

**APPENDIX K**  
**SAMPLING AND ANALYSIS PROCEDURES**  
**FOR THE**  
**WYOMING OIL AND GAS CONSERVATION COMMISSION**  
**GROUNDWATER BASELINE SAMPLING, ANALYSIS, AND MONITORING PROGRAM**

**1.0 PURPOSE AND SCOPE**

This sampling and analysis procedure (SAP) provides the minimum requirements and protocols that shall be followed by oil and gas operators or their contractors per Chapter 3, Section 46 of the Wyoming Oil and Gas Conservation Commission (WOGCC) Rules and Regulations for the groundwater baseline sampling, analysis and monitoring program. Operators shall implement this SAP in lieu of developing a project specific SAP unless otherwise approved by the Supervisor.

The purpose of the SAP is to document field sampling procedures and laboratory methods that will be used to ensure that consistent and representative data is collected, and that a uniform method of data reporting to the agencies is established.

**2.0 SAMPLING PROCEDURES**

The purpose of this section is to describe the procedures to be used when selecting sampling locations, groundwater monitoring parameters and procedures, sample handling, and field documentation requirements.

**2.1 SAMPLING LOCATION SELECTION**

Groundwater sampling locations shall be selected as part of the groundwater baseline sampling, analysis and monitoring plan to be submitted with the Application for Permit to Drill (APD) (Chapter 3, Section 46(a)). Sampling locations shall be selected in accordance with Chapter 3, Section 46, and are dependent upon the Supervisor's approval of the plan.

Information sources that may be useful for identification of available water sources that could be selected as sampling locations include:

- 1) The Wyoming State Engineer's Office (SEO) maintains records of permitted water wells and diversions. The water well records may be accessed via the SEO website at: <https://sites.google.com/a/wyo.gov/seo/>
- 2) The United States Geological Survey (USGS) has data and reports available online about water and groundwater resources within the state of Wyoming on the water resources of Wyoming website at: <http://wy.water.usgs.gov/>
- 3) Additional groundwater information may be available through the USGS National Hydrography Dataset for Wyoming, which can be downloaded at: <http://nhd.usgs.gov/>
- 4) The Wyoming State Geological Survey (WSGS) may also be a useful source for information regarding geology and hydrogeology of the basins. The WSGS data may be accessed at: <http://www.wsgs.uwyo.edu/Data/GIS/Default.aspx>

## **2.2 GROUNDWATER MONITORING PARAMETERS**

The following parameters in Table 1 have been identified as the minimum required constituent list for the purpose of the baseline sampling program. The operator may desire to analyze for additional constituents, but is not required. All groundwater samples shall be collected and analyzed according to the summary of analytical methods, holding times, sample containers, preservatives, and reporting limits included on Table 1, or by EPA approved equivalent methods, subject to approval by the Supervisor. Samples shall be collected for the compositional analysis of dissolved gases, with the instruction for the lab to run the compositional analysis only if the dissolved methane concentrations exceeds 5 mg/L.

**TABLE 1. MINIMUM REQUIRED BASELINE SAMPLING**

<i>ANALYTE</i>	<i>CAS #</i>	<i>FIELD METHOD</i>	<i>ANALYTICAL METHOD</i>	<i>SAMPLE CONTAINERS</i>	<i>PRESERVATIVES</i>	<i>REPORTING LIMIT</i>	<i>HOLDING TIME</i>
<b>INORGANIC COMPOUNDS</b>							
Alkalinity (total bicarbonate, and carbonate as CaCO <sub>3</sub> )	471-34-1	Unfiltered	SM 2320b	2x 250-mL poly	Cool to 4° C	10 mg/L	14 days
Bromide	24959-67-9		EPA 300.0 or 9056			0.1 mg/L	28 days
Chloride	16887-00-6		EPA 300.0 or 9056			0.2 mg/L	28 days
Fluoride	16984-48-8		EPA 300.0 or 9056 or SM 4500 F-C			0.2 mg/L	28 days
Sulfate	14808-79-8		EPA 300.0 or 9056			1.0 mg/L	28 days
Total Dissolved Solids	--		SM 2540 C			10 mg/L	7 days
Phosphorus, Total	7723-14-0		EPA 365.4	1x 250-mL poly	H <sub>2</sub> SO <sub>4</sub> to pH<2 Cool to 4° C	0.1 mg/L	28 days
Nitrate and Nitrate as N	14797-55-8		EPA 353.2	1x 100-mL poly			
IRB	--		BART	Lab supplied			
SRB/SFB	--		BART		2-8 days		
Barium	7440-39-3	0.45 µm filter in field	EPA 200.7/200.8 or SW 846 6010 or SW 846 6020	1x 250-mL poly	HNO <sub>3</sub> to pH <2 Cool to 4° C	0.05 mg/L	180 days
Boron	7440-42-8					0.005 mg/L	
Calcium	7440-70-2					1.0 mg/L	
Iron	7439-89-6					0.03 mg/L	
Magnesium	7439-95-4					1.0 mg/L	
Manganese	7439-96-5					0.001 mg/L	
Potassium	7440-09-7					1.0 mg/L	
Selenium	7782-49-2					0.001 mg/L	
Sodium	7440-23-5					1.0 mg/L	
Strontium	7440-24-6					0.01 mg/L	

