Navajo Nation Environmental Protection Agency

Quality Assurance Plan for Surface Water Quality Data Collection

Quality Assurance Plan (QAP) for Surface Water Quality Data Collection

Section A – Project Management Elements

Section B – Data Generation and Acquisition Elements

Section C – Assessment and Oversight Elements

Section D – Data Validation and Usability Elements

Follows format of USEPA's December 2002 document: "Guidance for Quality Assurance Project Plans, EPA QA/G-5" (EPA/240/R-02/009)

Section A – Project Management Elements

A.1	Title and Approval Page
A.2	Table of Contents
A.3	Distribution List
A.4	Project Organization
A.5	Problem Definition and Background
A.6	Project Description
A.7	Quality Objectives and Measurement Criteria
A.8	Special Training and Certification
A.9	Documents and Records

Section A.5 - Problem Definition/Background

Obtain chemical, physical and biological water quality data by monitoring and sampling Navajo Nation surface waters,

Compare these data to the 2007 Navajo Nation Surface Water Quality Standards to determine if the water quality standards are attained,

Determine designated use support and surface water impairment using Guidance for Assessing the Quality of Navajo Nation Surface Waters to Determine Impairment (Integrated 305(b) Reporting and 303(d) Listing),

Prepare 305(b) Reports,

Section A.5 Problem Definition/Background

List waters as impaired through 303(d) listing as required,

Determine sources of impairment,

Pursue regulatory enforcement of impairment sources if required,

Revise monitoring and sampling plan based on water quality data findings, and

Revise the surface water quality standards based on water quality data findings.

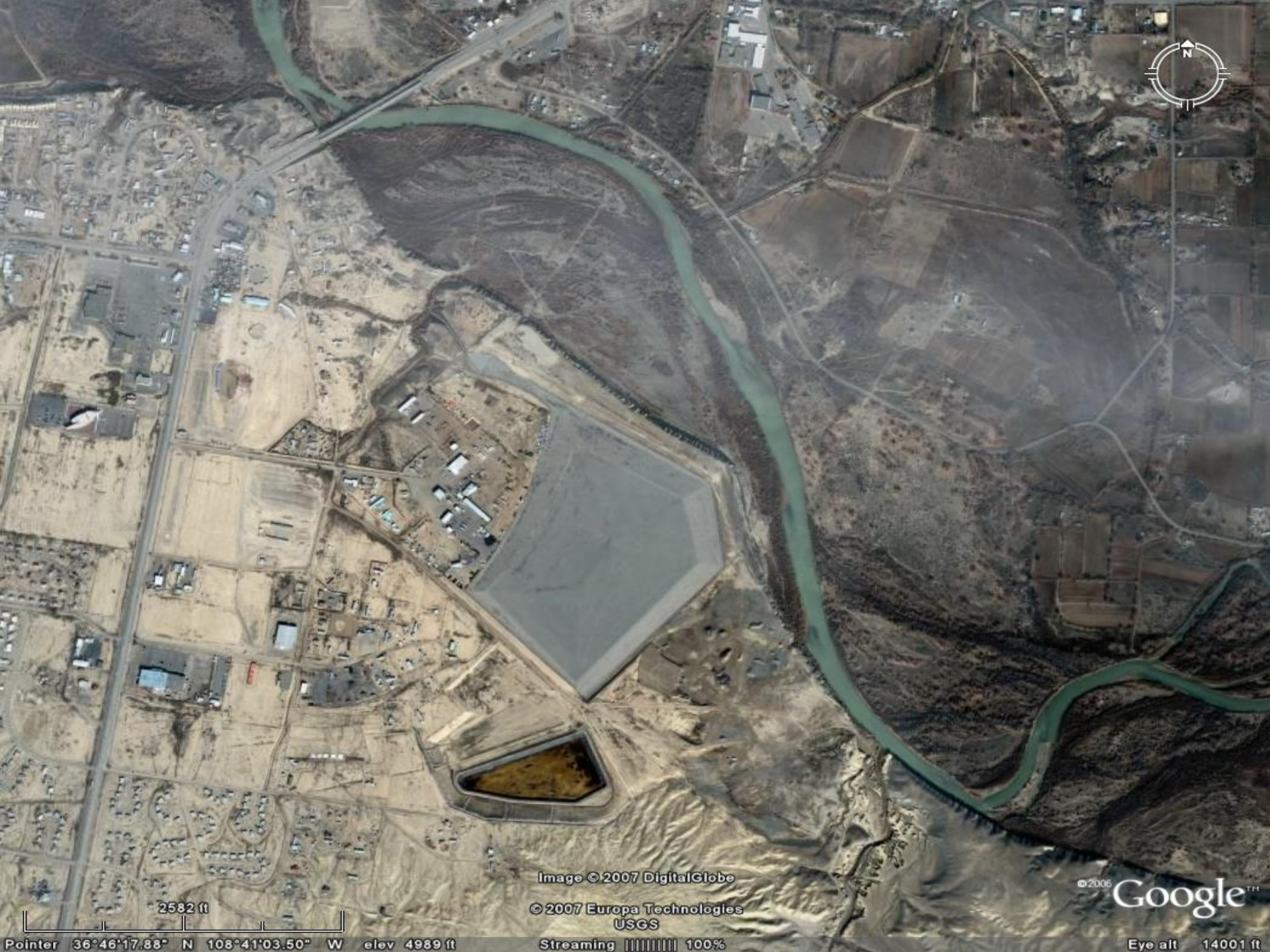
Section A.5 - Problem Definition/Background

