# SAMPLING AND ANALYSIS PLAN
# F039 DELISTING PETITION

# MAX ENVIRONMENTAL TECHNOLOGIES, INC. FACILITY
# BULGER, PENNSYLVANIA

***Prepared for:***

**MAX Environmental Technologies, Inc.**
**Pittsburgh, Pennsylvania**

***Prepared by:***

**Key Environmental, Inc.**
200 Third Avenue
Carnegie, Pennsylvania 15106

**OCTOBER 2017**

# TABLE OF CONTENTS

## LIST OF TABLES



## LIST OF FIGURES



## LIST OF ATTACHMENTS

# 1.0 INTRODUCTION

## 1.1 Statement of Purpose

This Sampling and Analysis Plan (SAP) has been prepared by Key Environmental, Inc. (KEY) on behalf of MAX Environmental Technologies, Inc. (MAX) for sampling and analysis activities at MAX's Bulger facility. This SAP describes the field procedures and data acquisition methods necessary to collect and analyze sludge samples generated from leachate treatment, in support of a Delisting Petition for F039 listed waste. F039 is regulated pursuant to 40 CFR 261.31 (Hazardous wastes from non-specific sources) and is defined as "*leachate (liquids that have percolated through land disposed wastes) resulting from the disposal of more than one restricted waste classified as hazardous under subpart D of this part*."

Sludge is generated at the Bulger Facility as a result of treatment of leachate from multiple land disposal units. Approximately 40 to 60 cubic yards of sludge are generated every quarter. As a result of the mixture and derived-from rules, the sludge is considered F039 listed waste unless the sludge meets the RCRA UTS for certain parameters, per a pending Consent Order and Agreement between MAX and the PA Department of Environmental Protection (PADEP). The treated effluent from the wastewater treatment plant is discharged pursuant to an NPDES permit and is regulated under the Clean Streams Law and Clean Water Act.

This SAP was prepared to be consistent with the applicable components of USEPA's Sampling and Analysis Plan Guidance (May 2014) and will be supplemented by a Quality Assurance Project Plan (QAPP), which will be prepared subsequent to approval of the scope of the sampling and analysis program. Applicable KEY Standard Operating Procedures (SOPs) are provided in Attachment A and are referenced herein where appropriate. Where a discrepancy exists between an SOP and specific protocol included in this SAP, the procedure specified in the main body of the SAP takes precedence.

## 1.2 Site Background and Operational History

The Bulger facility (originally known as the Mill Service, Inc. Bulger facility) opened in 1958. It is located approximately 18 miles west-southwest of Pittsburgh and currently operates as a beneficial use construction fill landfill under a PADEP Consent Order and Agreement. . Historically, the facility accepted waste acid from western Pennsylvania steel mills, which were neutralized with lime and placed in an unlined impoundment (Impoundment No. 1). The impoundment reached capacity in the mid-1970s, and was replaced with a lined impoundment (Impoundment No. 2).

By 1987, this second unit also reached capacity and was closed under a RCRA consent order. The consent order was amended in 2000 to allow the facility to place select soils and sludges on the second impoundment to create a cap support zone. Material for the cap support zone came from select generators and projects approved by PADEP. Significant waste streams consisted of basic oxygen and blast furnace sludge, foundry sands, sludges, slags and dusts.

Closure requirements for the first (pre-RCRA) impoundment consisted of leachate collection and placement of a soil cap. Waste placement in this impoundment ceased prior to the effective date of the RCRA regulation. Closure (soil cover) was completed in the early 1980s, and until 2005, a flat soil cover was maintained. In 2006, the facility owners reached an agreement with PADEP to place a RCRA cap on the first impoundment, consisting of materials similar to those used for Impoundment No.2. In 2009, MAX accepted their first waste from shale gas drilling, and by 2013, the majority of the materials for the cap support zone came from this industry. Closure also required leachate collection. Acceptance criteria for the “beneficial use” program are based primarily on PADEP’s regulated fill criteria with low organic contamination..

Waste streams disposed at the Bulger facility are the following (past and present):

- Waste pickle liquor, consisting of a mixture of sulfuric, hydrochloric, and nitric/hydrofluoric acids (K062, metals) all prior to 1987
- Emission control dust and sludge generated from steel production in electric arc furnaces (K061, metals) prior to 1987;
- Wastewater treatment plant sludges generated from steel operations;
- Foundry sands and soils, including both hazardous (metals) and non-hazardous materials;
- Oil and gas drilling wastes.

Leachate generated at the facility is treated in a wastewater treatment plant using lime, acid and polymer, then pumped to a clarifier. Sludge is pumped from the clarifier to a thickener. The thickened sludge is removed to lined roll-off boxes, from which the water drains through geotextile fabrics back into the treatment system. Solids generated through the treatment process are sampled prior to disposal as residual waste. The solids consist primarily of lime sludge with some metals. Approximately 40 to 60 cubic yards of sludge is generated every month. Sludge is disposed of at the Bulger facility, the company’s Yukon facility 30 miles south of Pittsburgh or another facility as long as the sludge meets the facility’s acceptance criteria and/or criteria being established for the pending COA for sludge management at the Bulger facility.

## 1.3 Project Organization

KEY will provide management and technical support to the MAX Project Manager (Mr. Carl Spadaro). KEY shall provide a Project Manager (Mr. Robert Hubbard, P.E.) and support staff as needed for all components of the Delisting Petition. Field and Technical Services, LLC (FTS) will provide support for sample collection, field quality assurance, field documentation, and data validation. Laboratory analysis and quality assurance will be provided by Fairway Laboratories, located in Altoona, Pennsylvania. Contact information for project management follows:

Mr. Carl Spadaro
Environmental General Manager
MAX Environmental Technologies, Inc.
Foster Plaza #5, 651 Holiday Drive
Pittsburgh, PA 15220
cspadaro@maxenvironmental.com
412-343-4900

Mr. Robert Hubbard, P.E.
Project Manager
KEY Environmental, Inc.
200 Third Avenue
Carnegie, PA 15106
bhubbard@keyenvir.com
412-279-3363

# 2.0 SCOPE OF WORK OVERVIEW

## 2.1 Sampling and Analysis Rationale

The sampling and analysis program developed for the Delisting Petition is based on historical knowledge of the materials handled at the Bulger facility, the results of recent sampling and analysis activities, and prior discussion with PADEP representatives. The proposed program is designed to provide sufficient data, including temporal variations, to prepare Delisting Risk Assessment System (DRAS) simulations and complete the petition.

### 2.1.1 Sampling Rationale

Clarifier sludge at the Bulger facility was sampled on May 15, 2017. Rainfall is generally spread fairly evenly throughout the year, with the two driest months being February and October (2.24 and 2.17 inches of rain, respectively) and the two wettest months are typically May and July (3.27 and 3.35 inches of rain, respectively). In order to provide a complete picture of potential seasonal/temporal variations in the wastewater treatment system, three additional sampling events are proposed for October and December, 2017 and March 2018.

### 2.1.2 Analytical Rationale

Historical analytical results for samples obtained to support the delisting petition process are presented in Table 1. Historical analyses were comprehensive in nature but were completed, in part, based on generator knowledge, which is in accordance with 40 CFR 262.11. Laboratory reports for the samples are provided as Attachment B. The results have been contrasted to Universal Treatment Standards (UTS) as codified in 40 CFR 268.40, referenced in 40 CFR 261.31. F039 was listed as a hazardous waste as a result of the potential presence of multiple constituents, many of which cannot be analyzed via routine analytical methods.

In addition, the regulations list many constituents that cannot be considered to be present in the materials managed at either of MAX's facilities (namely pesticides and herbicides, polychlorinated biphenyls [PCBs], and polychlorinated dibenzo-p-dioxins and furans [PCDDs/PCDFs]) given the materials managed at the facility and waste acceptance criteria.

The historical sample was analyzed for volatile and semi-volatile organics, pesticides, polychlorinated biphenyls (PCBs), chlorinated herbicides, total and amenable cyanide, fluoride, chloride, total metals, and TCLP metals. Very few analytes were detected by the laboratory. The maximum concentrations of constituents were contrasted to the UTS as well as USEPA Regional Screening Levels (RSLs) such that the implications of land disposal restrictions and potential risks are considered. The following detections (versus their respective UTS and RSL) were reported:

| Constituent | Units | Maximum Concentration | UTS | Region 3 RSL | Ratio of Max to UTS | Ratio of Max to RSL |
|---|---|---|---|---|---|---|
| **Volatile Organics** | | | | | | |
| 2-Butanone | mg/kg | 0.0673 | 36 | 2700 | 0.002 | 0.00002 |
| **TCLP Metals** | | | | | | |
| TCLP Antimony | mg/L | 0.0732 | 1.15 | -- | 0.064 | -- |
| TCLP Barium | mg/L | 0.607 | 21 | -- | 0.029 | -- |

As shown in the preceding table, very few constituents have been detected as a result of the prior delisting-oriented sampling and analysis. Nonetheless, as a conservative (i.e., protective) approach, the analytical program for the Bulger facility for the next three rounds of sampling will consist of the complete analytical suite for the previous sampling and analysis effort, in spite of the fact that generator knowledge indicates that many of the constituents to be analyzed will not be present in the sludge. This conservative approach has been taken to address the potential for seasonal variability, as requested by PADEP. For any additional samples beyond the next three rounds, the analytical program for the Bulger facility will include those constituents detected at concentrations greater than approximately five percent of the UTS or RSL, as previously analyzed at the site.

Only one volatile organic constituent was detected in the historical sample – 2-butanone. This analyte was detected at a concentration orders of magnitude below its respective UTS or RSL as shown. However, volatile organics will be included in the analytical program to provide information regarding potential seasonal variability.

No semi-volatile organic constituents were detected in the previous sampling event at the Bulger facility. However, two semi-volatiles were detected in the sampling conducted at the similar Yukon facility, namely benzidine and bis[2-ethylhexyl]phthalate. In spite of the absence of SVOCs in the historical sample at Bulger, comprehensive SVOC analysis is included in the analytical program for the planned delisting samples (next three rounds).

No pesticides, herbicides or PCBs were detected in the sample. Two constituents were reported as not detected, at reporting limits that exceeded the UTS. These were chlordane and toxaphene. However, based on generator knowledge of the types of materials accepted at the facility, and the fact that reporting limits were generally below the UTS, it is assumed that pesticides, chlorinated herbicides and PCBs are not considered to be constituents of interest for the clarifier sludge. However, for the sake of completeness, pesticides, herbicides and PCBs will be analyzed during the next three proposed delisting petition sampling events.

Multiple metals were detected in the analysis for total concentration as expected based on the nature of the materials managed at the facility (see Table 1). Many of the metals were detected in the historical sample, including barium, beryllium, cadmium, chromium, lead, mercury, nickel, vanadium and zinc. These analytical results are shown in Table 1, but no UTS exist for total metals (only TCLP metals). Given the nature of the materials historically managed at the facility, both total and TCLP metals will be analyzed during the three subsequent sampling events.

No cyanides (total or amenable) were detected in the historical sample, however, both constituents will be included in the three additional sampling events to confirm the previous result.

As shown in the preceding tabulation and discussion, the sludge contains limited organics and very little in the way of leachable metals. The detected concentrations are well below their respective UTS (or, if UTS have not been established for this constituent, the RSL). However, based on comments received from PADEP, the three additional sampling events for this site shall include all previously reported analytes, with the addition of TCLP SVOCs, which will be important in evaluating the wastes in the Delisting Risk Assessment Software modeling effort that will follow.

The proposed analytical suite is also based on the historical information on the types of wastes handled at this facility, as discussed in Section 1.2. Pickle liquor, emission control dust, and other steel-manufacturing wastes typically contain metals, with very limited (if any) amounts of organic constituents. As noted in Section 2.1.1, three additional sludge samples will be collected from the Bulger facility (October and December 2017 and March 2018) and will be analyzed for the following parameters:

- VOCs
- SVOCs
- Pesticides
- Chlorinated Herbicides
- PCBs
- Target Analyte List Metals
- Total and Amenable Cyanide
- Fluoride
- Sulfide
- Percent Solids
- TCLP SVOCs TCLP Metals

The three additional sampling rounds coupled with the available historical data will provide an adequate basis to demonstrate seasonal variability (or lack thereof) of concentrations of constituents of interest in the sludge, as well as confirm the historical results. Table 2 provides a summary of the planned sampling and analysis program for the Bulger sludge.

## 2.2 Sample Locations

One composite sample of sludge will be collected from the roll-off containers that receive sludge from the thickener tank during each of the three sampling events. The composite sample will be generated by collecting a vertical core sample from each quadrant of any full or partially full roll-off box (one or more boxes may contain material at the time of sampling).

A sample for volatile organic analysis will be obtained as a random grab sample from one of the cores to eliminate the potential for loss of volatiles during subsequent sample processing. The volatile organic aliquot will be obtained from the center of a core such that the potential for losses as a result of volatilization from the surface of the contained sludge is minimized.

The remaining vertical core samples will then be homogenized via coning and quartering. Sample containers will be filled once the coning and quartering process is complete. Excess material will be returned to a roll-off box.

One such composite sample per event is adequate for characterization purposes because the treatment process results in mixing that minimizes time or location variabilities.

Because the roll-offs are emptied periodically, and because the amount of sludge generated is small, it may be necessary to collect the sample from the thickener tank (if the roll-off is empty). A similar vertical core/quadrant-based approach will be used in the event that samples must be collected from the thickener. Figure 2 shows the locations of the roll-off staging area and the thickener, as well as the clarifier.

