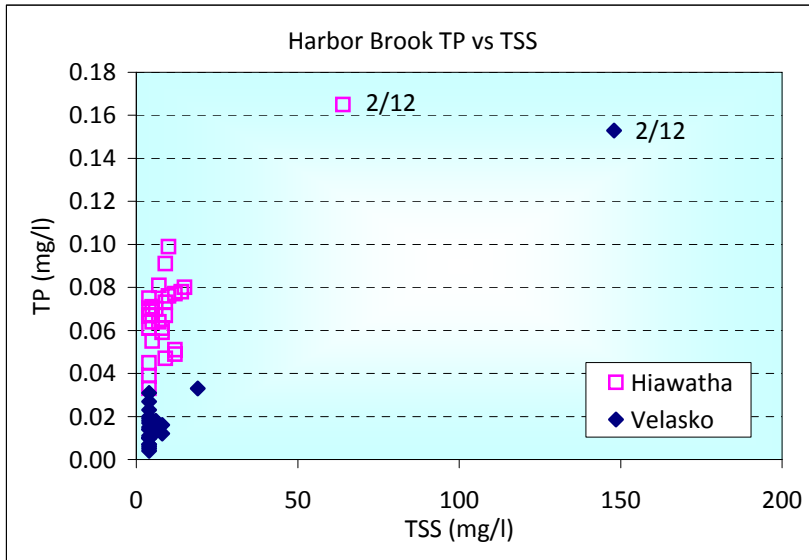
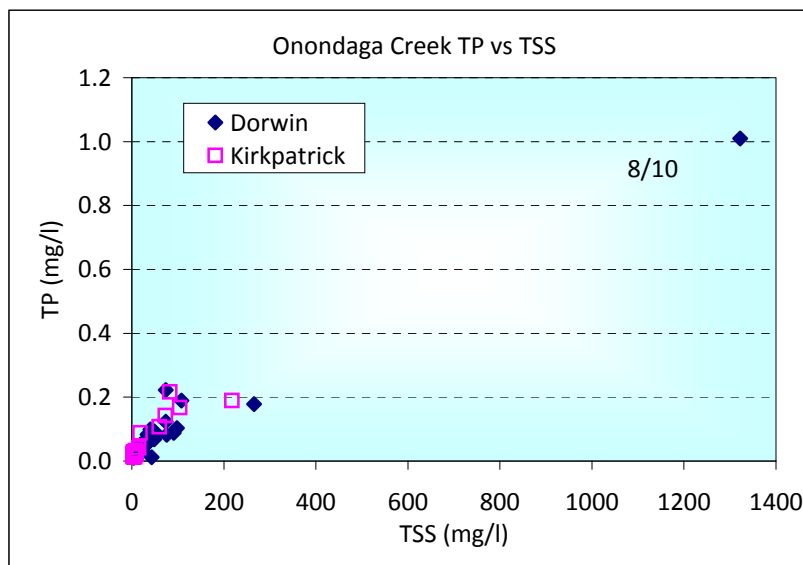
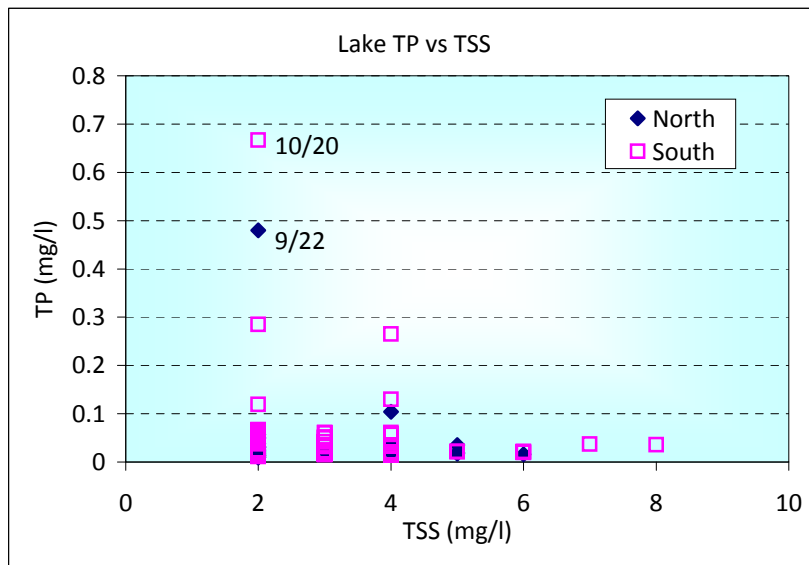
All results in question were verified at time of analysis. A new flag 'x' will be created and added by the lab: "Sample result failed the criteria for limnological reasonableness". TKN-F is unusually low in all instances, recommend flagging only this parameter with new flag "x".

SAMPLE_NO	SITE	IND_CODE	SOURCE	CATEGORY	DEPTH	START_DATE	NH3 (mg/l)	TKN-F (mg/l)	NH3-N LAB_COMMENTS	TKN-F LAB_COMMENTS
2909569	SOUTH	922	Lake 12m South	Onondaga Lake	12	8/25/2009	0.275	0.203		
2912609	SOUTH	920	Lake 6m South - Duplicate	Quality Control	6	11/3/2009	0.289	0.201	Sample is duplicate of #2912604.	Sample is duplicate of #2912604. TKN-F reprep'd 11/10.
2912604	SOUTH	920	Lake 6m South	Onondaga Lake	6	11/3/2009	0.299	0.257		
2906649	SOUTH	924	Lake 18m South	Onondaga Lake	18	6/16/2009	0.357	0.354		
2909570	SOUTH	923	Lake 15m South	Onondaga Lake	15	8/25/2009	0.533	0.221		
2909571	SOUTH	924	Lake 18m South	Onondaga Lake	18	8/25/2009	0.98	0.565		

Attachment 6

Ambient Monitoring Program 2009 Data QC Review
TP vs TSS in Onondaga Lake and tributaries, 2009

Attachment 6. TP vs TSS in Onondaga Lake and tributaries, 2009.



Attachment 7

Ambient Monitoring Program 2009 Data QC Review
Analytical results from 2009 >10-year average
(1999-2008) plus two standard deviations

Attachment 7. Analytical results from 2009 that were greater than the 10-year average (1999-2008) plus two standard deviations.

Onondaga Creek Sites

SITE: DORWIN						
Average of VRESULT	START_DATE					
ConcatenateText	2/3	2/12	3/3	3/10	8/10	10/29
BOD5 (mg/L): 3.12					4	4
Ca (mg/L): 117					121	
FCOLI-MF (count/100): 3,591					6000	4600
Fe (mg/L): 8.4076		9.58			37.3	
Hardness (mg/L): 425					437	
Mn (mg/L): 0.2523					1.23	
NO2 (mg/L): 0.1135		0.13				
ORG-N (mg/L): 0.8693		0.957			2.91	
SRP (mg/L): 0.012	0.014	0.03	0.012	0.016		0.019
TKN (mg/L): 0.9349		1.05			2.96	
TOC (mg/L): 5.0217					6.39	6.41
TOC-F (mg/L): 4.5695					6.26	6.36
TP (mg/L): 0.2324					1.01	
TSS (mg/L): 224		266			1,322	

SITE: KIRKPAT			
Average of VRESULT	START_DATE		
ConcatenateText	2/12	3/10	10/29
Mn (mg/L): 0.2385	0.24		
TOC (mg/L): 6.1442			6.23
TOC-F (mg/L): 5.5166			6.22
TP (mg/L): 0.2016		0.216	
TSS (mg/L): 213	218		

Harbor Brook Sites

SITE: VELASKO		
Average of VRESULT	START_DATE	
ConcatenateText	1/21	2/12
DO-field (mg/L): 15.0839		16.95
NO3 (mg/L): 2.3945	2.41	
TP (mg/L): 0.0826		0.153

SITE: HIAWATHA			
Average of VRESULT	START_DATE		
ConcatenateText	2/12	4/28	6/24
BOD5 (mg/L): 5.5486			9
DO-field (mg/L): 14.472	14.87		
NH3-N (mg/L): 0.2646		0.343	

OCDWEP Comments:

Rainfall data obtained from the Metro weather station indicated these rainfall amounts.
 8/9/2009 - 1.25 inches 8/10/2009 - 1.12 inches 10/29/2009 - 1.48 inches

Attachment 7. Analytical results from 2009 that were greater than the 10-year average (1999-2008) plus two standard deviations (continued)

Ley Creek

SITE: PARK								
Average of VRESULT	START_DATE							
ConcatenateText	1/21	2/3	2/12	4/28	5/27	8/6	8/18	9/15
DO-field (mg/L): 14.1545			14.16					
FCOLI-MF (count/100): 4,353					6,000			
Mn (mg/L): 0.2097	0.213							
Na (mg/L): 503		528						
NO2 (mg/L): 0.0474							0.083	
ORG-N (mg/L): 0.8363				1.14	0.956			
SO4 (mg/L): 242								243
SRP (mg/L): 0.0312					0.036			
TDS (mg/L): 1,837		1,904				21,224		

OCDWEP notes that this TDS result was entered incorrectly in the database and has been corrected.

Ninemile Creek

SITE: RT48											
Average of VRESULT	START_DATE										
ConcatenateText	2/12	3/10	3/31	4/14	4/28	5/27	6/9	6/24	9/1	9/29	10/29
BOD5 (mg/L): 3.8052	4		6	4	4	4	4	5	4		4
FCOLI-MF (count/100): 3,403						5000				4700	5100
Fe (mg/L): 2.2217	3.3										
ORG-N (mg/L): 0.8006		0.886									
SRP (mg/L): 0.0233	0.041										
TOC-F (mg/L): 4.8025											6.2
TP (mg/L): 0.1313	0.245										0.159
TSS (mg/L): 72.1605	120										

East Flume

SITE: EFLUME											
Average of VRESULT	START_DATE										
ConcatenateText	1/13	2/3	4/14	4/28	6/9	6/24	7/21	9/15	10/15	11/12	12/22
BOD5 (mg/L): 7.8744			9	10	10	9	11		9		
Chloride (mg/L): 1,017	1,170										
K (mg/L): 17.7139					18			27		31.8	
Na (mg/L): 738	767										
NH3-N (mg/L): 1.7439	2.12									1.75	1.99
NO2 (mg/L): 2.8102		3.43									

OCDWEP Comments:

Rainfall data obtained from the Metro weather station indicated these rainfall amounts.

5/26/2009 - 0.15 inches 9/26/2009 - 0.35 inches 9/27/2009 - 0.73 inches
 9/28/2009 - 0.09 inches 9/29/2009 - 0.30 inches 10/29/2009 - 1.48 inches

Attachment 7. Analytical results from 2009 that were greater than the 10-year average (1999-2008) plus two standard deviations (continued).

