TMDL Data Evaluation

Laboratory Data

TMDL Audit: _____ Date: _____

Laboratory: _____ Field: _____

Laboratory Name: _____ Certification #: _____

Address: _____

_____

_____

Phone: _____ Fax: _____

Laboratory Director: _____ Phone: _____

QA Officer: _____ Phone: _____

Participating Laboratory Staff:

Name	Title	Areas of Responsibility

EA Staff:

TMDL Data Evaluation

Laboratory Data

TMDL Audit: _____ Date: _____

Laboratory: _____ Field: _____

Audited Project: *(if consecutive numbers, specify the range further verification occurs at the end)*

TABLE 1 – SUMMARY OF INFORMATION RETRIEVED FROM STORET (

Add field and laboratory ID information from the laboratory records in the shaded areas. Otherwise verify Ids by entering "Y" or the ID from the organization records.

DATE	Station ID	From Lab Records		Parameter	Result	Unit	Comment	MDL	Sample Fraction	Depth (m)
		Field ID	Lab ID							

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 2 – METHOD/CERTIFICATION SUMMARY			
Lab Certified? Y/N[1]	Method / Analyte	Field ID	Lab ID
	BOD		
	Chlorophyll A		
	Fecal Coliform		
	NH3		
	NO2		
	NO3		
	NOx(NO_2+NO_3)		
	o-P		
	TKN		
	TP		
	TSS		
	Turbidity		
	Hardness		
	Calcium		

[1] *Certification status at the time that samples were analyzed*

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 2 – METHOD/CERTIFICATION SUMMARY

Lab Certified? Y/N[1]	Method / Analyte	Field ID	Lab ID
	Magnesium		
	Arsenic		
	Copper		
	Lead		
	Mercury		

[1] *Certification status at the time that samples were analyzed*

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

COMPLETE GRAY AREA(S) OR INCLUDE ADDITIONAL INFORMATION ONLY IF THE RESPONSE TO A GIVEN QUESTION IS "N". IF A GIVEN RESPONSE ONLY APPLIES TO ONE OF THE AUDITED SAMPLES, RECORD THE LABORATORY ID OF THE AFFECTED SAMPLE.

REPRESENTATIVENESS

_____ The samples as characterized by the following criteria accurately represent the samples as received by the laboratory.

Holding times were met.

Proper and acceptable preservation was documented.

_____ Samples that did not meet holding times or were not properly preserved were appropriately qualified

Enter Y or include tables as part of the final report.

TABLE 3 – HOLDING TIMES SUMMARY

Holding Times Were Met: *(enter information into shaded area **only if** holding time was not met*

Parameter	Requirement	Lab ID	Collection		Prep		Analysis		Use Q? Y/N
			Date	Time	Date	Time	Date	Time	
BOD	48 h								
Chlorophyll A	24h/21d 48h (if tested immediately								
Fecal Coliform	6 h								
NH3	28 d								
NO2	48 h								
NO3	48 h								
NOx	28 d								
o-P	48 h								
TKN	28 d								
TP	28 d								

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 3 – HOLDING TIMES SUMMARY

Holding Times Were Met: *(enter information into shaded area **only if** holding time was not met*

Parameter	Requirement	Lab ID	Collection		Prep		Analysis		Use Q? Y/N
			Date	Time	Date	Time	Date	Time	
TSS	7 d								
Turbidity	48 h								
Hardness	6 mo								
Calcium	6 mo								
Magnesium	6 mo								
Arsenic	6 mo								
Copper	6 mo								
Lead	6 mo								
Mercury	28 da								

TABLE 4 – ACCEPTABLE PRESERVATION

Laboratory checked samples for proper and acceptable preservation

Lab ID	Parameter	pH		Temperature		Used "Y"? Y/N
		Requirement	Y *or enter pH value*	Requirement	Y *or enter lab temperature*	
	BOD			4+/-2°C		
	Chlorophyll A			4+/-2°C		
	Fecal Coliform			4+/-2°C		
	NH3	<2		4+/-2°C		

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 4 – ACCEPTABLE PRESERVATION
Laboratory checked samples for proper and acceptable preservation

Lab ID	Parameter	pH		Temperature		Used "Y"? Y/N
		Requirement	Y *or enter pH value*	Requirement	Y *or enter lab temperature*	
	NO2			4+/-2°C		
	NO3			4+/-2°C		
	NOx	<2		4+/-2°C		
	o-P			4+/-2°C		
	TKN	<2		4+/-2°C		
	TP	<2		4+/-2°C		
	TSS			4+/-2°C		
	Turbidity			4+/-2°C		
	Hardness	<2				
	Calcium	<2				
	Magnesium	<2				
	Arsenic	<2				
	Copper	<2				
	Lead	<2				

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 4 – ACCEPTABLE PRESERVATION Laboratory checked samples for proper and acceptable preservation						
Lab ID	Parameter	pH		Temperature		Used "Y"? Y/N
		Requirement	Y *or enter pH value*	Requirement	Y *or enter lab temperature*	
	Mercury	<2				

COMPARABILITY

_____ The laboratory demonstrated that the results are comparable to other data by including in the associated analysis/prep batch an acceptable SRM, QC Check Sample or other sample with a verified concentration or appropriately characterized unacceptable results.

Enter Y or include tables as part of the final report.

TABLE 5 – QC CHECK SAMPLE EVALUATION The QC Check Sample or other sample type (e.g., SRM) with a verified concentration is associated with the analysis/prep batch and is acceptable.					
			QC Check Sample		
Lab ID	Parameter	Acceptance Criterion	QC Sample ID	Y *or enter observed & true values, and % recovery*	"J" Used? (Y/N)
	BOD	GGA 198±30.5mg/L			
	Chlorophyll A	*Enter lab acceptance limits:*			
	Cu in seawater (required SRM)	*Enter mfg acceptance limits:*			

SENSITIVITY

_____ The results are reported to a level that is sufficient for making decisions. *USABILITY CRITERION*

Enter Y or include tables as part of the final report.