# 3.0 PROJECT DATA QUALITY OBJECTIVES

This section provides a discussion of Data Quality Objectives (DQOs) for the project. A discussion of the general objective and a definition of the problem is provided. Specific DQOs in the form of decision criteria area identified. Data quality indicators and measurement quality objectives are described. Data review and validation are data management are also discussed. A discussion of assessment oversight is also provided.

## 3.1 Project Objectives and Problem Definition

The objective of the sampling and analysis program specified in this SAP is to generate data sufficient to proceed with the preparation of a delisting petition for the sludge generated at the Bulger facility that could be classified as F039. The data generated must be representative of the sludge over various seasonal conditions and representative of the types of materials managed at the facility in multiple regulated units.

Additionally, the data generated must be sufficient to meet any and all requirements specified by stakeholders, specifically PADEP and USEPA. The issue to be addressed via the planned data collection efforts may be succinctly stated in the following problem definition:

*Are the concentrations of constituents of interest in the Bulger leachate treatment plant sludge below concentrations that are protective of human health and the environment assuming that land disposal of the sludge at the Bulger facility, or any other land disposal operation occurs?*

Evaluation of historical information regarding the materials managed at the facility, consideration of plans for future material management (consistent with prior management practices), and review of analytical data obtained to date formed the basis for identification of constituents of interest and required analysis as discussed in Section 2.1.2. One sludge samples was analyzed for a wide variety of constituents as previously discussed and while only a limited number of organic constituents have been detected, the next three sampling events will evaluate all previously analyzed constituents, as well as TCLP semi-volatile organics. The specific metals to be investigated consist of the majority of those on the USEPA Target Analyte List. Essential human nutrients (calcium, magnesium, potassium, and sodium) are included on the TAL but will not be analyzed given that they are nontoxic except at extremely high doses. The complete list of inorganic parameters identified for analysis is as follows:

| | | |
|---|---|---|
| Aluminum | Cobalt | Selenium |
| Antimony | Copper | Silver |
| Arsenic | Iron | Thallium |
| Barium | Lead | Vanadium |
| Beryllium | Manganese | Zinc |
| Cadmium | Mercury | Cyanide |
| Chromium | Nickel | Amenable Cyanide |

The preceding inorganics will be analyzed on both a total and a leachable basis (i.e., as received samples and TCLP extract samples). Analysis will be completed using SW-846 6000/7000 series methods and Method 1311 for extraction purposes (i.e., the TCLP). Analytical methods for the cyanide analyses are presented in Table 2.

Semi-volatile organic analysis (both total and TCLP) will also be completed. It is planned that SW-846 Method 8270C will be used for these analyses. Semi-volatile constituents that can be quantitated via this method consist of many of the semi-volatile organics on the Target Compound List (TCL) as well as other (but not all) semi-volatile constituents for which UTS have been promulgated. The semi-volatile organic constituents that have been targeted for analysis and which were previously analyzed, are the following:

| | | |
|---|---|---|
| 1,2,4-Trichlorobenzene | 2,6-Dinitrotoluene | 4-Bromophenylphenyl ether |
| 1,2-Dichlorobenzene | 2-Chloronaphthalene | 4-Chloro-3-methylphenol |
| 1,2-Diphenylhydrazine | 2-Chlorophenol | 4-Chloroaniline |
| 1,3-Dichlorobenzene | 2-Methylnaphthalene | 4-Chlorophenyl phenyl ether |
| 1,4-Dichlorobenzene | 2-Methylphenol | 4-Nitroaniline |
| 2,4,5-Trichlorophenol | 2-Nitroaniline | 4-Nitrophenol |
| 2,4,6-Trichlorophenol | 2-Nitrophenol | Acenaphthene |
| 2,4-Dichlorophenol | 3- & 4-Methylphenol | Acenaphthylene |
| 2,4-Dimethylphenol | 3,3-Dichlorobenzidine | Acetophenone |
| 2,4-Dinitrophenol | 3-Nitroaniline | Aniline |
| 2,4-Dinitrotoluene | 4,6-Dinitro-2-methylphenol | Anthracene |

| | | |
|---|---|---|
| Benzidine | Chrysene | Hexachloroethane |
| Benzo(a)anthracene | Dibenzo(a,h)anthracene | Indeno(1,2,3-cd)pyrene |
| Benzo(a)pyrene | Dibenzofuran | Isophorone |
| Benzo(b)fluoranthene | Diethyl phthalate | Naphthalene |
| Benzo(ghi)perylene | Dimethyl phthalate | Nitrobenzene |
| Benzo(k)fluoranthene | Di-n-butyl phthalate | N-Nitrosodipropylamine |
| Benzoic Acid | Di-n-octyl phthalate | Pentachlorophenol |
| Benzyl Alcohol | Diphenylamine | Phenanthrene |
| Bis(2-chloroethoxy)methane | Fluoranthene | Phenol |
| Bis(2-chloroethyl)ether | Fluorene | Pyrene |
| Bis(2-chloroisopropyl)ether | Hexachlorobenzene | Pyridine |
| Bis(2-ethylhexyl)phthalate | Hexachlorobutadiene | |
| Butyl benzyl phthalate | Hexachlorocyclopentadiene | |

Volatile organic analysis will also be completed, using SW-846 Method 8260B. This method was used previously at the site, and is capable of reporting numerous compounds. The volatile organics that will be reported are as follows:

| | | |
|---|---|---|
| 1,1,1,2-Tetrachloroethane | 4-Methyl-2-pentanone | Dichlorodifluoromethane |
| 1,1,1-Trichloroethane | Acetone | Ethylbenzene |
| 1,1,2,2-Tetrachloroethane | Acrolein | Hexachlorobutadiene |
| 1,1,2-Trichloroethane | Acrylonitrile | Iodomethane |
| 1,1-Dichloroethane | Benzene | Isopropylbenzene |
| 1,1-Dichloroethene | Bromodichloromethane | Methylene chloride |
| 1,2,3-Trichloropropane | Bromoform | Naphthalene |
| 1,2,4-Trichlorobenzene | Bromomethane | Styrene |
| 1,2-Dibromo-3-chloropropane | Carbon disulfide | Tetrachloroethene |
| 1,2-Dibromoethane (EDB) | Carbon tetrachloride | Toluene |
| 1,2-Dichlorobenzene | Chlorobenzene | trans-1,2-Dichloroethene |
| 1,2-Dichloroethane | Chloroethane | trans-1,3-Dichloropropene |
| 1,2-Dichloropropane | Chloroform | Trichloroethene |
| 1,3-Dichlorobenzene | Chloromethane | Trichlorofluoromethane |
| 1,3-Dichloropropane | cis-1,2-Dichloroethene | Vinyl chloride |
| 1,4-Dichlorobenzene | cis-1,3-Dichloropropene | Xylenes (total) |
| 2-Butanone | Dibromochloromethane | |
| 2-Chloroethylvinyl ether | Dibromomethane | |

While several additional volatiles are quantifiable via this method, only the volatiles listed above and reported previously will be reported, as only a limited number of volatile organics have ever been detected.

Pesticides will be analyzed using SW-846 Method 8081B. The following pesticides have been analyzed and reported in the previous sampling rounds, and hence will be analyzed for in the next three sampling rounds, even though no pesticides have been detected during previous sampling events:

| | | |
|---|---|---|
| 4,4'-DDD | Aldrin | beta-BHC |
| 4,4'-DDE | alpha-BHC | Chlordane (tech) |
| 4,4'-DDT | alpha-Chlordane | delta-BHC |

| | | |
|---|---|---|
| Dieldrin | Endrin aldehyde | Heptachlor epoxide |
| Endosulfan I | Endrin ketone | Isodrin |
| Endosulfan II | gamma-BHC (Lindane) | Methoxychlor |
| Endosulfan sulfate | gamma-Chlordane | Toxaphene |
| Endrin | Heptachlor | |

Chlorinated herbicides will be analyzed using SW-846 Method 8151A. The following herbicides will be reported in the next three rounds, as done previously, even though no herbicides have been detected:

| | | |
|---|---|---|
| 2,4-D | 2,4-DB | Dicamba |
| 2,4,5-T | Acifluorfen | Dichloroprop |
| 2,4,5-TP (Silvex) | Dalapon | Dinoseb |

PCBs will be analyzed using SW-846 Method 8082. No PCBs have been detected during previous sampling events. The following PCBs will be reported in the next three sampling rounds:

| | | |
|---|---|---|
| PCB-1016 | PCB-1242 | PCB-1260 |
| PCB-1221 | PCB-1248 | |
| PCB-1232 | PCB-1254 | |

## 3.2 Data Quality Objectives

DQOs are qualitative and quantitative criteria upon which project decisions are based. For the purposes of this project, the DQOs are predicated on the problem statement provided in Section 3.1. The primary questions identified with respect to the problem statement are as follows:

> *Are the concentrations of constituent of interest determined via sampling and analysis of the sludge representative of the materials disposed at the facility?*
>
> *Are the concentrations of constituents of interest determined via sampling and analysis of the sludge representative of various seasonal conditions?*
>
> *Are the concentrations of the constituents of interest below the UTS such that land disposal of the sludge is not prohibited?*
>
> *Are the concentrations of constituents of interest (total and extractable) below concentrations that are protective of human health and the environment?*
>
> *Can the sludge generated at the Bulger Facility that could be classified as F039 be delisted as a hazardous waste?*

The first two questions can be readily addressed. Specifically, review of historical information regarding materials managed at the facility provides a direct indication of the nature of the material and the constituents that may be present. This information has been supplemented via the collection of samples with analysis for a wide variety of constituents. The analytical results for these samples has provided confirmatory evidence regarding the nature of the disposed materials and hence the potential constituents of interest in the leachate and associated sludge. By design samples reflective of various seasonal meteorological conditions can be assessed. The historical and planned samples taken together will constitute quarterly samples. Quarterly sampling is routinely used to yield results representative of seasonal variations and is stipulated in many regulatory programs including RCRA.

The third question above, relating to comparison to the UTS can be addressed via the analysis of target constituents using robust, approved analytical methods. The laboratory will be instructed to attain detection limits (i.e., either reporting limits or sample-specific method detection limits) which are below the UTS on a constituent-specific basis. Comparison to the UTS will be completed using electronic software (e.g., MicroSoft Excel and conditional formatting). The decision regarding attainment of UTS will be made by KEY and will be documented in the planned delisting petition for agency review.

The fourth question will be answer via simulation of fate and transport using USEPA's DRAS software. Based on inputs regarding volumes and concentrations (both total and leachable), DRAS will yield predicted risk estimates for potential human and ecological receptors. The software also yields Maximum Allowable Concentrations (MAC) for the constituents of interest which are based on protection of the most sensitive receptor. If the representative concentrations determined as a result of the sampling and analysis program proposed in this SAP are below the MAC, it may be concluded that the sludge does not pose a risk to human health or the environment. The decision regarding protectiveness will be made by KEY and will be documented in the planned delisting petition for agency review.

The final question above is predicated on the outcome of the preceding four questions. This decision will ultimately be made by PADEP and USEPA and will be contingent upon review of the Delisting Petition, publication of the intent to delist the waste in the Pennsylvania Bulletin and consideration of public comments (if any).

### 3.3 Data Quality Indicators and Measurement Quality Objectives

Data Quality Indicators (DQIs) provide a means to evaluate the quality of data. Precision, accuracy, representativeness, completeness, comparability, and sensitivity (method detection limits) are generally considered in this respect. These parameters (i.e., PARCCS and measurement quality objectives) are discussed in more detail in the associated QAPP for this project.

Precision, accuracy, and sensitivity are essentially a function of the selected analytical methods. USEPA analytical methods have been selected for this project and the precision, accuracy, and sensitivity are specified. Representativeness has been addressed in the preceding section based on review of historical disposal practices and consideration of temporal variability.

Completeness relates to the percentage of valid data obtained versus that which was expected. For this project, data are expected to be 100% complete. Comparability will be achieved via the use of routine reporting units such that data may be contrasted to previous results, to the UTS, or to MACs developed as a results of DRAS simulations. The laboratory has been instructed to achieve detection limits suitable to assess compliance with UTS.

A primary component of data quality is selection of the appropriate analytical level for the intended data use. Appropriate analytical levels, as described in "Data Quality Objectives for Remedial Response Activities" (USEPA, March 1987), are as follows:

- Level I – Field screening or analysis using portable instruments, appropriate for field screening and health and safety monitoring.
- Level II – Field analysis using more sophisticated portable instruments, possible set up in a mobile laboratory.
- Level III – Analysis performed in an off-site laboratory, using documented sampling and analysis procedures, with EPA Contract Laboratory Program- type deliverables; Level III may require data validation.
- Level IV – Analysis performed in an off-site laboratory, following Contract Laboratory Program procedures, characterized by rigorous QA/QC protocols and full validation of the data.
- Level V – Analysis by non-standard methods in an off-site laboratory.

For this project, analytical data will be used for (indirect) risk assessment purposes in that the USEPA's DRAS will be utilized. Consequently, Level III data are required at a minimum. Complete data packages will be provided by the laboratory, including information regarding sample chain of custody/receipt condition, results of laboratory control sample analysis, and laboratory certification for the analytical methods used. Detection limits shall be appropriate to ensure that concentrations at or below the UTS can be measured (to the extent practicable based on available technology).

