CHESAPEAKE BAY WATER-QUALITY MONITORING PROGRAM

WEST VIRGINIA NONTIDAL NUTRIENT AND SEDIMENT SAMPLING

QUALITY ASSURANCE PROJECT PLAN

JUNE 1, 2011 to MAY 31, 2012

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF WATER AND WASTE MANAGEMENT

IN COOPERATION WITH THE
U.S. GEOLOGICAL SURVEY

Created September 2011

QUALITY ASSURANCE PROJECT PLAN

for the

West Virginia Non-Tidal Monitoring Program
NUTRIENT AND SEDIMENT SAMPLING

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for the period of

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Approvals:

Douglas B. Chambers, Project Chief, USGS — Date

John Wirts, Project Coordinator, WVDEP — Date

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CONTENTS

Tables

A. Project Management

A.1 Introduction

This Quality-Assurance Project Plan (QAPP) describes quality-assurance goals and measures for the Non-Tidal Monitoring program designed to support Chesapeake Bay restoration programs.

The project, the *Non-Tidal Monitoring Program*, includes the monitoring of nutrient and suspended-sediment concentrations and streamflow in selected West Virginia tributaries of the Potomac River. This project is supported through West Virginia Department of Environmental Protection (WVDEP) and U.S. Geological Survey (USGS) cooperative funds. The objectives of this project are to:

- characterize nutrient and sediment concentrations in terms of flow and load for seven (7) West Virginia tributaries to the Potomac River;
- provide nutrient and sediment data for calibration of the Chesapeake Bay Watershed model (WSM) and loading inputs to the Chesapeake Bay Water-Quality (WQ) model; and
- integrate the information collected in this program with other elements of the monitoring program to gain a better understanding of the processes affecting the water quality of the Chesapeake Bay.

The WVDEP and the USGS conduct this project cooperatively. Sampling events, goals, and objectives for this project are overseen by the USGS Project Chief, Douglas B. Chambers.

A.2 Distribution List

This QAPP will be distributed to the following project participants:

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A.3 Project/Task Organization

Douglas B. Chambers, USGS, is the Project Chief for the West Virginia Non-Tidal Monitoring Program and is responsible for the technical design, operation, and execution of the program as outlined in the annual scope of work to WVDEP. He is also responsible for the evaluating and describing of collected data, quality assurance and quality control for the program, and producing USGS reports. Doug is also the Water-Quality Specialist for the USGS West Virginia Water Science Center.

John Wirts, WVDEP, DWWM, Watershed Assessment Branch, serves as the Project Coordinator for the Potomac River Non-Tidal Monitoring Program. He is tasked with assuring that all project commitments, the project timetable, and deliverables are completed.

A.4 Problem Definition/Background

The decline in water quality of the Chesapeake Bay within the last decade has, in large part, been attributed to excessive nutrients entering the estuary from its surrounding tributaries. In an effort to improve the water quality of the Bay, Federal, State, and local governments have initiated point and non-point source nutrient-reduction programs within the tributary basins discharging to the Bay. Monitoring at key sites can help to quantify improvements in water quality and verify the effectiveness of nutrient-control measures implemented in the watersheds.

In addition, the quality of the river discharge, and the timing and magnitude of the pollutant concentrations and loads delivered to the estuary are important data needed to enhance knowledge of or need to strengthen other components of the Chesapeake Bay water-quality monitoring program. The integration of all of these components will lead to a better understanding of the factors influencing water quality that can then be translated into better water-quality management for the Bay and its tributaries.

With these general goals in mind, the West Virginia Department of Environmental Protection (WVDEP), in cooperation with the USGS, initiated the West Virginia portion of the Non-Tidal Monitoring Program as part of the Chesapeake Bay Water-Quality Monitoring Program.

The Chesapeake Bay Non-Tidal Water Quality Monitoring Work Group and the State of West Virginia selected six Potomac River tributaries – Patterson Creek, the South Branch of the Potomac River, Cacapon River, Warm Springs Run, Opequon Creek, and Rockymarsh Run–for sampling. Additionally, Mill Creek, a tributary of Opequon Creek, will be sampled. Combined, these streams contribute over 30 percent of the flow to the Potomac River above Point of Rocks, Maryland and they contribute nutrients and sediments from a wide range of land-use, geologic, and hydrologic conditions. A sampling site will be established near the most downstream stream flow gaging station on each stream to monitor nutrient and sediment concentrations and streamflow to help calculate transport of these nutrient and sediment loads to the Potomac River and, ultimately, to Chesapeake Bay.

A.5 Project/Task Description

Water-quality samples that are representative of the entire river cross section are collected and later analyzed to determine concentrations of selected nutrient species and suspended sediment in the river. These samples are collected during different seasons across different flow regimes. When combined with the continuous, 15-minute flow record from the USGS gage at each station, it is possible to estimate nutrient and sediment loads on a monthly and annual basis with a known level of confidence. Additionally, water-quality field measurements are made for dissolved oxygen, pH, alkalinity, specific conductance, water temperature and air temperature.

The USGS's National Field Manual for the Collection of Water-Quality Data (Wilde and others, 1998, http://water.usgs.gov/public/owq/FieldManual/index.html) describes the sampling process in detail. Data-collection quality will be monitored by the assessment of field blanks and replicates and by annually conducting and documenting the results of random field audits.

Streamflow, nutrient, and suspended-sediment concentration data sets from each monitoring station will be forwarded to John Wirts at WVDEP by March 30 of each year for the previous USGS water year (October thru September). Semi-annual reports describing field activities, quality-control results, and data-management issues will be submitted with preliminary data to John Wirts on 15 November and 15 May.

A.6 Data-Quality Objectives and Criteria for Measurement Data

This study provides West Virginia resource managers with information that can help to quantify changes in water quality, quantify nutrient loads critical for evaluating progress towards reducing controllable nutrients to the Chesapeake Bay, and verify the effectiveness of nutrient-control measures taken in the watersheds. These data can be also be used to calibrate or validate models used to calculate watershed capload allocations. A calibrated model was developed that can simulate constituent relationships, seasonal variation, and changes in trends. As a result, water-quality samples need to be collected monthly throughout the year under different streamflow conditions to determine loads within a known confidence interval. Once completed, this information is then given to researchers and Bay resource managers.

Quality-control samples, both replicate samples and blanks, will be collected for each station. The project has a goal of two quality –control samples per site, unless an increased number is warranted. Detailed quality assurance procedures are described for NWQL in Maloney (2005), and for the USGS Kentucky Sediment Laboratory in Shreve and Downs (2005).

A.7 Special Training Certification

Field sampling teams will be led by USGS personnel trained in water-quality sampling operations, record management, quality-assurance procedures, instrument operations and maintenance, and troubleshooting. Laboratory personnel must be trained in analytical methods, quality-control procedures, record management, maintenance and troubleshooting.

A.8 Documentation and Records

Water-quality field measurements of temperature, dissolved oxygen, pH, alkalinity, and specific conductance are recorded at each site. Additionally, water-quality samples are collected and submitted for analysis to the USGS National Water-Quality Laboratory in Denver, Colorado. Samples are evaluated for total nitrogen (ammonium plus organic nitrogen), dissolved nitrite, dissolved nitrate plus nitrite, dissolved ammonia, total phosphorus, dissolved orthophosphate, and total suspended solids. Suspended sediments are analyzed at the USGS Sediment Laboratory in Louisville, Kentucky.

