# MEMORANDUM

**DEPARTMENT OF ENVIRONMENTAL QUALITY**
DIVISION OF LAND PROTECTION AND REVITALIZATION
OFFICE OF SPILL RESPONSE AND REMEDIATION

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**SUBJECT:** Quality Assurance Project Plan for the Alternate Water Supply Program, Revision 2, Document Number LPR-SRR-2014-03

**TO:** Elizabeth Lamp, Regional Directors

**FROM:** Jeffery Steers

**DATE:** August 8, 2014

**Summary:**

The Department of Environmental Quality (DEQ) Storage Tank Program investigates reports of petroleum releases and ensures they are characterized and cleaned up to prevent risk to human health and the environment. If water supplies are impacted by petroleum constituents, the DEQ Storage Tank Program may provide an alternate water supply or treatment system to remove petroleum from the water supply. The purpose of the Quality Assurance Project Plan (QAPP) for the Alternate Water Supply Program is to ensure that procedures used and data collected by DEQ staff and DEQ-hired contractors are of sufficient quality to support the decisions about the need to provide alternate water supplies to persons having wells that are impacted by petroleum.

Organizational changes have been made since Revision 1 to the QAPP became effective. Also, the Land Protection Division has formed a Quality Assurance Workgroup to provide review and auditing assistance to programs within the division. The QAPP is revised at this time to reflect these recent changes.

**Electronic Copy:**

An electronic copy of this guidance in PDF format is available for staff internally on DEQNET, and for the public on DEQ's website at: http://www.deq.virginia.gov.

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# VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
## STORAGE TANK PROGRAM

## Quality Assurance Project Plan – Alternate Water Supply Program
*Revision 2*
(August 8, 2014)

Guidance Document # LPR-SRR-2014-03

# Alternate Water Supply Program – Quality Assurance Project Plan Approval

9-8-2014

Jeffery Steers — Date
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9-4-2014

Elizabeth Lamp — Date
Director, Office of Spill Response and Remediation

8-11-2014

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8/8/2014

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9/4/2014

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# VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
## STORAGE TANK PROGRAM

## Quality Assurance Project Plan – Alternate Water Supply Program
*Revision 2*
(August 8, 2014)

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# List of Acronyms

AST – Above Ground Storage Tank

AWS – Alternate Water Supply

BRRO – Virginia Department of Environmental Quality, Blue Ridge Regional Office

BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes

CEDS – Comprehensive Environmental Database System. This is the database system that is used by the Department of Environmental Quality staff.

CFU – Carbon Filtration Unit. Within the context of this document and program, a carbon filtration unit may refer not only to the carbon canisters, but to the entire treatment train used to remove organic constituents from a private water supply. The treatment train typically includes, but is not limited to, pre-filters for sediment, carbon canisters, and an ultraviolet disinfection unit.

DBCP – 1,2 dibromo-3-chloropropane

DCLS – Division of Consolidated Laboratory Services. The Division of Consolidated Laboratory Services is a unit within the Virginia Department of General Services and is the state's laboratory.

DEQ – Virginia Department of Environmental Quality

DIPE – Di isopropyl Ether

EDB – Ethylene Dibromide, a.k.a. 1,2 dibromoethane

GC/MS – Gas Chromatography/Mass Spectrometry

GIS – Geographic Information System

KSAs – Knowledge, Skills, and Abilities

MTBE – Methyl Tertiary Butyl Ether

NRO – Virginia Department of Environmental Quality, Northern Regional Office

OSRR – Office of Spill Response and Remediation. The Virginia Department of Environmental Quality Central Office unit responsible for overseeing storage tank regulatory compliance and ensuring that release response and corrective actions are taken following a petroleum release.

PC# - Pollution Complaint Number. All potential or confirmed releases of petroleum into the environment are assigned a pollution complaint number by the Virginia Department of Environmental Quality.

PRO – Virginia Department of Environmental Quality, Piedmont Regional Office

QA – Quality Assurance

QC – Quality Control

RP – Responsible Person. This is the entity responsible for initiating release response and corrective action following a petroleum release.

RPD – Relative Percent Difference

SVOCs – Semi-volatile Organic Compounds

SWRO – Virginia Department of Environmental Quality, Southwest Regional Office

TAME – Tertiary Amyl Methyl Ether

TAT – Turn Around Time. This is the length of time needed for the Division of Consolidated Laboratories to analyze a sample and provide the results to the Department of Environmental Quality.

TBA – Tertiary Butyl Alcohol

TPH – Total Petroleum Hydrocarbons

TRO – Virginia Department of Environmental Quality, Tidewater Regional Office

UST – Underground Storage Tank

VOCs – Volatile Organic Compounds

VPDES – Virginia Pollution Discharge Elimination System

VRO – Virginia Department of Environmental Quality, Valley Regional Office

# Alternate Water Supply Program – Quality Assurance Project Plan Approval

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Jeffery Steers Date
Director, Division of Land Protection and Revitalization

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Elizabeth Lamp Date
Director, Office of Spill Response and Remediation

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John Giese Date
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CFU Program Manager, Office of Spill Response and Remediation

# 1.0 INTRODUCTION

Petroleum contaminated drinking water supplies represent instances of known receptor impact and must receive the highest level of priority and attention by staff. The Department of Environmental Quality (DEQ) Storage Tank Program investigates reports of petroleum in drinking water and provides alternate water supplies when and where appropriate.

Upon receiving a report of a potentially impacted water supply, DEQ staff and/or contractors usually will collect samples from the water supply. DEQ staff members also have the authority to require persons responsible for petroleum releases to determine if nearby water supply wells are contaminated. If a water supply is contaminated, the DEQ may provide an alternate water supply or a treatment system to remove petroleum from the existing water supply.

The purpose of this Quality Assurance Project Plan is to ensure that procedures used and data collected by DEQ staff and DEQ-hired contractors are of sufficient quality to support the decisions about the need to provide alternate water supplies to persons having wells that are impacted by petroleum.

# 2.0 PROJECT DESCRIPTION AND MANAGEMENT

Staff members from the DEQ Storage Tank Program are responsible for investigating reports of petroleum contamination in water supply wells. Upon receiving a report of petroleum contamination in a water supply well, DEQ staff will contact the operator of that well to verify the report of petroleum contamination in the well and request permission for DEQ's Carbon Filtration Unit (CFU) contractor to collect samples from the water supply. If the operator will allow the CFU contractor to collect samples from the water supply system, the Case Manager will immediately notify the Carbon Filtration Unit (CFU) Program Manager in the Central Office, Office of Spill Response and Remediation (OSRR) that a water supply system needs to be assessed.

Upon receiving a water supply assessment request from a regional Case Manager, the CFU Program Manager will call the water supply (well) operator and request permission for the CFU contractor to collect samples from the water supply. Provided that permission is granted, the CFU Program Manager will contact the CFU contractor and direct them to assess the site and collect samples from the water supply. Assessment samples will, at a minimum, be analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Additional analyses may be performed as deemed necessary. During the assessment, the CFU contractor also analyzes general water chemistry parameters for system design purposes and evaluates the site to determine a suitable location for a treatment system should one be needed to remove petroleum constituents from the water supply.

The schedule for deciding whether to provide an alternate water supply or water treatment system for the existing water supply is based upon site-specific conditions. If the water supply is obviously contaminated by petroleum, regional staff will notify the CFU Program Manager in OSRR that the water is contaminated prior to receiving the analytical results. Unless the staff investigating the contaminated water supply report are certain that the water is contaminated by petroleum, the DEQ will wait until analytical results are received before deciding whether to provide a carbon filtration system.

## 2.1 Project Responsibilities

When a potentially contaminated water supply well is reported to DEQ, Storage Tank Program staff and managers must investigate the report and ensure that the necessary actions are taken to provide potable water to the impacted party. The Storage Tank Program retains a Carbon Filtration Unit (CFU) contractor to install and maintain treatment systems on impacted water supplies. This CFU contractor generally is used to assist DEQ with the investigation (sampling) of potentially impacted water supplies. The DEQ also may direct the CFU contractor to provide bottled water on an interim basis until the CFU is operational.

All persons involved with the AWS program are responsible, either directly or indirectly, for the quality of data generated as part of the program and for the decisions that are made based upon the data that is collected. Sections 2.1.1 through 2.1.9 describe the roles and responsibilities of DEQ staff, managers, and the CFU contractor in the AWS program. Figure 1 illustrates the lines of formal and functional

communications within the AWS Program.

### 2.1.1 Regional Case Manager

Petroleum releases must be reported to the appropriate DEQ Regional Office. Upon receiving a report of a petroleum contaminated water supply, the Regional Storage Tank Program Manager will direct one of the Regional Case Managers to investigate the report. The individual Case Manager to whom a contaminated water supply report is assigned is responsible for investigating the report and determining if the water supply needs to be assessed by the CFU contractor for the potential provision of a Carbon Filtration System. If evidence exists that the water supply is or may be contaminated by petroleum, the Case Manager will contact the operator of the water supply and request permission for DEQ's CFU contractor to collect samples from the water supply. If the operator will allow the CFU contractor to collect samples from the water supply system, the Case Manager will immediately notify the CFU Program Manager in OSRR that a water supply system needs to be assessed by providing an AWS Referral Form. Information to be provided on the form includes:

1. pollution complaint number;
2. water supply operator's name, address, and phone number;
3. location (address) of the impacted water supply if different than the operator's address;
4. results of previous analytical results for the water supply; and
   special sampling needs (i.e. leaded gasoline might be a contaminant of concern) or other unique issues related to the site.

The assessment performed by the CFU contractor includes sampling the water supply for VOCs and SVOCs. The CFU contractor also collects information about general water chemistry parameters such as iron, hardness, and pH and evaluates the site's physical constraints to determine a suitable location for a treatment system should one be needed.

The Case Manager may visit the site and collect water samples if this activity is deemed important to the investigation. Samples collected by DEQ staff will be submitted to the Department of General Services, Division of Consolidated Laboratory Services (DCLS) for analysis.

Site Characterizations led by the responsible person (RP) also may involve the collection of data from water supply wells. If the Case Manager believes that water supply wells near a release may be impacted, the Case Manager may direct the RP to collect samples from water supply wells as part of the Site Characterization process. The Case Manager may accompany the RP or the RP's consultant when samples are collected and may split samples with the RP/consultant if needed. Case Managers need to inform the CFU Program Manager of contaminated wells found during the Site Characterization process. The CFU contractor then will be directed to assess those sites and design carbon filtration system for them.

When a water supply is impacted by petroleum, the Case Manager will continue with the Site Characterization and Corrective Action process. If the person responsible for the contamination is known, the Case Manager will work with that person to ensure that they characterize the release and undertake corrective actions needed to address risks posed by the release. The RP must, as part of corrective action, provide the impacted person(s) with a petroleum free water supply. If the RP is not known, the site will be placed in the State Lead Program and the Case Manager will work with the State Lead contractor to characterize the contamination and take the corrective actions that are necessary to protect human health and the environment.

Quality control is a major component of the Case Manager's duties. Samples collected by the Case Manager or other DEQ staff must meet the data quality objectives. In most instances, samples will be collected in accordance with standard procedures and Case Managers are expected to be familiar with sampling procedures before samples are collected. Guidelines for collecting samples from water supplies are contained both in this document and in the Storage Tank Program Technical Manual. The Case Manager has the authority to modify sample collection procedures on a site-specific basis in order to meet the data quality objectives at the individual site.

### 2.1.2 CFU Program Manager

Storage Tank Program staff in both the regional offices and OSRR share in the responsibilities for implementing the Alternate Water Supply (AWS) Program. Daily management of the CFU contract for the AWS Program is administered by the CFU Program Manager.

When Regional staff investigate a potentially impacted water supply and evidence indicates that the water supply is contaminated by petroleum, they must contact the CFU Program Manager. The CFU Program Manager then directs the CFU contractor to visit the site and collect water quality samples and other site specific information related to the existing water supply. The purposes of the site visit are to: (1) confirm the presence of petroleum constituents in the water supply; and (2) obtain the information needed to design an appropriate water treatment system for the site. Once a carbon filtration system is installed at a site, the CFU Program Manager and the CFU contractor decide upon an appropriate preventive maintenance schedule for the treatment system. This preventive maintenance schedule includes the collection of additional water samples.

Procedural and guidance documents for the AWS program are developed jointly by the Storage Tank Program personnel in OSRR and the Regional Offices. The CFU Program Manager and the State Lead Program Manager are jointly responsible for coordinating the development of standard procedures for the AWS program and modifying existing procedures as needed. The CFU Program Manager along with other Central Office Staff must assist the Regional Case Manager as needed with water supply investigations and the evaluation of corrective action plans for impacted sites.

Quality assurance documents for the AWS Program are developed jointly by storage Tank Program Staff from OSRR and the Regional Offices. The CFU Program Manager must assist the Storage Tank Quality Assurance Manager with the development, assessment, and revision of QA/QC procedures for the AWS

Program.

**NOTE: The CFU Program Manager directs the CFU contractor on a daily basis and is the primary point of contact for AWS assessment requests and issues related to the operation and maintenance of existing CFUs. If the CFU Program Manager is not available, an email message will be sent to the regional Storage Tank Program Managers regarding the OSRR point of contact for AWS-related issues. In most instances, the alternate points of contact will be the State Lead Program Manager and the OSRR Program Assessment Specialist.**

### 2.1.3 State Lead Program Manager & Storage Tank Program Quality Assurance Manager

The State Lead Program Manager is responsible for the overall management of both the State Lead contract and the CFU contract. The State Lead Program Manager also is responsible for major AWS projects involving public water line extensions. The State Lead Program Manager and the CFU Program Manager are jointly responsible for the development of AWS-related procedures and activities related to investigating potentially impacted drinking water supplies, and the installation and maintenance of CFUs.

The State Lead Program Manager also functions as the Quality Assurance Manager for the Storage Tank Program. The State Lead Program Manager, functioning as the Quality Assurance Manager, is responsible for developing, maintaining, and updating all quality assurance documents for the AWS Program. This person also must:

1. distribute quality assurance documents, policies, and procedures;
2. assess the effectiveness of quality assurance procedures for the AWS Program;
3. identify deficiencies in the quality assurance process and determine the actions needed to correct those deficiencies; and
4. identify training needs and report those needs to the Director of OSRR and the Regional Storage Tank Program Managers.

The State Lead Program Manager, serving as the Storage Tank Program's Quality Assurance Manager also will work with the CFU Program Manager to develop, review, and revise AWS procedures.

The State Lead Program Manager is one of the OSRR staff members who may direct the CFU contractor to perform an assessment, conduct operation and maintenance activities on an active CFU, or undertake emergency work at a site having an existing CFU.

### 2.1.4 OSRR Program Assessment Specialist

The OSRR Program Assessment Specialist is responsible for assessing the effectiveness of various components of the Storage Tank Program. The Program Assessment Specialist will, along with the State Lead Program Manager, assess the effectiveness of the quality assurance procedures for the AWS Program, identify deficiencies in the quality assurance process, and determine the actions needed to

correct those deficiencies. The Program Assessment Specialist also will assist with the development, review, and revision of AWS-related procedures.

The Program Assessment Specialist assists the CFU Program Manager and State Lead Program Manager with various AWS and major waterline projects and is one of the OSRR staff members who may direct the CFU contractor to perform an assessment, conduct operation and maintenance activities, or undertake emergency work at a site having an existing CFU.

### 2.1.5 Remediation Programs Manager

The Remediation Programs Manager oversees all corrective action functions related to releases from storage tanks. This person supervises the State Lead Program Manager/Storage Tank Program Quality Assurance Manager, the CFU Program Manager, and the OSRR Program Assessment Specialist.