### 3.4 Data Review and Validation

All newly generated analytical data will be reviewed and validated. The laboratory will be requested to provide Contract Laboratory Program equivalent deliverables. The data review process will be initiated shortly after sample collection. Laboratory sample analysis confirmation sheets will be reviewed to ensure that the laboratory has properly logged the samples for analysis. A preliminary review of the analytical data will be completed upon receipt of the laboratory report to ensure that all requested results are provided and that the requested data packages have been received. These preliminary data review processes will be completed by KEY.

Validation of the analytical data will be completed by FTS. It is planned that Level 1 validation will be completed for both organics and inorganics. Validation of the data will consist of consideration of sample and instrument-related quality assurance criteria. The following quality assurance/quality control issues will be assessed during the validation process:

| **Organics** | **Inorganics** |
|---|---|
| Data Completeness | Data Completeness |
| Sample Receipt | Sample Receipt |
| Holding Time Compliance | Holding Time Compliance |
| Surrogate Recoveries | Laboratory Control Sample Results |
| Method Blank Results | Laboratory Blank Results |
| Instrument Calibration | Instrument Calibration |
| Electronic Data Deliverable Accuracy | Electronic Data Deliverable Accuracy |

Tier 2 data validation memoranda will be prepared and will be provided as an appendix to the Delisting petition. To the extent that data review and validation reveal any issues that may affect the decision making process (e.g., elevated detection limits), the issues will be discussed in the text of the delisting petition. Corrective action, likely consisting of collection of a supplemental sample or samples will be initiated in the event that any noncompliance issues are considered critical for the decision making process. It is considered unlikely that this eventuality will occur, however.

### 3.5 Data Management

The laboratory shall provide electronic data deliverables for each sample. These results will be input into an Excel spreadsheet to facilitate comparison to UTS and eventual reporting to PADEP. Each spreadsheet will be checked to ensure that all results are reported accurately. Complete copies of analytical data packages will be provided to PADEP as an appendix of the Delisting Petition.

### 3.6 Assessment Oversight

Mr. Robert Hubbard will act as project manager for KEY and shall have responsibility for implementation of the quality assurance program. Mr. Hubbard has 33 years of environmental consulting and engineering experience, has undergone USEPA quality assurance training, has direct experience with data validation and reporting, and has prepared Delisting Petitions on two previous occasions.

Quality Assurance activities will be conducted each time a sampling event is completed, each time analytical results are received, and upon the completion of preparation of an internal draft Delisting Petition. Mr. Hubbard will have direct authority to require corrective action for any deficiencies related to data management and interpretation. Review processes and corrective action will be documented in electronic form and will be retained in the project files. Mr.

Hubbard will have the authority to recommend additional sampling if believed necessary although the ultimate authority for implementation of additional sampling and analysis will reside with Mr. Carl Spadaro of MAX.

## 4.0 SLUDGE SAMPLING PROCEDURES

This section presents the procedures for sludge sampling. A grab sample will be obtained from either a dewatering roll-off box (preferred) or from a thickener (if the roll-off is empty).

### 4.1 Sludge Sample Collection Procedures

Sludge sampling will be conducted according to the procedures presented in the following subsections and the applicable procedures specified in KEY SOP No. 31 (Attachment A). The following general sampling methodologies may be employed, depending on the consistency of the sludge and the depth to the material inside the roll-off (or thickener):

- A hand auger may be used to reach into the roll-off, if the sludge consistency allows.
- A probe mechanism with a disposable poly liner can be pushed into the sludge.
- If sampling from the thickener is necessary because of inadequate sludge in the roll-off, a hand auger or Ponar dredge (or similar, bottom-filling device) may be used to bring sludge to the surface.
- Samples from each quadrant of each sludge container will be mixed via the coning and quartering method to ensure that the resultant sample aliquots are representative.

If necessary, a ladder may be used to enable the sampling technician to access the sludge with the appropriate equipment. It is preferable, however, that the technician stand on the ground and reach over the top of the roll-off box to obtain the sample. Additional health and safety information is presented in Section 10. It is intended that this sampling be conducted using Level D personal protective gear (gloves, safety shoes, hard hat and safety glasses).

Sample bottles will be provided by the laboratory. Disposable trowels or spoons will be used to composite the samples and transfer sludge from the sampling equipment into the bottles.

## 5.0 EQUIPMENT DECONTAMINATION

All equipment involved in sample collection must be either new and disposable or decontaminated prior to initiation of on-site activities, between each use and prior to demobilization from the site. Sampling equipment decontamination will be conducted according to the applicable procedures provided in KEY SOP No. 25 (Attachment A).

For non-disposable sampling equipment used to collect samples for laboratory analysis for organics an isopropyl alcohol rinse and de-ionized water rinse will be completed following the detergent wash and potable water rinse. Where possible, disposable equipment is preferred.

However, for more expensive equipment, decontamination before and after use will be required. Decontamination will be conducted per KEY SOP 25 (Attachment A). The following equipment will be needed for decontaminating non-disposable equipment:

- Potable water supply and sprayer
- Cleaning brushes
- Phosphate-free detergent
- Isopropyl alcohol
- Deionized water
- Paper towels
- Aluminum foil

## 6.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTES

It is anticipated that the following types of investigation-derived waste (IDW) will be generated during sampling activities:

- Excess laboratory sample aliquot volume;
- Equipment decontamination fluids;
- Personal protective equipment (PPE); and
- Disposable sampling equipment.

Management of IDW will be conducted according to the applicable procedures provided in KEY SOP No. 04 (Attachment A). IDW generated during sampling (decontamination fluids, PPE, equipment) will be emplaced in the roll-off boxes with the sludge for land disposal. Non-impacted materials (e.g., paper, plastic) will be bagged and managed as general refuse. Excess sample aliquot volume will be disposed by the laboratory upon completion of analysis in accordance with their waste management practices.

## 7.0 SAMPLE HANDLING

The following sections detail the procedures for the handling, documentation, and analysis of sludge samples for chemical analysis.

### 7.1 Sample Analysis

Chemical analyses of sludge samples will be completed according to the requirements presented in the QAPP and this SAP. All chemical analyses will be performed by a Pennsylvania Certified Laboratory. Laboratory certification shall be in accordance with the National Environmental Laboratory Accreditation Program (NELAP). Each of the three sludge samples collected for this activity will be analyzed for the following analytical suites:

- VOCs
- SVOCs Pesticides
- Chlorinated Herbicides

- PCBs
- TAL metals
- Total and amenable cyanide
- Fluoride
- Sulfide
- Percent Solids
- pH
- TCLP SVOCs
- TCLP metals

### 7.2 Sample Containers

Sample containers and appropriate preservatives (where necessary) will be supplied by the analytical laboratory. After the respective sample containers have been filled with appropriate sample media and preserved as necessary, samples will be properly identified using sample container labels. Sample container specifications are described in Table 2 and KEY SOPs No. 22 and 23 (Attachment A).

### 7.3 Sample Designations

A sample designation system that identifies the sample matrix and location will be used. Samples will be identified as Bulger-RO or TH (roll-off or thickener)-MMDDYY (date). Potential sample locations were depicted on Figure 2.

### 7.4 Labeling, Preservation, and Chain of Custody

Each sample bottle will be labeled prior to filling. The sample labels will include, but not be limited to, the following information:

- Project/Site Name;
- Sample Identification (Location);
- Sample Collection Time and Date;
- Sampler's Initials;
- Preservative, if applicable, mark "None" if unpreserved; and,
- Requested Analyses.

Samples for chemical analysis shall be preserved as necessary. Preservation requirements are described in KEY SOPs No. 22 and 23 (Attachment A). Pre-preserved bottles will be provided by the analytical laboratory. Filled sample bottles will be placed in a cooler and chilled to a temperature of four degrees Celsius (4$^{\circ}$C) and maintained at this temperature pending delivery to the laboratory. Ice or re-freezable ice packs will be used to maintain proper sample temperature. If ice is used, samples will be packaged in sealable plastic bags to minimize contact of water with the sample containers

A record of all samples collected will be maintained in the project field logbook, associated field monitoring/sampling forms, and chain-of-custody forms (COC). The original copy of the completed COC will accompany all samples shipped from the Site to the laboratory. The COC will either be placed in the sample shipping package (e.g., cooler), or hand-delivered to a laboratory courier or sample receiving department personnel. If the COC is shipped within the sample cooler, the COC will be placed in a sealable water-resistant bag (e.g., Ziploc® bag) and taped to the inside of the cooler's lid. A copy of the completed COC will be retained. A detailed description of COC requirements is described in KEY SOP No. 24 (Attachment A).

## 7.5 Sample Shipping

All samples will be transported to the analytical laboratory in durable, waterproof, and secured plastic coolers. Sample coolers will generally be supplied by the laboratory. All samples will be packaged very carefully to prevent sample breakage by using bubble wrap or similar materials. Samples will be shipped via overnight carrier (e.g., Federal Express, United Parcel Service), courier service provided by the laboratory or hand delivered to the analytical laboratory, generally within 24 hours of collection. Additionally, the sample security and preservation must be maintained if samples are not to be transported immediately to the laboratory. A detailed description of the sample shipment procedures is provided as KEY SOP No. 23 (Attachment A).

## 7.6 Sample Documentation

All data and information generated in the field will be recorded directly into bound notebooks. Field logbooks are the primary source of documentation for all site activities. They serve as legal record of all investigative activities. All pertinent information regarding the site and sampling procedures must be documented.

Information recorded in the notebook should be noted with the date and time of entry. The following items should be included as logbook entries in addition to the field data and measurements acquired during the investigation:

- Name and location of site;
- Date and time of arrival and departure;
- Sampling event description;
- Prevailing weather conditions;
- Names and affiliations of persons on-site and purpose of visit;
- Name of person keeping log;
- Photographic log.

The sampling event description should include methodology, sample numbers and volumes, description of samples, date and time of sample collection, and name of sample collector. All information should be recorded in permanent ink for the legal record. The page of the logbook should be numbered for ease of reference. At the end of each field day, the project scientist/engineer or his designee should sign and date the notebook to verify the day's activities.

A detailed description of the field logbook documentation procedure is provided as KEY SOP No. 03 (Attachment A). Upon return to the office, photographs will be printed, labeled, and a digital copy shall be saved electronically in the project files.

## 8.0 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Because of the focused sampling conducted for this project (one representative sample per event), field quality control samples are not necessary and will not be collected.

## 9.0 FIELD VARIANCES

If a field or situation requires clarification (not provided in this SAP), the field personnel shall contact the KEY Project Manager, who will make recommendations to enable the task to be completed. This may necessitate contact with MAX personnel. Any field changes will be documented in the field logbook, and in a memo to the client, as well as being documented in the final report prepared for the delisting petition.

## 10.0 FIELD HEALTH AND SAFETY PROCEDURES

Health and safety issues of primary concern for this project consist of the following:

- Slip, trip or fall hazards typical of an industrial setting, including the potential for sludge on the ground surface
- Vehicular traffic
- Broken glass (i.e., sample bottles)
- Ladder use
- Ambient environmental conditions (heat/cold) and associated health issues

Confined space entry will be avoided if at all possible. In the event that it is necessary to enter the roll-off box to collect a sample, the buddy system and safety gear will be used. Additional details on the hazards and control methods associated with collection of sludge samples from a roll-off box are outlined in Table 3.

## 11.0 REFERENCES

USEPA, March 1987. Data Quality Objectives for Remedial Response Activities. EPA/540/G-87/003.

USEPA, May 2014. Sampling and Analysis Plan Guidance and Template, Version 4, General Projects. R9QA/009.1. https://www.epa.gov/quality/sampling-and-analysis. August 2017.

USEPA, June 2017. Regional Screening Level (RSL) Summary Table (TR=1E-6, HQ=0.1). https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017. August 2017.