All data will be recorded using standardized data sheets for the specific projects (Attachment A). These data will be keyed into the USGS data management systems by technicians who collect the data. These data will be provided to WVDEP in hard copy in the form of tables and data summaries. Electronic data will be submitted with the final deliverables in ASCII text files and spreadsheets via CD-ROM or by email.

B. Measurement/Data Acquisition

B.1 Experimental Design

This document provides a detailed description of the monitoring and analysis components of a study conducted by the WVDEP, in cooperation with the USGS, to quantify nutrient and suspended-sediment contributions of 7 West Virginia tributaries to the Potomac River.

The number of events to be sampled and the number of samples per event is based on the requirements of the Chesapeake Bay Non-Tidal Monitoring Network. Water-quality samples need to be collected monthly during base flow and under various stormflow conditions. “Continuous” flow measurements also need to be collected.

Station Description
Monitoring stations were selected from a list of Chesapeake Bay Program priority monitoring sites. The location of the monitoring sites and drainage area information are presented in table 1.

Table 1. Location of West Virginia Non-Tidal Monitoring sites.

Station Name	USGS Station Identification	Latitude	Longitude	Drainage (sq. mi.)
Patterson Creek near Headsville, WV	01604500	39° 26’ 35”	78° 49’ 20”	211
South Branch Potomac River near Springfield, WV	01608500	39° 26’ 49”	78° 39’ 16”	1,486
Cacapon River near Great Cacapon, WV	01611500	39° 34’ 56”	78° 18’ 36”	675
Warm Springs Run near Berkeley Springs, WV	01613030	39°39’27.6”	78°12’18.3”	
Mill Creek at Bunker Hill, WV	01616400	39°20’04.6”	78°03’12.3”	
Opequon Creek near Martinsburg, WV	01616500	39° 25’ 25”	77° 56’ 20”	273
Rockymarsh Run at Scrabble, WV	01618100	39°28'59.1",	77°49'54.6"	9.9

B.2 Sampling Method

USGS personnel, with assistance from WVDEP and WVDA personnel, collect all water-quality samples at each of the seven West Virginia Non-Tidal Monitoring stations in accordance with the USGS National Field Manual for the Collection of Water Quality Data (Wilde and others, 1998).

Base-flow samples are collected monthly and stormflow samples are collected seasonally, with an average coverage of two storms per season. An experienced USGS Hydrologic Technician, assisted by an individual from either WVDEP or WVDA, will collect routine monthly, baseflow samples. The monitoring program emphasizes the collection of water-quality samples during periods of high flow (storm-event sampling), because most of the river-borne nutrient and suspended-sediment load is associated with storm events. Teams of two USGS Hydrologic Technicians will collect samples during high-flow events predicted through weather forecasts and by remote monitoring of river stage from the USGS offices. Discrete samples are collected during storm events, and can be collected during the rise, peak, or fall of the hydrograph. No more than one sample per day will be collected at each site, although storm samples may be collected on successive days during the same event. Discharge data are also collected for each of the streams throughout the period.

Base-flow and stormflow samples are collected using the equal-width increment (EWI) method. This method involves the collection of water-quality samples at the centroids of equal width increments along the river cross section. Water-quality samples are collected using the appropriate isokinetic sampler (table 1). These samplers hold either a 1-liter polyethylene bottle or a polyethylene bag. Samplers designed for shallow, wadeable conditions are mounted on a wading rod and samplers designed for deep conditions are lowered to the water using bridge crane. The general approach is to collect depth-integrated water samples using the Equal-Width Increment (EWI) sampling method, with minor variations to conform to site conditions. However, stream conditions, such as insufficient depth or velocity during periods of low-flow, may preclude the use of an isokinetic sampler. Under these conditions samples will be collected at multiple verticals across the stream width using a non-isokinetic sampler, typically an open-mouthed bottle or weighted-bottle sampler.

Sample volumes collected as part of EWI sample or a multiple vertical non-isokinetic sample will be composited in an 8-liter polypropylene churn splitter. All sample aliquots for analysis, whether whole-water or filtered, will be taken from the churn splitter.

Table 2. Isokinetic samplers and their associated use criteria.

Sampler Designation	Nozzle ID (in)	Container Size	Maximum Depth (ft)	Minimum Velocity (ft/sec)	Maximum Velocity (ft/sec)	Unsampled Zone (in)	Weight (lbs)
US DH-81	3/16	liter	9	2	6.2	4	1
US DH-81	1/4	liter	9	1.5	7.6	4	1
US DH-81	5/16	liter	9	2	7	4	1
US DH-2	3/16	liter	35	2	6	3.5	30
US DH-2	1/4	liter	20	2	6	3.5	30
US DH-2	5/16	liter	13	2	6	3.5	30
US D-95	3/16	liter	15	1.7	6.2	4.8	64
US D-95	1/4	liter	15	2	6.7	4.8	64
US D-95	5/16	liter	15	2	6.7	4.8	64

Patterson Creek
USGS personnel collect water samples from Patterson Creek at the Headsville streamflow gaging station. At low flows samples will be collected by wading, using a USGS DH-81 sampler. At storm flows samples will be collected using either a D-95 sampler or DH-2 sampler suspended from the WV Route 46 bridge near Champwood, WV, downstream from the gaging station.

South Branch Potomac River
USGS personnel collect samples from the South Branch Potomac River near Springfield using the EWI method. At low flows samples will be collected by wading, using a USGS DH-81 sampler. At storm flows samples will be collected using a D-95 sampler suspended from the W. Va. Secondary Route 3 bridge downstream from the gaging station.

Cacapon River
USGS personnel collect Cacapon River water samples at the USGS gaging station near Great Cacapon. At low flows samples will be collected by wading, using a USGS DH-81 sampler. At storm flows samples will be collected using a D-95 sampler suspended from the W. Va. Secondary Route 7 low-water bridge up to a stage of 4 feet, when sampling from the low-water bridge becomes dangerous. At stages exceeding 4 feet samples will be collected from the WV Route 9 bridge using a D-95 sampler suspended from a bridge crane.

Warm Springs Run
USGS personnel collect Warm Springs Run water samples at the USGS gaging station near Berkeley Springs. At low flows samples will be collected by wading, using a USGS DH-81 sampler. At storm

flows samples will be collected using a either a D-95 sampler or DH-2 sampler suspended from a bridge crane on the Morgan County Route 38-8 (Jimtown Road) bridge.

Mill Creek
USGS personnel collect Mill Creek water samples at the USGS gaging station at Bunker Hill. At low flows, samples will be collected by wading, using a USGS DH-81 sampler. At storm flows, samples will be collected using a either a D-95 sampler or DH-2 sampler suspended from a bridge crane on the U.S. Highway 11 bridge.

Opequon Creek
USGS personnel collect Opequon Creek water samples at the stream flow gaging station near Martinsburg. Low-flow samples will be collected by wading at a cross section about 40 feet upstream from the bridge using a USGS DH-81 sampler. Storm-flow samples will be collected using a either a D-95 sampler or DH-2 sampler suspended from the bridge on State Route 9, at the gaging site.