The Remediation Programs Manager will participate in reviewing Quality Assurance Procedures, Technical Assessments, and the subsequent revision of any Quality Assurance documents. The Remediation Programs Manager is one of the OSRR staff members who may direct the CFU contractor to perform an assessment, conduct operation and maintenance activities, or undertake emergency work at a site having an existing CFU.

### 2.1.6 OSRR Staff and Management

Technical guidance and procedures within the DEQ Storage Tank Program are developed jointly by OSRR staff/management and regional staff/management. Once a procedure is agreed upon by OSRR and the regions, OSRR staff and management provide a written copy of the guidance or procedure to OSRR and Regional staff.

The Storage Tank Program Quality Assurance Manager is the primary person within OSRR who is responsible for developing and updating the Quality Assurance documents that are needed for the Storage Tank Program. The Remediation Programs Manager and the OSRR Program Assessment Specialist also have major roles in the development, review, and update processes involved in the Storage Tank Program's Quality Management System. Other staff members within OSRR serve as DEQ experts in various areas related to storage tanks. These persons will be involved in the Quality Assurance process as their expertise is needed to develop new program procedures or evaluate and update existing procedures.

### 2.1.7 Regional Storage Tank Program Manager

The DEQ has six regional offices. The Regional Storage Tank Program Manager for each office is responsible for overseeing all activities performed by Storage Tank Program staff in that region. The Regional Storage Tank Program Manager assigns reports of contaminated water supplies to individual

Case Managers and ensures that reports of contaminated water supplies are investigated in accordance with DEQ procedures.

The Regional Storage Tank Program Manager and/or a person designated by the Regional Storage Tank Program Manager is responsible for assisting OSRR with the development, review, and revision of program procedures. The Regional Storage Tank Program Manager is also responsible for ensuring that all staff performing work on a project are familiar with Storage Tank Program standard procedures.

### 2.1.8 DEQ Carbon Filtration Unit Contractor

The CFU contractor hired by DEQ to install and maintain treatment systems on petroleum impacted water supplies is an integral component of the Quality Assurance process. At most AWS sites, the CFU contractor will collect more environmental data related to the AWS system than any other entity. The CFU contractor usually will collect samples from the water supply prior to installing a treatment system. The CFU contractor has five days after assignment to perform the assessment on a potentially impacted water supply. If they are unable to schedule the assessment with the operator, they must inform the CFU Program Manager and explain why the five day deadline for performing the assessment cannot be met. These assessment samples will be analyzed for petroleum constituents and general water chemistry so that a treatment system may be effectively designed for the site. Once a treatment system is installed, regular preventive maintenance performed on the system usually includes the collection and analysis of water samples to monitor current contamination levels in the water system and evaluate the effectiveness of the treatment system at removing the contaminants.

During preventive maintenance, samples generally are collected from the water system prior to and after the primary carbon filters in order to monitor the effectiveness of the unit. Samples collected from pre-filter locations provide DEQ and the CFU contractor with information about current contamination levels in the water supply. As a matter of procedure, DEQ usually instructs the CFU contractor to remove treatment systems from sites that have shown no detectable concentration of petroleum constituents for at least one year/four quarterly sampling events or after all constituents remaining in the water supply are statistically below the Program's risk management levels (RMLs).

### 2.1.9 DEQ Land Protection and Revitalization Quality Assurance Workgroup

The DEQ Division of Land Protection and Revitalization has developed a Quality Assurance Workgroup to provide quality assurance reviews and audit assistance to individual programs within the Land Protection Division. The Quality Assurance Workgroup will review quality assurance documents developed by the Storage Tank Program and assist the Storage Tank Quality Assurance Manager with auditing and assessing Quality Assurance/Quality Control (QA/QC) procedures used by this program. The Quality Assurance Workgroup is outside of the Storage Tank Program chain-of-command and is expected to add a level of objectivity to QA/QC reviews and audits.

The Quality Assurance Workgroup reviewed the Quality Assurance Project Plan for the AWS Program

before the plan was completed. The Quality Assurance Workgroup also will be involved in the review of all major revisions of this Project Plan.

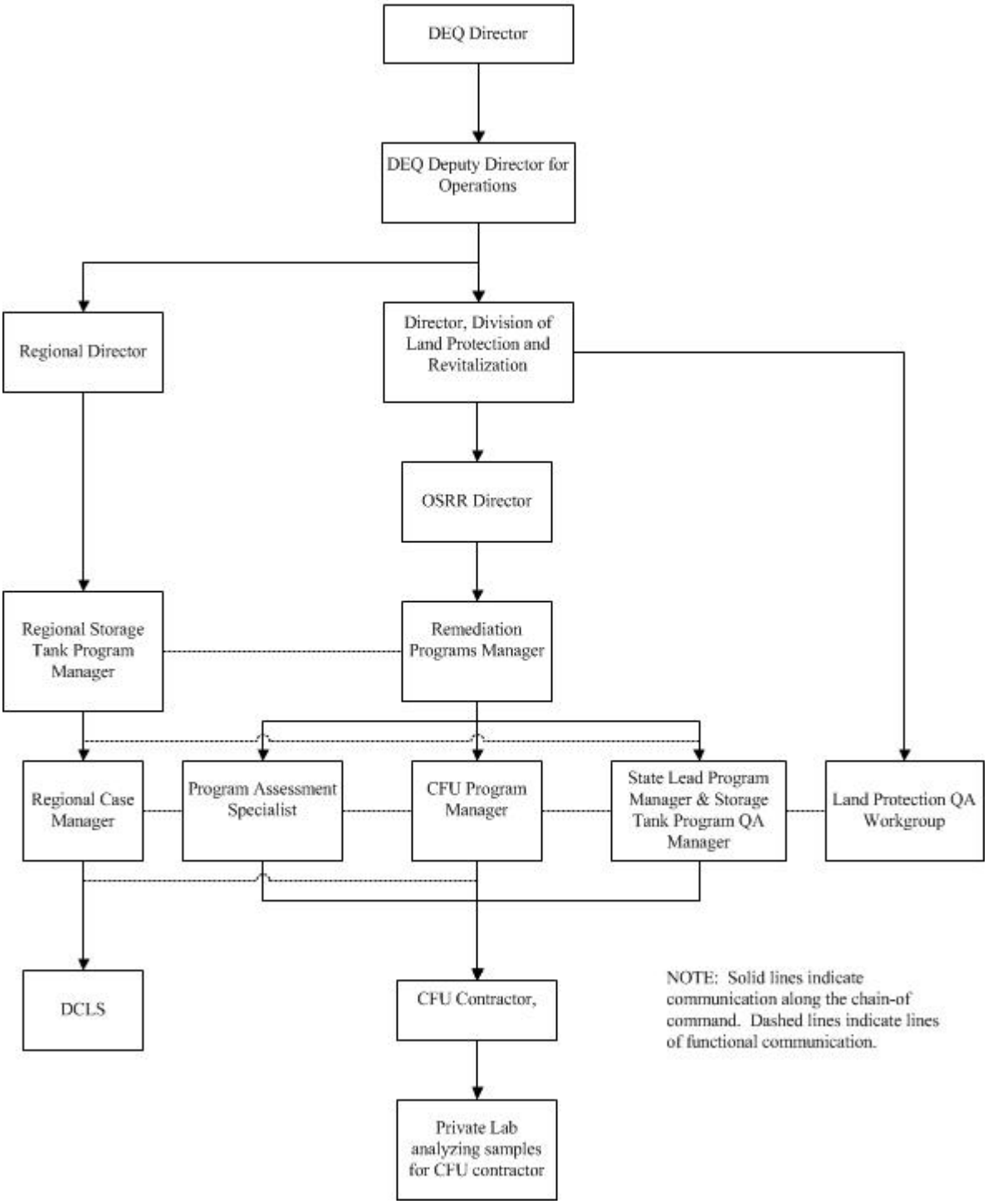
Technical System Audits and Management System Reviews of the AWS Quality Assurance Project Plan will be coordinated by the Storage Tank Program Quality Assurance Manager. The Quality Assurance Workgroup will assist with Technical System Audits and Management System Reviews.

## 2.2 Internal Communication and Coordination

To be effectively implemented, all staff and managers within the Storage Tank Program must understand and participate in implementing the Quality Management System. The Storage Tank Program Quality Assurance Manager is responsible for drafting or reviewing the AWS Quality Assurance Project Plan. After drafting the AWS Quality Assurance Project Plan, the Storage Tank Program Quality Assurance Manager will send copies of the document to DEQ personnel responsible for ensuring that the quality assurance process is followed. Quality Assurance Project Plans involve management and line staff in both OSRR and the Regional Offices, and these documents will be reviewed by managers within both OSRR and the Regional Offices as well as technical staff who can provide expertise and input on the proposed technical components of the project. Staff and managers reviewing quality assurance documents will provide comments to the Storage Tank Program Quality Assurance Manager who will consider these comments and suggestions when completing the quality assurance document. Revisions and updates to existing quality assurance procedures and policies will be provided to the same persons who reviewed the original document for review prior to completion of those policies and/or procedures.

Storage Tank Program functions are performed by DEQ staff and management in both the Regional Offices and in OSRR. Regional Offices within the DEQ have much autonomy and programs within the regions report to the Regional Director and then to the DEQ Chief Deputy Director. Staff members within OSRR, with input from the Regional Offices, develop policies and procedures for the Storage Tank Program. OSRR staff also manage statewide contracts for the program such as the CFU contract and the State Lead Contract and ensures consistency within the Storage Tank Program. OSRR is located within the Division of Land Protection and Revitalization and reports to the Division Director for Land Protection and Revitalization. Figure 2-1 illustrates the lines of formal and the lines of functional or informal communication that exist within the DEQ Storage Tank Program.

Figure 2-1. AWS Program Organizational Chart



## 2.3 Data Quality Objectives

Petroleum contaminated drinking water supplies represent instances of known receptor impact. The DEQ may provide an AWS whenever petroleum constituents (including gasoline additives such as MTBE) are detected in water supply wells. The DEQ will, as a general practice, provide an AWS when private wells are impacted by petroleum and petroleum constituents are the primary constituents of concern in the water supply.

Data quality objectives are primarily based upon the decisions that the data must support. Data collected for the AWS program may be utilized to:

1. determine if a well has been impacted by petroleum constituents;
2. design a treatment system to remove petroleum constituents from a water supply;
3. ensure that the system is operating as designed (detect breakthrough of petroleum contamination); and/or
4. determine if a CFU is still needed at the site.

The decisions that must be made do determine if a well is impacted by petroleum are different from the decisions that must be made to design a system or to ensure that the system is performing as expected. The data quality objectives for data collected as part of the AWS Program vary depending upon the decisions that must be made.

### 2.3.1 Data Quality Requirements - Private Water Supply Wells

Operators of private water supply wells are not required to test water in those wells for petroleum or other organic constituents. When a well reportedly is contaminated by petroleum, DEQ staff must investigate the report and determine if petroleum constituents are present in the well. If a potentially responsible person for the petroleum contamination is known, DEQ will require that person to collect samples and determine if the well has been impacted by petroleum. If the potentially responsible person is unable or unwilling to collect samples or the source of petroleum is unknown, samples will be collected by DEQ staff and/or the CFU contractor. DEQ staff may, at their discretion, chose to split samples with the potentially responsible person.

The primary objective of sample collection and analysis is to determine if a private water supply well has been impacted by petroleum. A secondary objective of sample collection and analysis is to determine if contaminants other than petroleum constituents are present in the water supply. Holding times, blank samples, and qualifiers all will be examined during the data validation process. Provided that the holding time has not been exceeded, nothing was detected in the blank samples, and the lab did not list the data as “unusable,” DEQ generally will consider the results reported by the lab to be usable for determining if a water supply has been impacted by petroleum.

The Storage Tank Program usually will provide an AWS when private water supplies are impacted by petroleum and petroleum constituents are the primary constituents of concern in the well. Analytical

results must indicate if petroleum constituents and/or contaminants other than petroleum constituents are present in a water supply well. False negative analytical results will result in a decision by DEQ not to supply a treatment system and may result in the exposure of a receptor to petroleum constituents.

DEQ AWS procedures require the continued maintenance of a CFU and the sampling of the system at that site for one year after petroleum constituents are no longer found in the well or statistical analysis indicates that the contaminant concentrations in the well are below the program's RMLs. False positive analytical results will cause DEQ to install and/or maintain a treatment system at the impacted residence for at least one year after petroleum was last detected in the water supply. The installation and maintenance of a CFU in a location where one is not needed is a needless use of a limited resource.

When a private water supply well has been impacted by both petroleum and non-petroleum constituents, the DEQ Storage Tank Program will evaluate the relative risks from the different types of contaminants. Analytical results must be as close to the actual concentrations of the constituents as possible so that the DEQ may compare the concentration of each constituent with its RML. If the DEQ believes that the non-petroleum constituents are the primary constituents of concern in a well, the Storage Tank Program may decide not to provide an alternate water supply.

### 2.3.2 Data Quality Requirements - Public Water Supplies

Public water supplies are regulated by the Virginia Health Department and operators of these water supply systems are required to test for contaminants (including petroleum constituents) on a routine basis. The DEQ may provide an AWS or assistance to the operator of a public water supply well when that well is contaminated by petroleum, the concentration of one or more of the petroleum constituents exceeds the Virginia Health Department standards for public water, the petroleum constituents are the primary constituents of concern in the water supply and the operator of the public water supply requests DEQ's assistance. DEQ staff and/or the CFU contractor may collect water samples from public water supplies to: (1) verify information provided by the operator of the water supply system; and/or (2) obtain additional information on which to base the decision to provide an AWS. Accuracy is, perhaps more important for these samples than for others collected as part of the AWS Program. DEQ's decision to provide a carbon filtration unit for an impacted public water supply is based upon the measured concentration of constituents in the sample. It is important, therefore, that the measured concentration be as close to the true value as possible. Holding times, blank samples, and qualifiers all will be examined during the data validation process. Provided that the holding time has not been exceeded, nothing was detected in the blank samples, and the lab did not list the data as "unusable," DEQ generally will consider the results reported by the lab to be usable for determining if the water supply has been impacted by petroleum at a level which requires DEQ's involvement.

NOTE: Public water may be supplied by a series of wells or well field. In those instances where water is supplied by multiple wells, the Storage Tank Program may base its decision to supply a filtration system on the basis of the concentration of petroleum constituents at the compliance point (the location where water from single or multiple sources enters the distribution system as defined by the Virginia Water Works Regulations).

### 2.3.3 Data Quality Requirements - Treatment System Design

The primary carbon filtration unit (CFU) design parameters are water throughput or usage and contaminant species and concentration. Secondary CFU design parameters are water chemistry measurements such as total iron, manganese, sulfate, hardness, and pH. The contaminant concentrations are derived from laboratory analysis of one or more water samples, and the water chemistry is obtained from on-site sample screening and/or laboratory analyses.

Information about contaminant species and concentration for system design purposes is mostly related to the types of constituents present in the water supply and the magnitude of those constituents. This information is provided by the assessment samples and the data quality requirements for assessment samples are much more stringent that the data quality requirements for designing a treatment system. Water usage generally is estimated based upon the number of persons in the residence. This information is needed to estimate the mass of contaminants that will need to be treated over a given period of time. The goal for the treatment systems that are installed is to remove petroleum constituents in an efficient and effective manner from the water supply. Treatment systems must be designed to remove all petroleum constituents and oxygenates to concentrations below 2 ug/l. Iron, manganese, and other various water chemistry related conditions may reduce the efficiency of carbon in removing petroleum constituents from a water supply. Water chemistry parameters such as pH, hardness, iron, etc. may affect carbon performance and information about these parameters is needed to determine if water chemistry needs to be changed before water goes through carbon for the removal of petroleum constituents. A schematic diagram of a typical treatment train used the AWS program is provided in Figure 2-2.