**TABLES**

# TABLE 1
# ANALYTICAL RESULTS - BULGER CLARIFIER SLUDGE
# MAX ENVIRONMENTAL TECHNOLOGIES, INC.
# BULGER, PA

| Analyte and Method | Units | Universal Treatment Standard (1) | 5/15/2017 | |
|---|---|---|---|---|
| | | | Result (2) | Qualifiers |
| **pH (9045D)** | | | | |
| pH | SU | - | 8.51 | |
| **Pesticides (8081B)** | | | | |
| 4,4´-DDD | mg/kg | 0.087 | 0.041 | U |
| 4,4´-DDE | mg/kg | 0.087 | 0.041 | U |
| 4,4´-DDT | mg/kg | 0.087 | 0.041 | U |
| Aldrin | mg/kg | 0.066 | 0.041 | U |
| alpha-BHC | mg/kg | 0.066 | 0.041 | U |
| alpha-Chlordane | mg/kg | 0.26 | 0.041 | U |
| beta-BHC | mg/kg | 0.066 | 0.041 | U |
| Chlordane (tech) | mg/kg | 0.26 | 2.05 | U |
| delta-BHC | mg/kg | 0.066 | 0.041 | U |
| Dieldrin | mg/kg | 0.13 | 0.041 | U |
| Endosulfan I | mg/kg | 0.066 | 0.041 | U |
| Endosulfan II | mg/kg | 0.13 | 0.041 | U |
| Endosulfan sulfate | mg/kg | 0.13 | 0.041 | U |
| Endrin | mg/kg | 0.13 | 0.041 | U |
| Endrin aldehyde | mg/kg | 0.13 | 0.041 | U |
| Endrin ketone | mg/kg | - | 0.041 | U |
| gamma-BHC (Lindane) | mg/kg | 0.066 | 0.041 | U |
| gamma-Chlordane | mg/kg | 0.26 | 0.041 | U |
| Heptachlor | mg/kg | 0.066 | 0.041 | U,D |
| Heptachlor epoxide | mg/kg | 0.066 | 0.041 | U |
| Methoxychlor | mg/kg | 0.18 | 0.041 | U |
| Toxaphene | mg/kg | 2.6 | 2.05 | U |
| **Polychlorinated Biphenyls (8082)** | | | | |
| PCB-1016 | mg/kg | 10(3) | 0.041 | U |
| PCB-1221 | mg/kg | 10(3) | 0.041 | U |
| PCB-1232 | mg/kg | 10(3) | 0.041 | U |
| PCB-1242 | mg/kg | 10(3) | 0.041 | U |
| PCB-1248 | mg/kg | 10(3) | 0.041 | U |
| PCB-1254 | mg/kg | 10(3) | 0.041 | U |
| PCB-1260 | mg/kg | 10(3) | 0.041 | U |
| **Chlorinated Herbicides (8151A)** | | | | |
| 2,4-D | mg/kg | 10 | 0.0157 | U |
| 2,4,5-T | mg/kg | 7.9 | 0.0157 | U |
| 2,4,5-TP (Silvex) | mg/kg | 7.9 | 0.0157 | U |
| 2,4-DB | mg/kg | - | 0.0157 | U |
| Acifluorfen | mg/kg | - | 0.0157 | U |
| Dalapon | mg/kg | - | 0.158 | U |
| Dicamba | mg/kg | - | 0.0157 | U |
| Dichloroprop | mg/kg | - | 0.0157 | U |
| Dinoseb | mg/kg | 2.5 | 0.0157 | U |

# TABLE 1
# ANALYTICAL RESULTS - BULGER CLARIFIER SLUDGE
# MAX ENVIRONMENTAL TECHNOLOGIES, INC.
# BULGER, PA

| Analyte and Method | Units | Universal Treatment Standard [1] | 5/15/2017 | |
|---|---|---|---|---|
| | | | Result [2] | Qualifiers |
| **Volatile Organic Compounds (8260B)** | | | | |
| 1,1,1,2-Tetrachloroethane | mg/kg | 6 | 0.0224 | U,I4 |
| 1,1,1-Trichloroethane | mg/kg | 6 | 0.0224 | U,I4 |
| 1,1,2,2-Tetrachloroethane | mg/kg | 6 | 0.0224 | U,I4 |
| 1,1,2-Trichloroethane | mg/kg | 6 | 0.0224 | U,I4 |
| 1,1-Dichloroethane | mg/kg | 6 | 0.0224 | U,I4 |
| 1,1-Dichloroethene | mg/kg | 6 | 0.0224 | U,I4 |
| 1,2,3-Trichloropropane | mg/kg | 30 | 0.0224 | U,I4 |
| 1,2,4-Trichlorobenzene | mg/kg | 19 | 0.0224 | U,I4 |
| 1,2-Dibromo-3-chloropropane | mg/kg | 15 | 0.0224 | U,I4 |
| 1,2-Dibromoethane (EDB) | mg/kg | 15 | 0.009 | U,I4 |
| 1,2-Dichlorobenzene | mg/kg | 6 | 0.0224 | U,I4 |
| 1,2-Dichloroethane | mg/kg | 6 | 0.009 | U,I4 |
| 1,2-Dichloropropane | mg/kg | 18 | 0.0224 | U,I4 |
| 1,3-Dichlorobenzene | mg/kg | 6 | 0.0224 | U,I4 |
| 1,4-Dichlorobenzene | mg/kg | 6 | 0.0224 | U,I4 |
| 2-Butanone | mg/kg | 36 | 0.0673 | I4 |
| 2-Chloroethylvinyl ether | mg/kg | - | 18.3 | U,I4 |
| Acrolein | mg/kg | - | 18.3 | U,I4 |
| Acrylonitrile | mg/kg | 84 | 0.0449 | U,I4 |
| Benzene | mg/kg | 10 | 0.009 | U,I4 |
| Bromodichloromethane | mg/kg | 15 | 0.0224 | U,I4 |
| Bromoform | mg/kg | 15 | 0.0224 | U,I4 |
| Bromomethane | mg/kg | - | 0.0224 | U,I4 |
| Carbon disulfide | mg/kg | - | 0.0224 | U,I4 |
| Carbon tetrachloride | mg/kg | 6 | 0.0224 | U,I4 |
| Chlorobenzene | mg/kg | 6 | 0.0224 | U,I4 |
| Chloroethane | mg/kg | 6 | 0.0224 | U,I4 |
| Chloroform | mg/kg | 6 | 0.0224 | U,I4 |
| cis-1,3-Dichloropropene | mg/kg | 18 | 0.0224 | U,I4 |
| Dibromochloromethane | mg/kg | - | 0.0224 | U,I4 |
| Dibromomethane | mg/kg | 15 | 0.0224 | U,I4 |
| Dichlorodifluoromethane | mg/kg | 7.2 | 0.0224 | U,I4,G |
| Ethylbenzene | mg/kg | 10 | 0.0224 | U,I4 |
| Hexachlorobutadiene | mg/kg | 5.6 | 0.0224 | U,I4 |
| Iodomethane | mg/kg | 65 | 0.0224 | U,I4 |
| Methylene chloride | mg/kg | 30 | 0.0897 | U,I4 |
| Naphthalene | mg/kg | 5.6 | 0.0224 | U,I4 |
| Tetrachloroethene | mg/kg | 6 | 0.0224 | U,I4 |
| Toluene | mg/kg | 10 | 0.0224 | U,I4 |
| trans-1,2-Dichloroethene | mg/kg | 30 | 0.0224 | U,I4 |
| trans-1,3-Dichloropropene | mg/kg | 18 | 0.0224 | U,I4 |
| Trichloroethene | mg/kg | 6 | 0.0224 | U,I4 |
| Trichlorofluoromethane | mg/kg | 30 | 0.0224 | U,I4 |
| Vinyl chloride | mg/kg | 6 | 0.0090 | U,I4 |
| Xylenes (total) | mg/kg | 30 | 0.0449 | U,I4 |

# TABLE 1
# ANALYTICAL RESULTS - BULGER CLARIFIER SLUDGE
# MAX ENVIRONMENTAL TECHNOLOGIES, INC.
# BULGER, PA

| Analyte and Method | Units | Universal Treatment Standard (1) | 5/15/2017 | |
|---|---|---|---|---|
| | | | Result (2) | Qualifiers |
| **Semivolatile Organic Compounds (8270D)** | | | | |
| 1,2,4-Trichlorobenzene | mg/kg | 19 | 9.36 | U,A7 |
| 1,2-Dichlorobenzene | mg/kg | 6 | 9.36 | U,A7 |
| 1,2-Diphenylhydrazine | mg/kg | - | 9.36 | U,A7 |
| 1,3-Dichlorobenzene | mg/kg | 6 | 9.36 | U,A7 |
| 1,4-Dichlorobenzene | mg/kg | 6 | 9.36 | U,A7 |
| 2,4,5-Trichlorophenol | mg/kg | 7.4 | 9.36 | U,A7 |
| 2,4,6-Trichlorophenol | mg/kg | 7.4 | 9.36 | U,A7 |
| 2,4-Dichlorophenol | mg/kg | 14 | 9.36 | U,A7 |
| 2,4-Dimethylphenol | mg/kg | 14 | 9.36 | U,A7 |
| 2,4-Dinitrophenol | mg/kg | 160 | 46.8 | U,A7,F |
| 2,4-Dinitrotoluene | mg/kg | 140 | 9.36 | U,A7 |
| 2,6-Dinitrotoluene | mg/kg | 28 | 9.36 | U,A7 |
| 2-Chloronaphthalene | mg/kg | 5.6 | 9.36 | U,A7 |
| 2-Chlorophenol | mg/kg | 5.7 | 9.36 | U,A7 |
| 2-Methylnaphthalene | mg/kg | - | 9.36 | U,A7 |
| 2-Methylphenol | mg/kg | 5.6 | 9.36 | U,A7 |
| 2-Nitroaniline | mg/kg | - | 9.36 | U,A7 |
| 2-Nitrophenol | mg/kg | - | 9.36 | U,A7 |
| 3 & 4-Methylphenol | mg/kg | 5.6 | 9.36 | U,A7 |
| 3,3´-Dichlorobenzidine | mg/kg | - | 9.36 | U,A7 |
| 3-Nitroaniline | mg/kg | - | 9.36 | U,A7 |
| 4,6-Dinitro-2-methylphenol | mg/kg | 160 | 46.8 | U,A7 |
| 4-Bromophenyl phenyl ether | mg/kg | 15 | 9.36 | U,A7 |
| 4-Chloro-3-methylphenol | mg/kg | 14 | 9.36 | U,A7 |
| 4-Chloroaniline | mg/kg | 16 | 9.36 | U,A7 |
| 4-Chlorophenyl phenyl ether | mg/kg | - | 9.36 | U,A7 |
| 4-Nitroaniline | mg/kg | 28 | 9.36 | U,A7 |
| 4-Nitrophenol | mg/kg | 29 | 9.36 | U,A7 |
| Acenaphthene | mg/kg | 43.4 | 9.36 | U,A7 |
| Acenaphthylene | mg/kg | 3 | 9.36 | U,A7 |
| Acetophenone | mg/kg | 9.7 | 9.36 | U,A7 |
| Aniline | mg/kg | 14 | 9.36 | U,A7 |
| Anthracene | mg/kg | 3.4 | 9.36 | U,A7 |
| Benzidine | mg/kg | - | 46.8 | U,A7,F |
| Benzo (a) anthracene | mg/kg | 3.4 | 9.36 | U,A7 |
| Benzo (a) pyrene | mg/kg | 3.4 | 9.36 | U,A7 |
| Benzo (b) fluoranthene | mg/kg | 6.8 | 9.36 | U,A7 |
| Benzo (g,h,i) perylene | mg/kg | 1.8 | 9.36 | U,A7 |
| Benzo (k) fluoranthene | mg/kg | 6.8 | 9.36 | U,A7 |
| Benzoic acid | mg/kg | - | 93.6 | U,A7 |
| Benzyl alcohol | mg/kg | - | 9.36 | U,A7 |
| Bis(2-chloroethoxy)methane | mg/kg | 7.2 | 9.36 | U,A7 |
| Bis(2-chloroethyl)ether | mg/kg | 6 | 9.36 | U,A7 |
| Bis(2-chloroisopropyl)ether | mg/kg | 7.2 | 9.36 | U,A7 |
| Bis(2-ethylhexyl)phthalate | mg/kg | 28 | 9.36 | U,A7 |
| Butyl benzyl phthalate | mg/kg | 28 | 9.36 | U,A7 |

# TABLE 1
# ANALYTICAL RESULTS - BULGER CLARIFIER SLUDGE
# MAX ENVIRONMENTAL TECHNOLOGIES, INC.
# BULGER, PA

| Analyte and Method | Units | Universal Treatment Standard (1) | 5/15/2017 | |
|---|---|---|---|---|
| | | | Result (2) | Qualifiers |
| **Semivolatile Organic Compounds (8270D)** | | | | |
| Chrysene | mg/kg | 3.4 | 9.36 | U,A7 |
| Dibenz (a,h) anthracene | mg/kg | 8.2 | 9.36 | U,A7 |
| Dibenzofuran | mg/kg | - | 9.36 | U,A7 |
| Diethyl phthalate | mg/kg | 28 | 9.36 | U,A7,F |
| Dimethyl phthalate | mg/kg | 28 | 9.36 | U,A7 |
| Di-n-butyl phthalate | mg/kg | 28 | 9.36 | U,A7 |
| Di-n-octyl phthalate | mg/kg | 28 | 9.36 | U,A7 |
| Diphenylamine | mg/kg | - | 9.36 | U,A7 |
| Fluoranthene | mg/kg | 3.4 | 9.36 | U,A7 |
| Fluorene | mg/kg | 3.4 | 9.36 | U,A7 |
| Hexachlorobenzene | mg/kg | 10 | 9.36 | U,A7 |
| Hexachlorobutadiene | mg/kg | 5.6 | 9.36 | U,A7 |
| Hexachlorocyclopentadiene | mg/kg | 2.4 | 9.36 | U,A7 |
| Hexachloroethane | mg/kg | 30 | 9.36 | U,A7 |
| Indeno (1,2,3-cd) pyrene | mg/kg | 3.4 | 9.36 | U,A7 |
| Isophorone | mg/kg | - | 9.36 | U,A7 |
| Naphthalene | mg/kg | 5.6 | 9.36 | U,A7 |
| Nitrobenzene | mg/kg | 14 | 9.36 | U,A7 |
| N-Nitrosodimethylamine | mg/kg | - | 9.36 | U,A7 |
| N-Nitrosodi-n-propylamine | mg/kg | - | 9.36 | U,A7 |
| Pentachlorophenol | mg/kg | 7.4 | 46.8 | U,A7 |
| Phenanthrene | mg/kg | 5.6 | 9.36 | U,A7 |
| Phenol | mg/kg | 6.2 | 9.36 | U,A7 |
| Pyrene | mg/kg | 8.2 | 9.36 | U,A7 |
| Pyridine | mg/kg | 16 | 18.7 | U,A7 |
| **Total Cyanide (9014)** | | | | |
| Cyanide (total) | mg/kg | - | 2.29 | U |
| **Fluoride (9056A)** | | | | |
| Fluoride | mg/kg | - | 536 | I |
| **Sulfide (9030/9034)** | | | | |
| Sulfide | mg/kg | - | 89.7 | U |
| **% Solids (2540G)** | | | | |
| % Solids | % | - | 21 | |
| **Amenable Cyanide (4500)** | | | | |
| Amenable Cyanide | mg/kg | - | 2.29 | U |
| **Metals (6010B/7471B)** | | | | |
| Antimony | mg/kg | --(4) | 22.8 | U,I,L |
| Arsenic | mg/kg | --(4) | 18.3 | U,I |
| Barium | mg/kg | --(4) | 9140 | I,L |
| Beryllium | mg/kg | --(4) | 7.88 | |
| Cadmium | mg/kg | --(4) | 3.66 | J |
| Chromium | mg/kg | --(4) | 215 | I |
| Lead | mg/kg | --(4) | 125 | I |
| Mercury | mg/kg | --(4) | 0.139 | |