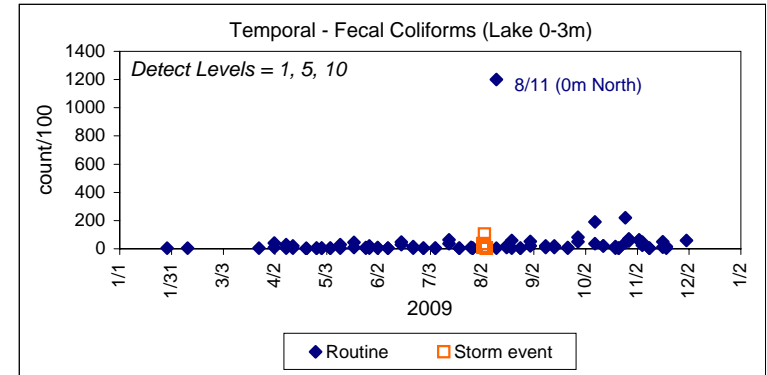
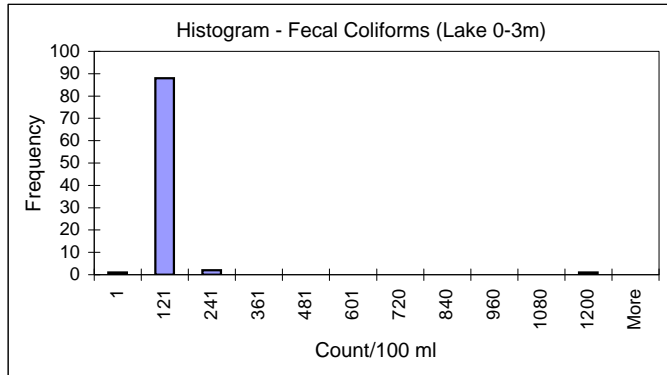
Tributary 5A

SITE: TRIB5A										
Average of VRESULT	START_DATE									
ConcatenateText	2/3	2/12	3/3	3/10	3/31	9/15	10/15	10/29	11/12	11/24
ALK-T (mg/L): 197		204						200		
Ca (mg/L): 170						189	177			201
Chloride (mg/L): 534										632
Cr (mg/L): 0.0847						0.106				
Cu (mg/L): 0.0426					0.0464	0.0679			0.0511	
DO-field (mg/L): 10.2012	11.1	12.75	11.69	10.47						
Fe (mg/L): 4.1041		7.83				4.32				
Hardness (mg/L): 500						548	513			578
Mn (mg/L): 0.1936		0.225								
Na (mg/L): 261										291
NO2 (mg/L): 0.0883		0.13								
NO3 (mg/L): 2.497	3.16									
TDS (mg/L): 1,413										1,470
TIC (mg/L): 50.235								52.2		
TP (mg/L): 0.2171						0.277				
TSS (mg/L): 91.6877		202								

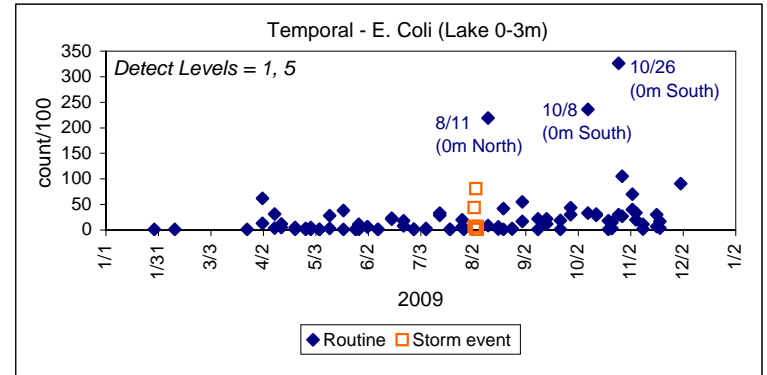
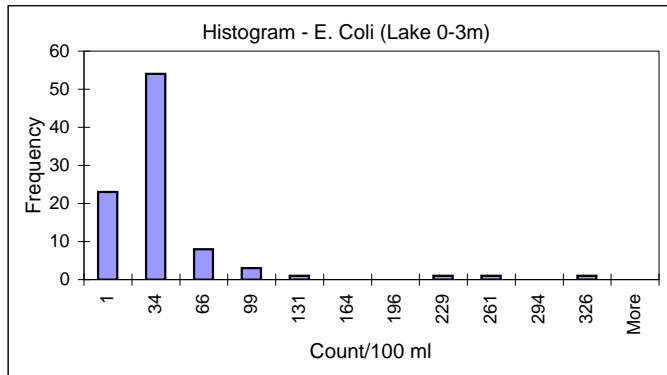
Attachment 8

Ambient Monitoring Program 2009 Data QC Review
Lake Outlier Analysis

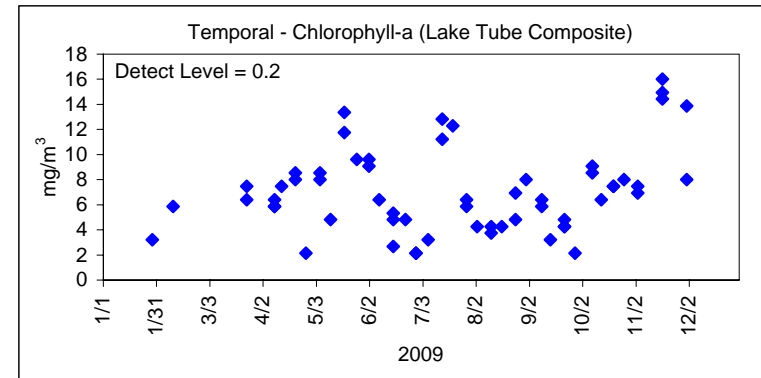
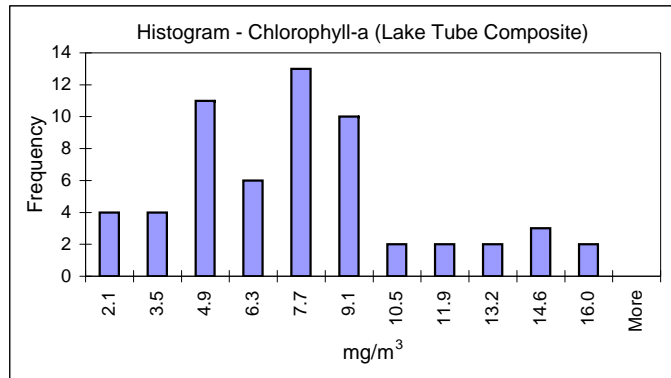
Fcoliforms	Frequency
1	1
121	88
241	2
361	0
481	0
601	0
720	0
840	0
960	0
1080	0
1200	1
More	0



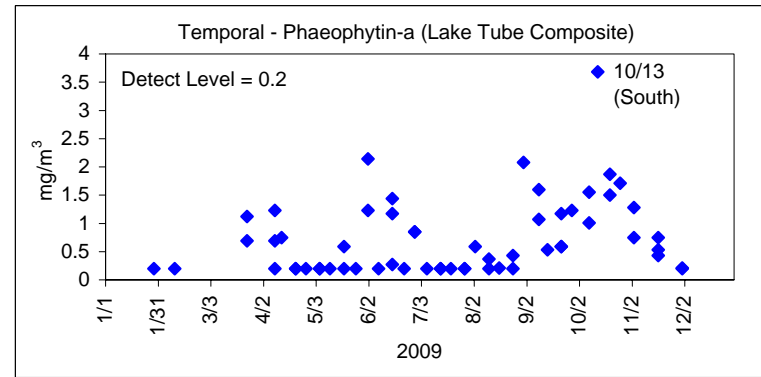
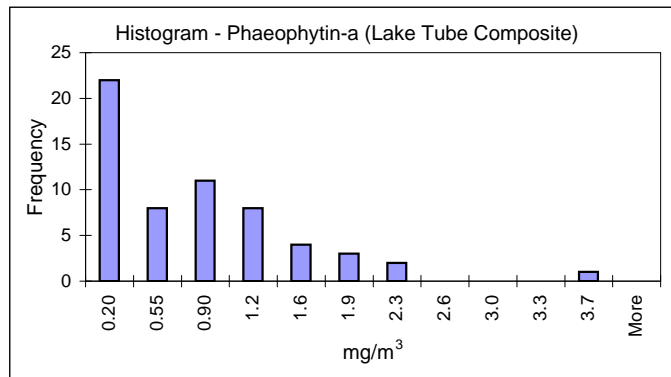
E.Coli	Frequency
1	23
34	54
66	8
99	3
131	1
164	0
196	0
229	1
261	1
294	0
326	1
More	0



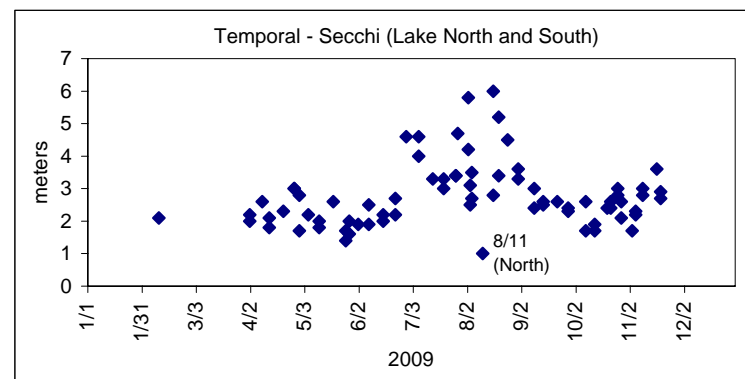
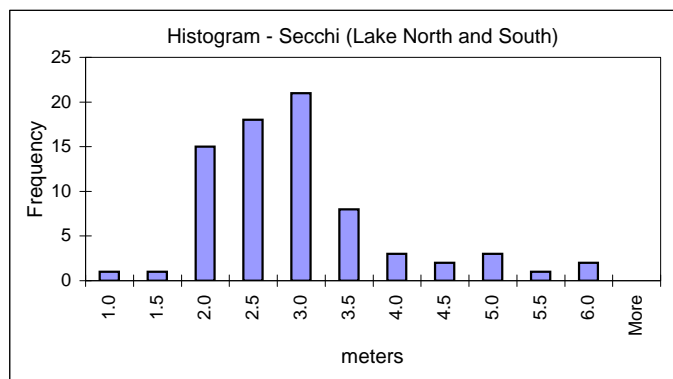
<i>Chlorophyll-a</i>	Frequency
2.1	4
3.5	4
4.9	11
6.3	6
7.7	13
9.1	10
10.5	2
11.9	2
13.2	2
14.6	3
16.0	2
More	0