The primary and secondary design parameters are used in concert with empirical data from other CFU sites provide the DEQ and CFU contractor with sufficient information to design a system to remove petroleum constituents from the water supply. All systems have multiple carbon tanks to ensure that all petroleum constituents are removed from the water supply before it reaches the point of use. Once installed, all systems undergo routine operation and maintenance. System performance is evaluated during the operation and maintenance process and the system may be modified or the operation and maintenance period may be adjusted if analyses show that not all petroleum constituents are being removed by the primary or “worker” tanks.

### 2.3.4 Data Quality Requirements - Treatment System Preventive Maintenance

Once a treatment system has been installed to remove petroleum from a potable water supply, the CFU contractor must monitor and maintain the system to ensure that the system is removing petroleum as designed. Samples often are collected as part of the process of maintaining the system. The CFU contractor usually collects raw water samples from prior to the carbon filtration units to monitor contaminant concentrations in the well and also collects samples from between the primary and secondary carbon treatment units to ensure that contaminants have not “broken through” the carbon.

The DEQ Storage Tank Program will maintain carbon treatment units on a water supply until petroleum constituents in the water supply remain below the detection limits for at least one year or below the program’s risk management levels (RMLs) as determined by statistical analysis. Data from the raw water

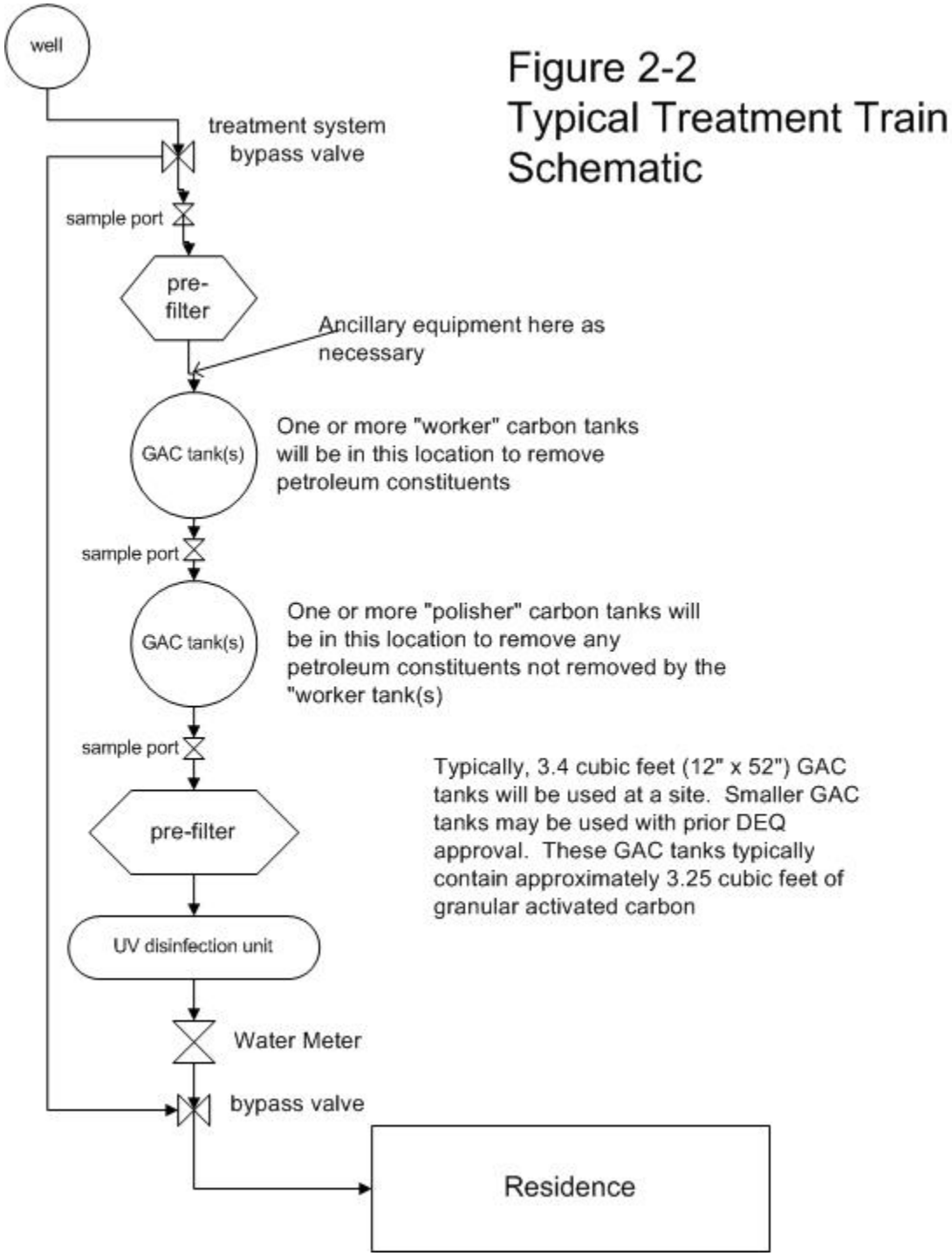



Figure 2-2
Typical Treatment Train Schematic

samples must be able to support decisions about terminating the CFU system at the site or, if contaminant concentrations increase significantly, re-designing the system to remove the increased contaminant mass.

Information from samples collected after the CFU will be used to determine the schedule on which the system should be monitored and one or more treatment tanks should be replaced. If petroleum constituents, in any concentration, are detected in the sample collected from between the primary and secondary treatment tanks, all of the treatment tanks will be replaced.

### 2.3.5 Data Quality Requirements for and Use of Secondary Data

Data generated by persons other than DEQ, the CFU contractor, the State Lead contractors, and/or generated as part of investigations not performed to meet the requirements of the DEQ Storage Tank Program is considered secondary data. Most of the secondary data relevant to the AWS Program is related to the presence of petroleum constituents at or near a water supply and the locations of wells near a petroleum release. This data is evaluated by DEQ staff members who determine if additional information is needed and if the DEQ needs to direct the CFU contractor to collect water samples from one or more water supplies in the area. Types of secondary data and the Storage Tank Program's use of this data within the AWS and State Lead Programs are discussed in sections 2.3.5.1 through 2.3.5.4.

When the DEQ Storage Tank Program receives or considers secondary data, the first step in the evaluation process is to determine if that data is relevant to the AWS Program. If the DEQ has no knowledge of petroleum contamination in an area, the secondary data first must indicate the existence of petroleum contamination. If the data is not relevant to the AWS Program, further evaluation is not needed. If the data is believed relevant to the AWS Program, staff will consider information about the data and the source of that data including the:

a. entity that generated the data;
b. date(s)/timeframe(s) when data was generated;
c. data type(s);
d. format of data (report, lab analytical sheets, affidavit, statement from local official, etc.); and
e. purpose of original report and data quality objectives (if known).

These elements will be used to compare the data with the data quality requirements for the AWS Program to determine if the data may be used by the AWS Program.

Much of the data used by the AWS Program is generated by tank owners/operators and their consultants to meet regulatory requirements pertinent to ASTs and USTs. This data, although generated by the tank owner/operator and their consultant, is considered "primary data" since it was generated to meet the Storage Tank Program's regulatory requirements.

#### 2.3.5.1 Analytical Data

The major type of secondary analytical data that the DEQ encounters in administering the AWS Program is generated as part of real estate transaction environmental site assessments. Occasionally, analytical data from other sources such as government studies or the sampling of municipal water supplies may be presented to DEQ.

Data quality objectives and quality controls for analytical data from these sources frequently are unknown. Virginia has no requirements for environmental site assessments related to real estate transfers and the DEQ has no input into these investigations before they are undertaken. The DEQ Storage Tank Program generally uses the analytical data from these sources to consider the presence or absence of petroleum constituents at a site and persons seldom provide this data to DEQ unless they find petroleum constituents or regulated substances in one or more of the samples they collected.

Except for samples collected as part of tank closure[1], tank owners/operators are required to report any detectable amounts of petroleum constituents or regulated substances in the environment to the Storage Tank Program. If petroleum constituents or regulated substances are present at a site, additional investigation at the site is warranted. The DEQ will require the tank owner/operator to perform this additional investigation. The presence of petroleum compounds at a site where the tank owner/operator is unknown, financially incapable, or unwilling to conduct corrective action may be accepted into the State Lead Program for additional evaluation. Once the DEQ directs a responsible person to undertake additional investigation or tasks one of our State Lead Contractors to perform this work, the analytical data generated as part of that investigation is considered primary data since it was generated specifically for the Storage Tank Program.

Occasionally, analytical data from an environmental site assessment or other type of secondary source will indicate petroleum constituents are present in a drinking water supply. If the potentially impacted water supply is a private well, the DEQ will contact the person operating that well and offer to have our Carbon Filtration Unit (CFU) contractor collect a sample from the water supply. If the well is found to be impacted by petroleum constituents and petroleum constituents are the primary constituents of concern in the water supply, the DEQ will offer to have the CFU contractor provide a carbon filtration system to the impacted party and maintain that system until a permanent, petroleum-free source of drinking water may be provided.

Public water supplies routinely are tested for a variety of constituents including various petroleum compounds. The DEQ may have the CFU contractor collect samples from petroleum-contaminated public water supplies and offer treatment systems to the operators of these systems on a case-specific basis.

[1] The reporting thresholds used for tank closure samples are 100 mg/kg TPH in soil samples, 1 mg/l in ground water samples.

#### 2.3.5.2 Historical Data (non-analytical data)

Historical data is another type of secondary data that may be used by the AWS Program. This data may include, but is not limited to, tank owner's/operator's records, government records, and information provided by persons residing at or near a site of interest. Much of this data is related to site history and use and tank ownership. Information about tank and land ownership is used in the process of determining the person responsible for a release from an UST or AST. The Storage Tank Program Technical Manual contains procedures for determining the person responsible for releases from USTs and ASTs including the documentation that is needed in order to make this responsible person determination.

Historical data about land use and site history may be used qualitatively to consider the types of materials that might have been used or handled at a site and the locations of activities or storage areas involving or containing these materials. This information may be used to further refine sampling and analytical work to be performed under the AWS Program. Assessment samples collected by the CFU contractor to determine if a well is impacted by petroleum constituents are analyzed for VOCs and SVOCs. If historical data presented to or obtained by DEQ staff indicate that a gasoline service station was present at a location prior to 1990 and water supplies are believed to be at risk of being impacted by petroleum from this site, staff will direct the CFU contractor to analyze samples for 1,2 dibromoethane (a.k.a. ethylene dibromide) and 1,2 dibromo-3-chloropropane (DBCP) in addition to VOCs and SVOCs to determine if constituents from leaded gasoline are present in local water supplies.

#### 2.3.5.3 Data from Computer Models and Publications

Contaminant fate and transport models may be used to characterize a release and estimate the fate of constituents introduced into the environment. The work performed to characterize a release is performed to meet DEQ's regulatory and statutory requirements and is considered primary data. Computer modeling is rarely performed as part of Environmental Site Assessments for real estate transactions and is seldom provided to DEQ in this type of a report. Secondary data derived from computer models and publications is rarely, if ever, used to determine if a site is eligible for the AWS Program.

#### 2.3.5.4 Data from Maps, Photographs, and Geographic Information Systems

Data from maps, photographs, and geographic information systems (GIS) generally is used once a release has been discovered, reported, and the case is already being evaluated by the Storage Tank Program. This data primarily is used to initially evaluate the receptors that may be present near a release and may warrant further investigation to determine if they have been impacted. This initial information provided by maps, photographs, county GIS, and similar sources is then investigated further by DEQ staff or the State Lead Contractor to determine the actual presence of potential receptors, collect names and addresses of persons and businesses, and obtain permission from these persons or businesses to gather additional information related to the release.

## 2.4 Personnel Qualifications and Training Requirements

The AWS Program must have data of a sufficient and known quality in order for DEQ to protect human health and the environment. Obtaining data of such quality requires that the persons collecting the data use procedures that will ensure the integrity of that data. DEQ staff and personnel collecting data for the CFU contractor must be familiar with and use established sample collection procedures in order to ensure that the data collected meets the AWS Program Data Quality Objectives.

### 2.4.1 Personnel Qualifications – DEQ Storage Tank Program Staff

The first step toward making sure that persons can perform a particular function or job is to ensure that they have the qualifications for that position. Personnel qualification is an issue that is dealt with primarily through the hiring process. Managers hiring staff list the knowledge, skills, and abilities (KSAs) that a person must possess in order to perform the required work. The KSAs are used to ensure that the staff hired for positions in this program have the requisite background education, training, and experience that are needed to do the job and that the DEQ cannot devote the resources to teach them. Examples of this include knowledge of hydrogeology, physical sciences, mathematics and statistics, and writing.

### 2.4.2 Training Requirements - DEQ Storage Tank Program Staff

When impacted water supplies are reported to DEQ, the Storage Tank Program staff will evaluate the report to determine further investigation is warranted. If staff believe that further investigation is warranted, usually they will contact the CFU Program Manager and request that the CFU contractor visit the site and assess the water supply. Occasionally, staff may collect samples. As a matter of course, analytes that DEQ and the CFU contractor look for in water samples include the more soluble petroleum constituents as these are the constituents that would most likely be detected if the well was contaminated by one of the petroleum products. Petroleum additives such as MTBE are among the most soluble constituents and DEQ and the CFU contractor will routinely analyze samples for MTBE when gasoline is a suspected contaminant source. New additives are periodically placed in petroleum products and DEQ staff need to be aware of these new additives so that samples can be analyzed for the most appropriate constituents.

NOTE: Although DEQ Storage Tank Program staff may collect water supply samples, generally it is more efficient and economical to have the CFU contractor perform this activity. The CFU contractor must visit the site prior to installing the system in order to determine an appropriate system location and the types of ancillary equipment that may be needed (iron filters, softeners, etc.) in order for the carbon filtration system to function efficiently.

DEQ Storage Tank Program staff assigned to investigate reports of contaminated water supplies must be familiar with and have copies of current Storage Tank Program Technical guidance and AWS Program procedures. The Regional Ground Water Manager is responsible for ensuring that staff are familiar with current guidance and procedures. Documentation of training and classes taken by DEQ staff is

maintained by the DEQ Office of Training Services.

### 2.4.3 Personnel and Corporate Qualifications – CFU contractor

The installation and maintenance of carbon filtration units is considered work related to the construction, removal, repair, and or improvement of a building or real property. Virginia regulations require contractors performing this type of work and having a total value of all such contracts exceeding $500,000 within a twelve month period to have a Class A Contractor's license issued by the Virginia Department of Professional and Occupational Regulation. The carbon filtration contract is for a two year period with up to three additional one-year extensions. The value of the first two years of the contract exceeds $1,000,000 and the carbon filtration unit contractor is required to have a Virginia Class A Contractor's License in order to bid on and hold this contract.

Virginia regulations also require persons performing plumbing work involving work on potable water supplies for others to have Virginia Master Plumber's Certification. Work performed under the carbon filtration unit contract often requires the connection of electrical appurtenances needed for or ancillary to the CFU to the building's electrical system. Persons performing this type of work for others are required to hold a Virginia Master Electrician's License.

### 2.4.4 Training Requirements - CFU contractor

Data quality objectives for the AWS Program are established by DEQ. Samples collected for the AWS program must meet the data quality objectives. Sample collection procedures for determining if a water supply has been impacted by petroleum constituents or additives are established by DEQ and outlined in Section 3.1.2 of this Quality Assurance Project Plan. CFU contractor personnel collecting samples to determine if a water supply has been impacted by petroleum must use the sampling procedures outlined in Section 3.1.2. The CFU contractor must provide documentation that all personnel collecting these samples have reviewed the procedures outlined in Section 3.1.2.