TABLE 6 – SENSITIVITY EVALUATION Laboratory reported values to a PQL that is equal to or less than the TMDL usability levels						
Lab ID	Parameter	Acceptable Minimum Reporting Level	Y *or enter reported value*[2]	TMDL Usability	Laboratory Reported Limit MDL PQL *circle one*	Y *or enter reported* ***PQL***[2]
	BOD	2 mg/L				
	Chlorophyll A			3 ug/L		

[2] *Note any obvious reasons for values that do not meet the listed TMDL usability concentration (e.g., sample dilution)*

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 6 – SENSITIVITY EVALUATION
Laboratory reported values to a PQL that is equal to or less than the TMDL usability levels

Lab ID	Parameter	Acceptable Minimum Reporting Level	Y *or enter reported value*[2]	TMDL Usability	Laboratory Reported Limit MDL PQL *circle one*	Y *or enter reported* ***PQL***[2]
	Fecal Coliform	2 cfu/100 mL (colonies/100 mL)				
	NH3			80 ug/L		
	NO2			40 ug/L		
	NO3			40 ug/L		
	NOx			40 ug/L		
	o-P			40 ug/L		
	TKN			400 ug/L		
	TP			40 ug/L		
	Turbidity	0.1 NTU				
	TSS	1 mg/L				
	Hardness			25 mg/L		
	Calcium					
	Magnesium					
	Arsenic*					

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 6 – SENSITIVITY EVALUATION Laboratory reported values to a PQL that is equal to or less than the TMDL usability levels						
Lab ID	Parameter	Acceptable Minimum Reporting Level	Y *or enter reported value*[2]	TMDL Usability	Laboratory Reported Limit MDL PQL *circle one*	Y *or enter reported* ***PQL***[2]
	Copper*					
	Lead*					
	Mercury*					

2. *Note any obvious reasons for values that do not meet the listed TMDL usability concentration (e.g., sample dilution)*
* *Use hardness calculator to determine minimum water quality criterion*

PRECISION

_____ The laboratory demonstrated acceptable precision for each set of duplicate analyses or properly characterized unacceptable precision. *USABILITY CRITERION*

Enter Y or include tables as part of the final report.

TABLE 7 – PRECISION EVALUATION Laboratory duplicates meet acceptance limits <=20% RPD or RSD or laboratory acceptance limits, whichever is more stringent										
Parameter	Lab ID *if performed in the same batch, enter information* ***once***	LCSD ***Enter a "-" if no LCD was done***			MSD ***use only if an LCSD is not analyzed***			SD ***use only if an LCSD is not analyzed***		
		Lab Limits* RPD RSD *circle units*	Y *or enter value*	Use J? Y/N	Lab Limits* RPD RSD *circle units*	Y *or enter value*	Use J? Y/N	Lab Limits* RPD RSD *circle units*	Y *or enter value*	Use J? Y/N
BOD										
Chlorophyll A										
NH3										
NO2										
NO3										

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 7 – PRECISION EVALUATION
Laboratory duplicates meet acceptance limits <=20% RPD or RSD or laboratory acceptance limits, whichever is more stringent

Parameter	Lab ID *if performed in the same batch, enter information **once***	LCSD *Enter a "-" if no LCD was done*			MSD *use only if an LCSD is not analyzed*			SD *use only if an LCSD is not analyzed*		
		Lab Limits* RPD RSD *circle units*	Y *or enter value*	Use J? Y/N	Lab Limits* RPD RSD *circle units*	Y *or enter value*	Use J? Y/N	Lab Limits* RPD RSD *circle units*	Y *or enter value*	Use J? Y/N
NOx										
o-P										
TKN										
TP										
TSS										
Turbidity										
Hardness										
Calcium										
Magnesium										
Arsenic										
Copper										
Lead										
Mercury										

*Enter only if lab limits are **greater than** 20%. Make a comment about acceptance limits & evaluate whether the 20% criterion was met.

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

BIAS

_____ The bias of the samples was accurately characterized by the laboratory:
Laboratory spikes
Concentration of laboratory spikes *USABILITY CRITERION*
Non-detect blanks or blanks values that do not significantly affect the sample result. *USABILITY CRITERION*
_____ Unacceptable recoveries or blank problems were appropriately qualified.

Enter Y or include tables as part of the final report.

TABLE 8 – SPIKE RECOVERY EVALUATION
Laboratory spikes meet acceptance limits of 80-120% recovery or laboratory acceptance limits, whichever are more stringent

Parameter	Lab ID *if performed in the same batch, enter information **once***	LCS *Enter a "-" if an LCS is not included with the preparation batch*			MS *Use only if an LCS is not included with the preparation batch*		
		Lab Limits^ % rcvy	Y *or enter % recovery*	Use J? Y/N	Lab Limits % rcvy	Y *or enter % recovery*	Use J? Y/N
NH3							
NO2							
NO3							
NOx							
o-P							
TKN							
TP							
Calcium#							
Magnesium#					@		
					@		
					@		
Arsenic#							
Copper#							

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 8 – SPIKE RECOVERY EVALUATION
Laboratory spikes meet acceptance limits of 80-120% recovery or laboratory acceptance limits, whichever are more stringent

Parameter	Lab ID *if performed in the same batch, enter information **once***	LCS *Enter a "-" if an LCS is not included with the preparation batch*			MS *Use only if an LCS is not included with the preparation batch*		
		Lab Limits^ % rcvy	Y *or enter % recovery*	Use J? Y/N	Lab Limits % rcvy	Y *or enter % recovery*	Use J? Y/N
Lead#							
Mercury#							

^*Enter only if laboratory limits are less stringent that stated acceptance criteria.*
#*Note: The LCS must have a recovery of 85-115% and the MS must have a recovery within 70-130%.*
@*For arsenic, evaluate the matrix spike that is associated with the preparation batch.*

TABLE 9 – REPRESENTATIVE SPIKE EVALUATION
The concentration of spiked samples is representative of audited samples in the associated set. The maximum spiked sample concentration can be no greater than 5X the concentration of the audited sample with the highest value. If any audited sample is non-detect, spike concentration must be no greater than 2X the TMDL usability criterion.