<i>ANALYTE</i>	<i>CAS #</i>	<i>FIELD METHOD</i>	<i>ANALYTICAL METHOD</i>	<i>SAMPLE CONTAINERS</i>	<i>PRESERVATIVES</i>	<i>REPORTING LIMIT</i>	<i>HOLDING TIME</i>
<b>HYDROCARBONS</b>							
Benzene	71-43-2	Unfiltered	SW 846 8260B	3x 40-mL VOA vials (no headspace)	HCL to pH<2 Cool to 4° C	0.001 mg/L	14 days
Ethylbenzene	100-41-4					0.001 mg/L	
Toluene	108-88-3					0.001 mg/L	
Xylenes, Total	--					0.003 mg/L	
Naphthalene	91-20-3					0.001 mg/L	
TPH-DRO	--	Unfiltered	EPA 8015D with silica gel cleanup	2x 1000-mL glass	Sulfuric Acid Cool to 4° C	0.5 mg/L	7 days
TPH-GRO	--		EPA 5035/8015D	3x 40-mL VOA vials (no headspace)	HCL to pH <2 Cool to 4° C	0.02 mg/L	14 days
<b>GASES</b>							
Dissolved Methane	74-82-8	Unfiltered	RSK175	3x 40-mL VOA vials (no headspace)	Cool to 4° C	0.026 mg/L	14 days
Dissolved Ethane	4-84-0						
Dissolved Propane	74-98-6						
<b>GAS COMPOSITIONAL ANALYSIS</b>							
Fixed Gases C1-C6		Dissolved Gases	RSK175	Specialized (lab supplied)	Benzoalkonium	0.026 mg/L	14 days
Stable isotropic concentration of the carbon ( <sup>12</sup> C and <sup>13</sup> C) and hydrogen ( <sup>1</sup> H and <sup>2</sup> H) in the methane			Laboratory Specific SOP			Variable	28 days

Notes: IRB – Iron Reducing Bacteria  
SRB/SFB – Sulfate Reducing Bacteria/Slime Forming Bacteria  
TPH-DRO – Total Petroleum Hydrocarbons Diesel Range Organics  
TPH-GRO – Total Petroleum Hydrocarbons Gasoline Range Organics  
VOA – Volatile Organic Analysis

All groundwater samples must be collected and analyzed according to the summary of analytical methods, holding times, sample containers, preservatives, and reporting limits included on Table 1, or equivalent, upon approval by the Supervisor.

## 2.3 SAMPLING PROCEDURES

The following procedures shall be used to collect groundwater samples from selected water sources. These procedures were developed from the Wyoming Department of Environmental Quality (WDEQ) Water Quality Division (WQD) Quality Assurance Project Plan (QAPP), and standard industry practices. Samples shall be collected by properly trained field personnel under the supervision of a state-licensed Professional Engineer or Professional Geologist or other qualified professionals upon approval by the Supervisor based on training and knowledge of standard industry practices.

The operator or their representative shall request the laboratory provide notification to them if the preliminary analytical results indicate one of the following conditions:

- i. The presence of thermogenic or mixture of thermogenic and biogenic gas;
- ii. The methane concentration is detected at or above 5 mg/L; or
- iii. BTEX compounds or TPH is detected at or above Department of Environmental Quality action levels in the water sample.