During various site visits, CFU contractor personnel also will collect and analyze water samples for general water chemistry. Procedures for analyzing water samples for general water chemistry are determined primarily by the test kit and/or instrument(s) used and persons analyzing samples in the field are expected to follow the manufacturer's instructions for the test kit and/or instrument used. The CFU contractor must, upon request, provide DEQ with a list of field test equipment used and instructions for operating that equipment. These persons must be trained or otherwise know how to use the test kits and instruments that will be used in the field to evaluate water chemistry. Documentation of personnel training in the use of field test kits and/or instruments used to analyze general water chemistry must be maintained by the CFU contractor and provided to the CFU and/or State Lead Program Manager upon request.

Part of the data collection process involves the recording of field notes. During site visits, persons collecting data in the field are expected to record certain types of information about the site. They must

be informed as to the types of information that must be recorded and the disposition of that information.

## 2.5 Documentation Requirements

### 2.5.1 Field Notes

DEQ Storage Tank Program staff visiting the site are responsible for recording information about the site and any samples collected. Staff are expected to record information collected from the site in a bound field notebook. Entries into the field notebook will be recorded in indelible ink. Field notes should include:

1. a site map,
2. description of potential contaminant sources,
3. a general description of the water supply system at the site,
4. sampling location(s) and sample collection procedures,
5. date and time that the site visit was performed and samples were collected, and
6. the names of any other DEQ personnel present.

Each page of field notes collected for a site should contain the pollution complaint number for the case and be initialed by the investigator and dated. Copies of all field notes must be placed in Enterprise Content Management (ECM); the agency's electronic document management system.

The CFU contractor also must record field notes during site visits. All field notes collected by the CFU contractor will be recorded in indelible ink on a standard field sheet that is used by the contractor. Each page of field notes collected by the CFU contractor should contain:

1. the PC# and site name,
2. the date and time of the site visit,
3. the number of hours worked,
4. name, address, and phone # of the DEQ Case Manager,
5. name, address, and phone # of the CFU contractor,
6. brief description of the work performed,
7. list of field instruments or kits used for testing water chemistry and expiration dates of any reagents or kits,
8. a list of materials and/or parts installed or replaced,
9. a list of existing system equipment,
10. a statement of site conditions,
11. consumer maintenance instructions to be completed prior to the next scheduled site visit,
12. a statement that the system has been placed back in to service and is working properly,
13. departure time from the site, and
14. the name and signature of the CFU contractor's employee in charge of the work performed.

If water samples are collected, the CFU contractor's field sheet also should contain:

1. sample collection time(s) and a description of sample collection location(s); and
2. the names and model numbers all instruments and field test kits used to analyze water samples for general water chemistry.

Copies of all field notes recorded by the CFU contractor must be provided to the CFU Program Manager.

### 2.5.2 Sample Analysis Requests

Samples collected by DEQ staff will be submitted to the Virginia Department of General Services, Division of Consolidated Laboratory Services (DCLS) for analysis. Sample analysis request forms (lab sheets) must be submitted to DCLS for each sample. A lab sheet must be filled out for each sample collected.

### 2.5.3 Chain-of-custody

Once a sample is collected, precautions must be taken to preserve the sample′s chemical and physical integrity during transport to the lab and storage prior to analysis. DEQ staff and the CFU contractor are responsible for documenting that the integrity of the samples has been maintained during transport to and storage at the lab.

The person collecting samples in the field is responsible for custody of those samples until those samples are placed in a cooler (or other appropriate shipping container) along with the necessary documentation and released directly to a courier or the laboratory. From this point forward, the laboratory is responsible for custody of the samples.

#### 2.5.3.1 Chain-of-custody - DEQ

DEQ chain of custody forms (Appendix A) must be used when submitting a sample for analysis. The chain-of-custody form may be prepared manually or by the Comprehensive Environmental Database System (CEDS). The person collecting samples should complete the chain of custody forms at the time the samples are collected. The sampler must print their name, sign, and date the completed chain-of-custody form. The original copy of the chain-of-custody form must be placed sealed in a zip-lock bag and then placed inside the shipping container (cooler).

Samples collected by DEQ staff are sent to the Virginia Department of General Services, Division of Consolidated Laboratory Services (DCLS). The original chain-of-custody form and all results and documentation are maintained by DCLS in a case file. This original information is released pending litigation. If a CEDS chain-of-custody form is used, the analytical results are posted in CEDS. If a

chain-of-custody form is filled out manually, certificates of analysis are returned to the person who collected the sample(s).

The most current information about DEQ Chain-of-Custody procedures may be found in the DEQ Investigator's Basic Procedures Manual. Staff should use the procedures listed in the Investigator's Basic Procedures Manual when filling out chain-of-custody forms and sample labels.

### 2.5.3.2 Sample Priority – Samples Submitted to DCLS

Staff submitting samples to DCLS for analysis must specify the priority for analyzing the sample. The DCLS Priority codes are listed in Table 2-1. Almost all assessment samples will be collected by the DEQ CFU contractor. If DEQ staff collect assessment samples, sample priority should be "code 4," 7 day turn around time. If staff split samples with a consultant or the CFU contractor, the samples should be analyzed as a priority "code 6," standard turn around time with chain-of-custody.

Table 2-1. DCLS Priority Codes

| | |
|---|---|
| Code 7 | Standard turn around time (TAT), listed price |
| Code 6 | Chain-of-Custody, Standard TAT, 1.1 x listed price |
| Code 5 | ½ standard TAT, 1.5 X listed price |
| Code 4 | 7 day TAT, 2 X listed price |
| Code 1 | Emergency sample. Pricing will be determined after completion of analysis. Since this requires lab employees to work around the clock to complete the analysis, the Regional Director or DEQ Director must approve Code 1 samples. |

### 2.5.3.3 Chain-of-custody - CFU contractor

When the CFU contractor sends samples to a laboratory, the following procedures should be used to document custody of the sample:

1. A Chain-of-custody form must be completed for all samples collected.
2. The Chain-of-custody form should be signed by each individual who has the samples in his/her possession.
3. If samples must be placed in multiple coolers, a separate Chain-of-custody form must be used for the samples in each cooler.
4. If the samples will be sent to the lab via a courier (i.e., commercial carrier)
    a. the original of the Chain-of-custody form and one copy should be placed in a watertight plastic bag inside the cooler (or other appropriate shipping container). It is recommended that this plastic bag then be taped to the lid or top of the shipping container.
    b. One copy of the Chain-of-custody form must be retained by the person collecting the samples and subsequently, placed in the appropriate case file.
    c. the waybill will serve as an extension of the Chain-of-custody record between

the final field custodian and receipt of the sample(s) in the lab.

d. the sender's copy of the waybill should be stapled to and placed in the appropriate case file with the sampler's copy of the Chain-of-custody form.

e. the waybill tracking number should be entered on the Chain-of-custody form and in the field log book.

5. If the samples are transported directly to the lab by the CFU contractor:

a. When samples are transported directly to the lab by the person who collected the samples, that person should initial the "Relinquished by" block on the form upon arrival at the lab.

b. The person at the lab receiving the samples should then initial the "received by" block on the Chain-of-custody form.

c. When the samples are transported to the lab by someone other than the person collecting the samples, the person who collected the samples must initial the "relinquished by" block on the form and the person who will transport the samples to the lab must initial the "received by" block.

d. Upon arrival at the lab, the person transporting the sample(s) will initial the second "relinquished by" block on the Chain-of-custody form and the person at the lab will initial the second "received by" block on the form.

### 2.5.4 Analytical Results

Analytical results provided to DEQ must be submitted on laboratory letterhead and signed by a person responsible for analyses performed by the lab. The analytical sheet(s) also must list the method used, detection limits, sample dilution (if applicable), and date(s) on which the sample was analyzed.

All samples collected by DEQ staff will be analyzed by DCLS. If a CEDS generated chain-of-custody form is used, DCLS will electronically submit the results to DEQ and these results will automatically be entered into CEDS. If a manual chain-of-custody form is used, analytical results for samples collected by regional staff will be sent to that Regional Office. The laboratory sheets received by DEQ regional staff will be placed in ECM. Regional staff will send a copy of the lab sheet(s) to the CFU Program Manager when the case is referred to OSRR.

Analytical results for samples collected by the CFU Program Manager or OSRR staff, will be sent to the CFU Program Manager. Analytical results for samples collected by the CFU contractor will be sent to the CFU contractor who will forward electronic copies of the lab sheets to the CFU Program Manager and the Case Manager. The CFU Program Manager will place all lab sheets received in ECM.

### 2.5.5 CFU contractor's Site Visit Report

The CFU contractor must submit a Site Visit Report (example in Appendix B) to the DEQ CFU Program Manager, the DEQ Case Manager, and the well owner/tenant within fifteen days after the site visit. A copy of the field report sheet must be attached to the Site Visit Report along with any analytical data

resulting from the site visit. The Site Visit Report must:

1. identify the site by PC number and property owner name,
2. list the date(s) of service, describe the type(s) of service performed,
3. provide a statement regarding system performance and a summary of the actual condition of equipment at the site,
4. provide specific recommendations for changes to preventive maintenance frequency or any system modifications that would improve system performance or simplify maintenance,
5. provide a statement certifying the proper disposal of any wastes,
6. contain analytical result sheets from the lab if samples were analyzed,
7. list the results of on-site water tests (iron, pH, hardness), if conducted, and
8. provide a detailed list of equipment that was installed or exchanged during the visit including the model and serial number for each piece of equipment installed during the visit.

# 3.0 DATA ACQUISITION

## 3.1 Sample Collection Process

Water supply wells that are potentially impacted are investigated by the DEQ Storage Tank Program staff. A major component of most investigations involves the collection of one or more water samples from the potentially impacted water supply. Samples may be collected by the potentially responsible person (i.e., a nearby entity that had a petroleum release), DEQ staff, and/or the CFU contractor.

### 3.1.1 Samples Collected by DEQ Staff

During the process of investigating a potentially impacted water supply, DEQ staff have the option of collecting samples and having those samples analyzed by DCLS or having the responsible person (if known) or the CFU contractor collect and analyze the samples. Staff also may decide to split samples with either the responsible person or the CFU contractor. Although not required, staff are encouraged to split samples with the responsible person when that entity will collect samples from potentially impacted water supplies.

A general procedure that DEQ staff will use for collecting samples from potentially impacted water supply wells is listed below. DEQ staff may modify this sampling procedure as appropriate to fit site specific conditions and objectives.

1. Investigation of possible petroleum contamination in a water supply well is initiated when:
    a. The DEQ receives a report of petroleum contamination (actual or potential) in a water supply well.
    b. There are water supply wells in the vicinity of a known petroleum release and the Regional Case Manager and Regional Storage Tank Program Manager decide that DEQ will collect samples from those wells to determine if they have been impacted by petroleum.
2. The Case Manager or other DEQ staff will contact the operator of the impacted well, obtain information about the site, and schedule a site visit. Prior to visiting the site, the Case Manager should (if possible) obtain the following types of information from the operator of the potentially impacted well:
    a. Types of potential contaminant sources near the well.
    b. Temporal variability (if any) of the contaminant.
    Staff must consider temporal factors when collecting samples from a potentially impacted water supply. If the reported water supply problem is intermittent, staff should, to the extent possible, work with the impacted party to ensure that samples are collected at a time when the problem is present.
3. The Case Manager or other DEQ staff will prepare sample containers with the appropriate preservative(s). Staff should be prepared to collect samples for both volatile

and semivolatile constituents unless they have personal knowledge of the site that makes this unnecessary.

4. Upon arrival at the site, the Case Manager or other DEQ staff will determine the location from which to collect samples. Samples from the water supply system will be collected from the location that is closest to the system pressure tank as possible and is prior to any water filtration conditioning equipment. Most pressure tanks have a drain valve on or in very close proximity to the tank. This is generally the most optimal location from which to sample water from a private water supply. In many instances, the pressure tank is located in a basement or in a vault outside of the house. If a drain valve on or near the pressure tank is used to purge the system prior to sample collection, staff may have to attach a garden hose to the drain valve in order to discharge the purge water outside of the space where the pressure tank is located. Once the system has been purged, staff should not use a garden hose to collect water samples as plasticizers and other types of organic compounds may leach from the hose and bias the samples. If it is not practical to collect samples from the pressure tank, samples should be collected from the outside spigot or inside faucet closest to the pressure tank.
5. If the sampling location is an indoor faucet, the Case Manager will remove any aerator from the faucet prior to collecting the sample. Passing water that contains volatile organic compounds (VOCs) through an aerator may result in the loss of some of the volatile compounds. Aerators also may be primary sources of microbial activity within the system. Microbial activity may compromise or bias sample quality.
6. Whenever possible, staff should purge the system for approximately ten (10) minutes prior to collecting water samples. Water samples should not be collected until cool water at a stable temperature is leaving the system. This stable, cool temperature indicates that the water was recently drawn from the aquifer/casing storage.
7. The person collecting the sample will don clean, unpowdered latex gloves before collecting samples.
8. When filling sample vials for VOC analyses, EPA recommends that the flow of water from the faucet or spigot be reduced to about 500 ml/minute; a water stream approximately the diameter of a pencil. The vials should be filled slowly and not allowed to overflow so as not to lose volatiles and/or a sufficient level of sample acidification. Vials should be filled until there is a positive meniscus of liquid above the vial. The vial should then be capped and subsequently, inverted and tapped to check for air bubbles in the sample. If air bubbles are observed, staff should collect another sample.
9. Fill out a lab tag for each sample, affix the tag to the corresponding sample container, and place the samples in a cooler on ice. Instructions for completing the lab tags are included in Appendix A. Be sure to separate the samples from the ice (e.g. place the samples in plastic bags) and wrap or otherwise protect the samples to reduce the possibility of sample container breakage during transport.
10. Prepare the test request forms. These can be prepared and submitted electronically through CEDS or a DCLS lab sheet may be manually prepared for each sample collected. Instructions for completing a DCLS lab sheet are included in Appendix A. It is recommended that staff record pertinent notes on the DLCS sheet such as “water smells like sewage,” “possible sources of contamination include kerosene and # 2 fuel oil”, etc.

11. Fill out a chain-of-custody form for the samples collected. See the Investigator's Basic Procedures Manual for the most current instructions for completing the chain-of-custody form.

Table 3.1. DCLS analytical methods for samples collected by DEQ Staff

| Analytical method | Volatile Organics (and MTBE) by GC/MS [1] | Semi-volatile Organics by GC/MS [2] | BTEX (and MTBE) |
|---|---|---|---|
| Quantification Limit | 1.0 ug/l (VOCs)<br>5.0 ug/l (MTBE) | 5.0 ug/l (SVOCs) | 1.0 ug/l (BTEX)<br>5.0 ug/l (MTBE) |
| Sample Volume | 2 x 40 ml | 2 x 1liter | 2 x 40ml |
| Container | glass 40 ml vial with Teflon cap liner | glass amber liter bottle with Teflon cap liner | glass 40 ml vial with Teflon cap liner |
| Preservation and Storage | preserve with HCL to pH< 2 and store at 4 ° C (add ascorbic acid if chlorine is expected) | store at 4 ° C | preserve with HCL to pH< 2 and store at 4 ° C (add ascorbic acid if chlorine is expected) |
| Holding time | 14 days | 7 days | 14 days |

All assessment samples (samples taken to determine if a water supply has been impacted by petroleum constituents) will be analyzed for both VOCs and SVOCs. Samples split with a contractor subsequent to the assessment period may be analyzed for BTEX and MTBE if the contractor also is having samples analyzed for BTEX and MTBE.

[1] This is DCLS Method: Volatile Organic Compounds in Water by Purge and Trap Capillary Column Gas Chromatography/Mass Spectrometry. For additional information, see SOP#3-177, adopted 3/14/2007, revision 0 7/1/2008. This is a DCLS hybrid method based on EPA Method 524.2

[2] This is DCLS Method: Determination of Semivolatile Organic Compounds (SVs) in Water by Liquid-Liquid Extraction (LLE) and Gas Chromatography/Mass Spectrometry (GC/MS). For additional information, see SOP# 3-441, adopted 12/7/2006. This is a DCLS hybrid method based on EPA Methods 625 and 8270.