A.5.1 Regulatory Perspective

Navajo Nation Clean Water Act

A.5.2 Historical Perspective – Sources of Water Body Impairment

Irrigation, Livestock Grazing, Mining, Oil and Natural Gas Fields, Refined Petroleum Products, Silviculture, Hydromodification, Construction, Sewage Treatment, Landfills, Storm Water Runoff, and others.


N
Image © 2007 DigitalGlobe
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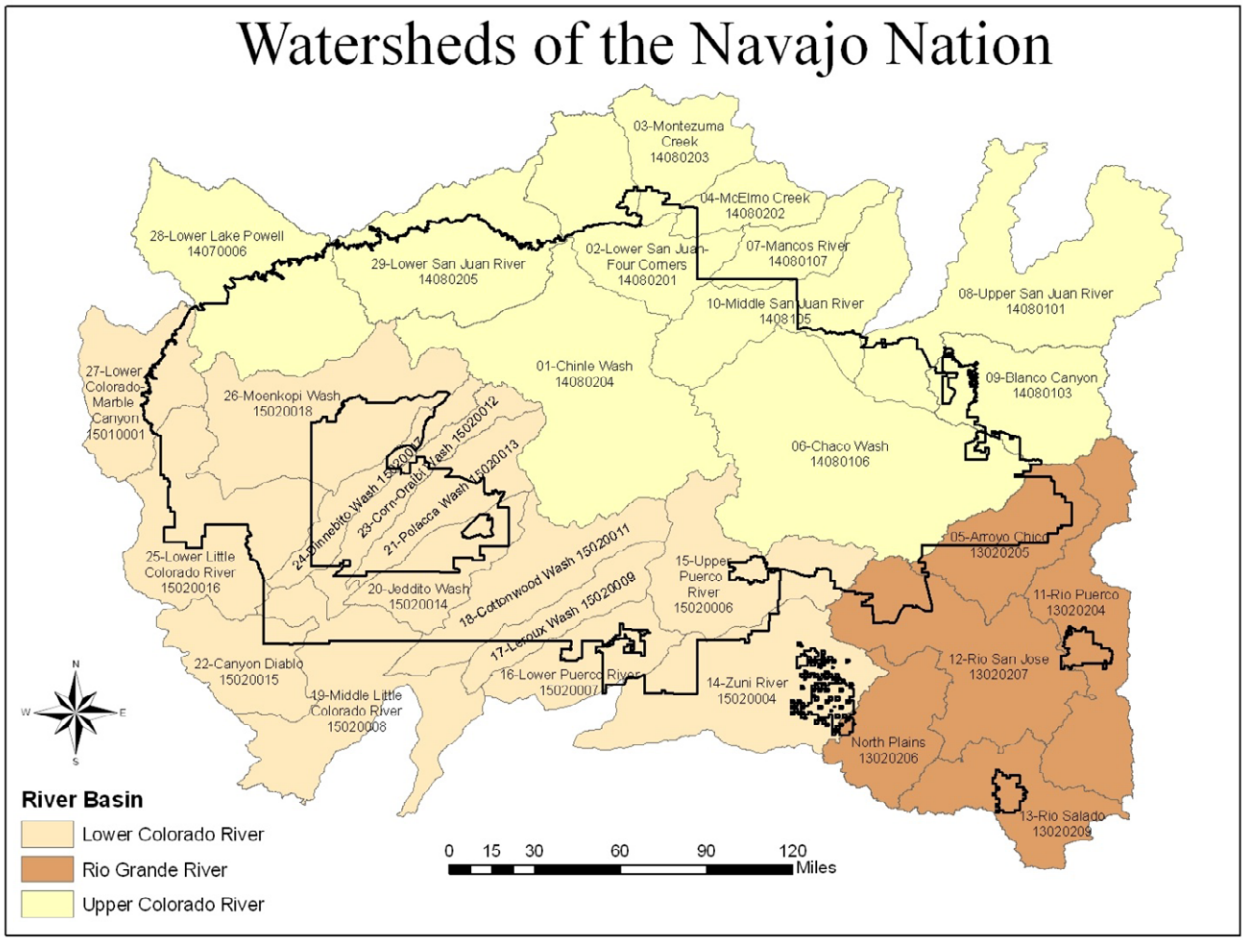
USGS
©2006 Google
2582 ft
Pointer 36°46'17.88" N 108°41'03.50" W elev 4989 ft
Streaming 100%
Eye alt 14001 ft