Rockymarsh Run
USGS personnel collect Rockymarsh Run water samples at the USGS gaging station at Scrabble. At low flows, samples will be collected by wading, using a USGS DH-81 sampler. At storm flows, samples will be collected using a either a D-95 sampler or DH-2 sampler suspended from a bridge crane on the County Road 5 (Scrabble Road) bridge.

Constituents Monitored
The monitoring program focuses on quantifying the water quality and loads of major nutrient species and suspended sediment from Patterson Creek, South Branch of the Potomac River, Warm Springs Run, Cacapon River, Mill Creek, Opequon Creek, and Rockymarsh Run. Chemical parameters monitored for the program include:

TN	total nitrogen
NO_2	dissolved nitrite
NH_4	dissolved ammonia as N
NO_{23}	dissolved nitrate plus nitrite as N
TP	total phosphorus
o-PO_4	dissolved orthophosphorus as P
TSS	total suspended solids
SSC	total suspended sediment

Analytical methods for these constituents are shown in table 2.

B.3 Sample Handling and Custody

Sample Treatment and Preservation

Water-quality samples collected by the USGS (Wilde and others, 1998) are split using a polypropylene churn splitter. The composite sample is introduced into a pre-cleaned plastic churn splitter and sub-samples for whole-water analysis are drawn while churning at a rate of 1.0 ft/second. The remaining samples are filtered on site for dissolved analysis using a 0.45-micrometer (average pore size, polycarbonate) capsule filter (Wilde and others, 1998). Sulfuric acid (4.5N) is added to the bottle to be analyzed for whole-water nutrients for preservation Nutrient samples are placed immediately on ice and chilled to a temperature of 4 degrees Celsius. Nutrient and total suspended solids samples are shipped to the USGS NWQL in Denver, CO according to USGS National Water Quality Laboratory technical memorandum 11.01 (P. Alex and P. Grano, 2011). This document can be found at (http://wwwnwql.cr.usgs.gov/USGS/tech_memos/nwql.2011-01.pdf). Suspended-sediment samples, collected concurrently with the water-quality samples from the churn splitter or collected separately, are shipped to the USGS Sediment Laboratory in Louisville, Kentucky, for analysis.

Table 3. Potomac River Non-Tidal Monitoring sampling parameters.

Lab Code	Parameter Code	Parameter/ Methodology	Reference	Reporting Level
		Total Nitrogen		
LC 2756	P62855	*Alkaline persulfate digestion* I-4650-03	Patton and Kryskalla (2003)	0.05 mg/L
		Nitrogen, Nitrite as N		
LC 3117	P00613	*Colorimetry* I-2540-90	Fishman (1993)	0.0010 mg/L
		Dissolved Nitrite & Nitrate as NO_{2+3}		
LC 1975	P00631	*Colorimetry, Cd-reduction* *I-2545-90*	Fishman (1993)	0.020 mg/L
		Dissolved Ammonia (NH_3)		
LC 3116	P00608	*Colorimetry* I-2525-89, I-2522-90	Fishman (1993)	0.010 mg/L
		Total Phosphorous		
LC 2333	P00665	*Colorimetry, Auto* USEPA 365.1	USEPA	0.004 mg/L
		Dissolved Orthophosphate (DIP or o-PO_4)		
LC 3118	P00671	*Colorimetry* I-2601-90, I-2606-89	Fishman (1993)	0.004 mg/L
		Total Suspended Sediment (SSC)		
n/a	P80154	*Hydroscopic glass-fiber filtration* ASTM test method D3977-97 Method C	Shreve and Downs (2008)	0.5 mg/L
		Total Suspended Solids (TSS)		
LC 169	P00530	*Gravimetric* I-3765-89	Fishman and Friedman (1989)	15 mg/L

B.4 Analytical Methods

Analytical Methods employed Analytical methods for these constituents are documented in table 2 and described in the USGS National Water-Quality Laboratory documents.

Laboratory Analysis

Water-quality samples collected by the USGS for the River Input Monitoring Program are analyzed by the USGS National Water-Quality Laboratory (NWQL) in Denver, CO. Analytical techniques employed by the laboratory are documented in table 2. Sediment samples are analyzed by the USGS Sediment Laboratory in Louisville, Kentucky (Shreve and Downs, 2008).

B.5 Quality Assurance/Quality Control

Quality assurance and quality control are a significant component of the monitoring program. The quality-assurance effort includes documentation of concentration variability within the cross section, sediment-transport analysis, quality assurance of sample-collection techniques and field personnel, and accounting for variability within and among the analyzing laboratories. Sample collection and processing, and data handling are performed in accordance with the USGS West Virginia Water Science Center's Water-Quality Quality Assurance plan. Quality-assurance results can be obtained from: USGS West Virginia Water Science Center, at 11 Dunbar Street, Charleston, WV, 25301.

Laboratory quality-control methods are documented in the USGS National Water-Quality Laboratory Quality Management System (Maloney, ed. 2005); available at http://wwwnwql.cr.usgs.gov/qas.shtml?qmsdars.

Field quality control is checked during random field audits. The Quality Assurance officer assures that samples were collected, labeled, and preserved according to standard operating procedures. A field checklist will be prepared, and a summary report will be submitted.

B.6 Instrument/Equipment Testing, Inspection, and Maintenance

Instrument probes are cleaned and thoroughly inspected between sampling events. If any probe is not functioning correctly, it is determined whether it is necessary to perform maintenance and/or replace (retire) the instrument.

Physical sampling gear is inspected before each use to assure that all parts are intact. Any gear that shows operational deficiency is not used until repairs can be made.

B.7 Instrument Calibration and Frequency

The meters used to determine field parameters are calibrated daily. Specific instructions for calibration are found in the operating manuals provided with the instrument. Fresh standards are available for calibration prior to each sampling period. The field technician is responsible for providing directions for appropriate calibration, including the appropriate potassium chloride concentration to use for salinity calibrations. Dissolved oxygen (DO) is measured with either a luminescent DO sensor or an amperometric meter. The DO meter is calibrated using the water-saturated air method.

A calibration record is maintained for each unit in a logbook. This log serves as documentation for pre- and post-calibration information for each parameter recorded. The log is useful in determining drift in a probe, which indicates that maintenance is necessary for maintenance. The field technician remains aware of questionable performance of any instruments, and determines when it is necessary to perform maintenance and/or replace an instrument.

B.8 Inspection Acceptance Requirements for Supplies and Consumables

The field technician routinely inspects equipment and supplies. The field technician is responsible for determining when supplies and consumables should be discarded. Special attention should be paid to the condition of any filtration supplies (filters, bottles, etc.) and ultra-clean gear to assure that they are uncontaminated. If contamination is suspected, the supplies should be discarded. Any supplies that have exceeded their expiration date are disposed of.

B.9 Data Acquisition

Streamflow data is a necessary data input in the load estimation model. Site summaries of historic streamflow conditions are shown in Table 3. Period of record indicates the period for which there are published discharge values for the USGS station. The annual mean for the period of record is the arithmetic mean of the individual daily-mean discharges for the designated period of record. The highest and lowest daily means are the maximum daily-mean discharge and minimum daily-mean discharge, respectively, for the designated period of record.