**TABLE 2 ACTION LEVELS**

<b>ANALYTE</b>	<b>ACTION LEVEL</b>
Benzene	0.005 mg/L
Ethylbenzene	0.7 mg/L
Toluene	1 mg/L
Xylenes, Total	10 mg/L
TPH-DRO	1.1 or 10 mg/L
TPH-GRO	7.3 mg/L

Note: Action levels were derived from the EPA Maximum Contaminant Levels (MCLs) or Chapter 17 of the Wyoming Water Quality Rules and Regulations.

### 2.3.1 WELL PURGING

Samples shall be collected directly from the well if the well is accessible and the sample can be collected without disturbing or removing any down-hole pump and/or wiring. If the well is not accessible for sampling (i.e. sealed), and is equipped with a dedicated pump, the sample shall be collected using the installed pump from a location prior to holding tanks, pressure tanks, or any water treatment system (softeners, reverse osmosis, etc.), if available. If

unavailable, a sample shall be collected from the closest sampling location to the well. Sealed water wells should not be opened. Samples are not required to be collected from non-accessible wells without a dedicated pump, or from non-operational wells as described in Chapter 3, Section 46(d).

A groundwater sample is considered representative of the aquifer being monitored when the well has been purged to remove stagnant water prior to collection of a sample for laboratory analysis. Purging can be considered complete when a sufficient volume of water has been removed from the well and/or stabilization of select groundwater parameters has been achieved. It is important to record the circumstances surrounding each sample collection event. These records can help resolve analytical discrepancies. One of the following purging methods below shall be used prior to sample collection:

**a. Purge by Volume Method**

For wells where the completion depth and the depth to water are known, or can be reasonably measured, removal of a *minimum* of three casing volumes of water from the well shall be completed prior to collecting a groundwater sample. In addition, groundwater stabilization parameters (temperature, pH, oxidation-reduction potential, specific conductance, dissolved oxygen, and turbidity) shall be collected after removal of every half casing volume of water. Minimum purge volume can be calculated by the following equation:

Minimum Purge Volume

$$= 3 * (\text{Total Well Depth in feet} - \text{Depth to Water in feet}) * \text{Well Capacity}$$

Where Well Capacity (gallons per foot) is based on well diameter:

2 inch well = 0.163	6 inch well = 1.47
4 inch well = 0.653	8 inch well = 2.61

**b. Stabilization of Parameters Method**

For wells where the completion depth and/or the depth to water are unknown, purging of groundwater until select field parameters have stabilized can be used to demonstrate that a representative sample was collected. Field parameters measured during purging shall include at a minimum temperature, pH, oxidation-reduction potential, specific conductance, dissolved oxygen, and turbidity. Field parameters should be measured every 5 minutes. Collection of parameters is most easily

conducted by utilizing a flow through cell equipped with the applicable sensors.

A minimum of six (6) parameter measurements shall be collected. If field parameters have not stabilized between the last three readings, purging and parameter measurement shall continue until stabilization has been achieved. Stabilization can be demonstrated by a variance of no more than +/- 10% for temperature, turbidity (if >10 NTU), dissolved oxygen (if > 0.5 mg/L), and specific conductance; +/- 10 mV for oxidation-reduction potential; and +/-0.2 standard units for pH.

To measure the purge rate of the well, a 5-gallon bucket and a timer capable of measuring time to seconds should be used. Flow rate is estimated by the recording the time it takes to fill a 5-gallon bucket, and converting to a gallons per minute (gpm) reading.

**TABLE 3 FIELD PARAMETERS**

<b>PARAMETER</b>	<b>MEASUREMENT SENSITIVITY</b>
Temperature	0.1 degrees Celsius or Fahrenheit
Turbidity	0.1 NTU
Dissolved Oxygen	0.01 mg/L
Specific Conductance	1 $\mu$ S/cm or 0.01 mS/cm
pH	0.1 s.u.
Oxidation-reduction Potential	1 mV

**c. Sampling Low-Yield Wells**

In low-yield wells when low-flow sampling methods are used, the well may be pumped at a flow rate comparable to the recharge rate (ideally < 0.30 ft of stabilized drawdown) and then sampled after at least one casing volume has been removed and field parameters have stabilized. However, in very low-yield wells that are unable to sustain even low-flow sampling rates (i.e. excessive drawdown), a single casing volume shall be removed, and field parameters are not required to stabilize before sampling. Turbidity values of 20 NTU or less may not be achievable in low-yield wells, and samples shall be collected as soon as an adequate volume of water has recovered to allow collection of samples.