1203
3

Section A.6 - Project Description



Watershed Name	2 digit code	8-digit HUC
Chinle Wash	01	14080204
Lower San Juan - Four Corners	02	14080201
Montezuma Creek	03	14080203
McElmo Creek	04	14080202
Arroyo Chico	05	13020205
Chaco Wash	06	14080106
Mancos River	07	14080107
Upper San Juan River	08	14080101
Blanco Canyon	09	14080103
Middle San Juan River	10	14080105
Rio Puerco	11	13020204
Rio San Jose	12	13020207
Rio Salado	13	13020209
Zuni River	14	15020004
Upper Puerco River	15	15020006
Lower Puerco River	16	15020007
Leroux Wash	17	15020009
Cottonwood Wash	18	15020011
Middle Little Colorado River	19	15020008
Jeddito Wash	20	15020014
Polacca Wash	21	15020013
Canyon Diablo	22	15020015
Corn-Oraibi Wash	23	15020012
Dinnebito Wash	24	15020017
Lower Little Colorado River	25	15020016
Moenkopi Wash	26	15020018
Lower Colorado - Marble Canyon	27	15010001
Lower Lake Powell	28	14070006
Lower San Juan River	29	14080205
North Plains	30	13020206
Upper Little Colorado River	31	15020002


8 10'01


8 10'01


8 10'01


8 10'0 1

Section A.6.1 - Surface Water Monitoring Types

Existing Conditions

Regulatory Compliance

Special Investigation

Section A.6.2 - Monitoring Locations

Watershed Name	Navajo Nation Watershed Code	USGS Hydrologic Unit Code	Area on Navajo Nation (square miles)	Year(s)
Arroyo Chico	05	13020205	534	2010 2013
Chaco Wash	06	14080106	4501	
Mancos River	07	14080107	64	
Upper San Juan River	08	14080101	412	
Blanco Canyon	09	14080103	282	
Middle San Juan River	10	14080105	1077	
Rio Puerco	11	13020204	129	
Rio San Jose	12	13020207	341	
Rio Salado	13	13020209	95	
Zuni River	14	15020004	521	
			(7956)	
Chinle Wash	01	14080204	4181	2011 2014
Lower San Juan River-Four Corners	02	14080201	903	
Montezuma Creek	03	14080203	89	
McElmo Creek	04	14080202	66	
Upper Puerco River	15	15020006	1756	
Lower Puerco River	16	15020007	527	
Lower San Juan River	29	14080205	1526	
			(9048)	
Leroux Wash	17	15020009	607	2012 2015
Cottonwood Wash	18	15020011	1400	
Middle Little Colorado River	19	15020008	495	
Jeddito Wash	20	15020014	637	
Polacca Wash	21	15020013	519	
Canyon Diablo	22	15020015	121	
Corn-Oraibi Wash	23	15020012	459	
Dinnebito Wash	24	15020017	356	
Lower Little Colorado River	25	15020016	1218	
Moenkopi Wash	26	15020018	1985	
Lower Colorado Wash-Marble Canyon	27	15010001	371	
Lower Lake Powell	28	14070006	1504 **(9672)**	

Section A.7 - Quality Objectives and Measurement Criteria

A.7.1 – Data Quality Objective (Decision Level): The objective of the water quality data obtained by surface water monitoring is that it must be of sufficient quality to be comparable to the Navajo Nation Surface Water Quality Standards.