# TABLE 1
# ANALYTICAL RESULTS - BULGER CLARIFIER SLUDGE
# MAX ENVIRONMENTAL TECHNOLOGIES, INC.
# BULGER, PA

| Analyte and Method | Units | Universal Treatment Standard (1) | 5/15/2017 | |
|---|---|---|---|---|
| | | | Result (2) | Qualifiers |
| **Metals (6010B/7471B)** | | | | |
| Nickel | mg/kg | --(4) | 765 | I |
| Selenium | mg/kg | --(4) | 45.6 | U,I |
| Silver | mg/kg | --(4) | 9.13 | U,G |
| Thallium | mg/kg | --(4) | 45.6 | U,I |
| Vanadium | mg/kg | --(4) | 46 | |
| Zinc | mg/kg | --(4) | 1480 | I |
| **TCLP Metals (1311/6010B/7471B)** | | | | |
| Antimony | mg/l | 1.15 | 0.0732 | |
| Arsenic | mg/l | 5 | 0.0400 | U |
| Barium | mg/l | 21 | 0.607 | |
| Beryllium | mg/l | - | 0.0100 | U |
| Cadmium | mg/l | 0.11 | 0.0200 | U |
| Chromium | mg/l | 0.6 | 0.0250 | U |
| Lead | mg/l | 0.75 | 0.0400 | U |
| Mercury | mg/l | 0.25 | 0.0020 | U,K,Q |
| Nickel | mg/l | 11 | 0.250 | U |
| Selenium | mg/l | 5.7 | 0.100 | U |
| Silver | mg/l | 0.14 | 0.0200 | U |
| Thallium | mg/l | - | 0.100 | U |
| Vanadium | mg/l | - | 0.100 | U |
| Zinc | mg/l | - | 0.100 | U |
| **pH (1311)** | | | | |
| pH | SU | - | 8.37 | |

**NOTES**

(1) 40 CFR 268.40 Univeral Treatment Standards For Non-Wastewaters. Analytes for which no UTS is available are indicated with "--".
(2) Non-detected values are laboratory reporting limits. Method Detection Limits reported by the laboratory for PCBs, total arsenic, and total silver. Reporting limits presented for the sake of consistency.
(3) UTS for PCB is the sum of all PCB Isomers
(4) No UTS for Total Metals. See TCLP results

U - Not detected at reported concentration
D - A continuing calibration verifcation analyzed with the analytical batch recovered above the acceptance range
F - The laboratory control sample analyzed with this preparation batch recovered above the acceptance range for
G - The laboratory control sample analyzed with this preparation batch recovered below the acceptance range for
I - The spike recovery was below the acceptance range for the matrix spike and/or matrix spike duplicate sample analyzed with the preparation batch
J - Detected between the method detection limit and the reporting limit; therefore, the result is an estimated value
I4 - Vials were prepared at the laboratory from the received container
K - The RPD result exceeded the quality control limits for the duplicate, laboratory control sample duplicate, or
L - The noted analyte was detected in the method blank
Q - Sample was analyzed at a dilution. Reporting limits were adjusted accordingly
A7 - A reduced amount of sample was used during the preparation step due to the matrix of the sample
SU - Standard units

**TABLE 2**
**SLUDGE SAMPLING AND ANALYSIS SUMMARY**
**MAX ENVIRONMENTAL TECHNOLOGIES, INC. FACILITY**
**BULGER, PENNSYLVANIA**

| Analyte | No. of Samples [1] | Method Reference | Bottle Type | Required Sample Volume | Preservation | Holding Time |
|---|---|---|---|---|---|---|
| VOCs | 3 | SW846 5035A<br>SW846 8260B | Bisulfate Vials, 1-40 mL Methanol Vial | 5 grams per vial | 4°C | 14 days to analysis |
| SVOCs | 3 | SW846 8270D | Glass | 30 grams | 4°C | 14 days to extraction; 40 days to analysis |
| Pesticides | 3 | SW846 8081B | Glass | 10 grams | 4°C | 14 days to extraction; 40 days to analysis |
| Chlorinated Herbicides | 3 | SW846 8151A | Glass | 30 grams | 4°C | 14 days to extraction; 40 days to analysis |
| PCBs | 3 | SW846 8082 | Glass | 10 grams | 4°C | 180 days to extraction |
| TAL Metals | 3 | SW846 6000/7000 series | Glass | 5 grams | 4°C | 28 days for Hg; 6 months for other metals |
| Total Cyanide | 3 | SW846 9010/9014 | Glass | 10 grams | 4°C | 14 days |
| Amenable Cyanide | 3 | SM20-4500 CN-C+E+G | Glass | 10 grams | 4°C | 14 days |
| pH | 3 | SW 846 9045D | Glass | 20 grams | 4°C | Technically a field analysis so immediately. |
| Fluoride | 3 | SW 846 9056A | Glass | 2.5 grams | 4°C | 28 days |
| Sulfide | 3 | SW 846 9030/9034 | Glass | 10 grams | 4°C | 7 days |
| % Solids | 3 | SW 846 2540G-97 | Glass | 25 grams | 4°C | 7 days |
| TCLP SVOCs | 3 | EPA 1311/3510C/8270D | Glass | 100 grams | 4°C | 14 days to TCLP extraction |
| TCLP Metals | 3 | EPA 1311/6010B/7471B | Glass | 100 grams | 4°C | 28 days to TCLP extraction for Hg; 6 months for other metals |
| pH | 3 | EPA 1311 | * | * | * | * |

(1) Three complete round of analyses will be performed in October and December 2017 and March 2018 .

* This is reported as a portion of the TCLP extraction, no additional sample aliquot needed.

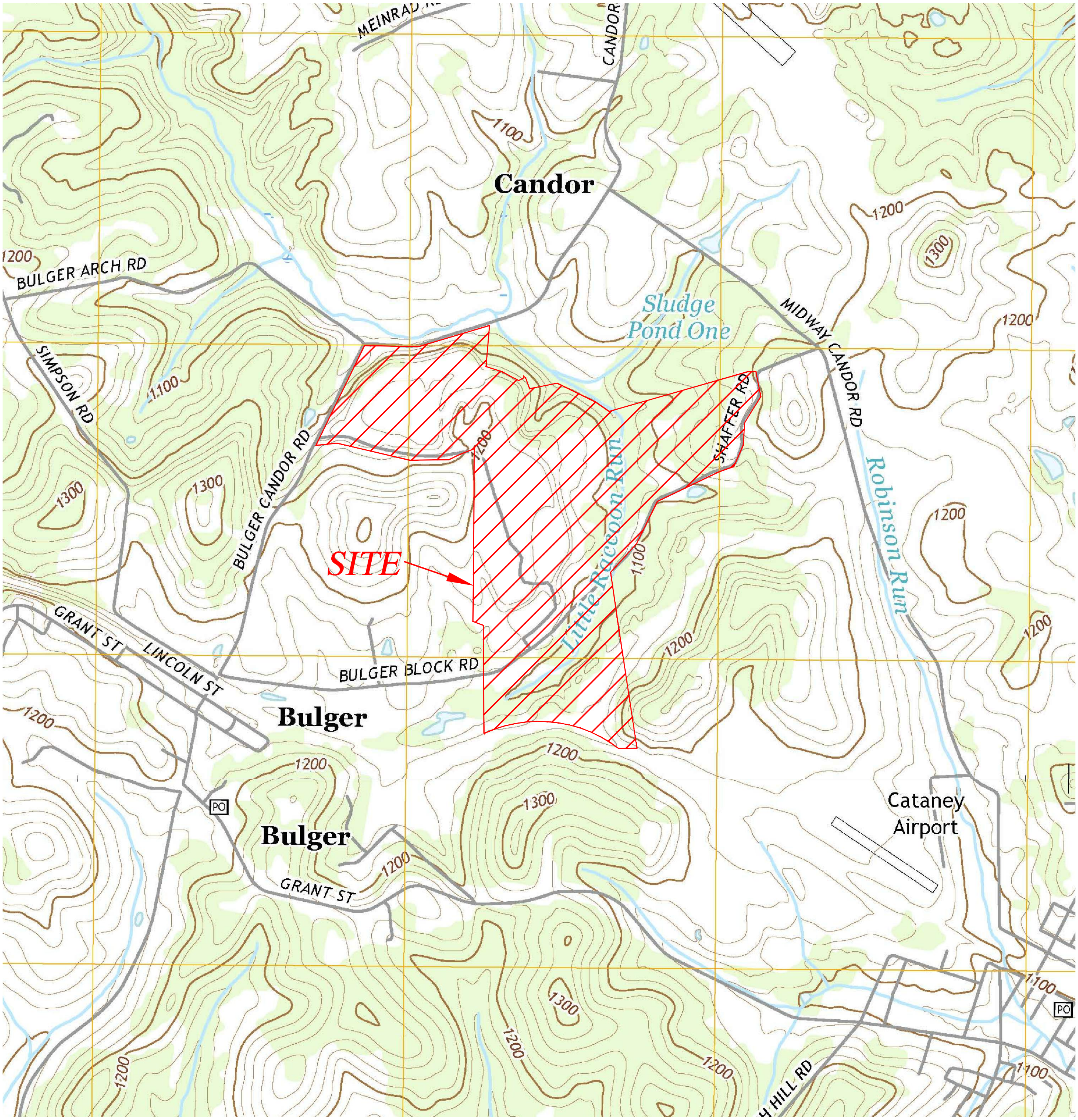
**TABLE 3**
**TASK SAFETY ANALYSIS**
**MAX ENVIRONMENTAL TECHNOLOGIES, INC. - BULGER FACILITY**
**BULGER, PENNSYLVANIA**

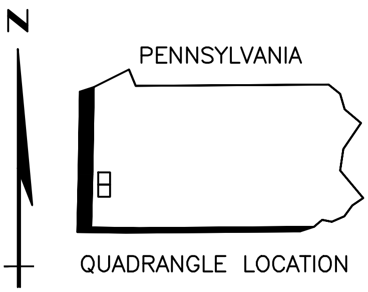
| TASK/JOB STEPS | HAZARD/<br><br>POTENTIAL DANGER | CONTROL METHOD/MEASURES TO ELIMINATE DANGER | STOP ACTION ITEMS |
|---|---|---|---|
| Detailed steps of the job in sequence<br><br>(who/how) | Potential for accidents, or hazards to be accounted for during job steps.<br>(what/when/where) | Precautions: behavioral, organizational, technical. Use of protective equipment.<br>(who/what/when/where/how) | Unsafe acts or unsafe conditions that will stop work for re-assessment of safe work practices |
| Getting to roll-off box location | Slips/Trips/Falls at ground level<br><br>Motor Vehicle/Equipment Traffic<br><br>Exposure to elements | Be careful while walking on terrain and walking over other debris or sludge.<br>If driving to roll-off box, keep alert when driving and do not use cell phones while driving.<br>If walking to roll-off box, be aware of other vehicles and equipment. Wear hard hat and high visibility vest along with Level D protection.<br>Check weather conditions and location of roll-off box if near high grass areas or in/around excessive mud. | Roll-off box in unsafe area (i.e.: close to moving equipment, conditions that pose slip/trip/fall<br><br>Unsafe path to roll-off box that needs sampled<br><br>Poor weather conditions<br><br>Not wearing the appropriate PPE |
| Accessing the roll-off box to be sampled. | Falling from access into roll-off box.<br><br>Possible sharp edges on roll-off box sides/top.<br><br>Pinch points between access ladder and roll-off box<br><br>Carrying equipment to the barge | Wear Level D protection including hard hat, safety glasses, high visibility vest, and gloves.<br><br>Be aware of surroundings.<br><br>Check sides and edges of roll-off box to locate a safe access point into the roll-off box.<br><br>Try to keep hands free and away from pinch point areas. | Not wearing the appropriate PPE<br><br>Unfavorable weather conditions (high wind, excessive rain, thunderstorms, extreme heat)<br><br>Roll-off box hazards not identified |
| Climbing into the roll-off box to retrieve samples. | Falling into roll-off box<br><br>Falling from ladder<br><br>Getting snagged on side of roll-off box<br><br>Bringing equipment into the roll-off box.<br><br>Exposure to material in roll-off box. | Wear Level D protection including hard hat, safety glasses, high visibility vest, and gloves.<br><br>Be aware of roll-off box content surroundings.<br><br>Lower multi-gas meter into roll-off box prior to entry to identify safe entry conditions. (Confined Space Entry procedures may need applied).<br><br>Maintain 3 points of contact while on ladder.<br><br>Hand equipment to one another in and out of roll-off box.<br><br>Secure ladder to side of roll-off box as best as possible. | Not wearing the appropriate PPE<br><br>Potential hazardous conditions inside roll-off box<br><br>Fail to secure ladder<br><br>Fail to follow CSE procedures (if applicable)<br><br>Cannot transfer equipment into roll-off box in a safe manner |