Table 4. Potomac River Non-Tidal Monitoring site drainage area and historic streamflow conditions.

[mi^2, square miles; ft^3/s, cubic feet per second]

Period of Record	Drainage (sq. mi.)	Period of Record Annual Mean discharge (ft^3/s)	Highest Daily Mean discharge (ft^3/s)	Lowest Daily Mean discharge (ft^3/s)
Patterson Creek near Headsville, WV (01604500)				
August 1938 to Present Year	211	170.1	11,100	0.48
South Branch Potomac River near Springfield, WV (01608500)				
August 1928 to Present Year	1,486	1,332	145,000	52
Cacapon River near Great Cacapon, WV (01611500)				
December 1922 to September 1995, October 1996 to Present Year	675	581.6	67,900	26
Opequon Creek near Martinsburg, WV (01616500)				
July 1947 to Present Year	273	239.7	15,000 (estimated)	26
Rockymarsh Run at Scrabble, WV (01618100)				
April 2008 to Present Year	9.9	10.56	119	3.40

Daily-mean discharges are computed by applying the daily mean stages (gage heights) to the stage-discharge curves (James and others, 2003). The USGS provides stage and discharge data for gaging stations on the internet. These data may be accessed at http://wv.usgs.gov.

B.10 Data Management

All data will be recorded using the PCFF software package or standardized data sheets (see Attachment A) for the specific projects. Data sheets will be coded with a site code (station name and station number, date, collection time, and collector's initials). These data will be entered into the USGS's data management systems by technicians who collect the data. All data files will be documented in metadata files. Data files will be maintained on the USGS computer network and backed up by on tape and at an offsite computer. The USGS WV Water Science Center in Charleston will house the archived copies of paper forms. Copies of the original data sets will be provided to WVDEP and maintained by the project coordinator. Electronic files with appropriate metadata will be forwarded to the appropriate analysts. The project data manager will maintain field data sheets, which will be kept at the same location as the electronic files.

Field data are entered into the USGS computers using standard USGS data entry procedures. Summary statistics are calculated to identify anomalies in the data. All data anomalies are verified against the raw data and corrected if necessary. Several times during the year, some provisional data files will be transferred from USGS to WVDEP. These intermediate data transfers include flow data from each station for the previous calendar year, raw nutrient and suspended-sediment data and quality-control results from the previous calendar year. Metadata files created by the data manager and linked to the data files also will be transferred to WVDEP. Additionally, further data requests can be coordinated by contacting Doug Chambers at the USGS West Virginia Water Science Center.

C. Assessment/Oversight

C.1 Assessment and Response Actions

The USGS quality-assurance officer will conduct random field and office audits to ensure that data collection and data manipulation follow guidelines set forth in the to the quality-assurance plan. A minimum of one field audit will be conducted each year. The field audit will consist of examining all aspects of the field collection for accuracy and adherence to sampling procedures. The field audit will be representative of all sites, but will not necessarily require a visit to each site. A summary report documenting the field activities will be provided. Office audits will be conducted to ensure that all logs are completed and up-to-date, and that proper data management and manipulation is being conducted. The principal investigator will be immediately notified of any deficiencies and take immediate corrective actions.

The project coordinator will continually monitor the logs and records associated with the project to assure that project schedules are being met. The project coordinator will immediately take any corrective action necessary if project schedules and procedures are being violated. The quality-assurance officer will perform and report on technical system audits and data-quality audits. Data-quality assessments will be conducted to determine whether the assumptions were met.

A USGS Water Science Center Water-Quality Review is held every three years by the USGS Regional Water-Quality Specialist and Regional Staff. Field methods are observed for consistency with USGS procedures and the District water-quality database (QWDATA) and the national database (STORET) are in agreement.

C.2 Reports to Management

Quarterly progress reports will be submitted from the USGS to WVDEP to describe semi-annual project activities (Attachment B). Any deviations from scheduled project activities will be noted and the effect of these deviations on the final project outcome will be described. Corrective measures will also be suggested. The Project Chief (USGS) will be responsible for producing and distributing progress reports. Additionally, progress will be reviewed during quarterly USGS West Virginia Water Science Center reviews.

D. Data Validation and Usability

D.1 Data Review, Validation, and Verification

Data will be verified using a previously developed data quality-control system. After being scrutinized during the data-entry phase, data are analyzed and plotted to examine any outliers or anomalies. These are then examined, verified, and corrected if necessary. Field audits are performed to assure that all data are collected according to standard operating procedures, and that the collection effort is consistent and equal. The USGS Project Chief is responsible for performing quality control, or assuring that quality control is performed by appropriate staff.

All field logs and information are thoroughly reviewed prior to data analysis to assure that all data were collected uniformly. Any data that are not collected according to standard operating procedures are examined to determine whether they are representative. All quality-assurance reports are examined prior to data analysis to verify that data were properly and consistently collected. Any deviations in data collection are taken into account during data analysis. All calibration logs are examined to determine how well the measurement instruments performed. If there appears to be significant drift in instrument performance, the data are adjusted accordingly. All raw data are kept in paper files. Data are entered twice and compared for keying errors. These errors will be corrected. Original (raw) data are retained by the Project Chief.

D.2 Validation and Verification Methods

The field technician or senior field staff person will verify all data entered in the field. This person will examine all data sheets to ensure that they are accurately and legibly completed. They will then sign and record the date and time on the data sheets when verified. All field validation must occur prior to leaving the site before samples are discarded. Any recording errors are to be marked through and initialed. The true value is to be recorded next to the error, and all errors are to be explained in the remarks column of the data sheet. These data sheets will be placed in a notebook and logged on a daily log sheet. These notebooks will be forwarded to the data manager on request. The data manager will forward the data sheets to the data entry staff. The final verified computerized data set is forwarded to the data analysts.
A substantial effort is incorporated into the monitoring program to document and ensure quality assurance (QA) and quality control (QC). The quality-assurance effort includes documentation of observed concentration variability within the cross section, sediment transport analysis, quality assurance of sample-collection techniques and field personnel, and the variability within and among the analyzing laboratories. Field quality control is verified during random field audits. The QA officer assures that samples are collected, labeled and preserved in accordance with standard operating procedures. Field blanks and trip blanks are submitted to evaluate the potential for contamination of samples during their collection, processing, and transport.