A.7.1 - Data Quality Indicators (Measurement Level to Support Decision): Define accuracy, bias, precision, representativeness, comparability, completeness, and sensitivity.

Section A.8 Special Training/Certification

Read and understand QAP.

USGS Sampling Method Training is recommended.

Section A.9 Documents and Records

Digital storage in ACCESS database compatible with WQX.

Section B – Data Generation and Acquisition Elements

B.1 Sample Process Design
B.2 Surface Water Sampling
B.3 Sample Packaging, Handling and Custody
B.4 Analytical Methods
B.5 Quality Control
B.6 Instrument/Equipment Testing, Inspection & Maintenance
B.7 Instrument/Equipment Calibration and Frequency
B.8 Inspection/Acceptance of Supplies and Consumable
B.9 Non-direct Measurements
B.10 Data Management

Section B.1.1 - Parameters of Concern

Most likely to be found.

May or may not have water quality standards.

Physical characteristics, nutrients, inorganics, organics, metals, bacteria, pathogens, algae, chrolophyll, radiochemicals, and others.

17-alpha-estradiol	Conductivity
17-alpha-ethynylestradiol	Cyanide (as free Cyanide)
17-beta-estradiol	Dissolved Oxygen
Acetaminophen	Hardness
Androstenedione	Lead (Pb)
Atrazine	Magnesium
Bisphenol A	Mercury
Caffeine	Nickel (Ni)
Carbamazepine	pH
DEET	Potassium
Diazepam	Selenium (Se)
Diethylstillbestrol	Silver (Ag)
Estriol	Sodium
Estrone	Sulfate
Fluoxetine	Temperature
Hydrocodone	Thallium (Tl)
Ioprimide	Total Kjeldahl nitrogen
Meprobamate	Total Phosphorous (as P)
Oxybenzone	Turbidity
Pentoxifyline	Vanadium (V)
Progesterone	Zinc (Zn)
Sulfamethoxazole	Blue-Green Algae
Testosterone	chlorophyll a
Trimethoprim	Total Algae
Aluminum (Al)	Total Nitrogen
Ammonia-N	Boron
Beryllium (Be)	Gross Alpha (pCi/L)
Bicarbonate	Molybdenum (Mo)
Cadmium (Cd)	Nitirite
Calcium	Nitrate
Carbonate	Radium 226 and 228
Chromium (Cr III + Cr VI)	Total Suspended Solids
Cobalt (Co)	Uranium (U)

Section B.2.1 – Sampling Preparation

Site selection.

Parameter selection.

Laboratory coordination (lab bottles, coolers, chain of custody).

Equipment and supply inventory (sampling, sample processing, field measurements, field forms, consumables, miscellaenous, decontamination).

Table B.2.1(a) - Common Stream Sampling Analytical Suite

Filtered (dissolved) Analytes	Non-Filtered (total) Analytes
Calcium	Aluminum (Al)
Magnesium	Ammonia-N
Sodium	Antimony (Sb)
Potassium	Arsenic (As)
Carbonate	Barium (Ba)
Bicarbonate	Beryllium (Be)
Sulfate	Boron
Chloride	Cadmium (Cd)
Aluminum (Al)	Chromium (Cr III + Cr VI)
Antimony (Sb)	Copper (Cu)
Arsenic (As)	Cyanide (as free Cyanide)
Boron	Fluoride (mg/L)
Cadmium (Cd)	Gross Alpha (pCi/L)
Chromium (Cr III + Cr VI)	Lead (Pb)
Cobalt (Co)	Mercury (Hg)
Copper (Cu)	Nickel (Ni)
Lead (Pb)	Radium 226 + 228
Molybdenum (Mo)	Selenium (Se)
Nickel (Ni)	Silver (Ag)
Silver (Ag)	Thallium (Tl)
Thallium (Tl)	Uranium (U)
Vanadium (V)	Zinc (Zn)
Zinc (Zn)	Total Suspended Solids
	Total Kjeldahl Nitrogen