**d. Sampling from Springs**

Sampling from a spring shall be conducted at the location closest to the point of emergence from the ground. For sampling of volatile organic constituents (VOCs, i.e. benzene, toluene, ethylbenzene, xylenes

(BTEX), dissolved gasses) groundwater is drawn into a syringe from a depth of approximately 2-inches below the surface of any pool associated with the seep, and then injected into the appropriate sample container for laboratory analysis. For larger volume samples, a stainless steel container may be used to collect the water sample from a depth of approximately 2-inches below the surface of any pool associated with the spring, taking care to not entrain foreign materials into the sample container (debris, insects), then transferring the collected sample into the appropriate sample container for laboratory analysis.

### **2.3.2 SAMPLE COLLECTION**

Groundwater samples shall be collected immediately after purging the well. Once purging is complete, the flow rate should be reduced in order to minimize the potential for loss of VOCs. Reducing the flow rate by adjusting a valve should be avoided. Closing of a valve does not decrease the flow rate of the pump, and may induce turbulence into the water column. If a pump is equipped with a variable flow controller, the flow rate should be reduced, and the new flow rate calculated. In addition, if the sampling point is equipped with an aerator, the aerator shall be removed, with the consent of the landowner, prior to sampling.

Groundwater sampling shall be conducted by personnel with the proper training and experience. The sampler should wear a new pair of disposable, powder-free 'exam-type' gloves in order to reduce cross contamination of the samples prior to sampling. In addition, gloves should be changed between sampling locations.

Samples shall be collected according to Table 1 in Section 2.2.

Unfiltered samples shall be collected directly from the sampling point into clean, laboratory-provided, and preserved (if required) sampling containers. Care should be taken when collecting the sample to minimize agitation when filling the sampling containers, and not to overfill sample containers containing preservatives. Samples collected for volatile constituents such as BTEX and TPH-GRO, shall be collected into VOA vials with no headspace. If air bubbles are observed after placing on the cap, a new sample shall be collected into a fresh bottle.

The goal of sampling groundwater is to obtain a sample that is representative of existing conditions. This becomes especially difficult when trying to obtain a representative sample for inorganic constituents, such as metals. In order to obtain a sample representative of existing groundwater, filtered samples shall be collected for metals analysis. Filtered samples will be

collected using a disposable in-line 0.45 micron filter. The in-line filter should be connected to disposable tubing that is then connected to the discharge point. Water from the filter shall be collected directly into the appropriate sampling containers. Care shall be taken when collecting the sample to minimize agitation when filling the sampling containers, and not to overfill sample containers containing preservatives. A new in-line filter and tubing shall be used between sampling locations.

To collect a sample for dissolved gases, fill a clean container of sufficient size (5-gallon bucket) with water from the sampling location. Connect a section of disposable tubing to the discharge point, and using a step-down valve, connect a short length of ¼-inch diameter disposable tubing to the valve. Adjust flow through the tubing so that it is low. Submerge the closed sample container to the bottom of the 5-gallon bucket. While under water, open the sample container and place the sampling line into the bottom of the sampling container. Monitor the time to allow enough water volume to flow through the sampling container to flush the sampling container for at least twice its volume. Slowly remove the sample line while maintaining the sample bottle beneath the surface of the water. Place the cap on the sample container while submerged in order to maintain the pressure head of the water. If collecting the sample for the compositional analysis quickly insert the benzalkonium tablet into the container prior to placing the cap. Remove the sample container from the bucket of water and check to make sure there are no air bubbles in the sample. If air bubbles are visible, collect another sample. If the water is effervescent, a gas headspace bubble in the VOA vial is acceptable, but the laboratory must be notified to analyze the gas headspace. Dissolved gas samples shall be stored and packed upside down. New sampling tubing and step-down valves shall be used at each sampling location.

### **2.3.3 SAMPLE HANDLING**

The sample containers and preservatives for each laboratory method are specified on Table 1. Sample containers shall be stored in a cool, dry location, separate from any VOC-containing materials. Sample containers containing laboratory prepared preservatives shall not be used if held on-site for an extended period of time or if exposed to extreme temperature conditions. Once opened, the sample containers shall be used immediately. If the container is used for any purpose other than sample collection, it shall be discarded.