# TABLE 3
# TASK SAFETY ANALYSIS
# MAX ENVIRONMENTAL TECHNOLOGIES, INC. - BULGER FACILITY
# BULGER, PENNSYLVANIA

| TASK/JOB STEPS | HAZARD/ POTENTIAL DANGER | CONTROL METHOD/MEASURES TO ELIMINATE DANGER | STOP ACTION ITEMS |
|---|---|---|---|
| Detailed steps of the job in sequence (who/how) | Potential for accidents, or hazards to be accounted for during job steps. (what/when/where) | Precautions: behavioral, organizational, technical. Use of protective equipment. (who/what/when/where/how) | Unsafe acts or unsafe conditions that will stop work for re-assessment of safe work practices |
| Retrieving material from the roll-off box | Standing on uneven material<br>Utilizing miscellaneous hand/power equipment (shovel, spade, pick, cordless drill w/ large drill bit, etc.)<br>Possible strains/sprains<br>Sinking into material | Wear Level D protection including hard hat, safety glasses, high visibility vest, and gloves.<br>Use equipment in safe manner, use tool for intended purpose, use care to avoid glass breakage.<br>Do not overexert when using equipment.<br>Be aware of surroundings. | Excessive loose/soft material in barge<br>Using wrong tool/equipment for sampling<br>Not performing sampling procedures per SOP |
| Climbing out of the roll-off box. | Falling onto ground<br>Falling into roll-off box<br>Getting snagged on side of box<br>Bringing equipment out of the box<br>Ladder safety | Wear Level D protection including hard hat, safety glasses, high visibility vest, and gloves.<br>Be aware of roll-off box and outside surroundings.<br>Try to keep hands free.<br>Hand equipment to one another in and out of roll-off box.<br>Secure ladder to side of roll-off box as best as possible.<br>Maintain 3 points of contact while on ladder. | Not wearing the appropriate PPE<br>Potential hazardous conditions inside roll-off box<br>Fail to secure ladder<br>Roll-off box hazards not identified<br>Cannot transfer equipment out of roll-off box in a safe manner |

**FIGURES**




0 1500 3000 FEET

REFERENCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLES
CLINTON, PENNSYLVANIA 2016
MIDWAY, PENNSYLVANIA 2016

ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

MAX ENVIRONMENTAL TECHNOLOGIES, INC.

| | |
|---|---|
| DRWN: SCC | DATE: 08/02/17 |
| CHKD: AEH | DATE: 08/02/17 |
| APPD: | DATE: |
| SCALE: | AS SHOWN |

KEY ENVIRONMENTAL INCORPORATED

SAMPLING AND ANALYSIS PLAN
F039 DELISTING
BULGER, PENNSYLVANIA

SITE LOCATION MAP

PROJECT NO: 17-472

FIGURE 1


MAX ENVIRONMENTAL TECHNOLOGIES, INC.

| | | |
|---|---|---|
| DRWN: SCC | DATE: 08/02/17 | KEY ENVIRONMENTAL INCORPORATED |
| CHKD: AEH | DATE: 08/02/17 | |
| APPD: | DATE: | |
| SCALE: | AS SHOWN | |

SAMPLING AND ANALYSIS PLAN
F039 DELISTING
BULGER, PENNSYLVANIA

REFERENCE: AERIAL OBTAINED FROM GOOGLE EARTH DATED 4-17-2016.

ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

SITE PLAN

PROJECT NO: 17-472

FIGURE 2

# ATTACHMENT A

## STANDARD OPERATING PROCEDURES (SOPs)

No. 03 – Field Logbook
No. 04 – Management of Investigation-Derived Wastes
No. 22 – Environmental Sample Preparation
No. 23 – Sample Handling, Preservation, Packaging and Shipping
No. 24 – Chain of Custody
No. 25 – Equipment Decontamination
No. 31 – Sediment Sampling

# 03 - FIELD LOGBOOK

## 1.0 SCOPE AND PURPOSE

This Standard Operating Procedure (SOP) establishes the requirements of the entry of information into logbooks to ensure that KEY field activities are properly documented. Field logbooks are the primary source of documentation for site activities, and serve as legal record of all occurrences during those activities. The project manager and the field team leader are responsible for ensuring the logbook entries provide sufficient information for the completion of an accurate and detailed description of field operations.

Complete and accurate logbook entries are essential to

- Ensure that data collection associated with field activities is sufficient to support the successful completion of the project
- Provide sufficient information that someone not affiliated with the project can independently reconstruct the field activities at a later date
- Maintain quality control throughout the project
- Document changes to or deviations from the Work Plan
- Fulfill administrative needs of a project
- Support potential legal proceedings associated with a specific project

### 1.1 Referenced SOPs

None

### 1.2 Definitions

(Reserved)

## 2.0 REQUIRED MATERIALS

The required materials for maintaining a field log book include a water-resistant, permanently bound notebook (such as *Rite in the Rain ALL-WEATHER ENVIRONMENTAL No. 550F* notebook (or equivalent) and a pen with permanent ink.

## 3.0 METHODOLOGIES

Pertinent information regarding the site and work procedures must be documented. Information recorded in the notebook should be noted with the date and time of entry. Each field crew shall maintain a single logbook. Legibility must be maintained. The following items are commonly included as logbook entries:

- Name and location of site
- Date and time of arrival and departure
- Name and affiliation of person keeping log
- Names and affiliations of project personnel present on site
- Sampling event description; including methodology, sample numbers and volumes, description of samples, date and time of sample collection, and name of collector
- Prevailing weather conditions and weather delays
- Technical measurements and readings, with notation of anomalous measurements
- Record of phone calls/and or contact with individuals at the site
- Record of approval of field changes to the scope of work
- Diagrams and sketches as needed to document sample locations
- Physical obstructions encountered during field activities
- Reference to global positioning system data collected, if applicable
- Description of equipment used
- Equipment problems encountered and resolution of such problems
- Management or disposal of investigation-derived wastes
- List and descriptions of photographs including camera used, photographer's name, and the direction or view angle of the photograph
- Equipment calibration information

Information should be recorded in permanent ink for the legal record. The company name, address, and phone number should be entered at the beginning of the log book. The title page should also include the start/finish dates for the activity, and whether more than one logbook is included in the record (e.g., Book __ of __). The pages of the logbook should be numbered for ease of reference. Blank spaces should be crossed out and initialed. No pages may be removed from the logbook for any reason.

All notes should be written at the time of observation. If this is not possible, the logbook should indicate when the observations were recorded and the reason for the delay. Changes or deletions should be crossed out with a single line and initialed by the individual making the change.

At the end of each field day, the project scientist/engineer or designee should sign and date each page of the notebook on which entries were made to verify the day's activities. Unused lines at the end of each day's work shall be marked with a diagonal line, signed and dated. The field team leader (or designee) must also sign and date the final daily entry page of each field crew member maintaining a separate logbook. Each day's work shall be recorded starting on a new page, with the date, time, weather conditions, and team members present.

On at least a weekly basis, completed pages must be copied to the project files on the office served so that the loss or accidental destruction of the logbook will result in a minimal loss of data. Copies shall be reviewed to ensure that they are legible.

## 4.0 QUALITY ASSURANCE/QUALITY CONTROL

At the end of each day of field activities, the individual or individuals maintaining the field logbook should review the notes for accuracy and completeness. Corrections, deletions, or additions should be stricken, initialed and dated.

## 5.0 DOCUMENTATION AND RECORD KEEPING

The first page of all field logbooks must contain the holder's name and contact information.

It is recommended that a running activity log be maintained, indicating the times of activities and observations; recorded data be written in the form of tables with an appropriate title; and that diagrams be included to illustrate pertinent information. Logbooks should be labeled with the project name, project number, and a consecutive number for cataloging purposes.

Copies made for the project file will become the primary record of the job activities. The filled logbook remains a working copy until project completion, at which time the logbook is physically stored in the project files.

## 6.0 REFERENCES

Environmental Research Center, University of Nevada - Las Vegas, March 1989, Soil Sampling Quality Assurance User's Guide: U.S. Environmental Protection Agency EPA/600/8-89/046, 260 p.

Fetter, C.W., 1994, Applied Hydrogeology: New York, Macmillan College Press Publishing Company, 691 p.

U.S. EPA, November 1992, RCRA Ground-Water Monitoring: Draft Technical Guidance: Office of Solid Waste and Emergency Response, OSWER-9950.1.

U.S. EPA, 1987, A Compendium of Superfund Field Operations Methods: Office of Solid Waste and Emergency Response, OSWER 9355.0-14.

U.S. EPA, 2005, Compliance-Focused Environmental Management System – Enforcement Agreement Guidance: National Enforcement Investigations Center, EPA-330/9-97-002R. http://www.epa.gov/oecaerth/resources/policies/neic/cfems_05.pdf.

U.S. EPA, 2007, Contract Laboratory Program Guidance for Field Samplers: Office of Superfund Remediation and Technology Innovation, OSWER 9240.0-44, EPA 540-R-17-06. http://www.epa.gov/superfund/programs/clp/download/sampler/clp_sampler_guidance.pdf.

U.S. EPA, 1988, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA: Office of Solid Waste and Emergency Response, OSWER 9355.3-01. http://www.epa.gov/superfund/policy/remedy/pdfs/540g-89004-s.pdf.

U.S. EPA, 1991, Guidance for Performing Preliminary Assessments Under CERCLA: Office of Solid Waste and Emergency Response, OSWER 9345.0-01A. http://www.epa.gov/superfund/sites/npl/hrsres/.

U.S. EPA, 1991, Guidance for Performing Site Inspections Under CERCLA: Office of Solid Waste and Emergency Response, OSWER 9345.1-05. http://www.epa.gov/superfund/sites/npl/hrsres/.

# 04 - MANAGEMENT OF INVESTIGATION-DERIVED WASTES

## 1.0 SCOPE AND PURPOSE

This standard operating procedure (SOP) presents general guidelines for the management of investigation-derived wastes (IDWs), such as, but not limited to the following:

- Drill cuttings generated during soil boring investigations or well installations
- Drilling fluids generated during soil boring investigations or well installations
- Groundwater generated during well development, monitoring well purging, aquifer testing (i.e., pumping tests), or remedial activities
- Water and sediment generated during equipment decontamination
- Used personal protective equipment
- Miscellaneous debris (e.g., well construction materials generated through abandonment of monitoring wells)

Due to the wide range of materials which may be generated and the variety of situations which may arise, it is likely that these SOPs will need to be supplemented with project-specific procedures. Where project-specific procedures are necessary, they should be developed to be consistent with the general guidelines presented below. Determination of the need for and scope of the development of project-specific procedures, will be determined as part of the initial project planning.

### 1.1 Referenced SOPs

None

### 1.2 Definitions

(Reserved)

## 2.0 REQUIRED MATERIALS

Management of investigation-derived wastes requires limited equipment. The following should be available onsite:

- Clean, new 55-gallon drums with lids
- Grease pen or paint stick for labeling
- Labels indicating drum contents and origin

# 3.0 METHODOLOGIES

## 3.1 Containerization

Project-specific requirements for containerization of waste materials will be developed during initial project planning. If applicable, this information may be presented in a project-specific waste management plan. Project-specific containerization requirements should be developed to be consistent with the general guidelines provided below.

1. All potentially impacted materials generated during any investigation or remedial activity must be containerized unless one of the exceptions described below under Item 10 apply. Unless directed otherwise by the client, containers (drums, frac tanks, roll-off boxes, etc.) are to be provided by the consultant or contractor.

2. All potentially impacted materials shall be placed in new or reconditioned 55-gallon (DOT-UN1A2) drums. All drums brought onsite must be clean and in sound condition, free of any rust, dents, holes, or other types of damage.

3. Various types of waste materials (e.g., soils, groundwater, PPE, etc.) must be containerized separately without exception. Additionally, dry and wet soils should be containerized separately, if feasible.

4. Materials generated from various plant process areas, which may require potentially different waste classifications, should be containerized separately.

5. If possible, drums should be filled to approximately 90% capacity. As necessary, drums containing liquids should have enough freeboard to prevent rupture in the event of freezing.

6. Containers inside of containers are not permitted by waste management regulations. As a result, PPE must be placed directly into the drum. **Do not place PPE in a plastic bag and in turn place the plastic bag into a drum.** This constitutes a violation of waste management regulations. Similarly, all soil samples must be removed from jars or plastic bags and the jars crushed or plastic bags torn prior to being placed in a drum.

7. All lids and gaskets must be securely fastened prior to moving from one location to another. The consultant or subcontractor is responsible for transporting containers to an on-site temporary staging area as directed by the Facility Waste Management Director. Containers must be loaded, transported and unloaded in a safe manner.

8. The exterior of all containers must be thoroughly cleaned prior to staging. All mud, dirt or debris must be removed, with no exception. Waste management facilities will not accept containers which are visibly dirty on the outside.

9. Under no circumstances shall non-waste materials or general trash be placed in waste containers. The consultant/subcontractor should provide a dumpster for management of non-waste materials and general trash.