Parameter	Lab ID *if performed in the same batch, enter information **once***	2X TMDL Usability Criterion	5 X conc. of highest audited sample	LCS Y or *Enter spiked sample concentration*	MS** Y *or Enter spiked sample concentration*
NH3		160 ug/L			
NO2		80 ug/L			
NO3		80 ug/L			
NOx		80 ug/L			
o-P		80 ug/L			
TKN		800 ug/L			
TP		80 ug/L			
Calcium					

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 9 – REPRESENTATIVE SPIKE EVALUATION

The concentration of spiked samples is representative of audited samples in the associated set. The maximum spiked sample concentration can be no greater than 5X the concentration of the audited sample with the highest value. If any audited sample is non-detect, spike concentration must be no greater than 2X the TMDL usability criterion.

Parameter	Lab ID *if performed in the same batch, enter information **once***	2X TMDL Usability Criterion	5 X conc. of highest audited sample	LCS Y or *Enter spiked sample concentration*	MS** Y *or Enter spiked sample concentration*
Magnesium					
Arsenic					
Copper					
Cu in sea water		##			
Lead					
Mercury					

*** - Use only if an LCS is not included with the preparation batch (except copper in seawater)*
- Matrix spike is required. If audited samples are non-detect, the concentration of the spike must be no greater than 2 X the reported laboratory seawater PQL or 2.9 ug/ L (whichever is greater).

_____ For Cadmium Reduction: Did all associated efficiency standards (nitrate) meet the criterion of 75-125% of the comparable nitrite standard(s)? (Y *or enter % efficiency*)

TABLE 10 – BLANK EVALUATION

Associated Sample Concentrations are greater than 10X the associated blank values *evaluate the preparation batch method blank, and the blanks that bracket the sample result*

Lab ID	Analyte	Laboratory Method Blank			Other (identify)*:_____			Other (identify) *:_____			Field *(if collected)*			
											Equipment		Field	
		Y *or enter blank value*	Sample Conc.	Use V? Y/N	Y *or enter blank value*	Sample Conc.	Use V? Y/N	Y *or enter blank value*	Sample Conc.	Use V? Y/N	Y *or enter blank value*	Sample Conc.	Y *or enter blank value*	Sample Conc.
	NH3													
	NO2													
	NO3													
	NOx													

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 10 – BLANK EVALUATION
Associated Sample Concentrations are greater than 10X the associated blank values *evaluate the preparation batch method blank, and the blanks that bracket the sample result*

Lab ID	Analyte	Laboratory Method Blank			Other (identify)*:_____			Other (identify) *:_____			Field *(if collected)*			
											Equipment		Field	
		Y *or enter blank value*	Sample Conc.	Use V? Y/N	Y *or enter blank value*	Sample Conc.	Use V? Y/N	Y *or enter blank value*	Sample Conc.	Use V? Y/N	Y *or enter blank value*	Sample Conc.	Y *or enter blank value*	Sample Conc.
	o-P													
	TKN													
	TP													
	TSS													
	Hardness													
	Calcium													
	Magnesium													
	Arsenic													
	Copper													
	Lead													
	Mercury													

**CA = Carryover Blank; Others used to assess contamination during prep or analysis:* _____

DATA INTEGRITY:

_____ The accuracy of the reported data was acceptable based on the following data quality indicators

Calibration Verification
Calibration Linearity
Proper Qualification of all results that are not bracketed with acceptable calibration/verification standards
Accurate Data Reduction
Analyte/method-specific requirements
Accurate records transcription

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

_____ Data were appropriately qualified if associated with unacceptable data quality indicators

Enter Y or include tables as part of the final report.

1. CALIBRATION

a. Number of standards

TABLE 11 – CALIBRATION ACCEPTANCE
The minimum number of standards were used to calibrate the instrument and the linearity of the initial calibration was equal to or greater than 0.995 CC.

Lab ID *if performed in the same batch, enter information **once***	Parameter *enter the concentrations of the standards used – include the concentration units*		Standards		Initial Calibration Linearity	
		Method #	Method Requirement	Y *or enter # of standards used*	Y *or enter observed CC*	Sample Analysis did not Proceed Y/N
	NH3	350.1	2			
		350.2	3			
		350.3	3			
	NO2	354.1	3			
	NO3	300.0	3			
		352.1	3			
		Calculated				
	NOx	353.1	3			
		353.2	3			
		353.3	3			
	o-P	300.0	3			
		365.1	3			

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 11 – CALIBRATION ACCEPTANCE
The minimum number of standards were used to calibrate the instrument and the linearity of the initial calibration was equal to or greater than 0.995 CC.

Lab ID *if performed in the same batch, enter information **once***	Parameter *enter the concentrations of the standards used – include the concentration units*	Method #	Standards: Method Requirement	Standards: Y *or enter # of standards used*	Initial Calibration Linearity: Y *or enter observed CC*	Initial Calibration Linearity: Sample Analysis did not Proceed Y/N
		365.2	3			
		365.3	2			
	TKN	351.1	3			
		351.2	3			
		351.3titr				
		Nessler	3			
		Electrode	3			
		351.4	3			
	TP	365.1	3			
		365.2	3			
		365.3	3			
		365.4	3			
	Turbidity^	FT 1600	1 *(in each range)*			

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 11 – CALIBRATION ACCEPTANCE
The minimum number of standards were used to calibrate the instrument and the linearity of the initial calibration was equal to or greater than 0.995 CC.