Samples will be identified with a unique sample identification number. It will be up to the operator or the operator's consultant how to identify each sampling location. Sample containers will be labeled using waterproof ink and shall indicate the company, project identifier, sample ID, date, time, sampler, matrix, preservatives.

After labeling, samples shall be placed in an insulated cooler on ice until packed for shipment to the laboratory. Sample containers shall be placed in Ziploc-style baggies and then wrapped in protective packing material (bubble wrap); do not use foam blocks many labs ship the VOA vials in. The foam will insulate the vials and the proper temperature for the sample will not be achieved. Sample containers shall then be placed in the insulated cooler in an up-right position (with the exception of the dissolved gas samples) and surrounded with sufficient ice to maintain a 4 degrees Celsius cooler temperature during shipping. Ice shall be double bagged into Ziploc-style baggies. If the cooler contains a drain outlet, it must be sealed over with tape on the inside and the outside of the cooler prior to sample packing.

A chain of custody form (COC) shall be placed in a Ziploc-style bag and taped to the underside of the cooler lid. The cooler shall be sealed with a custody seal and tape and either hand delivered to the laboratory, or shipped by overnight carrier for delivery to the analytical laboratory. The temperature of all coolers will be measured upon receipt at the laboratory. Therefore, a temperature blank shall be included with each cooler.

#### **2.3.4 CHAIN OF CUSTODY PROCEDURES**

Samples will be shipped under COC procedures to document the custody, transfer, handling, and shipping of samples. The sampler will be responsible for filling out the COC form and will sign the COC when relinquishing the samples to anyone else. One COC form will be completed for each cooler of samples collected. The COC will contain the following information:

- Sampler's signature
- Project number
- Date and time of collection
- Sample identification number
- Sample type
- Analyses requested
- Number of containers
- Preservatives
- Requested turn-around time
- Observations on sample condition that may be pertinent (i.e. effervescence)
- Signature of persons relinquishing custody, dates, and times
- Signature of persons accepting custody, dates, and times
- Method of shipment and shipping air bill number (if appropriate)

The person responsible for delivery of the samples to the shipping company will sign the COC form, retain a copy of the COC form, document the method of shipment (shipper/airbill number) and send the original and a second copy of the COC form with the samples. Copies of the final COC forms from the laboratory documenting sample custody shall be kept with the sampling information.

### **2.3.5 FIELD DOCUMENTATION**

All available water source purging data must be recorded in a bound, sequentially page-numbered field log book or on a data sheet that is referenced in the log book using a permanent ink. The field log book or data sheet must contain a complete record of all equipment used, activities conducted, measurements of field parameters per well casing volume produced, calculations, and observations including weather and water odor/color/clarity and effervescence. The information must be sufficient to allow the purging procedure to be reconstructed in sufficient detail to evaluate adequacy of the purging procedure. Field notes shall also include explanations of problems encountered during available water source purging and sampling and an explanation of any trouble-shooting techniques that were used. If a separate data sheet or field form is used, it should be designed with prompts for all of the required data. The following specific items must be included in each day's field notes:

- Facility ID
- Date and time of sample collection
- Weather conditions
- GPS coordinates of the available water source location
- API Number(s) for well(s) associated with the sample location
- Sample type (baseline or subsequent)
- Description of sampling location and condition
- Sample location ID
- Sample matrix, number and volume of samples, and preservatives, and analysis requested
- Personal Protective Equipment (PPE) used during sampling
- Decontamination information
- Equipment calibration information
- Estimated depth to water. Information on use of the available water source prior to sampling. The time of measurement since purging began should also be recorded;
- Depth to bottom of the well based on well construction information or on actual measurement (as appropriate)
- Calculations (casing volume, flow rate)

- Field parameter measurements
- Total volume and physical characteristics of the purged water, including odor, color, clarity, particulate matter, effervescence;
- Complete description of equipment used for purging, including type and capacity of pump used and pumping rate used to purge well,
- Name and affiliation of person(s) conducting purging, and any observers on site.
- The field parameter measurements for the final casing volume
- Photographs taken during the sampling
- Landowners comments on water quality

### **2.3.6 EQUIPMENT CALIBRATION**

The calibration process is necessary to ensure that the instrument is working properly, and that the results are within the range of acceptability as determined by the manufacturer's specifications. Calibration data shall be recorded to maintain a record of the calibration and proof of acceptability.