E. References

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Attachment A: Example of Field Data Sheet

U. S. GEOLOGICAL SURVEY SURFACE-WATER QUALITY FIELD NOTES

Station No. ________________

NWIS Record No. ______________

Station No. ______________________ Station Name ____ Field ID ______________

Sample Date ____________ Mean Sample Time ______ Time Datum ______ (eg. EST, EDT, UTC) End Date ________ End Time ______

*Sample Medium: WS WSQ OAQ *Sample Type: 9 (regular) 7 (replicate) 2 (blank) 1 (spike) _________

*Sample Purpose (71999): 10 (routine) 15 (NAWQA) 20 (NASQAN) 30 (Benchmark) _________________________

* see last page for additional codes

*Purpose of Site Visit (50280): 1001 (fixed-frequency SW) 1003 (extreme high flow SW) 1004 (extreme low flow SW) 1098 (NAWQA QC) _____

QC Samples Collected? Y N Blank Replicate Spike Other____________________

Project No. ____________________________________ Project Name____

Sampling Team _________________________________ Team Lead Signature ____________________________ Date __________

START TIME ________ GAGE HT ______ TIME ________ GHT _____ TIME ________ GHT _____ TIME ________ GHT _____ END TIME ________ GHT ______

FIELD MEASUREMENTS

Property	Parm Code	Method Code	Result	Units	Remark Code	Value Qualifier	Null Value Qualifier	NWIS Result-Level Comments
Gage Height	00065			ft				
Discharge, Instantaneous	00061			cfs				
Temperature, Air	00020	THM04 (thermister) THM05 (thermometer)		°C				
Temperature, Water	00010	THM01 (thermister) THM02 (thermometer)		°C				
Specific Conductance	00095	SC001 (contacting sensor)		µS/cm				
Dissolved Oxygen	00300	MEMBR (amperometric) LUMIN (luminescent)		mg/L				
Barometric Pressure	00025			mm Hg				
pH	00400	PROBE (electrode)		units				
ANC, unfiltered, Incr.	00419	TT001		mg/L				
Alkalinity, filtered, Incr.	39086	TT013		mg/L				
Carbonate, flt, Incr.	00452	TT019		mg/L				
Bicarbonate, flt, Incr.	00453	TT017		mg/L				
Hydroxide, flt, Incr.	71834	TT023		mg/L				
Turbidity [see attachment for codes]								
Other								
Other								

SAMPLING INFORMATION

Parameter	Pcode	Value	Information
Sampler Type	84164	3044 DH-81 3045 DH-81Teflon 3051 DH-95 Teflon 3052 DH-95 Plastic 3053 D-95 Teflon 3054 D-95 Plastic 3055 D-96 Bag Sampler 3057 D-99 Bag Sampler 3058 DH-2 Bag Sampler 3060 Weighted-Bottle Sampler Other (see last page for codes) ___________	Sampler ID: Sampler bottle/bag material: plastic teflon other ___________ Nozzle material: plastic teflon other ________ Nozzle size: 3/16" 1/4" 5/16"
Transit Rate, minimum	50014	ft/sec	Max depth used to determine transit rate
Transit Rate	50015	ft/sec	Velocity in vertical used to determine transit rate
Transit Rate, maximum	50016	ft/sec	
Sampler Splitter Type	84171	10 Churn, plastic, 8 L, cooler-type spigot 20 Churn, plastic, 14 L, cooler-type spigot 30 Churn, plastic, 8 L, cubitainer-type spigot 40 Churn, plastic, 14 L, cubitainer-type spigot 50 Churn splitter, fluoropolymer, 8 liter 60 Churn, fluoropolymer, 14 L, US SS-1 80 Cone splitter, fluoropolymer r (see last page for codes) __________	Splitter ID:
Sampling Method	82398	10 EWI; 20 EDI; 30 single vertical; 40 multiple vertical; other _______________	Filter type(s): capsule disc 142mm 25mm GFF membrane
Stream Velocity	81904	ft/sec estimated measured	
Hydrologic Condition	N/A	A Not Determined; 4 Stable, low stage; 5 Falling stage; 6 Stable, high stage; 7 Peak stage; 8 Rising stage; 9 Stable, normal stage	
Observations [Codes: 0=none; 1=mild; 2=moderate; 3=serious; 4=extreme]		Oil-grease (01300) ___ Detergent suds (01305) ___ Atm. Odor (01330) ___ Fish kill (01340) ___	Floating garbage (01320) ___ Floating algae mats (01325) ___ Floating debris (01345) ___ Turbidity (01350) ___

COMPILED BY: ____________________ CHECKED BY: ________________________ LOGGED INTO NWIS BY: ________________________

November 2009 1 SW Form version 8.0

Station No. ________________

SAMPLING CONDITIONS

Stream width: ____________ ft mi Left bank ___________ Right bank ___________ft Ice cover _____% Ave. ice thickness _____ in.

Sampling points: ___

Sampling location: wading cableway boat bridge upstream downstream side of bridge _____ ft mi above below gage __________

Sampling site: pool riffle open channel braided backwater Bottom: bedrock rock cobble gravel sand silt concrete other __________

Stream color: brown green blue gray clear other ________ Stream mixing: well-mixed stratified poorly-mixed unknown other______

Weather: *sky-* clear partly cloudy cloudy *precipitation-* none light medium heavy snow sleet rain mist ___________

wind- calm light breeze gusty windy est. wind speed______ mph *temperature-* very cold cool warm hot ____________

No. days since last significant rainfall _________

Observations:

Sample Comments (for NWIS; 300 characters max.):

LABORATORY INFORMATION *Sample Set ID* _____

SAMPLES COLLECTED:

Nutrients: ___WCA ___FCC ___FCA ___CC Major cations: ___FA ___RA Major anions: ___FU Trace elements: ___FA ___RA ___CU

Mercury: ___FAM ___RAM ___Wis. Hg Lab Lab pH/SC/ANC: ___RU

VOC: GCV (____ vials) Organics: ____GCC filtered __ unfiltered __ ___BGC ___C18 ___ Kansas OGRG Lab

Suspended solids: ___SUSO Turbidity: ___TBY

Phenols: ___PHE Oil&Grease: ___OAG Methylene Blue Active Substances: ___MBAS Color: ___RCB

Carbon: ___TPCN ___PIC filter1-vol filtered______mL filter2-vol filtered______mL filter3-vol filtered______mL ___DOC ___TOC

Stable Isotopes: ___FUS ___RUS Radiochemicals: ___FUR ___RUR ___SUR ___FAR ___RAR __CUR ___RUR T ___RURCV

___BOD ___COD Chlorophyll: ____ CHL Algae: ____ Invertebrates: ___IQE ___IQL ___IQM ___IRE Fish tissue: ___TBI

Ultraviolet Absorbing Substances: ___UAS

Other:______________ (Lab____________) Other:____ ________ (Lab____________) Other:______________ (Lab____________)

Other:______________ (Lab____________) Other:____ ________ (Lab____________) Other:______________ (Lab____________)

Suspended sediment: ____ CONC. S/F SIZE [No. bottles _____]

Microbiology: ____ (Lab_________________)

Laboratory Schedules: ___________ ___________ ___________ __________ __________ __________

Lab Codes: ________ add/delete _________ add/delete ________ add/delete ________ add/delete _______ lete

Comments: ____________________________________

Date shipped: __________ Lab(s): ________________ ___________________ _____________________

Date sediment sample shipped: _________ Sediment L _______________

Comments:

****Notify the NWQL in advance if shipping potentially hazardous samples—phone 1-888-ASK-NWQL or email LabLogin@usgs.gov**

Calibrated by:_________________________ Location:___ ________________ Station No. ________________
Date:_______________ Time:____________

METER CALIBRATIONS/FIELD MEASUREMENTS

TEMPERATURE Meter MAKE/MODEL ________________ S/N ____________ Thermister S/N ____________ Thermometer ID __________

Calibration criteria: ± 1 percent or ± 0.5 °C for liquid-filled thermometers ± 0.2 °C for thermisters — Local Meter ID:______________________________