Lab ID *if performed in the same batch, enter information **once***	Parameter *enter the concentrations of the standards used – include the concentration units*		Standards		Initial Calibration Linearity	
		Method #	Method Requirement	Y *or enter # of standards used*	Y *or enter observed CC*	Sample Analysis did not Proceed Y/N
Metals		Flame or Furnace	4			
	Calcium					
	Magnesium					
	Arsenic					
	Copper					
	Lead					
Metals		ICPES or ICPMS	1 *(must be high standard)+ calib. blank*			
	Calcium					
	Magnesium					
	Arsenic					
	Copper					
	Lead					
	Mercury	Cold Vapor	5+blank			

^_____ Only Formazin or styrene divinyl benzene (SDVB) were used for the initial calibration (Y/N).

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

b. Verification

TABLE 12 – CALIBRATION ACCEPTABILITY

The calibration curve for the audited samples was verified with a second source QC check, and the audited samples were bracketed between acceptable calibration verifications. Calibration Verifications were within +/- 10% of the standard value.

Sample ID	Parameter	***2nd source*** *(Nearest one before audited sample)*^^			CCV			PQL Verification
		2nd Source *Y/N*	Y *or enter calculated % Rcvy*	Analysis did not Proceed (Y/N)	**Nearest one <u>before</u> audited sample** Y *or enter calculated % Rcvy*	**Nearest one <u>after</u> audited sample** Y *or enter calculated % Rcvy*	Use "J""? (Y/N)	**If sample values are < PQL** Y *or enter lowest standard*
	NH3							
	NO2							
	NO3							
	NOx							
	o-P							
	TKN							
	TP							
	Turbidity#							
	Hardness							
	Calcium							
	Magnesium							
	Arsenic							

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 12 – CALIBRATION ACCEPTABILITY
The calibration curve for the audited samples was verified with a second source QC check, and the audited samples were bracketed between acceptable calibration verifications. Calibration Verifications were within +/- 10% of the standard value.

Sample ID	Parameter	*2nd source* *(Nearest one before audited sample)*^^			CCV			PQL Verification
		2nd Source *Y/N*	Y *or enter calculated % Rcvy*	Analysis did not Proceed (Y/N)	**Nearest one before audited sample** Y *or enter calculated % Rcvy*	**Nearest one after audited sample** Y *or enter calculated % Rcvy*	Use "J""? (Y/N)	**If sample values are < PQL** Y *or enter lowest standard*
	Copper							
	Lead							
	Mercury							

SOP Acceptance (if used)
0.1 – 10 NTU +/- 10%
11-40 NTU +/- 8%
41-100 NTU +/- 6.5%
>100 NTU +/- 5%

^^ A second source may be a standard, a SRM, or other sample type with a verified concentration such as a QC Check Sample. The standard must have been prepared from a different lot or vendor, and the verified SRM or QC Check sample must have been verified by an organization that is external to the laboratory.

c. Sample concentrations within calibration range

TABLE 13 – CONCENTRATION BRACKET EVALUATION
The concentration values of the samples and associated spikes were in the range established by the standard concentrations in the calibration curve

Sample ID	Parameter	Y *or enter standard concentration range*	*Enter (**A**) or below (**B**) calibration range*	Applicable qualifiers are reported@ Y *or identify missing codes*
	NH3			
	NO2			
	NO3			
	NOx			
	o-P			

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 13 – CONCENTRATION BRACKET EVALUATION
The concentration values of the samples and associated spikes were in the range established by the standard concentrations in the calibration curve

Sample ID	Parameter	Y *or enter standard concentration range*	*Enter (**A**) or below (**B**) calibration range*	Applicable qualifiers are reported[@] Y *or identify missing codes*
	TKN			
	TP			
	Turbidity[#]			
	Hardness			
	Calcium			
	Magnesium			
	Arsenic			
	Copper			
	Lead			
	Mercury			

[@] *U – Non detect*
M - Value is less than PQL and reported value is the PQL
K or L may be used but do not investigate further for appropriate use.
I – Value between MDL and PQL
J – Value is either above or below the established calibration range

[#] *J is the only expected qualifier*

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

2. DATA REDUCTION CHECKS

Review all audited samples against raw data for accurate data reduction as described below. Calculate the percent recovery for the laboratory control spikes that are associated with the audited samples (preparation batch).

TABLE 14 – DATA REDUCTION CHECKS
Reported/assessed values and associated LCS information are calculated correctly

Sample Concentration			Parameter	Sample ID	LCS	
Formula		Y *or enter reported & correct value**			Formula	Y *or enter incorrect & correct values*
mg/L= d1-d2 / P	d1=initial DO d2= final DO P=decimal volumetric fraction		BOD (unseeded)			
mg/L= d1-d2-b / P	as above b=DO depletion of seeded dilution blank		BOD (seeded)			
mg/m^3 (ug/L) =$26.7[(664_b-750_b)-(665_a-750_a)] \cdot V_1 / V_2$ X L b - before acidification a – after acidification V_1 =volume of extract (L) V_2 =volume of sample (m^3) (1000 L=1 m^3) L=light path length of width of cuvette (cm)			Chlorophyll A (Monochromatic)			
MF: Plate count X dilution **or** colonies X 100 / mL sample filtered MPN: see attached			Fecal Coliform			
Evaluate NH3 (below) then use spread sheet			Unionized Ammonia			
Sample response is between the responses of the bracketing adjacent standard responses and appears to support the reported value Check for dilutions if reported values are higher than the response indicates.			NH3		observed X100 / expected	
			NO2			
			NO3			
			NOx			
			o-P##			
			TKN			
			TP			