10. Under certain circumstances, the following exceptions to the above requirements may be made if provided by regulations and state/federal concurrence:

    - Some regulatory agencies may allow for all or a portion of generated materials (i.e., auger cuttings, drilling fluids) to be placed back into or onto the ground from which they were generated. The consultant is responsible for identifying these requirements.

    - If an operating water treatment facility exists on-site, groundwater and/or decontamination liquids may be managed into the treatment system if the discharge permit for the treatment facility provides for management of those liquids, and the liquids do not contain materials (e.g., solids or oils) which could potentially effect the operation of the system in an adverse manner. In this instance, consideration must be given to the classification and management of waste materials generated through the treatment of the liquid (e.g., spent activated carbon, filtered soils, etc.)

### 3.2 Container Designation and Labeling

Project-specific requirements for container identification and labeling will be developed during initial project planning. If applicable, this information may be presented in a project-specific waste management plan. Project-specific container designation and labeling requirements should be developed to be consistent with the general guidelines provided below.

1. Each container will be assigned a unique designation. This designation should include a sequential number associated with each waste type, a code which identifies the type of waste (e.g., "S" for soil, "GW" for groundwater, etc.), and the date the material was placed in the container (e.g. 1-GW-12/12/98; 2-GW-12/12/98 etc...). The container designation must be clearly marked on the lid and the side of the container prior to transport to the temporary on-site staging area. The markings must be made in a manner such that the markings are legible, highly visible and permanent (i.e., weather resistant). A "Mean Streak®" grease pen or a paint stick is recommended for marking the container.

2. A "Non-Hazardous Waste" label shall initially be affixed to the exterior side of the drum at a location at least two-thirds of the way up from the bottom of the container. Under the optional information section on the label, the following statement may be included "Material Classification Pending Results of Analysis".

3. The following information is to be recorded by field personnel in the field logbook, as appropriate:

- Container Designation
- Contents (e.g., soil, groundwater, PPE)
- Date that the container was filled
- Location where the drums are staged
- Location, and plant process area, where the material was generated (e.g., soil boring number, monitoring well designation)
- Relative moisture content (e.g., dry, moist, damp, wet, saturated) for soils only, for the purpose of managing the materials for disposal, damp or moist soil are considered "liquid"
- Approximate volume or percentage of the container filled

## 3.3 Container Storage

Project-specific container storage requirements will be developed during the initial planning phase. If applicable, this information may be presented in a project-specific waste management plan. Project-specific container storage requirements should be developed to be consistent with the general guidelines provided below.

1. If the investigative or remedial work is conducted at active or inactive sites owned formerly by the consultant's client, plans for container storage must be developed in conjunction with the current property owner.
2. If containers are to be transported to an on-site staging area, all container handling and moving must be conducted in a safe manner. Contractors are responsible for providing the necessary equipment (e.g., front-end loader, fork lift with drum grappler, etc.) to provide for safe and efficient staging of containers.
3. All containers shall be stored in a neat and organized fashion with all labels clearly visible. Containers shall not be stacked.
4. Containers holding materials of different waste classifications should be staged together to facilitate loading of the materials onto transport vehicles.
5. To the extent practicable, all containers should be protected from the elements.
6. If stored outdoors in an area where precipitation could accumulate, all containers must be placed on pallets.
7. In accordance with DOT requirements, all containers must be rust-free and in sound condition for shipment.
8. Prior to demobilization, field personnel should conduct an inspection of the container storage area to ensure all containers are clearly marked, clean and staged in a neat and organized manner.

## 3.4 Waste Material Inventory

KEY personnel are responsible for completing an inventory of waste materials stored at the project site. The inventory should be completed and entered into the central computer file at KEY's main headquarters in Carnegie, Pennsylvania as soon as possible following field demobilization. The central file is located on the data server by site name in the general directory - Dataserver-P:\projects\IDW\Year\Sitename.exe. The inventory will include a tabular summary of all containers stored at the project site and their respective contents. An example is provided as Attachment 1. Information should be entered into a tabular summary located by site name in the central file under the following headings:

- **Related Activity of Waste Generation** (e.g., RFI, Pilot Study, Interim Measures, etc.)
- **Type of Container** (e.g., drum, roll-off box etc.)
- **Container Designation** (the unique label affixed to the drum)
- **Container Contents** (e.g., soil, groundwater, PPE)
- **Generation Date** (date that the container was filled)
- **Staged Location** (location where the drums are staged pending removal)
- **Location and Plant Process Area Where Waste Was Generated** (e.g., former Process Area, Former Drip Track Area, etc.)
- **Relative Moisture Content** (e.g., dry, moist, damp, wet, saturated) for soils only. For the purposes of managing these materials, damp or moist soils are considered wet.
- **Volume or Percentage Contained (gallons)** (volume or percentage of drum filled - not to exceed 90 percent)
- **Comments** (other pertinent information, as appropriate)
- **Date Removed** (the date the drums are removed from the site for disposal)

### 3.5 Waste Material Sampling and Analysis

Composite samples of the containerized materials for laboratory analysis may be collected for each IDW media. The results of the analysis may be used for waste profiling purposes required by the waste management facility and/or waste classification purposes. Project-specific requirements for waste sampling and analysis will be developed during initial project planning. If applicable, this information may be presented in a project-specific waste management plan. Project-specific waste material sampling and analysis requirements should be developed to be consistent with the standard procedures provided below. To the extent practicable, historical information, site-specific analytical data and knowledge of the waste composition should be utilized to minimize sampling and analysis requirements.

1. Specific details regarding the number and types of samples to be collected, required laboratory turn-around time, analytical parameters and analytical methods will be determined on a project-specific basis during the initial planning phase. If applicable, this information may be presented in a project-specific waste management plan.

2. At a minimum, samples must be collected and handled in accordance with standard industry protocols. If an approved project-specific Sampling and Analysis Plan or Quality Assurance Project Plan exists, then sample collection and handling procedures, as specified therein, must be followed.

3. All analyses must be performed using the appropriate analytical methods specified in EPA SW846 “Test Methods for the Evaluation of Solid Wastes”.

4. The sampler must complete and maintain copies of all chain-of-custody documentation.

5. In accordance with Subpart CC or 40CFR Par 264/265 which became effective on December 6, 1996, hazardous wastes containing greater than 500 parts per million by weight total volatile organic compounds (VOCs), are subject to the emission control requirements of this rule. Determination of VOC content may be made through laboratory analyses or generator knowledge. Thus, analysis for VOCs will likely be required by the waste disposal facility for profiling purposes in the future. Analysis is to be performed using method 25D in 40CFR Part 60 Appendix A, or through the use of an approved alternate method. Knowledge-based waste determinations must be thoroughly documented.

6. Composite samples of similar waste classification of containerized materials will be profiled based on the characteristics presented in 40 CFR Part 261 Subpart C - Characteristics of Hazardous Wastes:

   - §261.21 - Characteristic of Ignitability
   - §261.22 - Characteristic of Corrosivity
   - §261.23 - Characteristic of Reactivity
   - §261.24 - Toxicity Characteristic

### 3.6 Transportation and Disposal

Transportation, disposal, and manifesting of IDW are generally the responsibility of the owner. However, on occasion, KEY may assume responsibility for this task upon client request.

## 4.0 QUALITY ASSURANCE/QUALITY CONTROL

(Reserved)

## 5.0 DOCUMENTATION AND RECORD KEEPING

All field notes, waste inventories, and disposal manifests are to be kept as part of the permanent project records.

## 6.0 REFERENCES

(Reserved)

# ATTACHMENT 1
# SOP 04 – MANAGEMENT OF INVESTIGATION-DERIVED WASTES
# IDW INVENTORY LOGSHEET

KEY ENVIRONMENTAL INCORPORATED

## IDW INVENTORY LOG

Date:

Project Name:

Project Number:

Location:

| Container Identification Number | Type of IDW (SW, GW, NAPL, PPE, Other | Date Filled | Comment / Label Description | Staging Location |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# 22 - ENVIRONMENTAL SAMPLE PREPARATION

## 1.0 SCOPE AND PURPOSE

This Standard Operating Procedure (SOP) presents procedures for selecting appropriate sample containers and preservatives when collecting environmental samples for analysis at a selected laboratory. Procedures for packaging and shipping environmental samples are presented in KEY *SOP 23 – Sample Handling, Preservation, Packaging and Shipping*.

Environmental samples are those that are anticipated to be relatively low in analyte concentration. These samples consist of materials that may have been impacted by source area materials, but do not consist of source area materials such as sludge, material from drums, material from bulk storage tanks, *etc.* Examples of environmental samples include: soil samples collected adjacent to or underlying a source area, stream and sediment samples, and groundwater samples (which do not contain non-aqueous phase liquid).

### 1.1 Referenced SOPs

23 – Sample Handling, Preservation, Packaging and Shipping

### 1.2 Definitions

(Reserved)

## 2.0 REQUIRED MATERIALS

Required materials for sample containers and preservation may include:

- Laboratory-provided various sized glass containers (with Teflon®-lined lids or caps, clear or amber colored) as required for analysis
- Laboratory-provided various sized polyethylene containers (with Teflon®-lined lids or caps) as required for analysis
- Nitric acid
- Sulfuric acid
- Hydrochloric acid
- Sodium hydroxide
- Sodium thiosulfate
- Filtration equipment, if required

Project-specific, appropriate sample container size, sample volume, holding times, and preservatives should be presented in the Quality Assurance Project Plan (QAPP). The selected laboratory should be able to provide the most complete guidance on this topic, and will have been consulted during the preparation of the QAPP. This SOP is intended to provide general information to field and office personnel while preparing the project planning documents, ordering and shipping supplies, and performing sample collection activities.

# 3.0 METHODOLOGIES

## 3.1 Sample Containers

To limit potential chemical or physical changes in a sample during collection and transport, the sample container selection should be based on the following:

- Sample containers should be new and certified clean prior to sampling activities
- Sample containers should be constructed of non-reactive materials
- Sample containers should not chemically or physically alter the sample

The most widely used containers for aqueous samples are composed of glass or polyethylene.

## 3.2 Aqueous Samples

### Glass Containers

Glass containers will be used when organic compounds are the analytes of interest. Sample volume will be sufficient to fill each sample container to allow the laboratory to attain the method-specific detection limits. Specific to volatile organic analysis, sample volume will be sufficient to fill each sample container so that no air bubbles are present. Once the sample container is full and preserved, if appropriate, it will be sealed with a Teflon®-lined screw cap. Specific container sizes for each analytical category are presented in the project-specific QAPP.

### Polyethylene Containers

Polyethylene containers will be used for aqueous samples when metals and/or inorganic analytes are the parameters of interest. One-liter polyethylene bottles with solid polyethylene or polyethylene-lined caps will generally be used to collect groundwater samples for metals and inorganic analysis. Once the sample container is full and preserved, if appropriate, it will be sealed with the polyethylene screw cap. Specific container sizes for each analytical category are presented in the project-specific QAPP.

## 3.2 Solid Samples

Sample containers for the soil matrix are typically clear glass with a volume of 8 ounces. Larger sample containers may be necessary depending upon the number and type of analyses.

## 3.3 Sample Preservation

Sample preservation is important to retard physical and chemical alterations of unstable analytes within the sample matrix. Sample preservation methods are limited and are generally intended to:

- Retard biological action
- Retard hydrolysis of chemical compounds and complexes

- Limit photolysis
- Reduce volatility of constituents
- Reduce sorption effects

Preservation is usually limited to acidification, treatment with an alkaline chemical, reducing light exposure, filtration, and refrigeration.

Prior to any form of preservation, the following parameters, at a minimum, will be measured in the field on water samples and recorded in the field notebook:

- pH
- Specific conductance
- Temperature

These field measurements record baseline information on the water sample prior to external influences such as temperature, dissolved carbon dioxide, or oxygen affecting the sample.

**Acidification**

Acidification of samples is generally performed for two purposes. Acidifying a (water) sample serves to limit metal adsorption to the sample container and will maintain the metal in a dissolved state. Secondly, acidification will act to inhibit bacterial growth. Samples to be acidified for either purpose will require a minimum volume of 100 ml and will be acidified to a pH < 2. Acidification is performed immediately after taking field measurements or following sample filtration.

**Alkaline Treatment**

Samples are preserved with an alkaline chemical (*e.g.* NaOH) to form salts with volatile compounds such as cyanide. Samples undergoing this preservation require a minimum volume of 100 ml and will be treated to a pH >12.

Preservation of the sample will be performed by the addition of NaOH until the desired pH is achieved (pH > 12). Preservation of a water sample is performed immediately after the field measurements are collected and recorded.

**Filtration**

Filtration of samples will be used only for specific analytical parameters. It will be used when the dissolved metal content of water is of concern. Filtration will not be performed for samples to be analyzed for volatile organics, semi-volatile organics, or total recoverable metals.

When sample filtration is required, the sample will be drawn through a 0.45 micron filter. The filter material will either be paper or fiberglass dependent on the nature of the sampled water. Filtration is performed immediately following the field measurements and prior to any other preservation methods. If the sample contains a significant level of suspended solids, a paper prefilter will be used prior to the 0.45 micron filter.

**Temperature Control**

All field samples that are to be analyzed by the laboratory will be sealed and then refrigerated during transfer to and storage at the laboratory. Refrigeration of samples is a bacterial inhibitor and slows the chemical and biological changes of a sample exposed to an oxidizing atmosphere. Transfer and storage of samples will be between $0^{o}$C and $10^{o}$C, with a target temperature of $4^{o}$C. Solid samples are typically limited to this preservation method.