Equipment used to collect field measurements shall be calibrated at the start of each day. More frequent calibration is commonly necessary, depending on the reliability and inherent stability of the instrumentation, extreme field conditions (weather/climate), continuous or heavy use, or high concentrations of monitored parameters. Where field calibration is possible, calibration should be verified and documented at the end of the day.

Results of the calibration shall be recorded in the field log book, or a field form referenced in the field log book. Calibration results outside of +/- 5% from the standard shall require the calibration procedure to be conducted again.

### **2.3.7 DECONTAMINATION**

Decontamination of non-dedicated or non-disposable equipment is necessary to prevent cross-contamination of sample locations. Dedicated or disposable equipment should be used whenever possible. All non-disposable equipment (e.g. instruments, buckets, non-dedicated pumps) must be decontaminated prior to use and between sample locations by using the following procedures:

- 1) Remove any visible surface contamination with a brush (sludge, sediment, etc) and rinse with tap water.
- 2) Wash with a dilute solution of tap water and non-phosphate laboratory grade detergent such as Alconox or equivalent. Pumps and non-disposable tubing must have water pumped through them.

- 3) Rinse with tap water.
- 4) Rinse with distilled or deionized water.
- 5) Allow to air dry.

Decontaminated equipment should be placed on clean plastic sheeting to dry and then stored in sealed containers when not in use to prevent contamination from airborne particles.

### **2.3.8 INVESTIGATION DERIVED WASTE**

Disposable field equipment (gloves, filters, valves, tubing) shall be bagged and disposed of as municipal solid waste. Unused sampling containers and preservatives shall be returned to the laboratory, or disposed of as municipal waste after disposing of the preservatives into a municipal sewer system diluted with water. Preservatives should not be disposed of in concentrated form or directly into the ground. Purge water will be discharged onto the ground at least 20-feet from and down-gradient of the water source and in a location designated by the landowner. Decontamination water should be collected and disposed of down-gradient from the water source. Purge water and decontamination water, if disposed of onto the surface, shall be discharged in a location to allow for infiltration of the water.

## **2.4 QUALITY ASSURANCE**

Data quality will be considered adequate if sampling was conducted according to this SAP or a Supervisor-approved site-specific SAP, samples were analyzed by approved analytical methods by an accredited/certified laboratory, and a data quality review of the field and laboratory data was conducted.

Samples shall be analyzed by laboratories that are accredited by the National Environmental Laboratory Accreditation Program (NELAP) or American Association for Lab Accreditation (A2LA) for the analytical methods that will be used as part of the baseline sampling program. Analytical methods will conform to approved United States Environmental Protection agency (US EPA) test methods such as Test Methods for Evaluating Solid and Hazardous Waste (SW-846), or other approved methods such as Standard Methods (SM) for the Examination of Water and Wastewater.

### **2.4.1 QUALITY ASSURANCE (QA) SAMPLES**

All field sampling programs require the collection of additional samples to provide quality control for the field or laboratory procedures. These include field duplicates, trip blanks, equipment rinsate blanks, and several kinds of field blanks. A description of each of the various quality control (QC) sample types is

provided below. Table 2 summarizes the minimum rate at which QC samples must be collected.

Field replicates/splits/collocated samples are independent samples of the same medium collected at the same time from the same location. Replicate samples will be collected for all the same analytes as the parent sample. Replicates/splits must be submitted for analysis “blind”, meaning that they should not be identified to the laboratory as duplicate samples. The duplicate samples shall be identified with a nonexistent sample location ID that is similar to, but different from the other sample location IDs at the site. All other labeling shall be identical to the investigative samples. The true identity of the duplicate samples shall be recorded in the field logbook, but not on the COC form or sample labels and tags that are sent to the laboratory.

Trip blanks are required only when samples are collected for analysis of VOCs, including BTEX. They are prepared from analyte-free water by the laboratory, and are transported to the sampling site with the VOC sample bottles for the investigative sampling. They are kept with the samples throughout the sampling program and are shipped for analysis with the samples. They are not opened on site, and are designed to evaluate VOC contamination encountered within the coolers during the shipping and handling procedures. Trip blanks are prepared in 40 ml VOA vials with Teflon septum lids, and must be chilled and handled in the same manner as a water sample for VOC analysis. Two trip blank vials per each shipping container or cooler containing VOC samples are required. Trip blanks shall be analyzed for BTEX.