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 14 – DATA REDUCTION CHECKS
Reported/assessed values and associated LCS information are calculated correctly

Sample Concentration			Parameter	Sample ID	LCS	
Formula		Y *or enter reported & correct value**			Formula	Y *or enter incorrect & correct values*
mg/L= (A-B)X1000 / Vol (ml)	A=filter +dried residue (mg) B=weight of filter (mg)		TSS			
Hardness (EDTA) mg $CACO_3$/L = AXNX50000 / mL Sample	A = mL EDTA titrant N = normality of EDTA titrant		Hardness			
Hardness, mg equivalent $CaCO_3$/L =2.497(Ca, mg/L) + 4.118 (Mg, mg/L)			Hardness (Calcium and Magnesium)			
Sample response is between the responses of the bracketing adjacent standard responses and appears to support the reported value, or the printed raw data report matches the value reported in STORET. Check for dilutions if reported values are higher than the response indicates.			Calcium		observed X100 / expected	
			Magnesium			
			Arsenic			
			Copper			
			Lead			
			Mercury			

##May be color corrected (check if reported result is significantly less than estimated result due to color blank subtraction)
**For nutrients and metal, enter only Y or N.*

3. METHOD SPECIFIC REQUIREMENTS

a. Microbiology

i) _____ All blanks were <1cfu/100 ml. (Enter Y *or identify sample IDs and associated blank results*)

ii) _____ Colony counts are between 20 – 60 colonies per plate. (*Enter Y or identify sample ID exceeding ideal range*)

(1) _____ Reported values from colony plate counts outside the above range were qualified with a "B" (unless reported value is from a 100 ml sample and the count is less than 20). (Enter Y *or identify sample ID exceeding ideal range*)

(2) _____ If all counts are above 60, the result is calculated and reported from the highest dilution.

iii) _____ Samples identified as TNTC were appropriately reported with the filtration volume and "Z". (Enter Y *or identify sample ID that was not correctly reported*)

iv) _____ If the sample was verified, the result was adjusted based on the results of the verification:

verified coliform count/100 mL=original colony count X $\frac{100 \text{ X number of verified colonies}}{\text{total number of coliform colonies subjected to verification}}$

v) _____ If more than one plate met the above criteria (3.a.ii above), the reported number is adjusted:

$$\text{Total coliforms/100 mL} = \frac{\text{total coliform colonies counted X 100}}{\text{total mL sample filtered}}$$

or the reported value is the arithmetic average of all acceptable results.

vi) _____ If all counts fall below 20 colonies per plate, calculate and report using the same formula as v) above.

vii) _____ Each batch of prepared media or each lot of commercial media this is associated with the audited samples has acceptable positive and negative controls. (Enter Y *or enter sample Ids that are associated with the failed media tests)*

viii) For MF:

(1) _____ Incubation time is 24 hrs +/- 2 hours. (Enter Y *or total incubation time or "NV" for not verified*)

(2) _____ Temperature is maintained at 44.5+/- 0.2°C. (Enter Y *or enter temperature exceedance*)

(3) _____ If the membrane filter technique was used, the sample set(s) is associated with a beginning and ending blank (Enter Y *or identify missing blank ("I" for initial; "E" for ending)*.

ix) For MPN:

(1) _____ The temperature for the presumptive phase is maintained at 35+/- 0.5°C. (Enter Y *or enter temperature exceedance*)

(2) _____ Any negative results must be have incubated for 48 hours. (Enter Y *or enter the sample ID and the total incubation time.*)

(3) _____ If there is growth (turbidity), gas production or acidity, laboratory proceeded to the confirmed phase in EC Media. (Enter Y *or enter sample IDs that were not confirmed*)

(a) _____ Incubation time for confirmed phase is 24 hrs +/- 2 hours. (Enter Y *or total incubation time or "NV" for not verified*)

(b) _____ Temperature for confirmed phase is maintained at 44.5+/- 0.2°C. (Enter Y *or enter temperature exceedance*)

b. BOD

i) _____ Dilution blank is less than 0.2 mg/L uptake. *(enter Y or value(s) of the associated dilution blank(s))*

ii) _____ Value is calculated from a dilution that has > 2 mg/L depletion unless 100% sample is used. *(enter Y or values used to calculate reported value)*

iii) _____ Value is calculated from a dilution that has a residual of at least 1 mg/L. *(enter Y or values used to calculate reported value)*

iv) _____ Nutrient, mineral and buffer solutions have been added to the BOD bottles if the dilutions used to calculate the BOD result contain more than 67% sample.

v) _____ If more than one dilution meets a., then results are reported as averaged values. (Enter Y *or sample values that were not appropriately averaged*.)

vi) _____ Temperature is maintained at 20+/- 1°C.

vii) _____ Incubation time is 5 days. (Enter Y *or total incubation time or "NV" for not verified*)

viii) _____ Evidence of toxicity is evaluated (increased dilution results in increased depletion). (Enter Y *or "NA" for not addressed*)

c. Turbidity

i) _____ If secondary standards are used to verify calibration, the secondary standards are checked against the primary standards quarterly. *(Enter Y or actual time interval or "NV" for not verified)*

d. TSS

i) _____ Stabilization is demonstrated by at least two weighings less than 0.5 mg difference. (Enter Y *or note the instances in which the two weighings were not performed or were outside the 0.5 mg difference*).