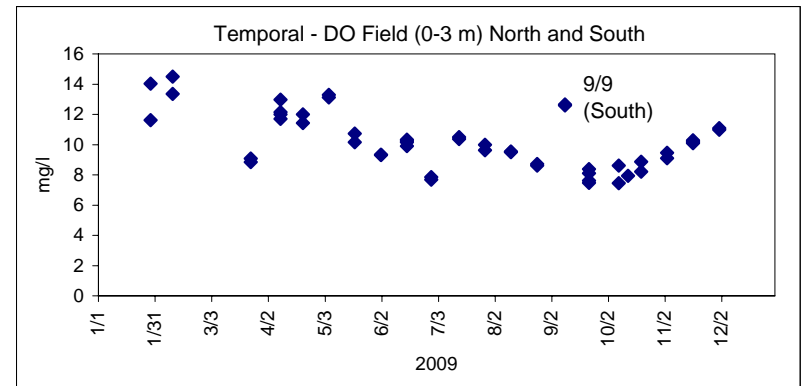
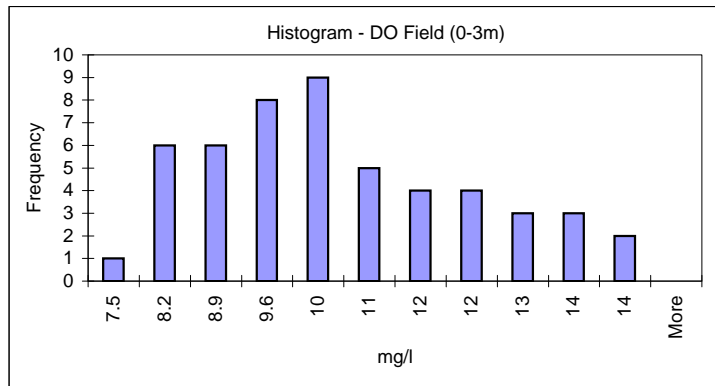
<i>Phaeophytin-a</i>	Frequency
0.20	22
0.55	8
0.90	11
1.2	8
1.6	4
1.9	3
2.3	2
2.6	0
3.0	0
3.3	0
3.7	1
More	0



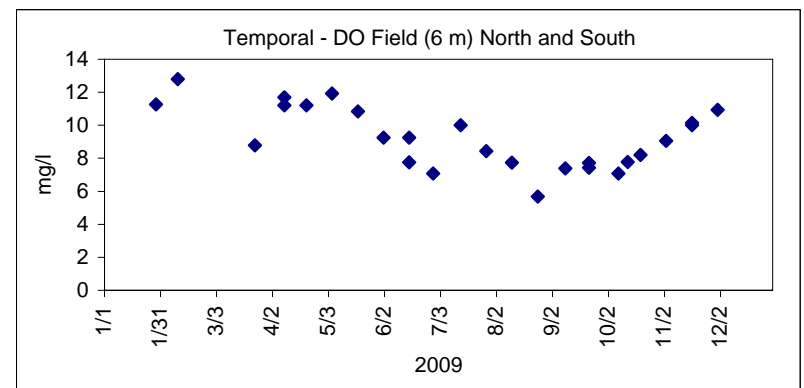
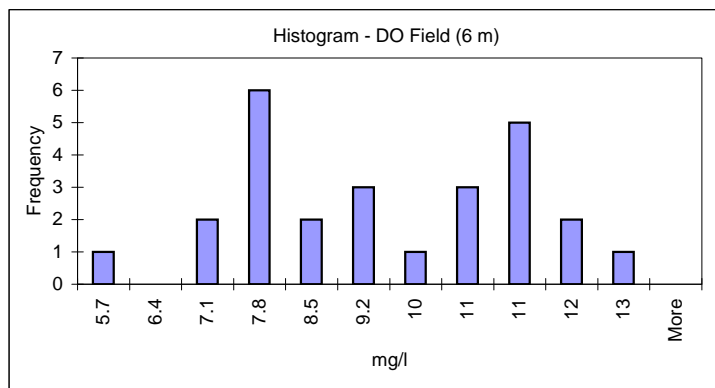
Secchi	Frequency
1.0	1
1.5	1
2.0	15
2.5	18
3.0	21
3.5	8
4.0	3
4.5	2
5.0	3
5.5	1
6.0	2
More	0



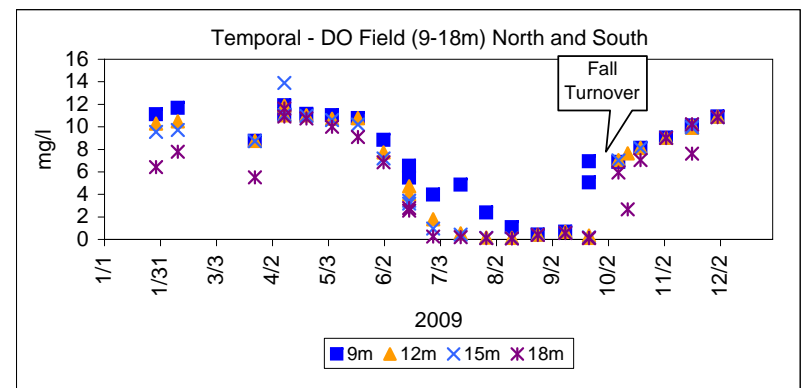
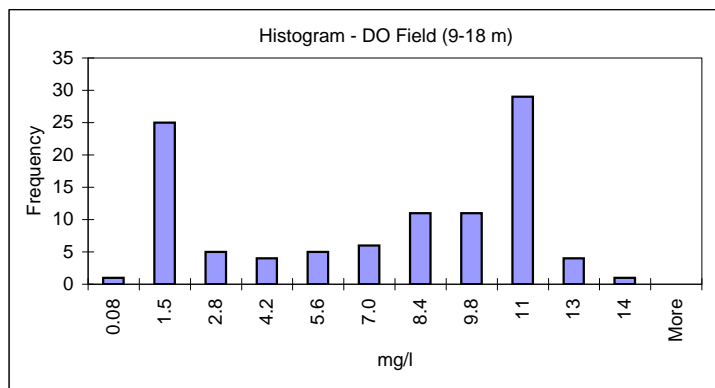
DO-Field	Frequency
7.5	1
8.2	6
8.9	6
9.6	8
10	9
11	5
12	4
12	4
13	3
14	3
14	2
More	0

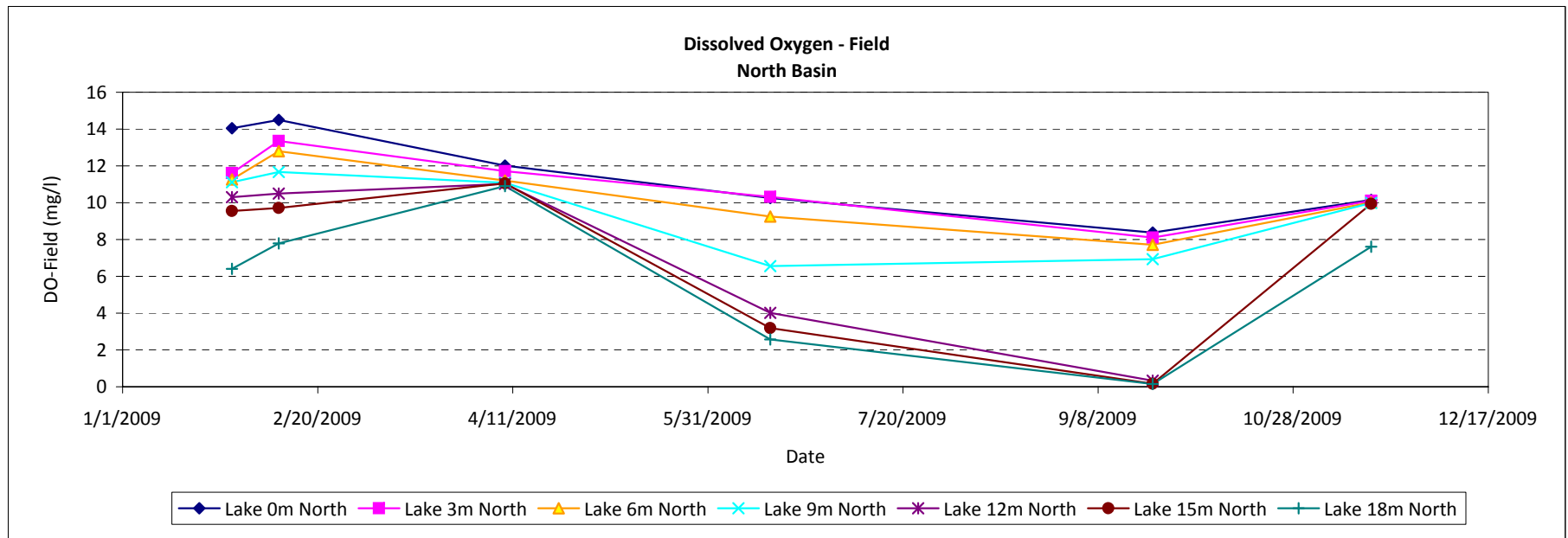
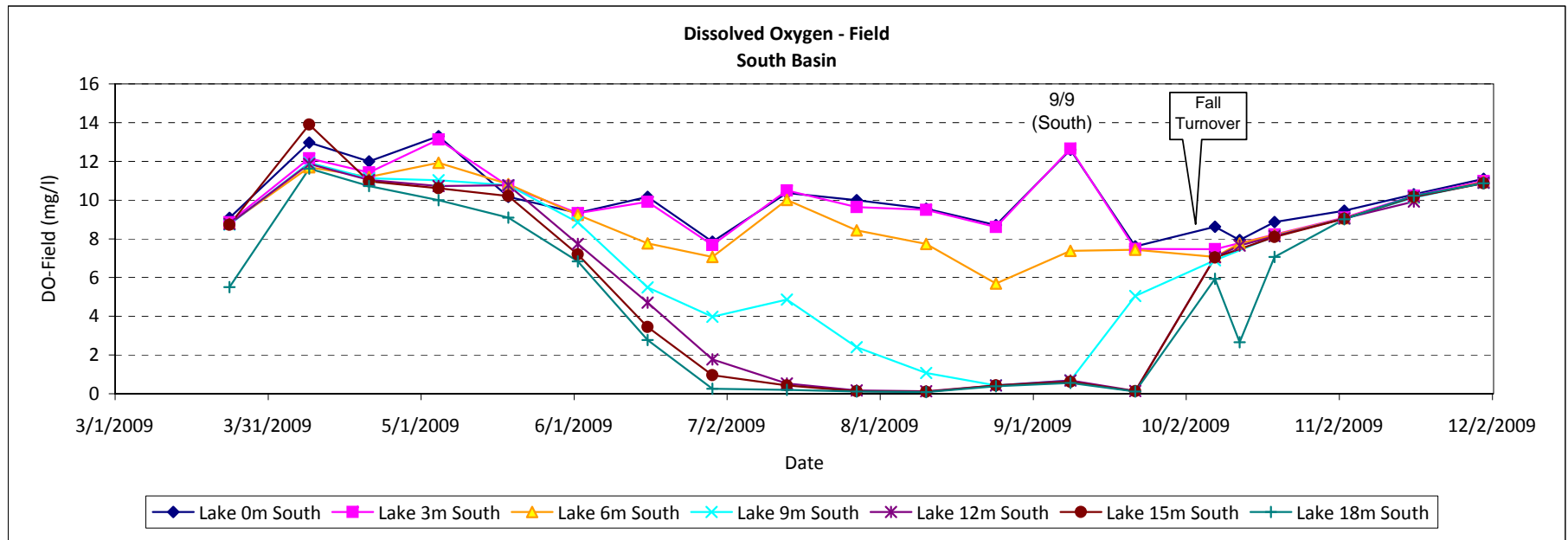


DO-Field	Frequency
5.7	1
6.4	0
7.1	2
7.8	6
8.5	2
9.2	3
10	1
11	3
11	5
12	2
13	1
More	0