Equipment blanks or rinse blanks are obtained from the last rinse of analyte-free water during decontamination of sample collection equipment. No extraordinary decontamination procedures should be followed when a rinse blank is collected. The date and time of collection shall be noted, as well as the ID number of the investigative sample collected just prior to decontamination, and the ID number of the next sample collected with the decontaminated equipment. If dedicated or disposable equipment is used, rinse blanks need not be collected.

If contamination is detected in a rinse blank, extensive re-sampling may be required, based on the rate of rinse blanks collected, e.g. 20 locations re-sampled if rinse blanks are collected at the rate of 1 per 20 samples; 10 locations resampled if rinse blanks are collected at the rate of 1 per 10 samples. Rinse blanks shall be collected for metals and BTEX.

**Table 4 Guidelines for Minimum QA/QC Samples**

Medium	Replicates (duplicates) <sup>1</sup>	Trip Blanks <sup>2</sup>	Rinse Blanks <sup>1</sup>
Aqueous	One in 20	One set per shipping container containing VOC samples	One per 20 decontamination procedures

<sup>1</sup> Replicate and rinse blank samples are collected at the minimum rate of 1 per 20 samples/decon procedures. If fewer than 20 samples are collected, one replicate and one rinse blank sample must be collected.

<sup>2</sup> Trip blanks are prepared in the laboratory or at another off-site location from distilled or deionized water. They are never prepared on-site, or from soils or other solid material.

Laboratory quality assurance samples (matrix spike (MS)/matrix spike duplicates (MSD)) will be prepared and analyzed by the laboratory. The results of the laboratory quality assurance samples shall be reported with the original sample results. A narrative of any quality issues shall be included with the laboratory report from the lab.

#### **2.4.2 DATA QUALITY REVIEW**

Data quality reviews shall be conducted by the operator or their consultant on all data once finalized laboratory reports have been received. The results of a data quality review must be documented on a Data Quality Review Sheet and reported with the associated laboratory reports. The objective of a Data Quality Review is to ensure that data was collected and reported properly. A data quality review includes review of both field and analytical data.

##### **2.4.2.1 FIELD DATA REVIEW**

Field data to be reviewed includes log books and sampling sheets to confirm that this SAP was followed, that data was properly entered and recorded (transcription/spelling errors), proper field/sampling procedures were used, and that there were no conditions that occurred that could affect the reliability of the data.

##### **2.4.2.2 LABORATORY DATA REVIEW**

Procedures to validate laboratory data shall be derived from the U.S. EPA's Contract Laboratory Program, National Functional Guidelines for Organic Data Review, and Contract Laboratory Program, National Functional Guidelines for Inorganic Data Review. Analytical reports shall be checked to verify that holding times were met, proper matrix and

units were reported, all requested analyses were conducted, and that proper analytical methods were used. Also, results of all blanks, surrogate spikes, MS/MSDs, laboratory control samples, and target compound identification and quantitation shall be reviewed/evaluated to determine if results were within method acceptance limits.

The overall completeness of the data package shall also be evaluated. Completeness checks shall be administered on all data to determine whether deliverables are present. At a minimum, deliverables will include sample COC forms, analytical results, and QA/QC summaries. The reviewer shall determine whether all required items are present and request copies of missing deliverables. In addition, any deficiencies in the lab reports requiring corrective action shall be brought to the attention of the lab. The results of the data validation review be summarized in a Data Validation Report for each sample report issued by the laboratory and the reviewer shall certify if the data was collected in accordance with this SAP and is suitable for use.

### **3.0 DATA REPORTING**

This section describes how the analytical results from the baseline sampling shall be reported. Copies of field documents, laboratory reports, and the data quality review results shall be submitted to the WOGCC. In addition, the operator may be required to provide an electronic data deliverable (EDD) of the laboratory data to the WOGCC for potential inclusion into a groundwater database. The WOGCC will make the EDD format available for download for use by the laboratories. The WOGCC will be responsible for making the results of the sampling available to the public and the WDEQ WQD.

The operator or their representative must request the laboratory provide notification to them if the preliminary analytical results indicate one of the following conditions:

- i. The presence of thermogenic or mixture of thermogenic and biogenic gas;
- ii. The methane concentration is detected at or above 5 mg/L; or
- iii. BTEX compounds or TPH is detected at or above Department of Environmental Quality action levels in the water sample.