11. Record at least the following information about each sample in the field notebook:
    a. sample location
    b. station ID (must match station ID listed on lab tag and lab sheet)
    c. time collected
    d. preservation method (if any)
    e. other observations as deemed important by the sampler (e.g. water from the tap smelled like gasoline)
12. Place a lab sheet for each sample container in a watertight plastic bag and affix the plastic bag to the inside of the cooler lid.
13. If the sample will be sent to the lab via a commercial carrier, record the waybill number in the field book.

### 3.1.2 Samples Collected by the CFU contractor

The CFU contractor collects more samples related to the AWS Program than any other entity. DEQ generally will direct the CFU contractor to assist with the investigation to determine if a water supply is contaminated by petroleum products. The assessment samples collected by the CFU contractor to determine if petroleum constituents are present in the water supply will be analyzed for volatile organic compounds and semi-volatile organic compounds. If constituents of leaded gasoline are believed to be a potential issue due to historical uses of the site and vicinity, the CFU contractor will be directed to have a sample analyzed for ethylene dibromide (EDB) and 1,2 dibromo – 3 - chloropropane. The CFU contractor also will collect samples related to general water chemistry at the site to aid in the development of a treatment system should one be required for the site.

The CFU Program Manager is responsible for directing the CFU contractor to collect samples from a potentially impacted site. When the CFU Program Manager directs the CFU contractor to collect samples from a potentially impacted site he will usually inform the CFU contractor what analyses to perform based upon the contaminants suspected.

The sampling procedure used by the CFU contractor to determine if a water supply has been impacted will be quite similar to those used by DEQ staff.

1. The CFU contractor will determine the location from which to collect samples. Samples from the water supply system will be collected from the location that is closest to the system pressure tank as possible and is prior to any water filtration conditioning equipment.
2. If an indoor faucet is the most appropriate location from which to collect samples, the CFU contractor will remove any aerator from the faucet prior to collecting the sample.
3. The CFU contractor will purge the system for at least ten (10) minutes before collecting samples.
4. The person collecting the sample will don clean, unpowdered latex gloves before collecting samples.
5. Sample containers will be filled slowly to minimize the loss of volatile constituents and maintain a sufficient level of sample preservative. When filling sample vials for VOC analyses, EPA recommends that the flow of water from the faucet or spigot be reduced to about 500 ml/minute; a water stream approximately the diameter of a pencil. VOC vials will be capped with a positive meniscus to prevent the formation of air bubbles.
6. After samples are collected, they will be labeled and placed in a cooler on ice.
7. The person collecting the samples will then record information related to the sample in the logbook including the time that the sample was collected, the location from which the sample was collected, the parameters to be measured, preservation used (if any), and sample identification number.
8. After collecting all samples, the CFU contractor will complete the Chain-of-custody form and the necessary lab sheets.
9. The CFU contractor will then keep one copy of the Chain-of-custody form along with the waybill and place this documentation in the appropriate case file in their office.
10. The laboratory, upon completing the analyses, will send the analytical information to the

CFU contractor along with the Chain-of-custody form indicating the lab's receipt of the samples. This information should also be placed in the appropriate case file in the CFU contractor's office.

When samples are collected to determine if a water supply has been impacted by petroleum, the CFU contractor will usually analyze water from the site to determine general water chemistry. Parameters often measured in the field to determine general water chemistry at a site include pH, hardness, iron, and hydrogen sulfide. Procedures for analyzing these and other parameters in the field may vary depending upon the test kit and/or instrument used. In all cases, the CFU contractor will perform the analyses for these parameters in accordance with instructions provided by the manufacturer of the test kit and/or instrument used to measure the parameter of interest. The CFU contractor will also ensure that all staff analyzing samples in the field are familiar with and trained to use the test kits and instruments used in the field. A list of and instructions for all test kits and instruments used to analyze water chemistry in the field will be provided to DEQ.

When water is analyzed in the field, the person analyzing the water will record the information obtained from the test kit and/or instrument in the field notebook. This information will be placed in the appropriate case file in the CFU contractor's office and copies of field notes also will be provided to the CFU Program Manager. If the test kit used has a listed shelf life, the person collecting and analyzing samples will record the expiration date on the field sheet. The DEQ will not accept results from test kits that have exceeded the expiration date.

Once DEQ has determined that a treatment system is necessary for the water supply, the CFU contractor will install and maintain the system. Maintenance includes monitoring contaminant concentrations before entering the system and after leaving the system to ensure that the system is operating appropriately.

## 3.2 Sample Handling Requirements

Proper sample handling is necessary to minimize accidents and ensure sample integrity. Samples collected for the AWS program will be labeled (tagged) immediately after collection, wrapped in a plastic sleeve or other protective covering to prevent breakage of the sample container, and placed on ice. Although not required, it is recommended that staff and the CFU contractor place the sample containers in plastic bags. The samples will then be delivered or shipped to a laboratory for analysis.

Table 3-2 Analytical requirements for samples collected by the CFU contractor

| Constituent(s) of concern | Analytical Method | Preservation | Sample Volume | Container | Holding Time |
|---|---|---|---|---|---|
| BTEX (and MTBE) | EPA Method 8021B | cool to ≤6°C | 1 x 40 ml | glass 40 ml vial with Teflon cap liner | 14 days |
| volatile organics and MTBE | EPA Method 8260 | cool to ≤6°C | 1 x 40 ml | glass 40 ml vial with Teflon cap liner | 14 days |
| semi-volatile organics | EPA Method 8270 | cool to ≤6°C | 1 x liter | glass amber liter bottle with Teflon cap liner | 7 days |
| Ethylene dibromide and 1,2 dibromo-3-chloropropane | EPA Method 8011 or EPA Method 504.1[a] | cool to ≤6°C Method 8011, cool to 4°C, Method 504.1 | 1 x 40 ml | glass 40 ml vial with Teflon cap liner | 14 days |

All assessment samples will be analyzed for volatile organics and MTBE and semi-volatile organics. If constituents of leaded gas are believed to be a potential issue at the site, the CFU Program Manager will direct the CFU contractor to have a sample analyzed for ethylene dibromide (EDB) and 1,2 dibromo-3-chloropropane.

The lab analyzing samples for VOCs and SVOCs needs to include tentatively identified compounds that were detected by these methods. These tentatively identified compounds are constituents that were found during the analysis, but are not part of the target analyte list.

Samples collected during the preventive maintenance process may be analyzed for BTEX and MTBE in those cases where data indicate that these are the only constituents of concern at the site.

Separatory Funnel Extraction, EPA Method 3510C, is the preparation method used for samples analyzed for SVOCs.

[a] The CFU contractor for the 2011 CFU contract has chosen to use Method 504.1.

## 3.3 Analytical Method Requirements

The DEQ has a no-tolerance practice for petroleum constituents in private drinking water wells. If petroleum constituents are encountered in a private well, the CFU Program Manager will instruct the CFU contractor to install and maintain a treatment system on that well until petroleum is no longer detected in the well, another petroleum free drinking water source is provided to the impacted person(s), or statistical analysis indicates petroleum constituents in the well are below the program's RMLs.

The DEQ practice of installing and maintaining treatment systems on all impacted private water supplies places a high degree of importance on sample analyses. Analyses performed must have low detection limits in order for DEQ to adequately protect human health. Samples must be placed in appropriate

containers and analyzed in accordance with established method requirements. Starting on January 1, 2012, the lab utilized by the CFU contractor must be accredited and meet the Virginia Environmental Laboratory Accreditation (VELAP) standards.

Samples collected by DEQ staff will be analyzed by personnel from DCLS in accordance with DCLS standard analytical procedures. Containers and maximum holding times for DCLS analytical methods used by the AWS Program are listed in Table 3-1.

## 3.4 Quality Control Requirements

Quality control refers to the series of procedures and activities that are performed to ensure that the data collected meet the established standards. Within the context of the AWS Program, the primary purpose of quality control is to ensure that the sampling and analytical protocols are properly executed and that errors in the data set are recognized and corrected before DEQ staff make a decision using erroneous data or data that are of insufficient quality to support the required decision.

### 3.4.1 Quality Control Samples

When DEQ staff collect water samples from a water supply system, the primary objective is to determine if the water system is contaminated by petroleum constituents. Contamination may, in some instances, be obvious and samples are analyzed to confirm the type(s) of contaminants present and provide information for the preliminary design of an alternate water supply. Most of the time, however, impacted water supplies are reported to DEQ when a constituent becomes detectable via a faint taste or smell and the contaminant concentration in water is less than 100 ppb. In order to determine if contaminants in a sample may have been introduced by the sample container, preservative, or sampling procedure (including environment), staff are required to collect a field blank along with the other samples that they collect during their investigation.

#### 3.4.1.1 Trip Blanks

Trip blanks are quality control samples consisting of reagent grade deionized water placed in the appropriate sample containers and preserved in accordance with the method requirements. These blanks usually are prepared by the laboratory prior to sample collection activities. The purpose of trip blanks is to determine if the sample container, preservative, or transportation process may be introducing contaminants into the samples. These blanks are placed in the cooler when staff or the CFU contractor leave their office, taken into the field, and subsequently analyzed in the lab along with the samples collected in the field. Trip blanks are analyzed for the same parameters or constituents as the other samples. Trip blanks do not need to be analyzed if the constituents of concern in all other samples collected and analyzed from that trip are below the detection limits.

The need for quality control at AWS sites may vary depending upon the stage of work at the site.

Perhaps the most critical phase is the initial investigation where DEQ must determine if the water supply is contaminated. One VOC and one SVOC trip blank will be prepared when samples will be collected as part of the initial investigation to determine if a water supply has been impacted by petroleum. Once a CFU has been installed at a site, the CFU contractor will periodically perform preventive maintenance on the system. During these preventive maintenance visits, the CFU contractor may collect samples of both the raw and the treated water. The CFU Program Manager will determine when the CFU contractor needs to include trip blanks in a preventive maintenance sampling event at a site. The CFU Program Manager will randomly choose at least two preventive maintenance visits per month during which the CFU contractor will use trip blanks.

#### 3.4.1.2 Field Blanks

Another type of quality control sample that staff and the CFU contractor should collect is a field blank. Field blanks also may be called sampling blanks and the purpose of field blanks is to determine if the sampling procedure or environment within which the samples are collected may be introducing contaminants into the samples. Field blanks should be collected by placing reagent grade water into an appropriately preserved sample container at the location where other samples are collected. Once the field blank is collected, it is labeled and placed in a cooler along with the other samples. During the process of determining if a well is contaminated by petroleum, samples will be analyzed for volatile organic constituents. Field blanks that are analyzed should also be analyzed for VOCs since these constituents are more likely to be present as a result of cross contamination than are the SVOCs. If constituents of concern from all other samples collected at the site are below the detection limits, there is no need to analyze field blanks submitted with the samples.

One field blank will be collected at each site during the initial investigation phase of work. After a site has received a system and subsequent samples are collected as part of the preventive maintenance program, the CFU Program Manager will direct the CFU contractor to periodically take field blanks. The CFU Program Manager will randomly choose at least two preventive maintenance visits per month during which the CFU contractor will collect field blanks.

### 3.4.2 Laboratory Quality Control Procedures

Samples collected by DEQ staff must be sent to the Virginia Department of General Services, Division of Consolidated Laboratory Services (DCLS) for analysis. Samples analyzed by DCLS must be analyzed in accordance with DCLS QA/QC protocols for the analyses requested.

Samples collected by the CFU contractor will be sent to a private lab for analysis. The Storage Tank Program expects these samples to be analyzed by one or more of the EPA Methods Listed in Table 3-2. Samples analyzed by a SW-846 Method must meet the Quality Control requirements specified in SW-846. Samples analyzed by an EPA Drinking Water Method must meet the Quality Control requirements specified for that method in the Federal Drinking Water Regulations.

The EPA Drinking Water and Waste Water Analyses are similar to the SW-846 methods for the same analytes and the DEQ Storage Tank Program will accept samples analyzed by a Drinking Water or Wastewater method. Labs analyzing samples by a Drinking Water or Wastewater method must meet the Quality Control requirements specified for the analysis performed.

Laboratories are expected to use blanks to check data quality. After performing the calibration standards, laboratory personnel are expected to run a method blank every twelve hours. The method blank must be performed on each system that is used to analyze samples by that particular method (i.e. if two GC/MS systems will be used, then a method blank must be run on each system).

The analysis of heavily contaminated samples potentially creates problems with cross contamination of subsequent samples analyzed by the same equipment. An instrument blank should be analyzed after any grossly contaminated sample is analyzed to demonstrate that the analytical equipment has been decontaminated.

### 3.4.3 Duplicate Samples

Another type of quality control sample that may be utilized in the AWS Program is the duplicate sample. Duplicate samples are samples collected from the same location (i.e. water spigot, sampling port on CFU system), as close to the same time as possible, and analyzed for the same constituents using the same analytical method(s). Duplicate samples generally are labeled so that the laboratory will not know that the samples are duplicates. The purpose of duplicate samples is to check method precision. The CFU Program Manager and the CFU contractor will determine on a case-by-case basis the need for duplicate samples.

## 3.5 Data and Document Management

Storage Tank Program staff in both the regional offices and OSRR and the CFU contractor all contribute to the base of information collected for a site and all of these entities, either directly or indirectly are involved in the decisions that are made about the site. A key component of the decision making process is the availability of information. Data and document management consists of the systematic storage and retrieval of information related to the AWS Program.

### 3.5.1 Data Management

There are three basic types of data that are managed under the AWS program. These three types are site data/information, water quality information, and financial information.

When a report of a potentially impacted water supply is received, a Case Manager in one of the Regional Offices will investigate the complaint and obtain additional site information such as site location, potential contaminant sources, and site owner’s name, address, and phone number. The regional Case

Manager then will fill out an AWS referral form, place that form in ECM, and notify the CFU Program Manager that an AWS referral form has been placed in ECM.

Water quality information is provided to the CFU Program Manager in the form of laboratory analytical reports. These laboratory analytical reports are from laboratories used by the CFU contractor or from DCLS if the samples were collected by DEQ staff. Copies of laboratory reports are attached to the respective site report prepared by the CFU contractor. Laboratory results from samples collected by DEQ staff are provided to the Case Manager or person who collected the samples. The Case Manager is responsible for placing an electronic copy of the results into ECM and notifying the CFU Program Manager that analytical results have been received. The CFU Program Manager records laboratory analytical data in the AWS module of the CEDS database. Analytical data from the CFU contractor are filed electronically in ECM by the CFU Program Manager.

Financial information for each AWS site refers to costs expended for AWS measures. These costs are typically in the form of invoices from the CFU contractor. Municipal AWS costs also can take the form of inter-agency agreements that have been negotiated for public water supply water line extensions and hookups.

The CFU Program Manager is responsible for reviewing, approving, and processing CFU contractor invoices for payment. When approved for payment, the CFU Program Manager enters the invoice/cost information into the AWS database module. Electronic copies of invoices and approval forms are filed in ECM.

### 3.5.2 Document Management

Documents generated as part of the AWS Program include analytical data sheets, field notes, and CFU contract related documents. Field notes may be taken by DEQ Regional staff, the CFU Program Manager, OSRR staff, and the CFU contractor. Copies of field notes taken by the CFU contractor or DEQ staff will be scanned and placed in ECM.

Documents generated as part of the AWS Program are considered to be part of the pollution complaint record series of documents. Pollution complaint files are scanned and the records are retained by DEQ in accordance with the document retention schedule (Document Retention Schedule No. 440-011).