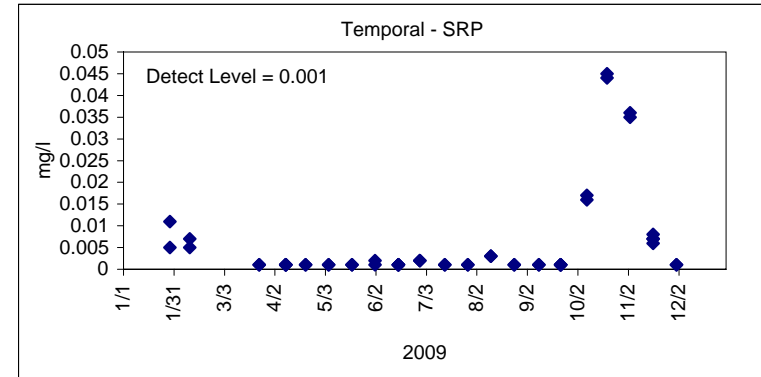
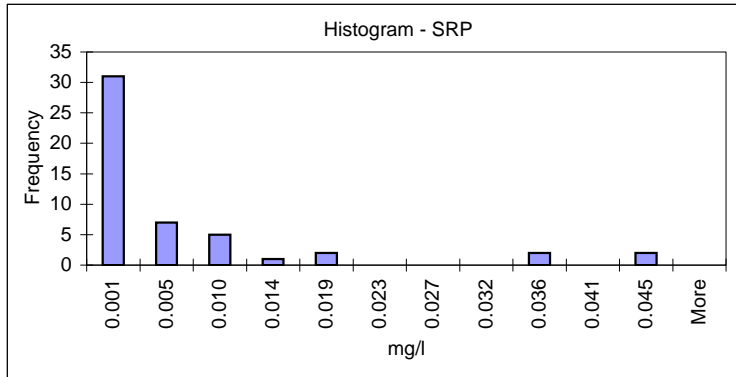


DO-Field	Frequency
0.08	1
1.5	25
2.8	5
4.2	4
5.6	5
7.0	6
8.4	11
9.8	11
11	29
13	4
14	1
More	0

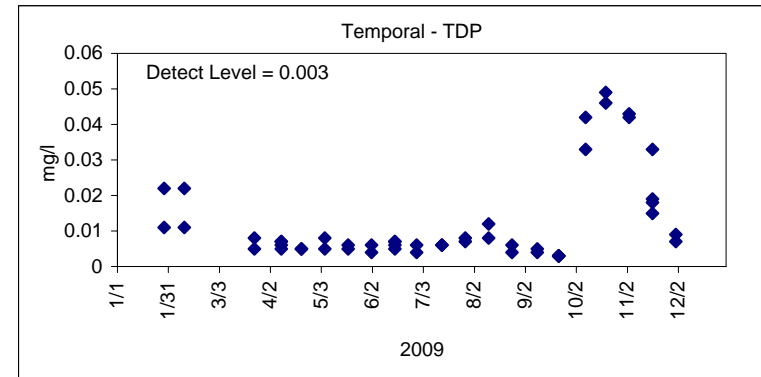
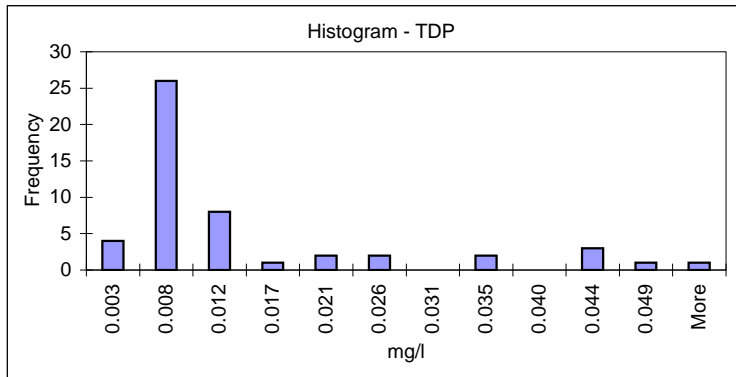




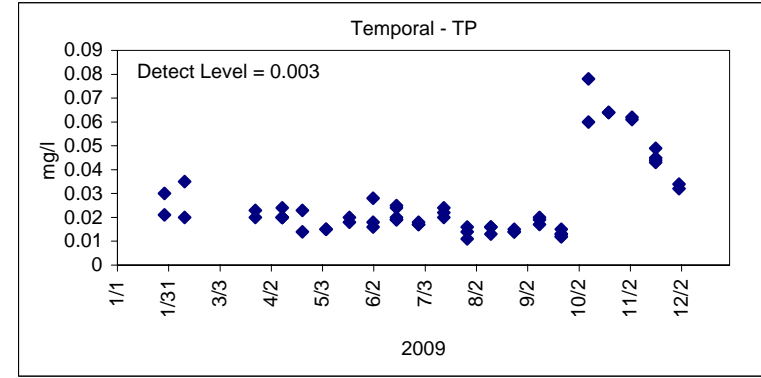
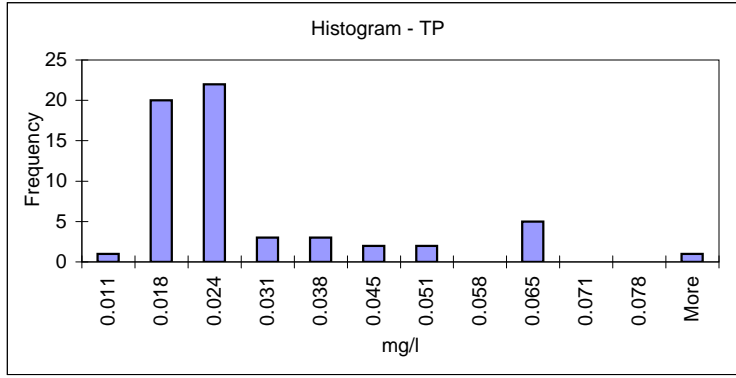
SRP	Frequency
0.001	31
0.005	7
0.010	5
0.014	1
0.019	2
0.023	0
0.027	0
0.032	0
0.036	2
0.041	0
0.045	2
More	0



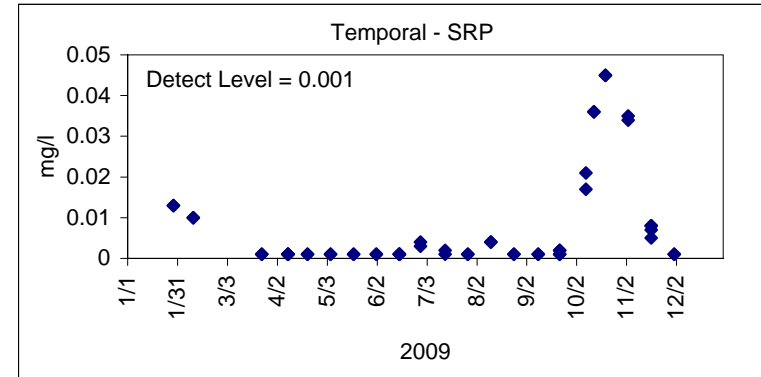
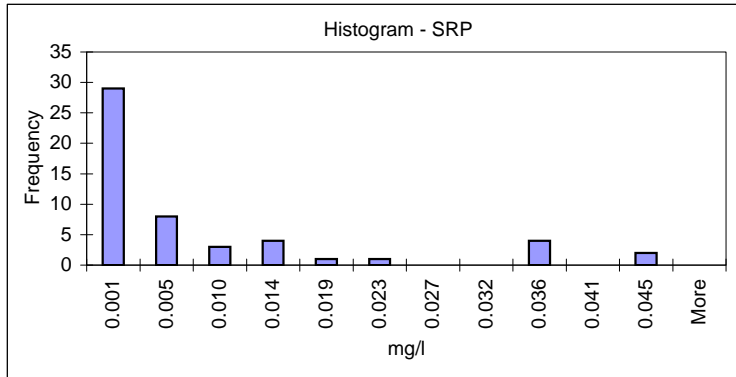
TDP	Frequency
0.003	4
0.008	26
0.012	8
0.017	1
0.021	2
0.026	2
0.031	0
0.035	2
0.040	0
0.044	3
0.049	1
More	1



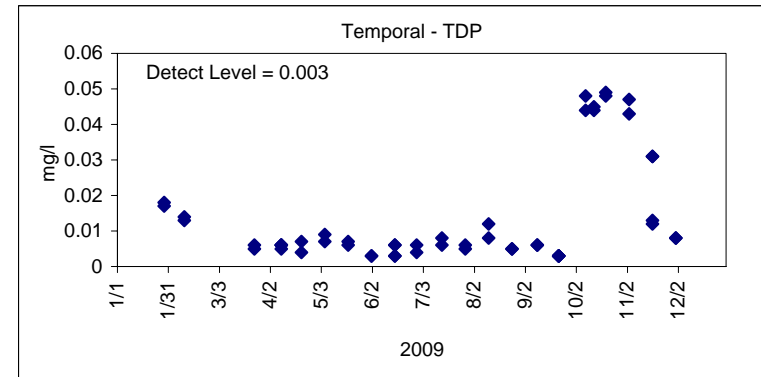
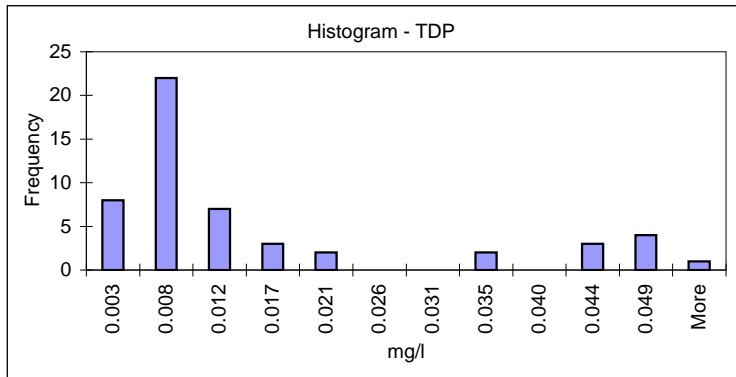
TP	Frequency
0.011	1
0.018	20
0.024	22
0.031	3
0.038	3
0.045	2
0.051	2
0.058	0
0.065	5
0.071	0
0.078	0
More	1



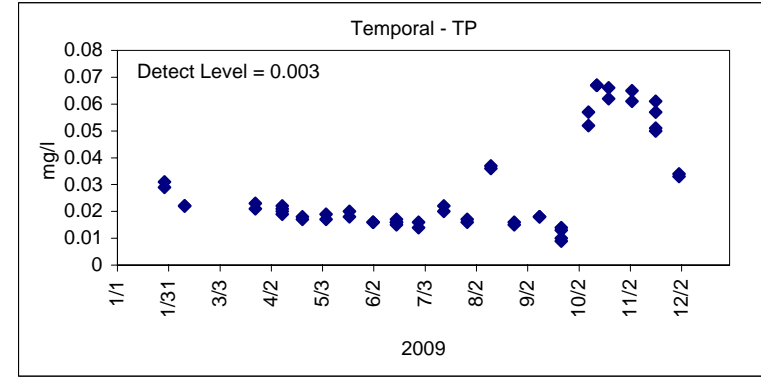
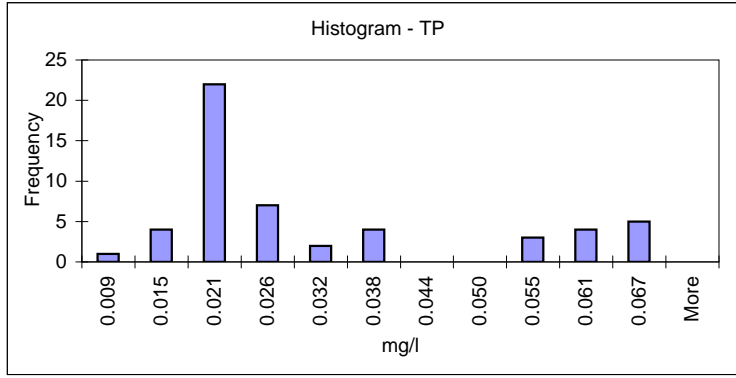
SRP	Frequency
0.001	29
0.005	8
0.010	3
0.014	4
0.019	1
0.023	1
0.027	0
0.032	0
0.036	4
0.041	0
0.045	2
More	0