ii) _____ Temperature is maintained between between 103 – 105 °C. *(Enter Y or actual time interval or "NV" for not verified)*

iii) _____ Balance is checked each day of use using weights that bracket the tare weight and the sample weight. Reported values must be within +/- 0.5 mg of the stated mass weight. (Enter Y *or note actual tare and sample weights, and the weights that were used.)*

e. Metals – ICPES

i) Interference Checks

(1) _____ An interference check sample is analyzed at the beginning, during and at the end of each run. (Enter Y *or identify which was not performed: "B"= beginning; "D" = during; "E"= end.)*

(2) _____ Each interference check is within the criterion of 1.5 standard deviation (sd) of the mean concentration. (Enter Y *or note the affected sample IDs*)

(3) _____ Data associated with a failed interference check **were not reported**. (Enter Y *or note the affected sample IDs*) *(Note: this means that neither corrective action nor reanalysis after corrective action was performed.)*

ii) _____ The ICP calibration blank is within 2 sd of the background mean calibration blank values. (Enter Y *or note the specific deviation*) *(Note: this means that the laboratory must have in-house acceptance limits based on the calibration blank values)*

(1) _____ Data associated with an unacceptable calibration blank **were not reported**. (Enter Y *or note the affected sample IDs*)

iii) _____ Serial dilutions, when performed resulted in calculated values that were within 5% of the original determination. (Enter Y *or note the affected sample IDs*)

(1) _____ Samples that did not meet the dilution criterion (iii above) were reported with a "J" qualifier. (Enter Y *or note the sample IDs*)

f. Metals – ICPMS

i) _____ The RSD of the mean (absolute signal, not concentration) of 5 or more aspirations of the tuning standard is < 5%. (Enter Y *or note the specific deviation.*)

ii) _____ Internal standards are within 60 – 125% of the values derived from the original calibration blank. (Enter Y *or note the specific deviation.*)

iii) _____ Calibration blank counts are subtracted from the target ion counts for each sample per method formula. (Enter Y *or note the sample IDs*)

g. Metals – Graphite Furnace

i) _____ For arsenic, further analyses are completed when the MS recovery is outside the 70-130% acceptance range and LCS is acceptable. Either an analyte addition test or method of standard additions as prescribed by the method was performed and evaluated. (Enter Y *or note the sample IDs*)

4. LABORATORY RECORDS

a. _____ Each analyte result can be associated with a field sample ID and a corresponding laboratory sample ID. (Enter *Y or if "N" refer to Tables 1 and 15:*)

5. REPORTING

a. _____ Each numeric result is associated with appropriate reporting units. (Enter Y *or note the sample ID's and analyte(s) that are not properly reported*.)

b. _____ Laboratory data qualifiers are reported (when applicable) and are associated with an analytical result. (Enter Y *or if "N refer to Tables2,3,4,6,7,9,11 or 12 or sections 3.a.ii.(1), 3.a.iii, 3.a.vii, 3.e.ii, 3.g.i.(1).(a).(ii), 3.g.i.(1).(b).(ii),.or 5.b.i.*)

i) In addition to those identified in the preceding tables and audit questions, these data qualifiers are reported:

_____ "A" – Reported value is mean of two or more determinations
_____ "?" – Data are rejected and should not be used
_____ "T" – Value is less than the MDL

Enter Y *or enter sample ID next to applicable qualifier*)

ii) _____ All "non-detect" results are appropriately reported with a "U" qualifier. (Enter Y *or if "N refer to Table 12.*)

iii) _____ "Non-detects" are reported with a non-zero positive numeric MDL value. (Enter Y *or identify the results that were not appropriately reported.*)

iv) _____ Applicable analyte results that are between the MDL and PQL are either reported with an "M" and a numeric PQL value or an "I" and a numeric value that is between the MDL and PQL. (Enter Y *or if "N refer to Tables 12.*)

v) _____ Applicable laboratory analyte results were reported with a "J" qualifier. (Enter Y *or if "N refer to Tables 4,6,7,11 or 12 or sections 3.a.vii, 3.g.i.(1).(a).(ii), 3.g.i.(1).(b).(ii).*)

vi) _____ Analyte results reported with a "J" qualifier have an associated explanatory comment or narrative that describes the condition. (Enter Y *identify the results that were not appropriately reported.*)

c. _____ All data are in agreement between the field records, the laboratory report and the data in STORET. (Enter Y *or include tables 14 and/or 15*).

6. QUALITY SYSTEM

a. _____ The laboratory's quality system is designed so that the laboratory continually assesses the quality of the data and implements corrective actions to improve data quality.

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 15 – ACCURATE FIELD RECORDS TRANSCRIPTION

	STORET Sta No.	Field Records	Lab Records	Y/N	STORET
Field ID *Enter Field ID from field records under" Field Records"; Enter "Y" in Lab and STORET or enter the reported ID. Enter "Y" under the Y/N column if there is a positive definitive link between the Field ID in the Field Records and the STORET Station number to which the data are associated.*					

Field Parameters: *For each STORET Station Number, enter field recorded value, (including units and qualifiers) under for each parameter; Enter "Y" in Lab and STORET or enter the reported data*

STORET Sta Number	pH	Specific Conductance	Temperature	DO	Turbidity	Depth	Laboratory	STORET

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 15 – ACCURATE FIELD RECORDS TRANSCRIPTION					
		Field Records			
	STORET Sta No.	Field ID	**Field Information**	Lab Records	STORET
Date *Enter field ID & date from field record under "Field Records"; Enter "Y" in Lab and STORET or enter the reported date*					
Time *Enter field ID & collection time from field record under "Field Records";; Enter "Y" in Lab and STORET or enter the reported date*					

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 16 – ACCURATE LABORATORY DATA TRANSCRIPTION