XENCO Laboratories

Trans West Analytical Services

3725 E. Atlanta Ave.
Phoenix, Arizona 85040
Phone: (602) 437-0330
Fax: (602) 437-0660

3860 S. Palo Verde Rd., Ste. 301
Tucson, Arizona 85040
Phone: (520) 573-1061
Fax: (520) 573-1063

Chain of Custody

Work Order No: _____

Date 10-01-10 Page 1 of 1

Project Manager:	PROJECT MANAGER		
Client Name:	Navajo Nation EPA		
Address:	PO Box 1999		
City, State ZIP:	Shiprock, NM 87420	Phone:	505/368-1037
Email:	PM @NNEPA.ORG	Fax:	505/368-1416

Bill to:	NNEPA WATER QUALITY PROGRAM		
Company:	"		"
Address:	P.O. BOX 3780		
City, State ZIP:	TUBA CITY, AZ 86045	Phone:	505/368-1037
Email:	PM @NNEPA.ORG	Fax:	

Project Name:	305(b)
Project Number:	
P.O. Number:	216460B
Sampler's Name:	SAMPLER

SAMPLE RECEIPT

Temperature (°C):			Temp Blank Present		
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice	
Cooler Custody Seals:	Yes	No	N/A	Total Containers:	
Sample Custody Seals:	Yes	No	N/A		

ANALYSIS REQUEST *FF- Field Filtered (Dissolved)

TAT

- ☐ Routine
- ☐ Rush - Prelim
- ☐ Rush - Final

Due Date:

Volatiles

- ☐ Encores
- ☐ Methanol Kits

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Group I - EDC/PCPP	*FF 200.8 = Sb,As,Cr,Cu,Tl	*FF 200.7 = Ca,Mg,Na,K,Al,B,Cd,Co,Pb,Mo,Ni,Ag,V,Zn	TOTAL 200.8 = Sb,As,Cr,Cu,Se,Tl,U	TOTAL 200.7 = Al,Ba,Be,B,Cd,Pb,Ni,Ag,Zn	*FF Alk, SO4, Cl	Total F, TSS_LOW	Total NH3, TKN	Total Cyanide	Total Mercury 1631	Gross Alpha, Rad 226/228	Comments
26-01_101001	H_2O	10/01/10	10:00 AM		11	X	X	X	X	X	X	X	X	X	X	X	

Use Project Code: NNEPA

Relinquished by: (Signature)	(Print Name)	Received by: (Signature)	(Print Name)	Date/Time
1 Sampler	SAMPLER		FEDEX-GALLUP, NM	10/01/10 - 4:00 PM
2				
3				

White copy to CAS, Yellow copy for final report, Pink copy to sampler

Revised : 8/26/2009

Figure B.2.1c - Navajo Nation EPA Water Quality Program Surface Water Sampling Form

Project: _____ Site Name: _____ Date: _____
Field Team: _____ Time: (arrival) _____ (departure) _____
Sample ID: _____ Sampling Time: _____ Sampler: _____
Sampling Method: Single Point Grab Multi-Point Grab
Easting: _____ Northing: _____ Site Elevation (ft): _____
Zone: _____ Datum: _____ GPS file name(s): _____

Site Description

SW Body Type: Perennial Intermittent Ephemeral Lined/unlined Canal Lake Pond Wetlands Spring/Seep Other: _____
Sampling Site: Pool Riffle Open Channel Braided
Observations (0-none) (1-mild) (2-moderate) (3-extreme): Floating Debris: _____ Floating Garbage: _____ Floating Algae Mats: _____
Fish Kill: _____ Detergent Suds: _____ Turbidity: _____ Atmospheric Odor: _____ Oil-Grease: _____
Last 24 Hour Weather: Clear Partly Cloudy | Light Medium Heavy Rain Snow None |
Calm Light Breeze Very Gusty Windy | Very Cold Warm Hot
Current Weather: Clear Partly Cloudy | Light Medium Heavy Rain Snow None |
Calm Light Breeze Very Gusty Windy | Very Cold Warm Hot
Water Color(s): brown green blue gray red none other: _____
Other Observations: _____