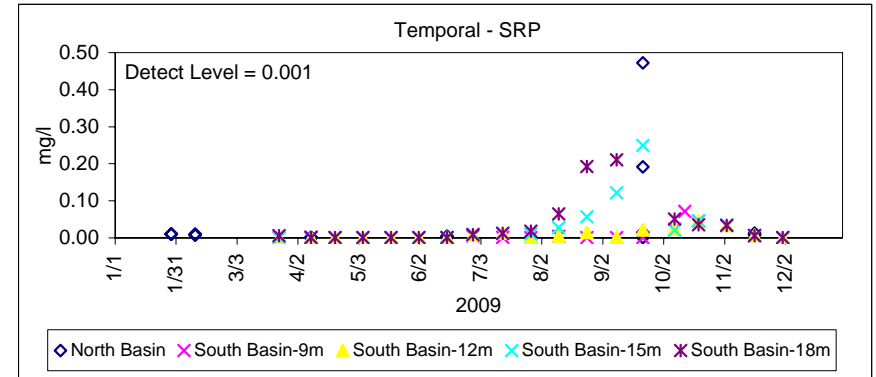
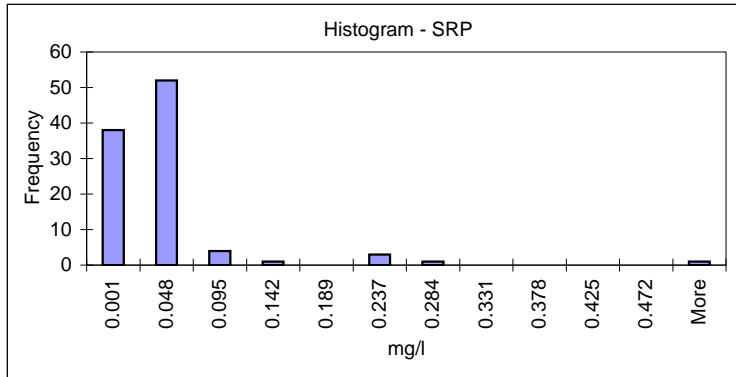
TDP	Frequency
0.003	8
0.008	22
0.012	7
0.017	3
0.021	2
0.026	0
0.031	0
0.035	2
0.040	0
0.044	3
0.049	4
More	1



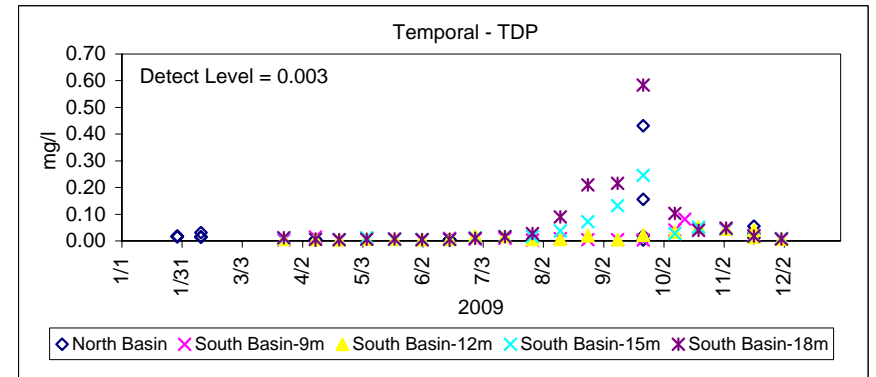
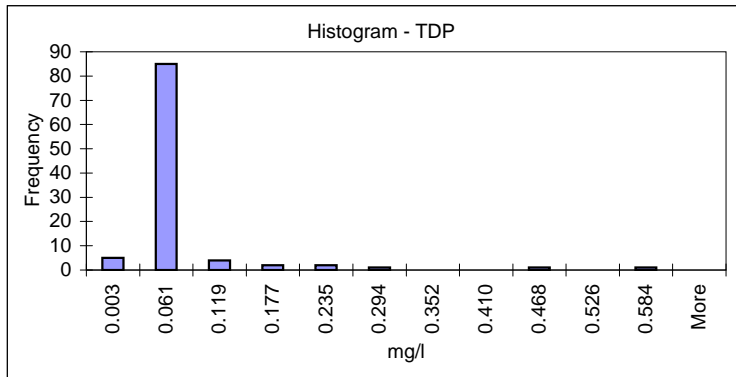
TP	Frequency
0.009	1
0.015	4
0.021	22
0.026	7
0.032	2
0.038	4
0.044	0
0.050	0
0.055	3
0.061	4
0.067	5
More	0



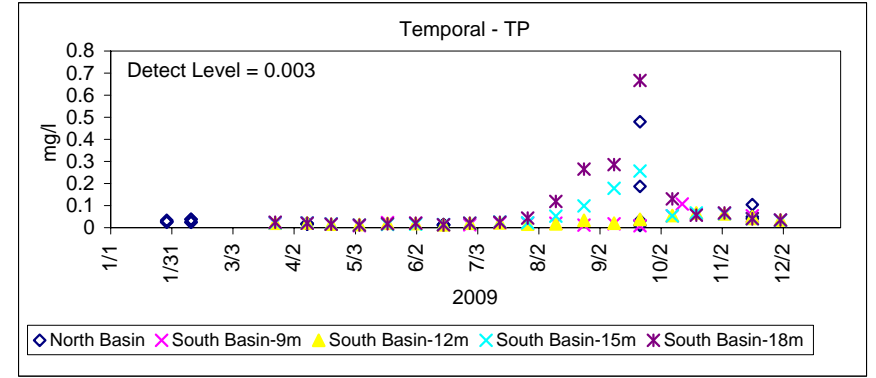
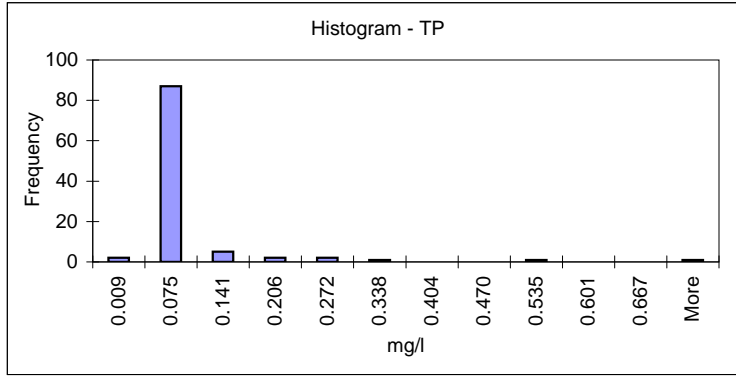
SRP	Frequency
0.001	38
0.048	52
0.095	4
0.142	1
0.189	0
0.237	3
0.284	1
0.331	0
0.378	0
0.425	0
0.472	0
More	1



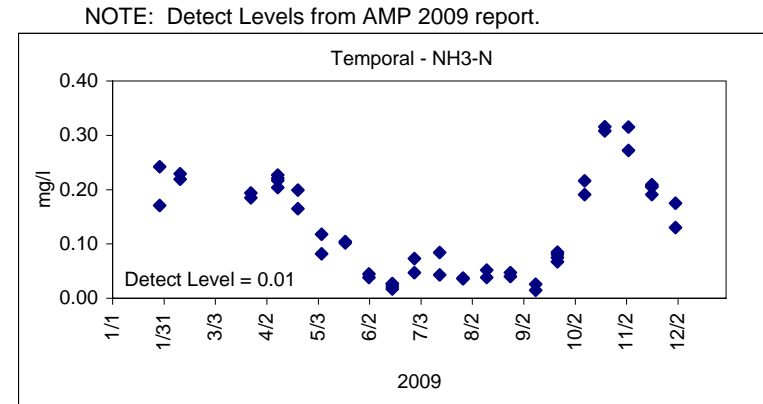
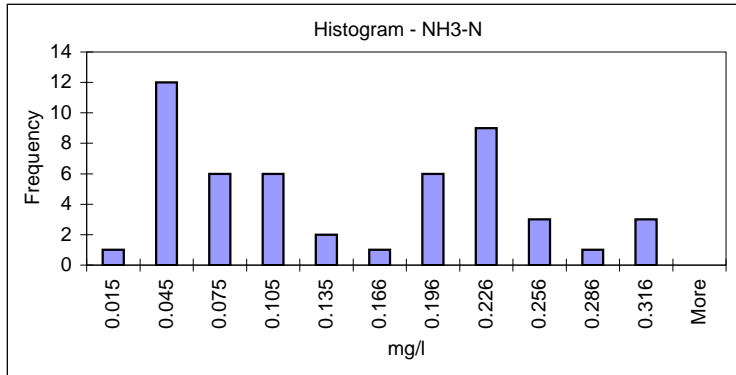
TDP	Frequency
0.003	5
0.061	85
0.119	4
0.177	2
0.235	2
0.294	1
0.352	0
0.410	0
0.468	1
0.526	0
0.584	1
More	0



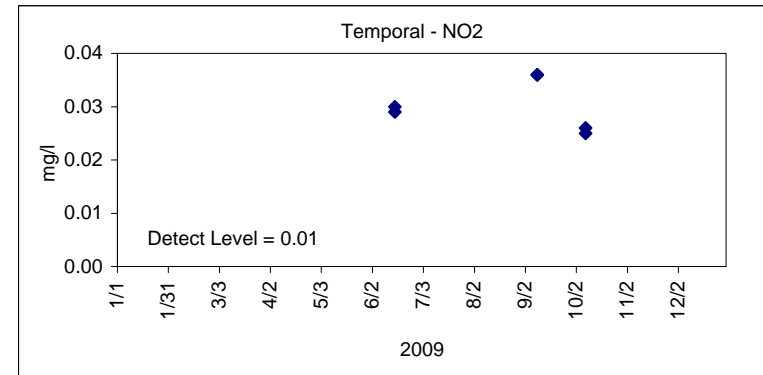
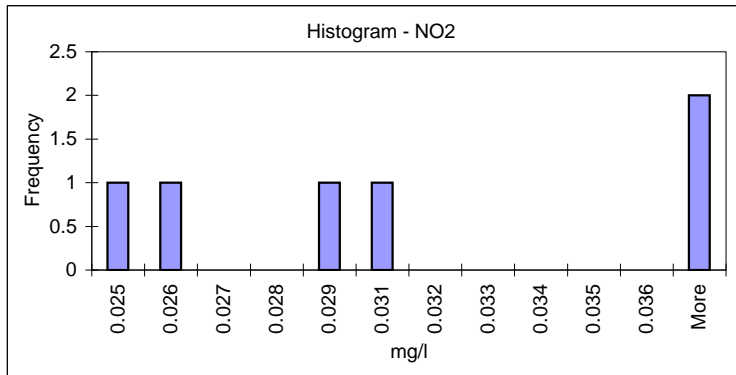
TP	Frequency
0.009	2
0.075	87
0.141	5
0.206	2
0.272	2
0.338	1
0.404	0
0.470	0
0.535	1
0.601	0
0.667	0
More	1