Laboratory Results: *Enter Ids and values under Lab Records (including units and qualifier(s)); Enter "Y" in STORET or enter the reported data*

	Laboratory Records			STORET	
	Field ID (from Table 14)	Lab ID	Result	Lab ID	Result
BOD					
Chlorophyll A					
Fecal Coliform					
NH3					
NO2					
NO3					
NOx					
o-P					
TKN					
TP					
TSS					

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

TABLE 16 – ACCURATE LABORATORY DATA TRANSCRIPTION

Laboratory Results: *Enter Ids and values under Lab Records (including units and qualifier(s)); Enter "Y" in STORET or enter the reported data*

	Laboratory Records			STORET	
	Field ID (from Table 14)	Lab ID	Result	Lab ID	Result
Turbidity					
Hardness					
Calcium					
Magnesium					
Arsenic					
Copper					
Lead					
Mercury					

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

INSTRUCTIONS FOR EACH WORKSHEET SECTION: ENTER THE ID OF THE FIELD SAMPLES AUDITED. ENTER THE AUDIT RESULT IN THE BOXES BELOW THE ASSOCIATED SAMPLE ID PER INSTRUCTIONS FOR EACH WORKSHEET ITEM. IF A COMMENT IS REQUIRED FOR THE WORKSHEET ITEM, PROVIDE THE COMMENT IN "SEE COMMENT #" OR CHECK THE BOX TO INDICATE THAT A WRITTEN AUDIT COMMENT IS RECORDED FOR THE ITEM NUMBER.

Field Documentation Worksheet				
Enter Sample ID →				***See Comment #*** ↓
General Linkage				
1.1 The field sample ID in the field record matches the field sample ID reported by the laboratory for each associated analyte result				
Yes/No →				
1.2 All supporting field records associated with the field sample ID were linked. *FD 5000 sections 1.1.1 & 1.3*				
Yes/No →				
1.3 Records are legible. *FD 1100*				
Yes/No →				
Sample Collection				
2.1 The names of all personnel who collected the sample were recorded on all associated records for sample collection. *FD 5000 section 2.1*				
Yes/No →				
2.2 The sampling equipment used to collect the sample was recorded or the collection was indicated as a direct container grab sample. *FD 5000 section 2.10*				
Yes/No →				
2.3 The sampling equipment construction and materials were appropriate for the analytes collected. *FS 1001, section 2.2 and Tables FS 1000-1 through FS 1000-3*				
Yes/No →				
2.4 The sample container construction and materials were appropriate for the analytes collected. *FS 1001, section 4.1 and Table FS 1000-4*				
Yes/No →				
2.5 A specific description of the sample collection source, such as station number or physical location was recorded. *FD 5000 section 2.4*				
Yes/No →				
2.6 The collection depth was either recorded with depth units or indicated as a surface sample (top 1 foot of water column), as applicable. *FD 5100, section 4*				
Yes/No →				
2.7 If applicable, a water flow measurement with flow units was recorded for the sample source.				
Yes/No →				
2.8 The date of sample collection was recorded. *FD 5000 section 2.2*				
Yes/No →				
2.9 The time of sample collection was recorded if the maximum holding time for an analyte for the sample was ≤48 hours. *FD 5000 section 2.2.2*				
Yes/No →				

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

Field Documentation Worksheet				
Enter Sample ID →				***See Comment #*** ↓
2.11 If collected for the sampling trip, the type of QC sample and the time of collection of the QC sample was recorded. *FD 5000 section 2.11*				
Yes/No →				
Composite Sample Collection				
2.10.1 The type of composite sample was recorded. *FD 5100, section 4*				
Yes/No →				
2.10.2 A "begin" date and "end" date was recorded if the sample was collected as a composite sample over a duration comprising two calendar dates.				
Yes/No →				
2.10.3 A "begin" time and "end" time was recorded if the sample was collected as a composite sample over a duration greater than 15 minutes. *FD 5100, section 4*				
Yes/No →				
2.10.4 The number of aliquots or subsamples and the approximate or measured amounts of each aliquot or subsample collected for the composite sample were recorded, if applicable to the sampling plan. *FD 5000, section 2.13*				
Yes/No →				
2.10.5 The sample source description (such as station number or physical location) for all subsamples collected for the composite sample were recorded. *FD 5000, section 2.13.1*				
Yes/No →				
Sample Preservation				
3.1 Preservation information and verification was recorded for the sample, as applicable. *FD 5100 section 1 – 1.4*				
Yes/No →				
3.1.1 All samples for analytes requiring pH adjustment were tested for proper pH preservation during first-time sampling for the project. *FS 2000, section 1.4.2.1*				
Yes/No →				
3.2 The sample preservation conformed to DEP SOP requirements. *FS 1006, sections 1 – 1.2 and Tables FS 1000-4 through FS 1000-*				
Yes or list analyte groups →				
Sample Preservation for Autosamplers				
3.2.2 If applicable, the sample collected with an automatic sampler was chilled with wet ice or refrigerated at 4 ^{o}C. *FS 1006, section 4*				
Yes/No →				
3.2.1 If a composite sample was collected with an automatic sampler, the sample was chemically preserved within 15 minutes of collection of the last composite subsample. *FS 1006 section 4.1*				
Yes/No →				
Sample Filtration				
4.1 If applicable, the sample was filtered on-site at the time of collection. *FS 2001, section 2.1*				
Yes/No →				