Lab Tested against NIST Thermometer/Thermister? N Y Date: __________ ±______ °C

Measurement Location: SINGLE POINT AT _______ ft DEEP STREAMSIDE _____ FT FROM LEFT RIGHT BANK VERTICAL AVG/MEDIAN OF _____ PTS

Field Readings #1 ______ #2 ______ #3 ______ #4 _______ #5 _______ **MEDIAN:**________ °C Method Code _______ Remark ___ ___ Qualifier ___ ___

pH Meter MAKE/MODEL __________________ S/N _______________ Electrode ID _____________ Type: GEL LIQUID OTHER _______

Sample: FILTERED UNFILTERED CONE SPLITTER CHURN SPLITTER SINGLE POINT AT _____ FT DEEP VERTICAL AVG. OF _____ PTS

pH BUFFER	BUFFER TEMP	THEO-RETICAL pH FROM TABLE	pH BEFORE ADJ.	pH AFTER ADJ.	SLOPE	MILLI-VOLTS
pH 7						
pH 7						
pH 7						
pH ___						
pH ___						
pH ___						
CHECK pH ___						

TEMPERATURE CORRECTION FACTORS FOR BUFFERS APPLIED? Y N

Local Meter ID:______________________________

pH Buffer	Lot No.	Expiration Date
pH 7		
pH 10		
pH 4		

Calibration Criteria: ± 0.1 pH units, ± 0.3 if SC <75us/cm

Field Readings #1______ #2_____ #3_____ #4_____ #5 _____ **MEDIAN:** _______ **Units** Method Code _______ Remark ___ ___ Qualifier ___ ___

SPECIFIC CONDUCTANCE Meter MAKE/MODEL _________________ S/N ______________ Sensor Type: DIP FLOW-THRU OTHER_________

Sample: CONE SPLITTER CHURN SPLITTER SINGLE POINT AT ______ ft DEEP VERTICAL AVG. OF _______ POINTS Sensor ID _________________

Std Value µS/cm	Std Temp	SC Before Adj.	SC After Adj.	Std Lot No.	Std type (KCl; NaCl)	Std Exp. Date

Local Meter ID:____________________

AUTO TEMP COMPENSATED METER ___ Y N

CORRECTION FACTOR APPLIED? Y N

CORRECTION FACTOR= ___________

Calibration Criteria: ± 5 % for SC <100 µS/cm or 3% for SC >100 µS/cm

Field readings #1_____ #2_____ #3_____ #4_____ #5 _____ **MEDIAN:** _______ **µS/cm** Method Code _______ Remark ___ ___ Qualifier ___ ___

DISSOLVED OXYGEN Meter MAKE/MODEL ______________________________ S/N ____________________

Sensor Type: Amperometric Luminescent Sensor ID ________________________ Local Meter ID:____________________________

Water-Saturated Air Air-Saturated Water Air Calibration Chamber In Water Air Calibration Chamber In Air Air Saturated Water

Sample: SINGLE POINT AT _______ ft DEEP VERTICAL AVG. OF _____ POINTS BOD BOTTLE OTHER_____________ Stirrer Used? Y N

Calibration Temperature °C	Barometric Pressure mm Hg	DO Table Reading mg/L	Salinity Correction Factor	DO Before Adjustment	DO After Adjustment

Zero DO Check _________mg/L Adj. to _________mg/L Date ______________

Zero DO Solution Date__________ Thermister Check? Y N Date_________

Membrane Changed? N Y N/A Date: _______ _ Time: _______

Barometer Calibrated? N Y Date: __ ______ Time: _______

Phase Degrees/Slope/Gain/Scale Factor (100%)______________(Zero)________

Calibration Criteria: ± 0.2 mg/L **DO saturation** _______ %

Field readings #1______ #2_____ #3_____ #4_____ #5 _____ **MEDIAN:** _______ **mg/L** Method Code _______ Remark ___ ___ Qualifier ___ ___

SW Form version 8.0

Station No. __________________

TURBIDITY Meter: make/model ______________________ S/N Type: _________________ turbidimeter submersible spectrophotometer

Sample: Collection Time: ________ Measurement Time: ________ Sensor ID ________________

TURBIDITY VALUE = A x (B+C) / C

Measurement: In-situ/On-site Vehicle Office lab NWQL Other ___________________

Sample diluted? Y N Vol. of dilution water _________ mL Sample volume ________ mL

A= TURBIDITY VALUE IN DILUTED SAMPLE
B= VOLUME OF DILUTION WATER, mL
C= SAMPLE VOLUME, mL

Calibration Criteria: ± 0.5 TU or ± 5%	Lot Number or Date Prepared	Expiration Date	Concentration ____ (units)	Calibration Temperature °C	Initial instrument reading	Reading after adjustment
Stock Turbidity Standard						
Zero Standard (DIW)						
Standard 1						
Standard 2						
Standard 3						

COMMENTS:

Calibration Criteria:
< 100 Turbidity units ± 0.5 turbidity units or ± 5% of the measured Value, whichever is greater
> 100 Turbidity units ± 10%

Field Readings #1 ___________ #2 ___________ #3 ___________ #4 ___________ #5 ___________

MEDIAN _________ **Parameter Code** _________ FNU NTU NTRU FNMU FNRU FAU FBU AU Method Code _________ Remark ___ ___ Qualifier ___ ___

CROSS SECTION NOTES Barometric pressure = _________ mm Hg

Station	ft from left bank (00009) or ft from right bank (72103)	Time	Gage ht ft (00065)	Discharge (inst) cfs (00061)	Depth ft (81903)	Temp °C (00010) ____ (Method Code)	SC µS/cm (00095) ____ (Method Code)	DO mg/L (00300) ____ (Method Code)	DO sat % (00301)	pH units (00400) ____ (Method Code)	Turbidity ________ (______) ____ (Method Code)	NWIS Record No.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												

NOTES:

Station No. ____________________

ALKALINITY/ANC CALCULATIONS

Beginning H_2O temp. __________ °C

pH	ΔpH	Vol acid DC or mL	ΔVol acid DC or mL	ΔpH / ΔVol acid

End H_2O temp. __________ °C

Beginning H_2O temp. __________ °C

pH	ΔpH	Vol acid DC or mL	ΔVol acid DC or mL	ΔpH / ΔVol acid

End H_2O temp. __________ °C

CALCULATIONS

ALKALINITY (mg/L as $CaCO_3$) = 50044 (B) (C_a) (CF) / V_s

where:

B = volume of acid titrant added from the initial pH to the bicarbonate equivalence point (near pH 4.5), in milliliters. To convert from digital counts to milliliters, divide by 800 (1.00 mL = 800 counts)

C_a = concentration of acid titrant, in milliequivalents per milliliter (same as equivalents per liter, or *N*)

CF = Hach cartridge correction factor (default value is 1.01) [see OWQ WaQI Note 2005.02 for info]

V_s = volume of sample, in milliliters

For samples with pH = 9.2:

BICARBONATE (mg/L) = 61017 (B-2A) (C_a) (CF) / V_s

CARBONATE (mg/L) = 60009 (A) (C_a) (CF) / V_s

where:

A = volume of acid titrant added from the initial pH to the carbonate equivalence point (near pH 8.3), in milliliters. To convert from digital counts to milliliters, divide by 800 (1.00 mL = 800 counts)

NOTE: For samples with pH > 9.2, these equations for bicarbonate and carbonate will fail to give accurate results.