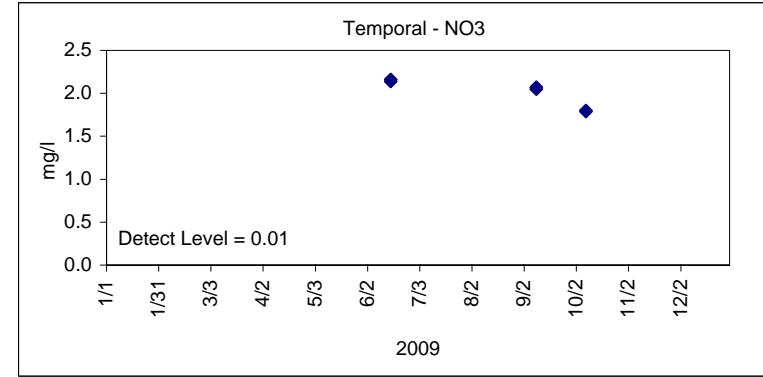
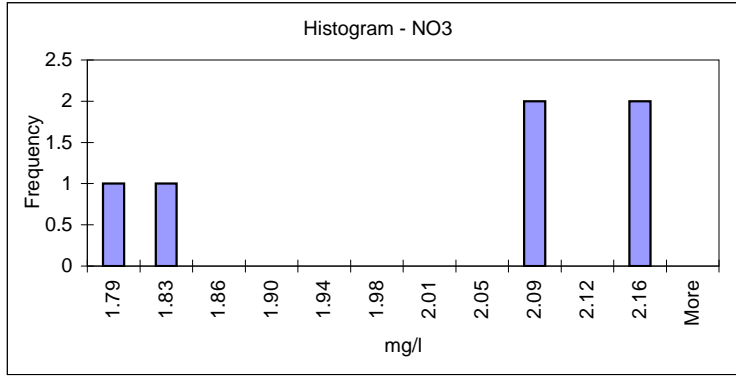
NH3-N	Frequency
0.015	1
0.045	12
0.075	6
0.105	6
0.135	2
0.166	1
0.196	6
0.226	9
0.256	3
0.286	1
0.316	3
More	0



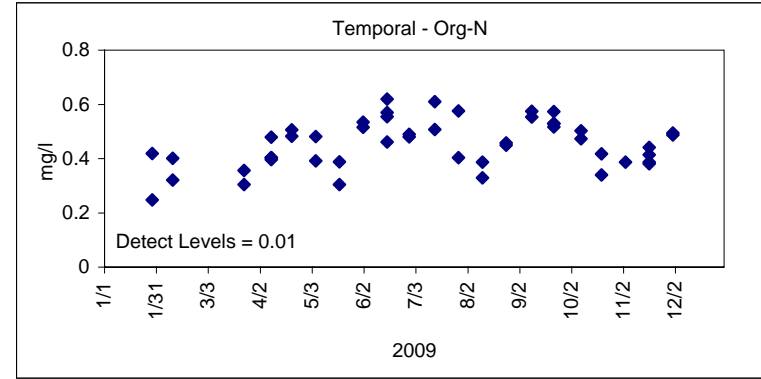
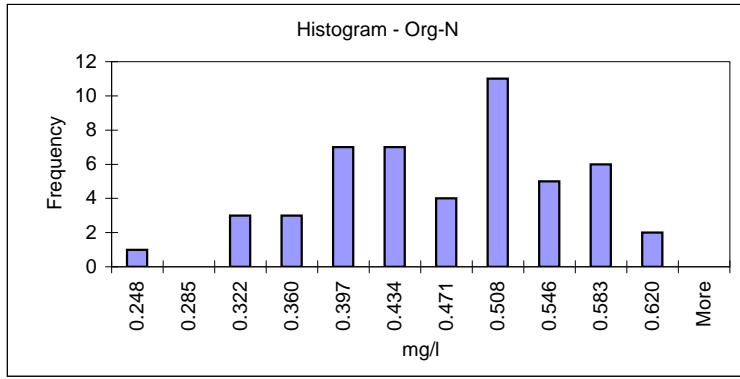
NO2	Frequency
0.025	1
0.026	1
0.027	0
0.028	0
0.029	1
0.031	1
0.032	0
0.033	0
0.034	0
0.035	0
0.036	0
More	2



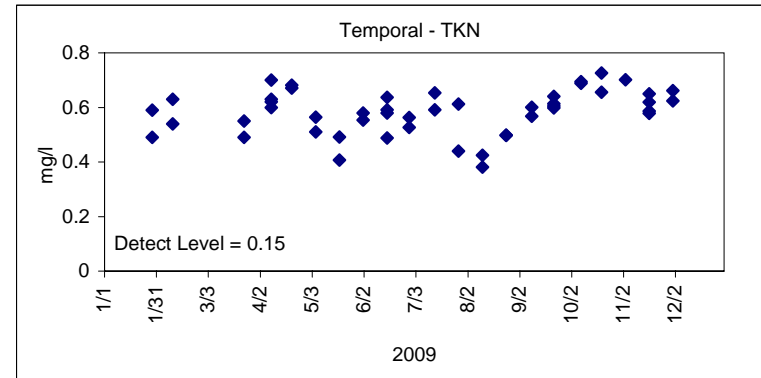
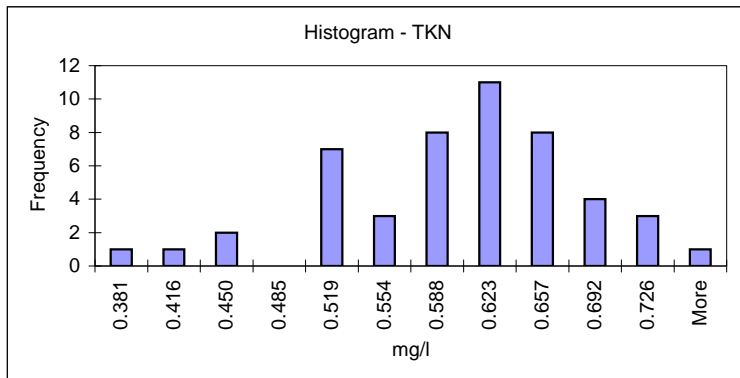
NO3	Frequency
1.79	1
1.83	1
1.86	0
1.90	0
1.94	0
1.98	0
2.01	0
2.05	0
2.09	2
2.12	0
2.16	2
More	0



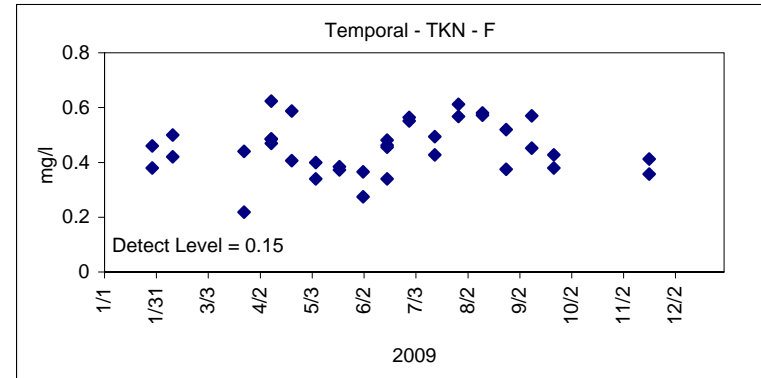
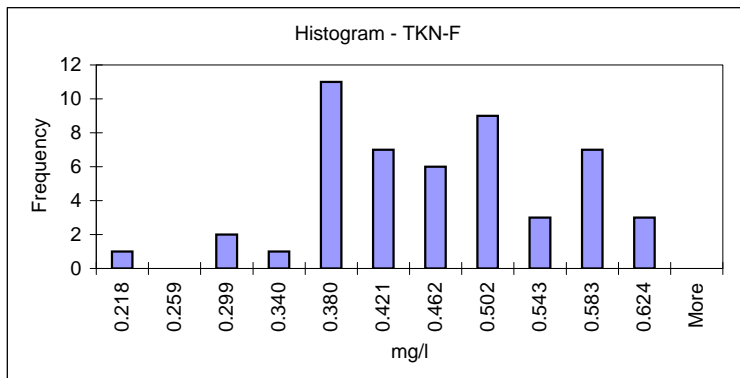
ORG-N	Frequency
0.248	1
0.285	0
0.322	3
0.360	3
0.397	7
0.434	7
0.471	4
0.508	11
0.546	5
0.583	6
0.620	2
More	0



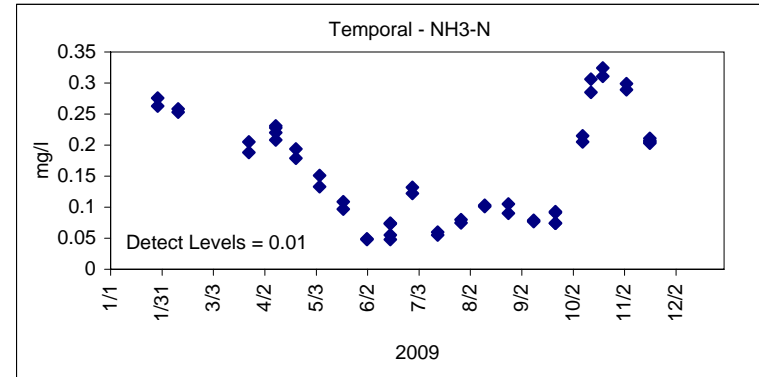
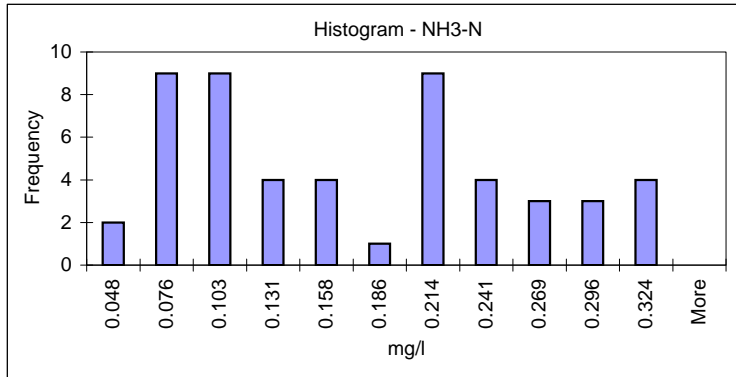
TKN	Frequency
0.381	1
0.416	1
0.450	2
0.485	0
0.519	7
0.554	3
0.588	8
0.623	11
0.657	8
0.692	4
0.726	3
More	1