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

Field Documentation Worksheet				
Enter Sample ID →				***See Comment #*** ↓
4.1.1 Unless otherwise specified by the sampling plan, the sample (usually, orthophosphate) was filtered using a 0.45 um pore size for the filter. *FS 2000, section 1.3.7*				
Yes/No →				
General Requirements for Field Testing Calibration Activities				
5.1 Information about all calibration standards used for field testing were linked to the calibration information associated with the field-testing measurements for the samples by means of a lot number or similar indication. *FD 4100*				
Yes or list deficient standard entries →				
5.2 The assayed or certified values, descriptions and expiration dates of all applicable standards were recorded for all calibrations and verifications. *FD 4100, sections 1.1 – 1.3*				
Yes or list deficient standard entries →				
5.3 For each instrument unit used for the measurement of the sample, the following information was recorded for all calibrations and verifications: *(Yes or list deficient data)* ↓ *FD 4100 sections 2.1 - 2.7*				
5.3.1 Instrument ID →				
5.3.2 Date/time →				
5.3.3 Instrument → display result & units				
5.3.4 Description of each standard used →				
Field Testing Measurements (Field Analysis of Samples)				
10.1 The field-testing analyte or parameter name and units is reported with the value for the field measurement result. *FD 5000 section 2.7*				
Yes or list analytes →				
10.2 A personnel name for the field-testing analyst is associated with the field-testing measurement result. *FD 5000 section 2.7*				
Yes or list analytes →				
10.3 A measurement date is associated with the field-testing result. *FD 5000 section 2.7*				
Yes or list analytes →				
10.4 A measurement time is associated with the field-testing result. *FD 5000 section 2.7*				
Yes or list analytes →				
10.5 The field-testing measurement was linked with the unique identification for the test instrument used. *FD 5000 section 2.7*				
Yes or list analytes →				
10.6 The field-testing measurement was linked to the associated field sample source (station number or physical location). *FD 5000 section 2.7*				
Yes or list analytes →				
Use of Field Data Qualifiers				
11.1 The sample field-testing result was qualified as an estimated value ("J" qualifier code) when the instrument calibration could not be verified. *FT 1000, section 2.2.4.2*				
Yes or list analytes →				

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

Field Testing Calibration Worksheet				
Enter Sample ID →				***See Comment #*** ↓
pH				
6.1 The sample measurement was chronologically bracketed with acceptable calibration verifications. *FT 1000 section 2.2.1*				
Bracket begin date/time →				
Sample test date/time →				
Bracket end → date/time				
6.2 The sample measurement was quantitatively bracketed with an appropriate choice of at least two calibration buffers for calibrations or verifications. *FT 1100 sections 1.2, 2.3.3 & 2.3.4*				
Begin low/high buffer values →				
Reported sample value →				
End low/high buffer values →				
6.3 All calibration verifications met the acceptance criterion of ± 0.2 standard pH units. *FT 1100 sections 2.1.2 & 2.3.4.1*				
Begin low/high buffer readings →				
End low/high buffer readings →				
Specific Conductance				
7.1 The sample measurement was chronologically bracketed with acceptable calibration verifications. *FT 1000 section 2.2.1*				
Bracket begin date/time →				
Sample test date/time →				
Bracket end → date/time				
7.2 The sample measurement was quantitatively bracketed with an appropriate choice of calibration standards for calibrations or verifications (except values below 100 umhos/cm). *FT 1200 section 3.2.1*				
Begin low/high buffer readings →				
End low/high buffer readings →				
7.3 All continuing calibration verifications were performed using standards within the range of sample measurements. *FT 1200 section 3.2.4*				
CCV standard value →				
7.4 All calibration verifications met the acceptance criterion of ± 5% of the verification standard value. *FT 1200 sections 3.2.2 & 3.2.4*				
Begin low/high buffer readings →				
End low/high buffer readings →				
CCV standard				

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

Field Testing Calibration Worksheet				
Enter Sample ID →				***See Comment #*** ↓
reading →				
DO				
8.1 The sample measurement was chronologically bracketed with acceptable calibration verifications. *FT 1500 sections 2.2 & 2.3*				
Bracket begin date/time →				
Sample test date/time →				
Bracket end → date/time				
8.2 All calibration verifications met the acceptance criterion of ± 0.3 mg/L dissolved oxygen when compared to the table of theoretical values for water-saturated air. *FT 1500 sections 1.1, 2.2.2.2. 2.3.1, 2.4.1, 2.4.2 and 2.4.3*				
Begin/end temperatures →				
Begin/end readings (mg/L) →				
Begin/end sat. values (mg/L) →				
Turbidity				
9.3 Initial calibration of the turbidimeter was performed using formazin or styrene divinylbenzene primary standards, whichever was required by the manufacturer of the instrument. *FT 1600 section 2.3*				
Yes/No →				
9.1 The sample measurement was chronologically bracketed with acceptable calibration verifications. *FT 1600 section 3.2.1*				
Bracket begin date/time →				
Sample test date/time →				
Bracket end → date/time				
9.2 The sample measurement was quantitatively bracketed with an appropriate choice of calibration standards for calibrations and verifications. *(Usability criterion) The test instrument must be verified within the range of sample values.* *(FT 1600 section 3.2.3)*				
Formazin or SDVB low/high std. values →				
Begin low/high standard values →				
Reported sample value →				
End low/high standard values →				

TMDL Audit: _____ Date: _____
Laboratory: _____ Field: _____

Field Testing Calibration Worksheet				
Enter Sample ID →				***See Comment # ↓***
9.4 All calibration verifications met the DEP SOP acceptance criteria applicable to the NTU ranges associated with the verification standard values. *FT 1600 section 3.2.2* Acceptance Criteria: 0.1 - 10 NTU: ± 10% 11 - 40 NTU: ± 8% 41 – 100 NTU: ± 6.5% > 100 NTU: ± 5%				
Formazin or SDVB low/high readings →				
Begin low/high standard readings →				
End low/high standard readings →				
9.5 Secondary standards were verified against the accepted primary standard calibration. *FT 1600, section 3.2.4*				
Yes/No →				