Use the Alkalinity Calculator at http://oregon.usgs.gov/alk or PCFF [http://water.usgs.gov/usgs/owq/pcff.html]

FIRST TITRATION RESULTS

Date ______________ Initials ______________

Begin time ____________ End time ____________

Alkalinity/ANC ______________ mg/L as $CaCO_3$

Bicarbonate ________________ mg/L as HCO_3^-

Carbonate ________________ mg/L as CO_3^{2-}

Acid: 1.6N 0.16N 0.01639N

Other: ______________________________

Acid Lot No. ___________________________

Acid Expiration Date ___________________

Sample Volume: ______________ mL

Filtered Unfiltered Churn Cone

Method: Inflection Point Gran

Fixed Endpoint

Stirring Method: Magnetic Manual

SECOND TITRATION RESULTS

Date ______________ Initials ______________

Begin time ____________ End time ____________

Alkalinity/ANC ______________ mg/L as $CaCO_3$

Bicarbonate ________________ mg/L as HCO_3^-

Carbonate ________________ mg/L as CO_3^{2-}

Acid: 1.6N 0.16N 0.01639N

Other: ______________________________

Acid Lot No. ___________________________

Acid Expiration Date ___________________

Sample Volume: ______________ mL

Filtered Unfiltered Churn Cone

Method: Inflection Point Gran

Fixed Endpoint

Stirring Method: Magnetic Manual

pH meter calibration	Meter make/model:		S/N	
Calibration Location:				
Electrode No.			Slope	Millivolts
Type: gel liquid other__________		pH 7		
		pH __		
pH buffer	**Buffer temp**	**Theoretical pH from table**	**pH before adj.**	**pH After adj.**
pH 7				
pH __				
Check pH ___				

Comments/Calculations:

Field titration by: ________________ Checked by: ____________

SW Form version 8.0

Station No. ________________

QUALITY-CONTROL INFORMATION

PRESERVATIVE LOT NUMBERS

7.5N — 7.7N HNO_3 ________ (METALS&CATIONS) 6N HCl ________ (Hg) 4.5N H_2SO_4 ________ (NUTRIENTS&DOC) Conc. H_2SO_4 ________ (COD, PHENOL) 1:1 HCl ________ (VOC)

________ Drops of HCL added to lower pH to ≤ 2
(NOTE: Maximum number of drops = 5)

BLANK WATER LOT NUMBERS

Inorganic (99200) ________ 2nd Inorganic (99201) ________ Spike Vials (99104) ________

Pesticide (99202) ________ 2nd Pesticide (99203) ________ Surrogate Vials ________

VOC/Pesticide (99204) ________ 2nd VOC/Pesticide (99205) ________

Filter Lot Numbers

Filter descriptions with parameter codes require NWIS LOT NUMBERS available at http://wwwnwql.cr.usgs.gov/qas.shtml?filters_home

Filter Type	Pore Size (microns)	Manufacturer's Lot Number	Parameter Code	NWIS Lot Number
Capsule	0.45		99206	
Disc	0.45			
142 mm GFF (organics)	0.70			
25 mm GFF (organic carbon)	0.70			
142 mm membrane (inorganics)	0.45			

Starting date for set of samples (99109) (YYMMDD) ________ **Ending date for set of samples** (99110) (YYMMDD) ________

QC SAMPLES

Sample Type	NWIS Record No.	Sample Type	NWIS Record No.	Sample Type	NWIS Record No.
Equip Blank ____	________	Sequential ____	________	Trip Blank ________	________
Field Blank ____	________	Spike ____	________	Other ________	________
Split ____	________	Concurrent ____	________	Other ________	________

NWQL Schedules/lab codes (QC Samples) ________ ________ ________ ________ ________ ________

________ ________ ________ ________ ________ ________ ________ ________ ________

COMMENTS: ____

(Circle appropriate selections)

99100 Blank-solution type
- 10 Inorganic grade (distilled/deionized)
- 40 Pesticide grade (OK for organics and organic carbon)
- 50 Volatile-organic grade (OK for VOCs, organics, and organic carbon)
- 200 Other

99101 Source of blank water
- 10 NWQL
- 40 NIST
- 55 Wisconsin Mercury Lab
- 140 EMD Chemicals
- 150 Ricca Chemical Company
- 200 Other

99105 Replicate-sample type
- 10 Concurrent
- 20 Sequential
- 30 Split
- 40 Split-Concurrent
- 50 Split-Sequential
- 200 Other

99102 Blank-sample type
- 1 Source Solution
- 30 Trip
- 40 Sampler
- 50 Splitter
- 60 Filter
- 70 Preservation
- 80 Equipment (done in non-field environment)
- 90 Ambient
- 100 Field
- 200 Other

99111 QC sample associated with this environmental sample
- 1 No associated QA data
- 10 Blank
- 30 Replicate Sample
- 40 Spike sample
- 100 More than one type of QA sample
- 200 Other

A complete set of fixed-value codes can be found online at:
http://wwwnwis.cr.usgs.gov/currentdocs/index.html

99106 Spike-sample type
- 10 Field
- 20 Lab

99107 Spike-solution source
- 10 NWQL

99108 Spike-solution volume, mL ________

99112 Purpose, Topical QC data
- 1 Routine QC (non-topical)
- 10 Topical for high bias (contamination)
- 20 Topical for low bias (recovery)
- 100 Topical for variability (field equip)
- 110 Topical for variability (field collection)
- 120 Topical for variability (field personnel)
- 130 Topical for variability (field processing)
- 140 Topical for variability (shipping&handling)
- 200 Topical for variability (lab)
- 900 Other topical QC purpose

REFERENCE LIST FOR CODES USED ON THIS FORM

A complete set of fixed-value codes can be found online at: http://wwwnwis.er.usgs.gov/currentdocs/index.html

Sample Medium Codes
- WS Surface water
- WSQ Quality-control sample (Replicate, Spike)
- OAQ Blank

Value Qualifiers
- e see field comment
- f sample field preparation problem
- k counts outside the acceptable range

Null-value Qualifiers
- e required equipment not functional or available
- f sample discarded; improper filter used
- o insufficient amount of water
- p sample discarded; improper preservation
- q sample discarded; holding time exceeded
- r sample ruined in preparation

84164 Sampler Type
- 100 Van Dorn Sampler
- 110 Sewage Sampler
- 125 Kemmerer Bottle
- 3044 US DH-81
- 3045 US DH-81 With Teflon Cap And Nozzle
- 3047 Sampler, Frame-Type, Plastic Bottle W/Reynolds Oven Bag
- 3048 Sampler, Frame-Type, Teflon Bottle
- 3049 Sampler, Frame-Type, Plastic Bottle
- 3050 Sampler, Frame-Type, Plastic Bottle W/Teflon Collapsible Bag
- 3051 US DH-95 Teflon Bottle
- 3052 US DH-95 Plastic Bottle
- 3053 US D-95 Teflon Bottle
- 3054 US D-95 Plastic Bottle
- 3055 US D-96 Bag Sampler
- 3057 US D-99 Bag Sampler
- 3058 US DH-2 Bag Sampler
- 3060 Weighted-Bottle Sampler
- 3061 US WBH-96 Weighted-Bottle Sampler
- 3070 Grab Sample
- 3071 Open-Mouth Bottle
- 3080 VOC Hand Sampler
- 4010 Thief Sampler
- 4115 Sampler, point, automatic
- 8000 None
- 8010 Other