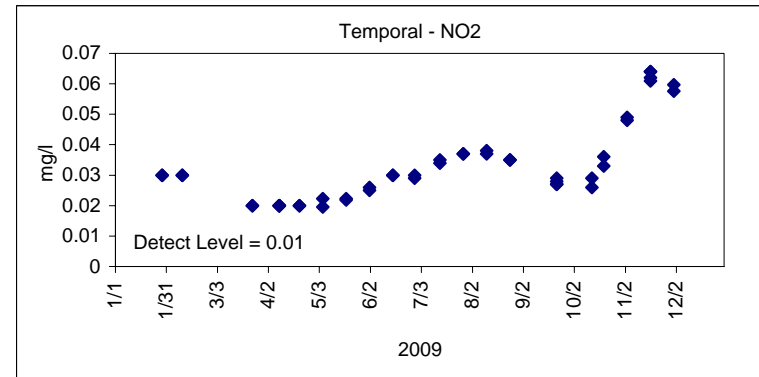
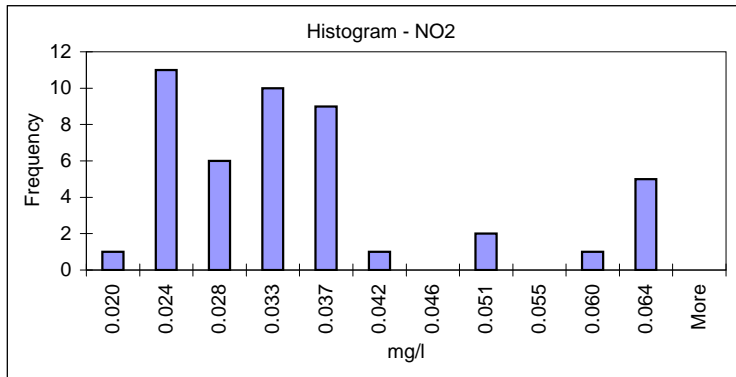
TKN-F	Frequency
0.218	1
0.259	0
0.299	2
0.340	1
0.380	11
0.421	7
0.462	6
0.502	9
0.543	3
0.583	7
0.624	3
More	0



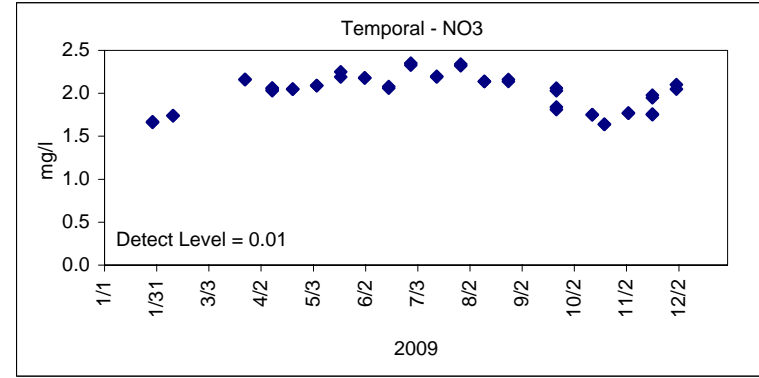
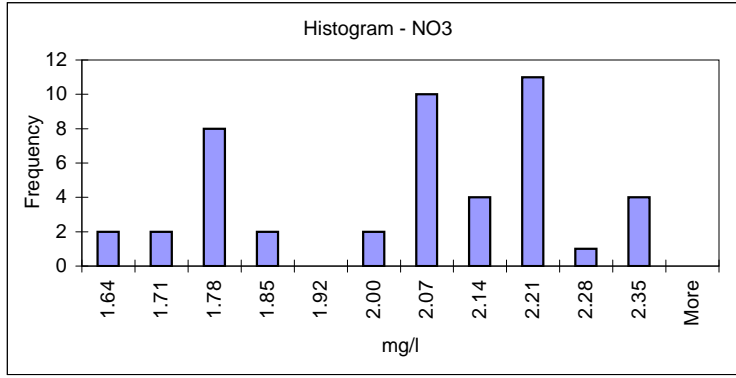
NH3-N	Frequency
0.048	2
0.076	9
0.103	9
0.131	4
0.158	4
0.186	1
0.214	9
0.241	4
0.269	3
0.296	3
0.324	4
More	0



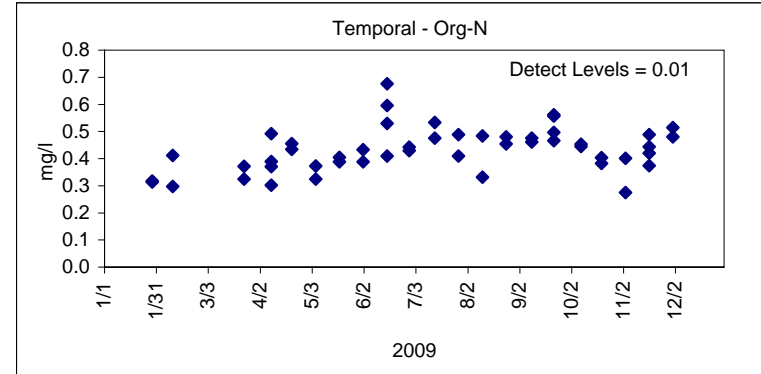
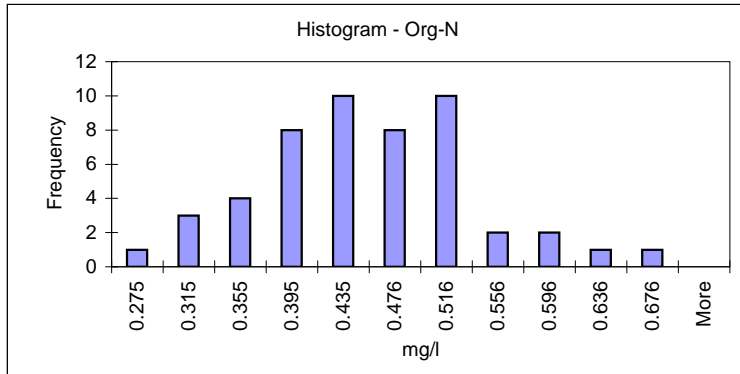
NO2	Frequency
0.020	1
0.024	11
0.028	6
0.033	10
0.037	9
0.042	1
0.046	0
0.051	2
0.055	0
0.060	1
0.064	5
More	0



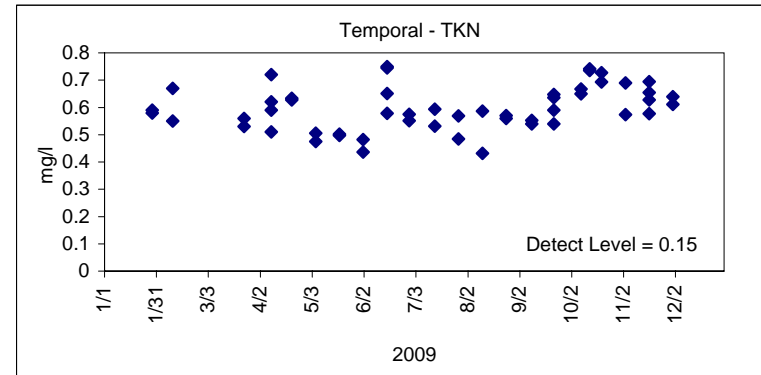
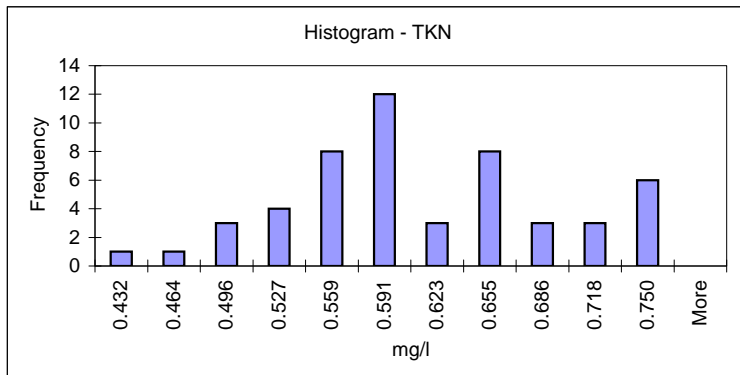
NO3	Frequency
1.64	2
1.71	2
1.78	8
1.85	2
1.92	0
2.00	2
2.07	10
2.14	4
2.21	11
2.28	1
2.35	4
More	0



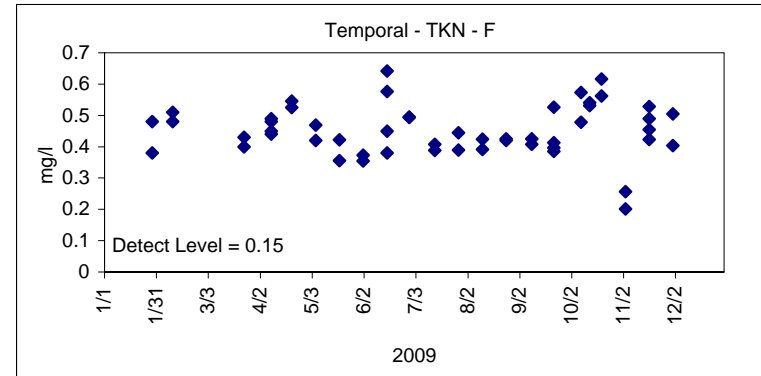
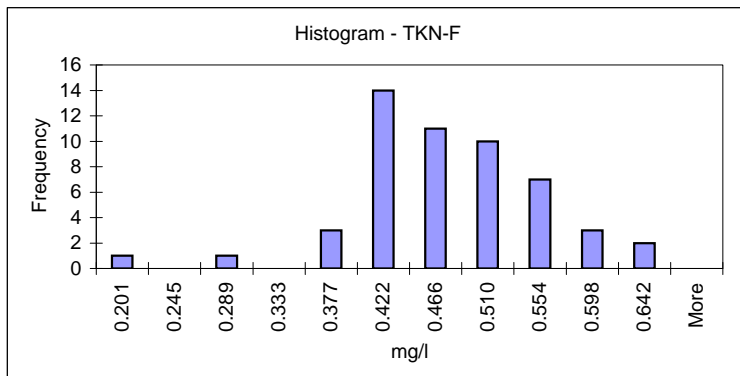
ORG-N	Frequency
0.275	1
0.315	3
0.355	4
0.395	8
0.435	10
0.476	8
0.516	10
0.556	2
0.596	2
0.636	1
0.676	1
More	0