_____
_____
_____
_____
_____

Wind Direction: _____ Wind Speed (mph): _____ Air T (°C): _____ Humidity (%): _____
Dewpoint (°C): _____ Barometric Pressure (mmHg): _____
Observed Water Quality Impacts: _____

_____

Field Parameters

Water T (°C): _____ pH: _____ Redox (mV): _____ Turb (NTU): _____
Conductivity (µS/cm): ____ TDS (mg/L): _____ Salinity (‰): _____ DO (mg/L): _____
DO (% sat): _____
Cl (total): _____ Cl (residual): _____
AC2012 – Ammonia as Nitrogen (mg/L): _____ AC4P12 - Ammonia as Nitrogen (mg/L): _____
AC2007 - Nitrate as Nitrate (mg/L): _____ AC2046 – Nitrite as Nitrite (mg/L): _____
AC4046 – Nitrite as Nitrite (mg/L): _____ AC2096 – Phosphorous as Phosphate (mg/L): _____
AC4P95 – Phosphorous as Phosphorous (mg/L): _____
Flow (cfs): _____ Gage Height (ft): _____ Meters Used: _____

_____
Photographs (Number and Description): _____

_____
_____
_____
_____
_____

Section B.2.2 – Field Surface Water Sampling Activities

Clean Hands/Dirty Hands Technique – Segregation of tasks according to level of contact with water sample.

Clean hands handles all operations involving direct contact with the sample (sampling with the sample container).

Dirty hands handles all operations involving direct contact with possible sources of contamination (filters, pumps, laboratory bottles).

Clean Hands/Dirty Hands required for:

Sampling Setup.

Surface Water Sampling - Stream and Lake Grab Sampling.

Sample Processing – Filtration.

Sample Packaging.

Section B.2.3 – Field Surface Water Measurement Activities

Conducted after sampling to avoid possible cross contamination.
Does not require Clean Hands/Dirty Hands.

Geocoordinates – latitude and longitude for new sites.
Atmospheric Measurements – temp, wind speed, barometer, etc.
Turbidity – Turbidity meter or Secchi disk for lakes.
Lake depth and surface color,
Temperature, pH, oxygen, conductivity, total dissolved solids, salinity, and reduction/oxidation.
Stream discharge.
Ammonia, phosphate, phosphorous, nitrate, nitrite, and chlorine.

Section B.2.4 – Decontamination Procedures

Conducted in field and/or office.
Does not require Clean Hands/Dirty Hands.

Phosphate free detergent soak.
Tap water rinse.
Dilute hydrochloric acid (non-metal parts only) soak.
Deinonized/distilled water rinse.
Put into 2 Ziploc bags wet for storage.

Section B.3 – Sample Packaging, Handling and Custody

Requires Clean Hands/Dirty Hands until sample is packaged with trash bags and put on ice into sample cooler.

Covers Chain-of-Custody procedures and FedEx mailing procedures.

Section B.4 – Analytical Methods

USEPA Analytical Methods chosen so that method detection level is below the lowest numeric water quality standard.

Laboratory will supply Quality Assurance Plan for their laboratory and for each analytical method.