#### 3.5.2.1 Document Management - DEQ Regional Offices

Most of the sampling and investigatory work performed by DEQ will be performed by the Regional staff. After performing a site visit, staff should scan their field notes and place those notes in ECM. When samples are collected by the Regional staff, the original laboratory data sheet(s) received from DCLS must be placed in ECM by regional staff. If the data indicate that the well is impacted by petroleum, the Regional Case Manager must notify the CFU Program Manager that the well is contaminated and provide information about the PC number and document date for the analytical results placed in ECM so that the CFU Program Manager may access the analytical data.

#### 3.5.2.2 Document Management - OSRR

The majority of samples collected at most AWS sites are collected by the CFU contractor. Copies of a Site Visit Report and any analytical results for samples collected by the CFU contractor must be provided electronically to the CFU Program Manager and the Regional Case Manager. The CFU Program Manager will enter the analytical results into CEDS and also will place a copy of the Site Visit Report and lab results into ECM.

After a treatment system is installed on an impacted water supply, the CFU contractor will perform regular preventive maintenance on that system. Part of preventive maintenance is the collection of samples to monitor system effectiveness and ensure that the system is removing petroleum from the water before persons are exposed. Copies of analytical results related to system preventive maintenance must be provided to the CFU Program Manager.

The CFU contract is managed entirely by the CFU Program Manager and OSRR. All documents related to the AWS contract such as invoices will be placed in ECM and maintained in accordance with the record retention schedule (Record Retention Schedule No. 440-011).

#### 3.5.2.3 Document Management - CFU contractor

Documents managed by the CFU contractor include field notes taken during site visits, laboratory analytical sheets, chain-of-custody records, and records related to the calibration and maintenance of equipment used to analyze water samples. The CFU contractor is expected to maintain individual case files for each AWS case. Field notes, laboratory analytical sheets, chain-of-custody records and other site specific information should be placed in the appropriate case file. The CFU contractor must provide the DEQ CFU Program Manager with copies of all analytical sheets and field notes. Chain-of-custody records must be provided to the CFU Program Manager as requested by the DEQ.

### 3.5.3 DEQ Documents Pertinent to the AWS Program

The Department of Environmental Quality also generates many guidance documents other than Quality Assurance Project Plans. Within the Storage Tank Program, all staff are notified that a new guidance document has been issued and, if applicable, what guidance document(s) have been superseded. If a guidance document has been superseded, staff are directed to discard the superseded document and the document is purged from the agency drive, accessible to all staff, that contains agency guidance documents.

Once per year, DEQ management and staff evaluate all agency guidance documents and determine which ones are current and which have been superseded. All superseded guidance documents not previously identified are taken out of circulation and are purged from the computer drive containing electronic copies of agency guidance documents. If superseded guidance documents affecting the Storage Tank Program are found, Regional Storage Tank Program Managers are notified and instructed to inform their

staff that the said document(s) have been superseded and staff should discontinue use. DEQ documents containing procedures relevant to the AWS Program are listed in Table 3-3.

| Table 3-3. DEQ Documents Containing Procedures Relevant to the AWS Program |
|---|
| Storage Tank Program Technical Manual, Fourth Edition. DEQ Guidance Document # 01-2024D. |
| Quality Assurance Project Plan – Alternate Water Supply Program. Guidance Document #2009-05. |
| Installation, Service & Maintenance of Carbon Filtration Units, Contract 15100. January 1, 2011. |
| Conducting Environmental Investigations, Investigator's Basic Procedures Manual. |

## 3.6 Instrument/Equipment Testing, Inspection, Calibration, and Maintenance

The quality of data collected from a site is dependent upon the instruments and other types of equipment that are used to collect the data. DEQ staff, the CFU contractor, and laboratories may use instruments that will collect or analyze data for a site. In all cases, instruments and equipment must be inspected, calibrated, and maintained to ensure the integrity of the data provided.

### 3.6.1 Instruments and Equipment used by DEQ Staff

DEQ Storage Tank Program staff do not routinely use instruments or equipment to collect information at potential AWS sites. If instruments or equipment are used to collect information about a site staff must:

1. calibrate the instrument in accordance with the manufacturer's instructions; and
2. document in the field notebook when calibration was performed.

Each DEQ office is responsible for maintaining instruments and equipment in accordance with the manufacturer's instructions. When collecting field data with a particular instrument, staff should document in the field notebook the most recent date that the instrument was last maintained.

### 3.6.2 Instruments and Equipment used by the CFU contractor

The CFU contractor routinely analyzes water samples in the field using instrument and/or field test kits. The data generated by field instruments and test kits such as pH and iron concentration is used to design a filtration system should one be needed to remove petroleum constituents from the water supply. Standard operating procedures for individual instruments and field test kits vary depending upon the kit or instrument used. In all cases, the CFU contractor will use the standard operating procedure that is provided by the manufacturer of the test kit or instrument used. Instruments must be calibrated and

maintained in accordance with the manufacturer's instructions and instrument calibration information must be recorded in the field notes.

Reagents provided in certain test kits may have a listed shelf life. When a test kit is used in the field, the person analyzing the sample must record the type of test kit used and the expiration date for the test kit or its reagents in the field notebook. Results from test kits that are obtained after the expiration date for the test kit will not be accepted by DEQ.

### 3.6.3 Instruments and Equipment used by Laboratories

The most critical component in the decision making process for a potential AWS site is the analytical results for water samples analyzed for petroleum constituents. Analyses of water samples for petroleum constituents are performed either in a private laboratory if the samples were collected by the CFU contractor or DCLS if the samples were collected by DEQ. Calibration of equipment used by private laboratories must be performed in accordance with the QA/QC requirements for the analytical method(s) used to analyze the samples. Equipment calibration at DCLS will be performed in accordance with the DCLS QA/QC procedures manual. Maintenance of equipment used to perform analyses will be performed in accordance with the manufacturer's instructions. The CFU Program Manager may require the CFU contractor to provide QA\QC procedures for commercial laboratories used by that contractor.

# 4.0 PROJECT ASSESSMENT AND CORRECTIVE MEASURES

The process of developing technical procedures for the DEQ Storage Tank Program, either in part or as a whole, is carried out by Storage Tank Program staff and managers within both the regional offices and OSRR. Reviews and assessments of the QA/QC components of the AWS Program will also be conducted by a group of persons from the Storage Tank Program. In order to obtain input from individuals who are outside of the program, the Storage Tank Program usually will request that the members of the Land Protection QA Workgroup assist with reviews and assessments of QA/QC procedures.

When assessments identify procedural changes in the program or quality assurance elements that need to be modified, corrective measures will be developed and implemented. The Quality Assurance Manager for the Storage Tank Program is responsible for coordinating the development of corrective measures. The CFU Program Manager, selected persons from OSRR, and a group of Regional Case Managers will assist with developing corrective actions to address the problems identified.

## 4.1 Management System Review

A management system review is an evaluation of an organization's management practices as they relate to quality assurance. Management system reviews will be performed on the AWS component of the Storage Tank Program to evaluate the effectiveness of existing management procedures designed to assure data quality, the adequacy of resources and personnel devoted to quality assurance functions, the effectiveness of training and assessments, and the applicability of data quality requirements. Management system reviews also will identify areas where quality assurance improvement is needed and areas where noteworthy accomplishments have been made within the program.

The Quality Assurance Manager for the DEQ Storage Tank Program is responsible for coordinating Management System Reviews. The CFU Program Manager, Remediation Program Manager, and the OSRR Program Assessment Specialist also will participate in evaluating management systems within the AWS Program. The Management System Reviews will examine the following elements of the AWS Program:

1. The overall effectiveness of the quality management system within the AWS Program,
2. Procedures, criteria, and schedules for conducting audits related to quality assurance within the AWS Program,
3. Responsibilities and authorities of DEQ managers and staff for implementing the Quality Assurance Project Plan for the AWS Program,
4. The level of resources committed to implementing the quality assurance component of the AWS Program,
5. changes in state or DEQ regulations, policies, or procedures that may affect the AWS Program,
6. Corrective actions taken to address deficiencies in QA/QC within the AWS Program, and

7. Training of persons performing work in the AWS Program.

The Storage Tank Program Quality Assurance Manager is responsible for drafting the Management System Review for the AWS Program. Persons assisting the Storage Tank Program Quality Assurance Manager will include the Remediation Programs Manager, the CFU Program Manager, and the OSRR Program Assessment Specialist. The draft Management System Review will be sent to the OSRR Director, the Land Protection QA Workgroup, and the Regional Storage Tank Program Managers for review. Comments will be incorporated as appropriate into the AWS Program Management System Review and the document will be approved by the OSRR Director.

The first Management System Review is expected to be performed approximately one year after the AWS Quality Assurance Project Plan is approved. The interval between Management System Reviews is expected to be approximately one year. Management System Reviews also will be performed when major AWS procedures are changed.

## 4.2 Data Quality Assessment

Decisions made within the AWS Program are based primarily upon analytical data for samples that are collected by the CFU contractor or DEQ staff. Data must, therefore, be of sufficient and known quality to support decisions made by the DEQ Storage Tank Program Staff.

Data quality assessments will be performed to evaluate data collected for the AWS Program to ensure that the data collected meet the Data Quality Objectives of the Program and ensure that corrective actions are taken if data quality is insufficient. The primary elements of assessing data quality within the AWS Program will be data validation and data quality audits.

### 4.2.1 Data Validation and Corrective Actions

Analytical data returned to the CFU contractor or DEQ staff from the laboratory must be validated to ensure that the data are of sufficient quality to support the decisions that must be made about the site. The CFU contractor will review and validate data submitted for samples collected by their staff. The DEQ Case Manager or CFU Program Manager will review and validate analytical information for samples collected by Regional staff or OSRR staff, respectively.

#### 4.2.1.1 Holding Time

Holding time is an important element that must be considered when evaluating the quality of data. Persons checking information provided by the lab must review information provided about sample collection date and sample analysis date to ensure that the holding time for the requested analysis was not exceeded. If the holding time was exceeded, DEQ will consider the analytical result received and the type of decision that must be supported by the data. Table 4-1 provides the recommended actions for

samples that exceed holding times based upon the purpose of the sample.

When a holding time is exceeded, it is important to determine why the holding time was exceeded in order to prevent or reduce the probability of a repeat occurrence. The CFU Program Manager and the person who collected the sample will review the sampling process used to determine why the holding time was exceeded. If the exceedance was attributed to the laboratory or to a site specific sample collection and handling procedure, the CFU Program Manager should document this conclusion in the appropriate case file. If the review indicates that standard sample collection procedures used by the CFU contractor and/or DEQ staff are causing holding times to be exceeded, the CFU Program Manager must notify the Storage Tank Program Quality Assurance Manager. The Quality Assurance Manager, CFU Program Manager, and the CFU contractor or DEQ Regional Case Managers will revise the sampling procedure as needed to meet the holding times for the samples.

Table 4-1. Decision Matrix for Samples that Exceed the Holding Time

| Purpose of Sample Collection | Result | Action |
|---|---|---|
| Samples collected to determine if private water supply well is impacted (assessment samples) | A holding time is exceeded and the concentration of any petroleum constituent > detection limit. | The sample result will be interpreted by DEQ as indicating the presence of petroleum in the well and DEQ will begin the AWS process. The Regional Case Manager and the CFU Program Manager have the authority to decide if another sample is needed. |
| | A holding time is exceeded and the concentrations of all petroleum constituents are below the detection limits. | An additional sample must be collected and analyzed. |
| Samples collected to determine if public water supply well is impacted | A holding time is exceeded and the concentration of any petroleum constituent is above the Virginia drinking water standards or a health advisory issued by the Health Department. | DEQ will begin the AWS process. The Regional Case Manager and the CFU Program Manager have the authority to decide if another sample is needed. |
| | A holding time is exceeded and the concentration of all petroleum constituents are below the detection limits. | An additional sample must be collected and analyzed. |
| Samples collected for system design and preventive maintenance: | A holding time is exceeded and the concentration of any petroleum constituent > detection limit and the analytical result is within one order of magnitude of the previous analytical result for that parameter. | The sample result will be used unless the CFU Program Manager believes another sample is needed. |
| | A holding time is exceeded and the concentration of all petroleum constituents are below the detection limits. | An additional sample must be collected and analyzed. |

#### 4.2.1.2 Field and Trip Blanks

If a field blank was submitted to the lab, the person collecting the sample will review analytical data

provided for that field blank. The presence of petroleum constituents or other organic analytes in a field blank suggests that sample integrity may be compromised and that constituents found in the samples may be from locations other than the water supply well. If any analytes are detected in blank samples, the CFU contractor or the Regional Case Manager must bring this to the attention of the CFU Program Manager. The CFU Program Manager and/or the State Lead Program Manager then will evaluate the situation considering the data quality objectives for the samples and determine the appropriate course of action and the necessary corrective measures. When organic analytes are detected in the field blank, staff or the CFU contractor usually will collect an additional round of samples from the site. A trip blank will be taken into the field by the sampler and the sampler will also collect another field blank. Both blanks will be analyzed along with any other samples collected as a means of assisting the CFU contractor and DEQ staff identify the source of cross contamination should the blanks contain detectable concentrations of organic constituents.

Table 4-2 contains a matrix of recommended actions that typically will be used should organic constituents be found in blank samples. The CFU Program Manager and/or the State Lead Program Manager have the authority to overrule these "recommended actions" on a case-specific basis should they believe another course of action is more appropriate.

#### 4.2.1.3 Qualified Data

Analytical data sheets provided by the lab should qualify the data presented on the sheet. DEQ staff and the CFU contractor should check the qualifiers to ensure that the data returned by the lab will support the decisions that must be made.

Qualified data may not be able to support the AWS decisions that DEQ must make at a site. Common qualifiers that staff and the CFU contractor may encounter are listed in Table 4-3 along with the corrective actions needed when these qualifiers are encountered.

#### 4.2.1.4 Action Level Notification

The DEQ Storage Tank Program has a no tolerance practice for petroleum constituents in private drinking water supplies. Persons finding petroleum constituents in private drinking water supplies are expected to immediately notify DEQ. Analytical method requirements including reporting limits are provided in Appendix C.

#### 4.2.1.5 Sample Paperwork

During the data validation process, the CFU contractor is expected to review the chain-of-custody form that was filled out for the samples and verify that the form was filled out correctly. The CFU contractor should, at a minimum, ensure that the chain-of-custody form contains the following:

Signature(s) of person(s) collecting the samples

Time and date of sample collection
Signature of the lab's sample custodian
All samples have a unique identification number or code

Table 4-2. Decision Matrix for the presence of organic compounds in blank samples (water only)

| Purpose of Sample Collection | Result | Action[1] |
|---|---|---|
| Samples collected to determine if private water supply well is impacted | Any volatile organic compound is detected in a field or trip blank | The data cannot support decisions that must be made regarding alternate water supplies at that site and an additional water sample from that location must be collected and analyzed. |
| Samples collected to determine if public water supply well is impacted | A petroleum constituent or other VOC is detected in the field or trip blank and the concentration of that constituent in the sample is below the Virginia drinking water standard for that constituent | Sample integrity may be compromised, however, the data suggest that the concentrations of organic constituents in the water do not exceed the drinking water standards. The CFU Program Manager and the State Lead Program Manager will decide if another sample from that location is needed. |
| | Any petroleum constituent or VOC is detected in field or trip blank and the reported concentration of that compound in the sample exceeds Virginia's drinking water standard | The data cannot support decisions that must be made regarding alternate water supplies at that site and an additional water sample from that location must be collected and analyzed. |
| Samples collected during CFU O&M | A constituent is found in a blank and the site has had less than 2 consecutive sampling visits where all constituents in the raw water are below detection limits. | The analytical results generally will be accepted unless the CFU Program Manager and/or State Lead Program Manager decide an additional sample is needed. |
| | A constituent is found in a blank and the site has had 2 or more consecutive sampling visits where all constituents in the raw water are below detection limits. | Generally, another sample should be collected and analyzed. Blanks also should be collected and analyzed. On a case-specific basis, the CFU Program Manager and the State Lead Program Manager may decide that another sample is not needed. |

[1] In all instances where volatile organic constituents are found in a blank, the CFU Program Manager, State Lead Program Manager and the CFU contractor must, to the extent possible, determine why one or more VOCs were found in a blank and take actions to prevent a future occurrence.