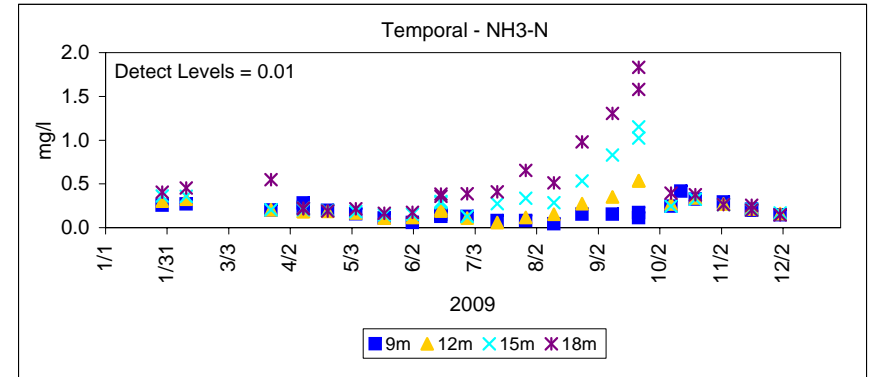
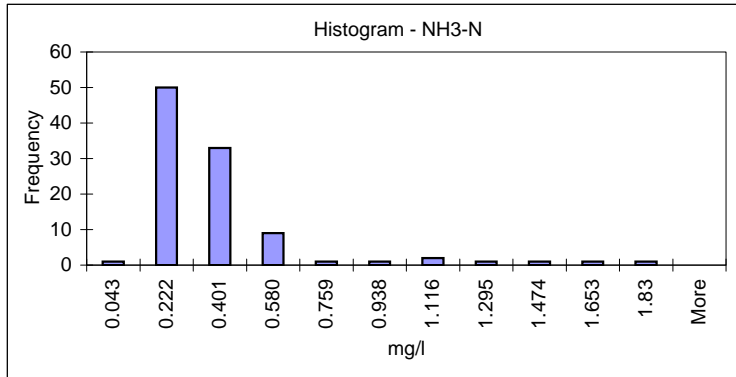
TKN	Frequency
0.432	1
0.464	1
0.496	3
0.527	4
0.559	8
0.591	12
0.623	3
0.655	8
0.686	3
0.718	3
0.750	6
More	0



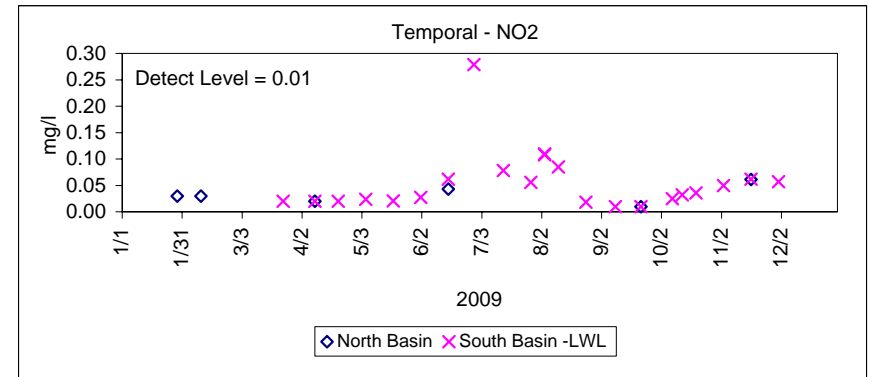
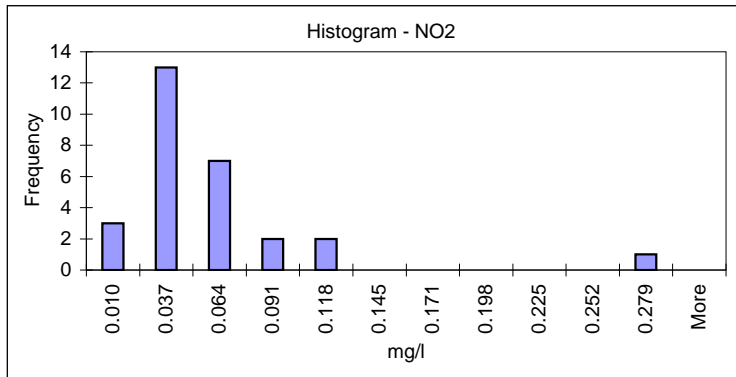
TKN-F	Frequency
0.201	1
0.245	0
0.289	1
0.333	0
0.377	3
0.422	14
0.466	11
0.510	10
0.554	7
0.598	3
0.642	2
More	0



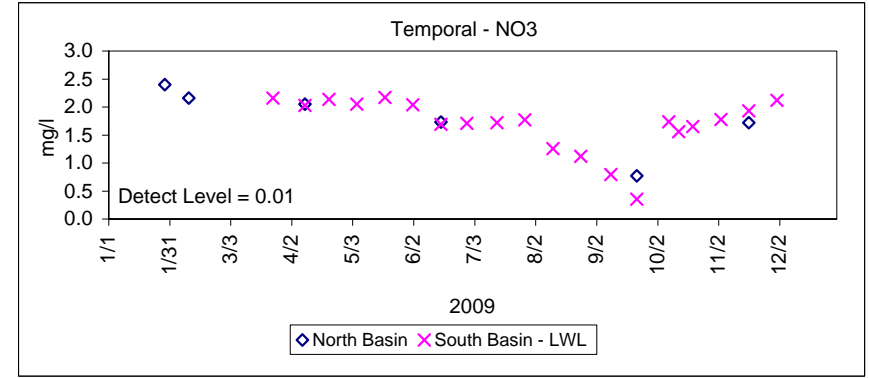
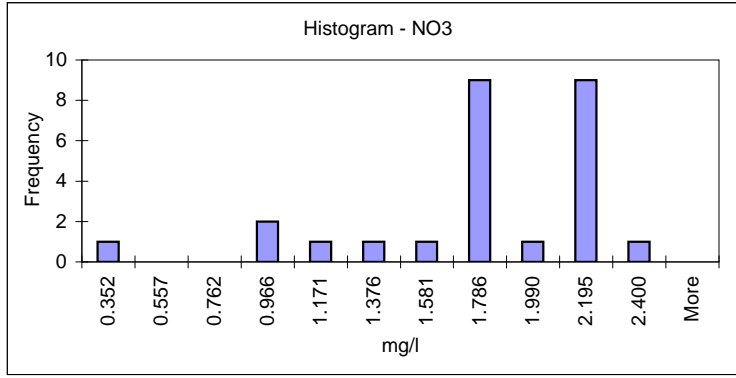
NH3-N	Frequency
0.043	1
0.222	50
0.401	33
0.580	9
0.759	1
0.938	1
1.116	2
1.295	1
1.474	1
1.653	1
1.83	1
More	0



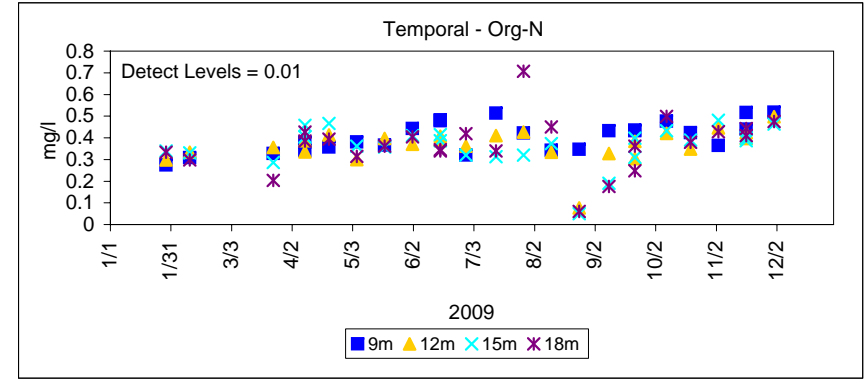
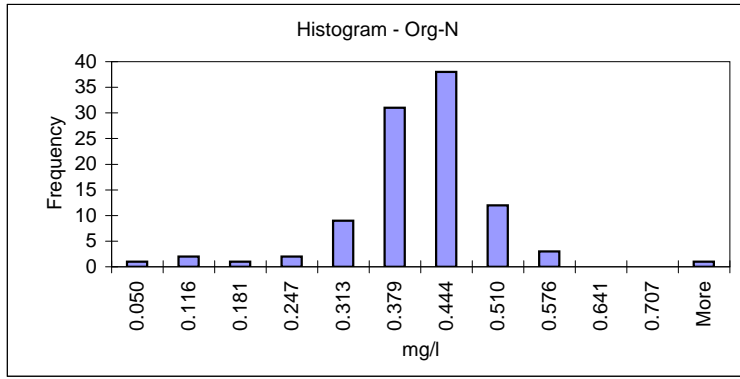
NO2	Frequency
0.010	3
0.037	13
0.064	7
0.091	2
0.118	2
0.145	0
0.171	0
0.198	0
0.225	0
0.252	0
0.279	1
More	0



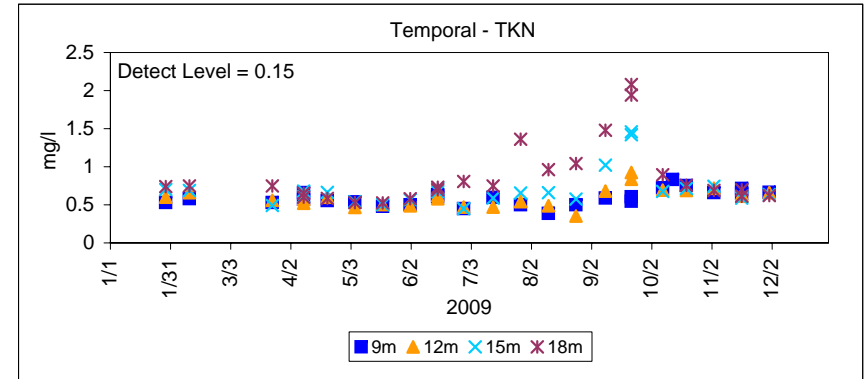
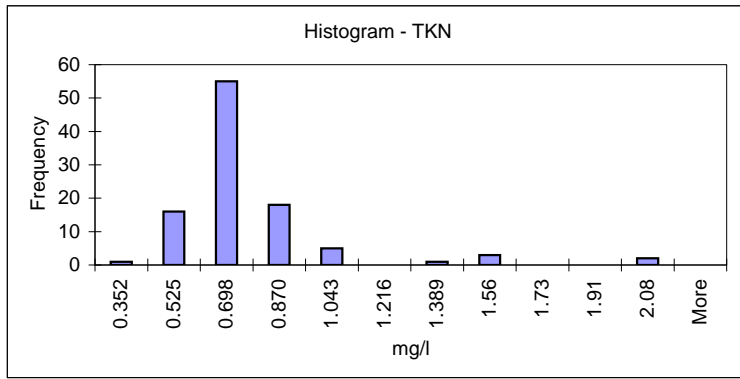
NO3	Frequency
0.352	1
0.557	0
0.762	0
0.966	2
1.171	1
1.376	1
1.581	1
1.786	9
1.990	1
2.195	9
2.400	1
More	0



ORG-N	Frequency
0.050	1
0.116	2
0.181	1
0.247	2
0.313	9
0.379	31
0.444	38
0.510	12
0.576	3
0.641	0
0.707	0
More	1



TKN	Frequency
0.352	1
0.525	16
0.698	55
0.870	18
1.043	5
1.216	0
1.389	1
1.56	3
1.73	0
1.91	0
2.08	2
More	0



TKN-F	Frequency
0.203	1
0.385	13
0.566	59
0.748	18
0.930	3
1.112	2
1.293	1
1.475	2
1.657	0
1.84	1
2.02	1
More	0