84171 Sample splitter type, field, code
- 10 Churn splitter, plastic, 8 liter, cooler-type spigot
- 20 Churn splitter, plastic, 14 liter, cooler-type spigot
- 30 Churn splitter, plastic, 8 liter, cubitainer-type spigot
- 40 Churn splitter, plastic, 14 liter, cubitainer-type spigot
- 50 Churn splitter, fluoropolymer, 8 liter (future develop ent)
- 60 Churn splitter, fluoropolymer, 14 liter, US SS-1
- 70 Cone splitter, plastic
- 80 Cone splitter, fluoropolymer
- 90 Sieve, wet
- 100 Sieve, dry
- 110 Riffle splitter (Jones)
- 200 Other

71999 Sample Purpose
- 10 Routine
- 15 NAWQA
- 20 NASQAN
- 30 Benchmark
- 40 SW Network
- 60 Lowflow Network
- 70 Highflow Network
- 110 Seepage Study
- 180 Cross-Section Variation

Sample Type Code
- 9 Regular
- 7 Replicate
- 2 Blank
- 1 Spike
- 4 Blind
- 5 Duplicate
- 6 Reference material
- 8 Spike solution
- A Not determined
- B Other QA
- H Composite

Alkalinity/ANC Parameter Codes
- 39086 Alkalinity, water, filtered, incremental titration, mg/L
- 00418 Alkalinity, water, filtered, fixed endpoint, mg/L
- 29802 Alkalinity, water, filtered, Gran titration, mg/L
- 00419 ANC, water, unfiltered, incremental titration
- 00410 ANC, water, unfiltered, fixed endpoint, mg/L
- 29813 ANC, water, unfiltered, Gran titration, mg/L
- 29804 Bicarbonate, water, filtered, fixed endpoint, mg/L
- 63786 Bicarbonate, water, filtered, Gran, mg/L
- 00453 Bicarbonate, water, filtered, incremental, mg/L
- 00440 Bicarbonate, water, unfiltered, fixed endpoint, mg/L
- 00450 Bicarbonate, water, unfiltered, incremental, mg/L
- 29807 Carbonate, water, filtered, fixed endpoint, mg/L
- 63788 Carbonate, water, filtered, Gran, mg/L
- 00452 Carbonate, water, filtered, incremental, mg/L
- 00445 Carbonate, water, unfiltered, fixed endpoint, mg/L
- 00447 Carbonate, water, unfiltered, incremental, mg/L
- 29810 Hydroxide, water, filtered, fixed endpoint, mg/L
- 71834 Hydroxide, water, filtered, incremental, mg/L
- 71830 Hydroxide, water, unfiltered, fixed endpoint, mg/L
- 71832Hydroxide, water, unfiltered, incremental, mg/L

Time Datum Codes

Time Zone	Std Time Code	UTC Offset (hours)	Daylight Time Code	UTC Offset (hours)
Hawaii-Aleutian	HST	-10	HDT	-9
Alaska	AKST	-9	AKDT	-8
Pacific	PST	-8	PDT	-7
Mountain	MST	-7	MDT	-6
Central	CST	-6	CDT	-5
Eastern	EST	-5	EDT	-4
Atlantic	AST	-4	ADT	-3

82398 Sampling Method
- 10 Equal Width Increment (EWI)
- 15 Equal Width Increment (non-isokinetic)
- 20 Equal Discharge Increment (EDI)
- 25 Timed Sampling Interval
- 30 Single Vertical
- 40 Multiple Verticals
- 50 Point Sample
- 55 Composite, multi-point samples
- 70 Grab Sample (Dip)
- 80 Discharge Integrated, Equal Transit Rate (ETR)
- 90 Discharge Integrated, Centroid
- 120 Velocity Integrated
- 8010 Other

60280 Purpose of Site Visit
- 1001 Fixed frequency, surface-water
- 1002 Storm hydrograph, surface-water
- 1003 Extreme high flow, surface-water
- 1004 Extreme low flow, surface-water
- 1005 Diurnal, surface-water
- 1006 Synoptic, surface-water
- 1098 NAWQA surface-water quality control
- 1099 Other, surface-water
- 3001 Occurrence Survey, bed sediment or tissue
- 3002 Spatial Distribution Survey, bed sediment or tissue
- 3003 Synoptic Study, bed sediment or tissue
- 3098 Bed-sediment or tissue quality control
- 3099 Other, bed sediment or tissue

Dissolved Oxygen
- AZIDE Azide-modified Winkler
- INDIGO Spectrophotometer, Indigo carmine
- INDKT Field Kit, Indigo carmine, visual
- LUMIN Luminscence sensor
- MEMB2 Amperometric, Membrane (DODEC)
- MEMBR Amperometric, Membrand electrode
- RHODA Field Kit, Rhodazine-D, visual
- SPC10 Spectrophotometer, Rhodazine-D
- WINKL Winkler titration

Parameter and method codes for field measurements and turbidity can be found in separate attachments at http://water.usgs.gov/usgs/owq/Forms.html

Attachment B: Example of Quarterly Report to West Virginia Department of Environmental Protection

SAMPLE

West Virginia Non-Tidal Monitoring Program : *Semi-Annual Progress Report*

Monitoring Sites:

- (01604500) Patterson Creek near Headsville, WV
- (01608500) South Branch of the Potomac River near Springfield, WV
- (01611500) Cacapon River at Great Cacapon, WV
- (01613030) Warm Springs Run near Berkeley Springs, WV
- (01616400) Mill Creek at Bunker Hill, WV
- (01616500) Opequon Creek near Martinsburg, WV
- (01618100) Rockymarsh Run at Scrabble, WV

Report Period: May 1, 2011 – November 30, 2011

Funding: West Virginia Department of Environmental Protection (WVDEP) and U.S. Geological Survey (USGS)

Start Date: June 2005

Completion Date: continuous

Project Personnel: USGS Chief: Doug Chambers; USGS Lead Technician: Jeremy White and additional assistance from various other USGS and WVDEP personnel.

Project Objectives:

Determine the ambient concentration of nutrient and suspended sediment water-quality samples collected over a range in flow conditions in four West Virginia tributaries to the Potomac River: Patterson Creek, the South Branch of the Potomac River, The Cacapon River, Warm Springs Run, Mill Creek, Opequon Creek, and Rockymarsh Run.

Sampling Events:

	Sample Type		
	Routine	Storm	QA/QC
Patterson Creek Nr Headsville	6	4	2
So. Br. Potomac @ Springfield	6	3	1
Warm Srpings Run	6	3	1
Mill Creek @Bunker Hill	6	4	1
Cacapon River @ Great Cacapon	6	4	1
Opequon Cr. Nr Martinsburg	6	3	1

SAMPLE