Table 4-3. Data Qualifiers and Required Corrective Actions

| Qualifier | Description | Required Corrective Action |
|---|---|---|
| J | The analyte was positively identified but the quantitation is an estimation | • Samples collected to determine if a private water supply well is impacted - collect another round of samples<br>• Samples collected to determine if a public water supply well needs an alternate water supply<br>◊ If the detection limit of the analysis is below the drinking water standard or the health advisory for the constituent(s), no further action is required.<br>◊ If the detection limit of the analysis is above the drinking water standard or health advisory for the constituent(s), an additional round of samples must be collected.<br>• Samples collected for system design and operation and maintenance<br>◊ If sample is for system design - CFU Program Manager and the CFU contractor will decide if information from an additional sample is needed in order to properly design the system<br>◊ If the sample was taken after the carbon unit(s) to monitor the system - the CFU should be replaced<br>◊ If the sample was taken before the carbon filtration units to monitor the concentration of constituents in the raw water, the CFU Program Manager and State Lead Program Manager will decide if another sample needs to be collected. |
| U | The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit | None provided that the detection limits are appropriate. |
| R | The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria | The data cannot be used to support any decision made about the site and staff or the CFU contractor must collect an additional round of samples from the site. |
| B | The analyte was found in associated blank, as well as in the sample | The data cannot support decisions that must be made regarding alternate water supplies at the site and staff or the CFU contractor must collect an additional round of samples. |

#### 4.2.1.6 Review of Laboratory QC Data

Laboratories are expected to follow the QA/QC requirements for the analytical method(s) used to analyze the samples. Some of the types of QC tools used to evaluate method performance include matrix spikes and matrix spike duplicates, method blanks, surrogate recovery data, and initial calibration data. The

DEQ does not expect the CFU contractor to review the laboratory QC data for each set of samples. The CFU contractor should request that the lab provide QC information for all samples that were collected during site assessment. The CFU contractor will randomly audit laboratory QC data for sets of samples submitted as part of routine preventive maintenance. The DEQ CFU Program Manager and the CFU contractor may check lab QC data for any set of samples if they believe that the data quality needs warrant this action.

Matrix spikes and matrix spike duplicates are tools that are used to evaluate the precision and accuracy of the analytical method on various matrices and to demonstrate acceptable recovery by the lab at the time of sample analysis (EPA 1994). Matrix spike and matrix spike duplicate samples must be analyzed at a frequency of one per 20 samples of the same matrix. According to EPA (1996), the recoveries of most compounds spiked into samples should be between 70 – 130 percent. The relative percent difference between the matrix spike recovery and the matrix spike duplicate must be within the limits listed in Table 4-4.

Accuracy is estimated from the recovery of spiked analytes from the matrix of interest (EPA 1996). Laboratory performance is estimated from the recovery of spiked analytes in the matrix spike sample. Matrix spike recovery percent is calculated using equation (1) below.

$$(1) \qquad \% \text{ recovery} = \frac{C_s - C_u}{C_n} \times 100$$

Where:

$C_s$ = the measured concentration of the spiked sample aliquot
$C_u$ = the measured concentration of the unspiked sample aliquot
$C_n$ = the theoretical concentration increase that results from spiking the sample

Precision is estimated from the relative percent difference (RPD) of the concentrations measured for matrix spike and matrix spike duplicate pairs. The RPD is calculated using equation (2) below.

$$(2) \qquad RPD = \frac{* C_1 – C_2 *}{[(C_1 + C_2)/2]} \times 100$$

Where

$C_1$ = Measured concentration of the first sample aliquot
$C_2$ = Measured concentration of the second sample aliquot

| Table 4-4. Matrix Spike and Matrix Spike Recovery and Relative Percent Difference Requirements | | |
|---|---|---|
| Compound | RPD – water matrix | RPD – soil matrix |
| 1,1-dichloroethene | ≤ 14 | ≤ 22 |
| Trichloroethene | ≤ 14 | ≤ 24 |
| Benzene | ≤ 11 | ≤ 21 |
| Toluene | ≤ 13 | ≤ 21 |
| chlorobenzene | ≤ 13 | ≤ 21 |
| These recommended relative percent difference values are from EPA (1994). | | |

Laboratories are expected to use method blanks to check data quality. After lab personnel perform the calibration standards, SW846 recommends that method blanks be prepared at a frequency of at least 5% (i.e. one method blank per 20 samples prepared at the same time and by the same procedures) for 8000 series methods. Lab personnel must analyze a method blank on each system that is used to analyze samples by that particular method (i.e. if two GC/MS systems will be used, then a method blank must be run on each system). The analytical results from the method blank sample should be less than the lab's detection limit for that method.

Surrogates, also known as system monitoring compounds, are added to all samples prior to sample purging so that the lab may monitor analytical performance (some of the more common surrogate compounds are listed in Table 4-5. Laboratories are expected to evaluate surrogate recovery data from individual samples versus the recovery limits developed by the lab. Surrogate recovery is calculated using equation (3) below.

$$\text{(3)} \qquad \text{Recovery (\%)} = \frac{\text{Concentration or amount of surrogate compound found}}{\text{Concentration or amount of surrogate compound added}} \times 100$$

Labs are expected to develop surrogate recovery limits in accordance with the analytical method requirements or recommendations.

Initial and continuing calibration of instruments also are required as a way of demonstrating that the equipment is capable of producing acceptable data for the constituents of interest. As part of the lab QC data audit, the CFU contractor will check the lab's documentation to ensure that initial and continuing calibration were performed.

DEQ staff and/or the CFU contractor also may request and review other lab QC data such as retention time, chromatograms and mass spectra as they believe necessary to meet the needs of the individual project.

| Table 4-5 Common Surrogate Compounds | |
|---|---|
| Compound | Compound Class |
| 4-bromofluorobenzene | Volatile Organics |
| 1,2-dichloroethane | Volatile Organics |
| Toluene | Volatile Organics |
| Nitrobenzene | Semi-volatile Organics |
| Fluorobiphenyl | Semi-volatile Organics |
| Terphenyl | Semi-volatile Organics |
| Phenol | Semi-volatile Organics |
| Fluoprophenol | Semi-volatile Organics |
| Tribromophenol | Semi-volatile Organics |
| Chlorophenol | Semi-volatile Organics |
| 1,2-dichlorobenzene | Semi-volatile Organics |
| Source: EPA. 1994. Region III Modifications to National Functional Guidelines for Organic Data Review. Multi-media, Multi-Concentration (OLMO1.0 - OLMO1.9). | |

### 4.2.2 Data Quality Audits

The Storage Tank Program Quality Assurance Manager is responsible for coordinating audits of data produced by DEQ staff and the CFU contractor for the AWS Program. The Data Quality Audit will be used to evaluate the quality of data generated by the CFU Program relative to the Data Quality Objectives. Analytical data sheets will be reviewed to determine if the detection limit for an analysis meets the data quality objectives, the sample was extracted and analyzed within the time limit specified for the method, and the analytical result was not qualified in such a way that might result in a failure to meet the data quality objective. Data Quality Audits also will evaluate the completeness of documentation related to sample collection and instrument calibration. The Data Quality Audit process primarily involves tracing the documentation that accompanies data from the time of collection to the time that data is used to make decisions. The CFU Program Manager, the OSRR Program Assessment Specialist, and the Land Protection QA Workgroup will assist with all Data Quality Audits.

## 4.3 Technical Assessments

The DEQ Storage Tank Program will use Technical Assessments to evaluate the AWS procedures used by both staff and the CFU contractor. Elements of the AWS program that may be evaluated within Technical Assessments include equipment used by staff, the CFU contractor, and laboratory personnel, documentation, calibration of equipment, sample holding times and sample qualifiers, and laboratory QC documentation.

The Technical Assessment process involves the review of analytical data via a Data Quality Audit. Data Quality Audits will be performed to evaluate the documentation of the quality of data generated for the AWS Program. The Data Quality Audit primarily will evaluate the completeness of field documentation,

analytical procedures, and quality control results. This audit process essentially involves tracing the paper trail that accompanies data from the time of sample collection to the time that the data is used to make decisions.

The AWS Program does not routinely generate a large volume of analytical data. Given the relatively small amount of analytical data generated by this program, the first Data Quality Audit for the AWS program will occur approximately two years after the implementation of Revision 2 to the AWS Quality Assurance Project Plan. The Storage Tank Program Quality Assurance Manager is responsible for overseeing the Data Quality Audit. The CFU Program Manager, the Remediation Programs Manager, and the OSRR Program Assessment Specialist will assist the Storage Tank Program Quality Assurance Manager with Data Quality Audits. The Storage Tank Program Quality Assurance Manager, the CFU Program Manager, and the Remediation Programs Manager may revise this schedule as necessary to account for changes in the program.

After the Technical Assessment of Data Quality is physically performed, the Storage Tank Program Quality Assurance Manager will draft the Technical Assessment, Data Quality Audit report for the specific components of the program that were evaluated, provide recommendations to address and correct any deficiencies or non-conformances noted, and present this to the Remediation Programs Manager, the CFU Program Manager, the OSRR Program Assessment Specialist, the Land Protection QA Workgroup, the OSRR Director, and the Regional Storage Tank Program Managers. Persons on the review team will evaluate the Technical Assessment, Data Quality Audit report and the recommendations made and provide their comments. The Quality Assurance Manager then will incorporate the comments into the Technical Assessment, Data Quality Audit report and the document will be approved by the OSRR Director.

## 4.4 Corrective Action Procedure

The Quality Management Plan for the Storage Tank Program will be reviewed annually, following the Technical Assessment of Management Systems, to determine if changes to AWS Quality Assurance Project Plan are needed. The Storage Tank Program Quality Assurance Manager is responsible for drafting any changes needed related to the AWS management system and procedures and forwarding this draft on to the OSRR Director, the CFU Program Manager, the Remediation Programs Manager, the OSRR Program Assessment Specialist, the Regional Storage Tank Program Managers, and the Land Protection QA Workgroup for review. The Storage Tank Program Quality Assurance Manager then will incorporate comments into the document.

The Technical Assessment of Data Quality will be performed approximately every two years. Following the completion of this assessment, data quality related policies and procedures of the AWS Quality Assurance Project Plan will be reviewed by the Storage Tank Program Quality Assurance Manager, the CFU Program Manager, the Remediation Programs Manager, and the OSRR Program Assessment Specialist. The AWS Quality Assurance Manager will modify the Quality Assurance Project Plan as needed to address issues identified during the Data Quality Technical Assessment and will forward this draft to the OSRR Director, the CFU Program Manager, the Remediation Programs Manager, the OSRR

Program Assessment Specialist, the Regional Storage Tank Program Managers, and the Land Protection QA Workgroup for review.

Minor changes to a Quality Assurance Project Plan will be issued as an amendment to the current Quality Assurance Project Plan and provided to EPA through an annual QA report. If major changes to the AWS Quality Assurance Project Plan are needed, a draft of an updated AWS Quality Assurance Project Plan will be submitted to EPA Region III for review. Major revisions to the AWS Quality Assurance Project Plan will become DEQ guidance only after the following persons have signed or otherwise indicated approval for the AWS Quality Assurance Project Plan:

1. EPA Region III Subtitle I Program Manager for Virginia
2. DEQ CFU Program Manager
3. DEQ OSRR Director
4. DEQ OSRR State Lead Program Manager/Quality Assurance Manager
5. DEQ Director, Division of Land Protection and Revitalization
6. CFU contractor

After all signatures have been obtained, the document is issued as DEQ Guidance.

# References

EPA. 1994. Region III Modifications to National Functional Guidelines for Organic Data Review. Multi-media, Multi-Concentration (OLMO1.0 - OLMO1.9).

EPA. 1995. Innovative Approaches for Validation of Organic and Inorganic Data – Standard Operating Procedures. Region III Analytical Services and Quality Assurance Branch.

EPA. 1996. Test methods for Evaluating Solid Waste, Physical/Chemical Methods (SW846).

# Appendix A

## DEQ Chain-of-Custody Forms, DCLS Lab Sheet, and Lab Tag

2804

**Shipping Seal Number** _____

**VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY**
**629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240**

# CHAIN OF CUSTODY RECORD

SAMPLERS: *(Signatures)* _____
Region or Unit _____
Address: _____

Phone No.: _____ Fax No.: _____
E-Mail: _____
If this is an Emergency (Priority1) sample, please print 24-hour contact name and number. _____

Identifying No.(s) *Case No.or* _____ *PC No. or* _____ *VPDES No. or other* _____

Lat. & Long. *(if known)* _____

| STATION ID | DATE | TIME | BASIC STATION DESCRIPTION or CONTAINER TYPE | COMP. | GRAB | TESTS TO BE RUN IN LAB | | | | | | | | | | | Observations & Field Tests *(optional for water & air media)* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |
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| Relinquished by: *(Signature)* | Date/ Time | Received by: *(Signature)* | Relinquished by: *(Signature)* | Date/ Time | Received by: *(Signature)* |
|---|---|---|---|---|---|
| Relinquished by: *(Signature)* | Date/ Time | Received by: *(Signature)* | Relinquished by: *(Signature)* | Date/ Time | Received by: *(Signature)* |
| Relinquished by: *(Signature)* | Date/ Time | Received in Laboratory by: *(Signature)* | Date/ Time | Shipping seal received n place? ____ Seal No._____ Lab Remarks: | |

Original to Accompany Shipment; copy attached to shipping label located outside of cooler; copy to Sampler

**Shipping Seal Number:** This is the number of the wire seal provided by DCLS that will be used to seal the individual coolers. All coolers not delivered by the sampler must have a shipping seal in place with the shipping seal number recorded on the COCR. The seal number is unique and entering it on the COCR makes that record unique.

**Form Number:** The multi-part forms have a unique form number at the top right corner. This number will be used to identify the form from all others when no shipping seal number is used.

**Samplers:** The person who collects the samples or is present when the samples are collected, labeled, and takes initial custody of the samples, prints their name *and* signs the COCR in this space.

**Case, PC, VPDES, or Other Number:** Record the reference number for the sampling event. The number is program specific. Program protocols should be followed when entering this number. When using CEDS, this reference number is referred to as the RUN ID.

**Lat. Long. (Optional):** The latitude and longitude may be entered at the top of the page if known. If more than one site is sampled during the sampling event, a lat/long must be entered for each station and the lat/long space at the top of the page should be left empty.

**Region or Unit & Address:** Enter the name of the region or central office unit responsible for collecting the samples and the address of the region or unit. This address may be used when returning certificates of analysis.

**Phone, Fax Numbers & E-mail Address:** Enter this contact information for the sampler. This information will be used to contact the sampler if questions arise concerning the samples or analysis.

**24-Hour Contact Information:** Enter the sample priority in this area. If the samples have a high priority (1), enter any and all information that can be used 24-hours a day to confer about sample analysis and results, e.g., home, work, cell phone numbers, and e-mail address.

**Station ID:** A brief description of the station at which the samples listed on this line were collected. Limit the description to information necessary for you to uniquely identify the station from all others collected. *This information must match the information on the sample tags and in the field log.*

**Date/Time:** Enter the date and time when the samples were collected. The date format is MMDDYYYY and the time format is military.

**Basic Station Description or Container Type:** Use this space for additional station description information if necessary. For situations where pre-cleaned containers are used, the container description information may be entered here. This information is optional.

**Comp/Grab:** Use this space to identify samples other than routine grab samples. In the case of composite samples, the number of samples or time frame of the composite should be entered. If a horizontal or vertically integrated sample is collected, the information may be entered in the station description or under “Observations & Field Tests”. This information is optional.