Parameter Name (All units are in ug/L unless otherwise indicated)	Chemical Abstracts Services Number	Lowest Numeric Water Quality Standard (All units are in ug/L unless otherwise indicated)	Analytical Method Used	Method Reporting Limit	Method Detection Limit	Container Type	Preservation	Holding Time
Aluminum (Al) (pH 6.5-9.0 for AqHbt)	7429905	87	200.7	80	40	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Ammonia-N	7664417	NCNS	350.1	100	20	500 mL plastic	H2SO4 to pH<2, Cool, 0 - ≤ 6ºC	28 days
Antimony (Sb)	7440360	5.6	200.8/200.7	2.0 / 25	0.30 / 10	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Arsenic (As)	7440382	10	200.8/200.7	3.0 / 25	0.60/ 10	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Barium (Ba)	7440393	1000	200.8/200.7	2.0 / 10	0.40 / 2.0	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Benzene	71432	5	8260B/8021B	0.50	0.10	3X 40mL VOA Vial	HCl pH<2, Cool, 0 - ≤ 6ºC	14 days
Beryllium (Be)	7440417	4	200.8/200.7	0.5 / 10	0.2 / 2.0	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Boron	7440428	630	200.7	100	8.0	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Cadmium (Cd)	7440439	5	200.8/200.7	2.0 / 3.0	0.20 / 0.30	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Chromium (Cr III + Cr VI)	7440473	100	200.8/200.7	5.0 / 10	2.0 / 2.0	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Chromium III (Cr III)	16065831	75000	Calculation	10	N/A			
Chromium VI (Cr VI)	18540299	11	SM3500Cr D	10	1.0	500 mL plastic	Cool, 0 - ≤ 6ºC	24 hours
Cobalt (Co)	7440484	50	200.8/200.7	0.50 / 10	0.10 / 2.0	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Copper (Cu)	7440508	200	200.8/200.7	2.0 / 10	0.70 / 4.0	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Cyanide (as free Cyanide)	57125	5.2	10-204-00-1-X/ SM4500CN G	5.0	3.0	500 mL plastic	Sodium thiosulfate if chlorinated, NaOH pH >12, Cool, 0 - ≤ 6ºC	14 days
Fluoride (mg/L)		4000	300.0	200	60	500 mL plastic	Cool, 0 - ≤ 6ºC	28 days
Gross Alpha (pCi/L)		15	900	Sample Derived/Matrix Dependant	0.4	1 gallon cubitaner	Cool, 0 - ≤ 6ºC	6 months
Lead (Pb)	7439921	15	200.8/200.7	2.0 / 10	0.30 / 3.0	500 mL plastic	HNO3 pH<2, Add additional acid if necessary, hold 24 hours after preserving	6 months
Mercury (Hg)	7439976	0.001	1631	0.5 ng/L	0.2 ng/L	500 mL fluorop;ymer	HCl or H2SO4 pH<2, Cool, 0 - ≤ 6ºC	90 days
Methylmercury		0.00011	1630	0.1 ng/L- 1 ng/L	0.02 ng/L - 0.04 ng/L	500 mL fluorop;ymer	HCl pH<2, Cool, 0 - ≤ 6ºC	6 months
Methylmercury (mg/kg fish)		0.3	1630	10 ug/Kg	4 ug/Kg	500 mL fluorop;ymer	HCl pH<2, Cool, 0 - ≤ 6ºC	6 months

Section B.5 – Quality Control

Accuracy – Closeness of measured values to true value.

Bias – Deviation of measured value from true value. Measured using quality controls such as blanks, post-calibration checks, and spiked samples.

Blanks – source water, equipment, field, and trip (travel) blanks.

Precision – Degree of agreement among multiple measurements. Measured using split and duplicate samples and repeated analyses of standards.

B.6 Instrument/Equipment Testing, Inspection & Maintenance

B.7 Instrument/Equipment Calibration and Frequency

Per manual specifications.

B.8 Inspection/Acceptance of Supplies and Consumable

Check expiration dates.

B.9 Non-direct Measurements

Only using data collected by NNEPA.

B.10 Data Management –

ACCESS database compatible with USEPA WQX database

Section C – Assessment and Oversight Elements

C.1 Assessment and Response Actions

Re-evaluate QAP on an on-going basis

C.2 Reports to Management

Compile report of QA/QC issues for management and USEPA.

Section D – Data Generation and Acquisition Elements

D.1 Data Review, Verification, and Validation

Very important to review laboratory data as soon as it becomes available.

Request that lab provide “draft” data for review.

D.2 Verification and Validation Methods

D.3 Reconciliation with User Requirements

Section D.2 – Verification and Validation Methods

Analytical Data Validation - Check for holding times, dilutions, method blanks, dissolved versus total concentrations, analyses requested was performed, data flags, etc.

Chemical Correctness – Cation-anion balance, relative constituent concentrations, and constituent ratios.

Data Comparison Checks – Laboratory data versus field measurements.

Comparison to Previous data for same site.

Calculated versus reported values.

Section D.3 – Reconciliation with User Requirements

NNEPA is direct user of data.

Secondary users of data include public access through USEPA WQX.

Make sure data is ready to be released to public.

Thank You

Eric Rich
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