**Tests To Be Run In The Lab:** Enter the group code from the DCLS catalog of services which contains the analysis desired.

**Observations & Field Tests:** Enter field observations or field tests. The same information should be entered in the field log and This information is optional.

**Relinquished By Date/Time, Received By:** Use this space to record transfers of the sample custody. The person with custody of the samples must relinquish the sample custody in the presence of the person receiving the custody of the samples unless the samples have been delivered by courier. The custodian signs the COCR in the “Relinquished By” section and enters the date and time. The new custodian must sign the COCR in the “Received By” section in the company of the original custodian. Subsequent changes in custody follow the same procedures.

**Shipping Seal Received:** In this space DCLS will record the number of the seal broken to gain access to the contents of the cooler. They will note if the seal is intact and may include additional remarks such as the condition of the samples, ice present, etc.

Shipping Seal No.
THUTEST

629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240

## CHAIN OF CUSTODY RECORD

SAMPLERS: *(Signatures)* ALT
Agency: Central Office
Address: 629 E. MAIN STREET
RICHMOND VA 23219
Phone No:
Fax No: 8046984561
E-mail:

Shipped Date: 11/13/2000

RUN ID IR2001N0202

If this is an Emergency (Priority1) sample, please print 24-hour contact name and number

FIRST LAST M 8041234567

| TESTS TO BE RUN IN LAB | | Group Code | FCMP | INUT1 | INUT2 | NME1 | | | | | | | | | | | | | | | | | Observations Field Tests, Remarks Ma |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STATION ID | Coll Date Time | | Typ | Typ | Typ | Typ | | | | | | | | | | | | | | | | | |
| IR2001N0202B | 09/20/2000 09:25 | | R | R | R | R | | | | | | | | | | | | | | | | | |
| IR2001N0202D | 09/20/2000 09:50 | | R | R | R | R | | | | | | | | | | | | | | | | | |
| IR2001N0202E | 09/20/2000 08:35 | | R | R | R | R | | | | | | | | | | | | | | | | | |
| IR2001N0202F | 09/20/2000 08:55 | | R | R | R | R | | | | | | | | | | | | | | | | | |
| IR2001N0202G | 09/20/2000 11:30 | | R | R | R | R | | | | | | | | | | | | | | | | | |
| IR2001N0202H | 09/20/2000 12:00 | | R | R | R | R | | | | | | | | | | | | | | | | | |

| Relinquished by: (Signature) | Date/ Time | Received by: (*Signature*) | Relinquished by: (*Signature*) | Date/ Time | Received by: (*Signature*) |
|---|---|---|---|---|---|
| Relinquished by: (Signature) | Date/ Time | Received by: (*Signature*) | Relinquished by: (*Signature*) | Date/ Time | Received by: (*Signature*) |
| Relinquished by: (Signature) | Date/ Time | Received in Laboratory by: (*Signature*) | Date/ Time | Shipping seal received intact ? No. of _____ | Lab Remarks: |

**Shipping Seal Number:** This is the number of the wire seal provided by DCLS that will be used to seal the individual coolers. All coolers not delivered by the sampler must have a shipping seal in place with the shipping seal number recorded on the COCR. The seal number is unique and entering it on the COCR makes that record unique.

**Form Number:** The multi-part forms have a unique form number at the top right corner. This number will be used to identify the form from all others when no shipping seal number is used.

**Samplers:** The person who collects the samples or is present when the samples are collected, labeled, and takes initial custody of the samples, prints their name *and* signs the COCR in this space.

**Case, PC, VPDES, or Other Number:** Record the reference number for the sampling event. The number is program specific. Program protocols should be followed when entering this number. When using CEDS, this reference number is referred to as the RUN ID.

**Lat. Long. (Optional):** The latitude and longitude may be entered at the top of the page if known. If more than one site is sampled during the sampling event, a lat/long must be entered for each station and the lat/long space at the top of the page should be left empty.

**Region or Unit & Address:** Enter the name of the region or central office unit responsible for collecting the samples and the address of the region or unit. This address may be used when returning certificates of analysis.

**Phone, Fax Numbers & E-mail Address:** Enter this contact information for the sampler. This information will be used to contact the sampler if questions arise concerning the samples or analysis.

**24-Hour Contact Information:** Enter the sample priority in this area. If the samples have a high priority (1), enter any and all information that can be used 24-hours a day to confer about sample analysis and results, e.g., home, work, cell phone numbers, and e-mail address.

**Station ID:** A brief description of the station at which the samples listed on this line were collected. Limit the description to information necessary for you to uniquely identify the station from all others collected. *This information must match the information on the sample tags and in the field log.*

**Date/Time:** Enter the date and time when the samples were collected. The date format is MMDDYYYY and the time format is military.

**Basic Station Description or Container Type:** Use this space for additional station description information if necessary. For situations where pre-cleaned containers are used, the container description information may be entered here. This information is optional.

**Comp/Grab:** Use this space to identify samples other than routine grab samples. In the case of composite samples, the number of samples or time frame of the composite should be entered. If a horizontal or vertically integrated sample is collected, the information may be entered in the station description or under “Observations & Field Tests”. This information is optional.

**Tests To Be Run In The Lab:** Enter the group code from the DCLS catalog of services which contains the analysis desired.

**Observations & Field Tests:** Enter field observations or field tests. The same information should be entered in the field log and This information is optional.

**Relinquished By Date/Time, Received By:** Use this space to record transfers of the sample custody. The person with custody of the samples must relinquish the sample custody in the presence of the person receiving the custody of the samples unless the samples have been delivered by courier. The custodian signs the COCR in the "Relinquished By" section and enters the date and time. The new custodian must sign the COCR in the "Received By" section in the company of the original custodian. Subsequent changes in custody follow the same procedures.

**Shipping Seal Received:** In this space DCLS will record the number of the seal broken to gain access to the contents of the cooler. They will note if the seal is intact and may include additional remarks such as the condition of the samples, ice present, etc

*Virginia Department*

*of Environmental Quality*

DCLS LAB USE ONLY

STATION ID

DATE COLLECTED (M M D D Y Y Y Y)

TIME COLLECTED

SAMPLE DEPTH

PROG. CODE

GROUP CODE

PRIOR CODE

CONTAINER #

BLANKS/DUPS

LAB PROC

UNIT CODE

COLLECTOR

SPECIAL STUDY NUMBER (00116)

%FRB (00002)

WEATHER (00041)

TIDE (00067)

TEMP.° C (00010)

FIELD pH (00400)

D.O. PROBE (mg/l) (00299)

COND. (µ MHOS/CM) (00094)

FLOW RATE (00061)

SALINITY (ppt) (00096)

RESIDUAL CHLORINE (50060)

SECCHI DEPTH (m) (00078)

AIR TEMP. (C°) (00020)

BAROMETER PRESSURE (00025)

LATITUDE NORTH

DEG. MIN. SEC.

LONGITUDE WEST

DEG. MIN. SEC.

COUNTY

OTHER STATION DESCRIPTION

COMMENTS

# Instructions for Completing the DCLS Lab Sheet

Staff must complete the following sections of the Lab Sheet:

*Prog. Code*
This two block section refers to the program code to which the cost of sample analysis will be billed.

*Station ID*
Station IDs will be: PCYYYYX9999Z

Where: YYYY is the four digit year
X is the regional identifier (e.g. S = SWRO)
9999 is the numeric incident code that matches the run ID#
Z is an alpha/numeric code regionally derived for station designation

NOTE: The Station ID is derived from the Run ID which is a CEDS identifier for the site

*Date Collected*
Contains the date on which the sample was collected (year, month, day).

*Time Collected*
Fill in the time of sample collection in military time.

*Catalog Number*
These six blocks, divided in half by a hyphen, are used in conjunction with the group code to indicate the type of analysis being requested. The first three digits are pre-printed with the DEQ agency code (190). the following three digits are used to indicate the analysis being requested. These catalog numbers are found in the "DCLS catalog of Services." Please note that the catalog numbers vary for the same services based on the associated group code.

*Group Code*
These six blocks are used in conjunction with the catalog number to indicate the type of analysis being requested. the first digit is preprinted with the letter "P" indicating the sample is being received with a lab sheet. The following five digits are used to indicate the analysis being requested. The group codes for analyses to be used for drinking water samples are:

BTEX
SWBW
SVW
VOCW

*Priority code*
This block on the lab sheet is used to indicate the sample priority. A blank in this area indicates a sample with no priority or a standard turnaround time. A "5" in this block indicates a priority sample. A "4" in this block indicates a high priority sample. All AWS samples should be submitted as high priority samples.

*Container #*
This set of blocks is used to indicate the number of the container associated with the lab sheet. The numbering scheme is up to the sample collector but a number should not be used more than once during a single sampling event. A "B" may be used in the first block to indicate a blank sample or a "D" may be used to indicate a duplicate sample. The number on the Sample Tag and the number in this block must match.

*Unit Code*
These blocks are used to indicate the unit or regional office which collected the sample and the unit or regional office which should receive copies of the results. The first three blocks indicate the unit number of the collector. Unit numbers are as follows:

SWRO - 001
BRRO - 002
NRO - 003
PRO - 004
TRO - 005
VRO - 007

*Collector*
Indicate the person who collected the samples. Use up to three initials to identify the collector.

*Latitude and Longitude*
Fill in the latitude and longitude of the sample collection location if known.

*Other*
The person collecting the sample may place additional information about the sample identification in this location (e.g. Jones well). Please note that this information is for the collector's use and cannot be used to locate a sample within DCLS.

*County*
Fill in the county or city from which the sample was collected

*Comments*
The person collecting the sample should fill in any comments or observations that they had when collecting the sample (e.g. water smelled like sewage).

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Name:

Date: Time: Disposition

Name:

Date: Time: Disposition

Name:

Date: Time: Disposition

| STATION ID | DATE COLLECTED | PRIOR |
|---|---|---|
| 2-MSC004.43 | 01/24/2006 | 6 |

| TIME COLLECTED | DEPTH | UNIT CODE | COLLECTOR |
|---|---|---|---|
| 1320 | .3 | 607 | CHM |

| LAB PROC | GROUP CODE | CONTAINER# | BLANKS/DUPS |
|---|---|---|---|
| | EC 4 | 1 | R |

PRESERVATIVES

125 ml Sterile plastic bottle with 100ml line, containing Sodium Thiosulfate; Preserve at 4? C

STATION ID

DATE COLLECTED (Y Y M M D D)

TIME COLLECTED

M/F

SURVEY DEPTH

UNIT CODE

COLLECTOR

CATALOG NUMBER 1 9 0 —

GROUP CODE

PRIORITY CODE

CONTAINER #

OTHER

PRESERVED

9/94

# Instructions for Completing the DCLS Lab Tag

Use a #2 lead pencil or indelible ink to fill out the lab tag. The information on the back of the lab tag must exactly match the information found on the lab sheet.

*Station ID*
Fill in the PC#

*Date collected*
Fill in the year, month, and day that the sample was collected

*Time collected*
Fill in the time that the sample was collected (military time)

*Preserved?*
If a preservative was added to the sample container, place a "Y" in this box.

*Sample # (___/___)*
The sample number refers to the number of containers in the shipment that are associated with a single lab sheet. DCLS analytical procedures require DEQ to provide duplicates of each sample to be analyzed. Fill in 2 on the sample tag for the first sample container and 2/2 on the sample tag for the duplicate sample.

# APPENDIX B

# EXAMPLE SITE VISIT REPORT

# SAMPLE REPORT

**http://www.samplesite.com**

**P.O. Box # #**
**Somewhere, VA #####**
**804-123-4567**
**800-123-4567**

Commonwealth of Virginia
Department of Environmental Quality
P.O. Box 10009
Richmond, Virginia 23240-0009
Attention: Harmon Fisher

SUBJECT: Billing for services rendered for contract # 0000000000

PC #00-0000

DATE OF VISIT: 00/00/00 TYPE OF SERVICE:

EQUIPMENT:

SUMMARY OF SERVICE PERFORMED:
*If new equipment is installed or equipment is exchanged, please provide model numbers and serial numbers of the new equipment.*

METER READING:

ON-SITE WATER TEST RESULTS (pH, hardness, iron):

Detailed summary of activities performed on-site as described by Field Technician.

Summary as to condition of equipment at the site:

Statement as to continued satisfactory performance of system:

Recommendations for changes in the PM frequency and/or system modifications:

Statement certifying the proper disposal of waste:

List of attachments:

# Appendix C

# Analytical Method Requirements for Samples Collected from a Water Supply System

| Analytical Method Requirements – Water Samples Collected from a Potable Water Supply Well or system | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Sample Preparation /Extraction Method | Analytical Method | Required Reporting Level[4] | Sample container | Preservation | Holding time |
| VOCs[2] | 5030B[3] | 8260B[3] | > detection limit | Glass with PTFE lined septum | cool to ≤6°C<br>.008% $Na_2S_2O_3$[1] | 14 days |
| | NA | EPA 524.2 | > detection limit | 40 – 120 ml glass vial w. PTFE-faced silicon septum (collect samples in duplicate) | 25 mg ascorbic acid or 3 mg sodium thiosulfate per 40 ml sample volume[1], Adjust pH to < 2 (4 drops 1:1 HCL per 40 ml sample volume), cool to ≤4°C | 14 days |
| SVOCs | 3510C[3] or 3520C[3] | 8270C[3] | > detection limit | Glass with PTFE lined cap | cool to ≤6°C, store in dark,<br>.008% $Na_2S_2O_3$[1] | 7 days until extraction, 40 days after extraction |
| | NA | EPA 525 | > detection limit | 1-liter or 1-qt. Amber glass bottle w. PTFE lined cap | 40-50 mg sodium sulfite[1], adjust pH to < 2 w HCL, cool to ≤4°C | 14 days until extraction, 30 days after extraction |
| BTEX & MTBE | 5030B[3] | 8021B[3] | > detection limit | Glass with PTFE lined septum | cool to ≤6°C,<br>.008% $Na_2S_2O_3$[1] | 14 days |

[1] add to remove free chlorine if chlorine is expected
[2] Analyses must report concentration of MTBE, DIPE, TAME, and TBA. Also, analysis should be run for sufficient time to allow naphthalene to elute from the GC.
[3] Method from SW 846
[4] If the sample(s) were collected by a Responsible Person or that person's consultant, they must immediately report results indicating impact to a water supply to the Regional Case Manager. If the State Lead Contractor collected the sample(s), the State Lead Contractor must immediately notify the Regional Case Manager upon receipt of any analytical results indicating impact to a water supply. The CFU contractor must immediately notify the CFU Program Manager of impacts to a water supply.

# Appendix D

# Alternate Water Supply Program - Quality Assurance Project Plan Distribution List

# Alternate Water Supply Program - Quality Assurance Project Plan Distribution List

Karen Crumlish, EPA Region III, Subtitle I Program Manager for Virginia

James Barnett, Virginia DEQ State Lead Program Manager

Harmon Fisher, Virginia DEQ, CFU Program Manager

Karen Haley-Wingate, Virginia DEQ, Program Assessment Specialist

Elizabeth Lamp, Virginia DEQ, Director, Office of Spill Response and Remediation

John Giese, Virginia DEQ, Remediation Programs Manager

Dan Manweiler, Storage Tank Program Manager, Southwest Regional Office

David Miles, Storage Tank Program Manager, Blue Ridge Regional Office

David Forrer, Storage Tank Program Manager, Valley Regional Office

Robyne Bridgman, Storage Tank Program Manager, Piedmont Regional Office

Cynthia Sale, Storage Tank Program Manager, Northern Regional Office

Maria Nold, Regional Director, Tidewater Regional Office

Rusty Stoner, Stoner Quality Water, Inc., T/A Culligan of Friedens, PA