## 3.4 Laboratory Selection and Coordination

Choosing a qualified analytical laboratory is an integral part of sampling activities. Regulatory program requirements and certifications must be considered in selecting the laboratory to ensure that the laboratory is capable of meeting project-specific requirements. Also, the provisions of any Consent Orders or Unilateral Orders applicable to the project must be reviewed and communicated to the laboratory to ensure project-specific requirements are met.

**Laboratory Selection**

An analytical laboratory will be chosen based on the following criteria:

- Capabilities of the laboratory including performance history, certifications, and regulatory program experience
- The qualifications and experience of the laboratory staff
- Availability of a designated technical client representative who serves as a single point of contact for all KEY projects
- Quality and completeness of standard deliverables, including electronic data transfer availability
- The specified analyses and turnaround time
- The adequacy of the laboratory’s quality assurance/quality control program

**Coordination**

After selecting a laboratory, the laboratory will be contacted and the following information requested pertaining to the sampling activities:

- Identification of a responsible party to act as sample custodian at the laboratory who is authorized to accept samples and verify the data entered from the accompanying chain-of-custody forms into the laboratory tracking system
- Provisions for a laboratory sample custody log consisting of serially numbered, standard laboratory tracking report sheets
- Specifications of laboratory sample custody procedures for sample handling, storage, and disbursement for analysis

The laboratory will be notified within 48 hours prior to receipt of samples. The samples will be packaged and shipped *via* express courier or hand delivered within 48 hours of collection to the laboratory. The laboratory will then be contacted to verify receipt of the samples and estimated turnaround time.

### 3.5 Sample Packaging and Shipping

Proper sample packaging and shipping accomplishes the following:

- Allows individual samples to be tracked through transport and analysis
- Limits the possibility of breaking or losing a sample bottle during transport
- Is part of formal chain-of-custody (COC) procedures (tracking of possession of the samples)

Samples will be packaged and shipped according to the procedures in *SOP 23 – Sample Handling, Preservation, Packaging and Shipping*.

## 4.0 QUALITY ASSURANCE/QUALITY CONTROL

(Reserved)

## 5.0 DATA RECORDING OR MANAGEMENT

(Reserved)

## 6.0 REFERENCES

U.S. Environmental Protection Agency, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document: Washington, D.C., OSWER-9950.1.

U.S. Environmental Protection Agency, 1986, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods - SW-846 3rd Edition (with revisions): Washington, D.C.

U.S. Environmental Protection Agency, 1987, A Compendium of Superfund Field Operations Methods, Part 1: Washington, D.C.,EPA/540/P-87/001.

U.S. Environmental Protection Agency, 1991, Compendium of ERT Groundwater Sampling Procedures: Washington, D.C., EPA/540/P-91/007.

# 23 - SAMPLE HANDLING, PRESERVATION, PACKAGING AND SHIPPING

## 1.0 SCOPE AND PURPOSE

This Standard Operating Procedure (SOP) describes the procedures associated with the handling, preservation, packaging, and shipment of environmental samples for laboratory analysis or testing. Environmental samples may consist of air, groundwater, surface water, sediments or soil. The objective of sample preparation, handling, packaging, and shipping protocols is to develop standard procedures which will preserve the integrity of the samples and minimize the potential for sample tracking errors, sample spillage or leakage, and/or sample container breakage. The field team leader is responsible for the implementation of the sample handling, preservation, packaging, and shipping requirements outlined in the project-specific work plan.

### 1.1 Referenced SOPs

24 – Chain of Custody

### 1.2 Definitions

(Reserved)

## 2.0 REQUIRED MATERIALS

Required materials may include the following:

- Sample containers (preserved, as necessary, provided by the laboratory)
- Sample bottle labels
- Chain-of-Custody forms
- Sample cooler
- Bubble wrap or other suitable packing material
- "Blue Ice" (*i.e.*, reusable, freezable ice packs) or sealed bagged ice
- Shipping bills (Federal Express, UPS, etc.)
- Field Logbook
- Indelible ink pens
- Packaging tape
- Zip-lock type plastic bags

## 3.0 METHODOLOGIES

### 3.1 Sample Handling

**Sample Containers**

Sample containers and appropriate preservatives (where necessary) will be supplied by the analytical laboratory. After the respective sample containers have been filled with appropriate sample media and preserved as necessary, samples will be properly identified using sample container labels, and the samples will be stored at an appropriate temperature (usually <4$^{o}$C) to preserve the integrity of the samples.

**Sample Preservation**

Preservatives will be supplied by the laboratory. When possible, preserved containers should be supplied by the lab. Common preservatives include hydrochloric acid (HCl), sulfuric acid ($H_2SO_4$), nitric acid ($HNO_3$), or sodium hydroxide (NaOH). Samples will be preserved in accordance with EPA protocol specified in SW-846 or the project specific protocols outlined in the quality assurance project plan (QAPP). Use of the preservatives will be noted on the COC for each particular sample and analytical parameter.

**Sample Labels**

Blank sample labels will be supplied by the analytical laboratory and affixed to the sample container. Sample labels will be completed using waterproof permanent markers or ink. The labels will be filled out at the time of sample collection by the field sampling personnel. The following identifying sample information will be included on the label:

- Client/Site
- Sample identification alpha-numeric code defined in the project planning documents
- Sample collector's initials
- Date and time (military) of sample collection
- Analytical method
- Laboratory analysis to be performed

**Chain-of-Custody Forms**

A chain-of-custody (COC) record will be established and maintained to document sample possession from the time of collection until receipt by the laboratory. A sample is considered to be in custody if it is in your physical possession, if it is in your view after being in possession, or if it is placed in a secure area with access controlled by you. Once samples are received by the laboratory, they will be handled under the laboratory internal COC procedures. Field sampling personnel will initiate a COC record by recording the following minimum data as the samples are collected:

- Client/Site
- Name(s) of sampler(s)
- Sample identification alpha-numeric code
- Date and time (military) of sample collection
- Type of sample (e.g., soil, groundwater)
- Number of containers per sample location
- Requested analyses
- Type of containers and preservatives used
- Name and address for the competed laboratory reports
- Name and address for the laboratory invoices
- Specific instructions/notes for the laboratory, as necessary

Sample COC forms will be placed in waterproof plastic bags and taped to the underside of the cooler lids. Sample COC forms will generally be supplied by the subcontracting analytical laboratory.

Subsequently, at each change of possession, the COC record will be signed by the person relinquishing the samples and by the person receiving the samples. The date and time of the transfer of possession of the sample will be recorded on the COC form; this occurs when the samples are transferred from the sampling personnel to the courier and when the samples are received at the analytical laboratory. Sample COC forms shall be completed in ink. Any transcription errors shall be corrected by striking the erroneous information with a single horizontal line. The correct information will be added immediately adjacent to the strikeout. The sampler should initial the correction. (Refer to *SOP 24 – Chain of Custody* for additional information).

## 3.2 Sample Packaging and Shipping

All samples will be transported to the analytical laboratory in durable, waterproof, secured metal or plastic coolers. Sample coolers will generally be supplied by the laboratory. All samples will be packaged very carefully to prevent sample breakage. Samples will be shipped *via* overnight carrier (*e.g.,* Federal Express or United Parcel Service) or hand delivered to the analytical laboratory, generally within 48 hours of collection. Airbills serve as custody documentation during shipping. However, project specific protocols will be checked to assure that specified sample holding times are not exceeded in the event that samples are not shipped on the same day that they were collected. Additionally, the sample security and preservation must be maintained if samples are not to be transported immediately to the laboratory. The following procedure should be followed for packaging samples for shipment to the laboratory for testing and/or analysis.

1. Place plastic bubble wrap matting or suitable material over the base and bottom corners of each cooler or shipping container.
2. Obtain a chain-of-custody record (similar to the example shown in Attachment 1of *SOP 24 – Chain of Custody*) and enter all the appropriate information as discussed above. Chain-of-custody records will include complete information for each sample. One or

more chain-of-custody records shall be completed for each cooler or shipping container as needed to manifest each sample.

3. Place bubble wrapping or other suitable material around glass bottles and place standing upright on the base of the cooler, taking care to leave room for packing material and ice or equivalent. Rubber bands or tape may be used to secure wrapping completely around each sample bottle.

4. Place additional bubble wrap and/or Styrofoam pellet packing or equivalent material throughout the voids between sample containers within each cooler.

5. Place cold packs or ice in heavy duty zip-lock type plastic bags, completely close the bags, and distribute such packages over the top of the samples. Add additional bubble wrap and/or Styrofoam pellets or other packing materials to fill the balance of the cooler or container.

6. If shipping the samples by express, courier, or delivery service, sign the chain-of-custody record thereby relinquishing custody of the samples. The date and time of custody transfer should be recorded on the chain-of-custody form. The custody transfer should be documented when directly transferring custody to a receiving party or when transmitting to a shipping service for subsequent receipt by the analytical laboratory. The shipping service should not be asked to sign chain-of-custody records.

7. Remove the last copy from the chain-of-custody record and retain with the field records. Place the original and remaining copies in a zip-lock type plastic bag and tape the bag to the underside of the lid of the cooler or shipping container.

8. Close the top or lid of the cooler or shipping container and with another person gently rotate the container to verify that the contents are packed so that they do not move. Improve the packaging if needed and reclose.

9. Packaging tape should be wrapped entirely around the sample shipping containers. A minimum of two full wraps of packaging tape will be placed in at least two places on the cooler or shipping container. Some project-specific QAPP may require custody seals be placed on the sample shipping containers. Sign and date the chain-of-custody tape.

10a. When transporting samples by automobile to the laboratory, and where periodic changes of ice are required, the cooler should only be temporarily closed so that reopening of the cooler can be easily performed. In these cases, chain-of-custody will be maintained by the person transporting the samples and chain-of-custody tape need not be used. If the cooler is to be left unattended, then chain-of-custody procedures should be implemented.

10b. If shipment is required, transport the cooler to an overnight express package terminal or arrange for pickup. Obtain copies of all shipment records as provided by the shipping service.

11. Upon receipt of the samples, the analytical laboratory will open the cooler or shipping container and will sign "received by laboratory" on each chain-of-custody form. The laboratory will verify that the chain-of-custody tape has not been broken previously and that the chain-of-custody tape number corresponds with the number on the chain-of-custody record. The analytical laboratory will then forward the back copy of the chain-of-custody record to the sample collector to indicate that sample transmittal is complete.

## 4.0 QUALITY ASSURANCE/QUALITY CONTROL

Prior to the samples leaving the site, each sample number and analyses, etc. are to be checked against the project planning documents, sample log sheets/field logbook, and chain of custody forms to ensure that all required samples have been collected and are labeled appropriately, and that bottles are filled for all required analyses.

Quality control samples such as rinsate blanks and duplicates will be specified by the project QAPP. A sample jar containing water should be sent as a temperature blank with each sample shipment requiring temperature preservation to ensure proper temperature is maintained. Also, a trip blank, provided by the laboratory will accompany shipments with samples intended for volatile organic chemical (VOC) analysis.

## 5.0 DOCUMENTATION AND RECORD KEEPING

The documentation for supporting the sample handling, preservation, packaging and shipping will consist of chain-of-custody records, shipping records and laboratory reports. In addition, a description of sample packaging procedures will be written in the Field Log Book. All documentation will be retained both physically and electronically in the project files.

## 6.0 REFERENCES

U.S. Environmental Protection Agency, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document: Washington, D.C., OSWER-9950.1.

U.S. Environmental Protection Agency, 1986, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods - SW-846 3rd Edition (with revisions): Washington, D.C.

U.S. Environmental Protection Agency, 1987, A Compendium of Superfund Field Operations Methods, Part 1: Washington, D.C., EPA/540/P-87/001.

U.S. Environmental Protection Agency, 1991, Compendium of ERT Groundwater Sampling Procedures: Washington, D.C., EPA/540/P-91/007.

# 24 - CHAIN OF CUSTODY

## 1.0 SCOPE AND PURPOSE

This Standard Operating Procedure (SOP) presents procedures for documenting possession/custody of environmental samples from the time of collection through delivery to the receiving analytical laboratory. At this point, internal laboratory records should document sample custody until final disposition. This SOP also discusses sample identification and the use of chain-of-custody (COC) forms.

Possession of a sample must be traceable from the time it is collected until analysis is completed. To document sample possession, chain-of-custody procedures are followed. Chain-of-custody evidence includes all documentation associated with the sample including the chain-of-custody form, sample label, custody seal, courier's receipt (if applicable), and field notebook.

A sample is under custody if one or more of the following criteria are met:

- It is in possession of the custodian or a designated member of the sampling team
- It is in plain view, after being in possession
- It was in possession and is secured against tampering
- It is placed in a designated secure area.

### 1.1 Referenced SOPs

23- Sample Handling, Preservation, Packaging and Shipping

### 1.2 Definitions

(Reserved)

## 2.0 REQUIRED MATERIALS

- Sample containers
- Sample container labels
- Chain-of-custody forms
- Zip-lock type plastic bags and tape
- Field logbook and permanent ink, waterproof pen
- Shipping airbills
- Shipping containers
- Locks or packaging tape
- Custody seals.

## 3.0 METHODOLOGIES

The Project Manager (or designee) is responsible for ensuring that sample labeling is completed in accordance with this SOP and that chain-of-custody forms are completed for sample shipments. All individuals relinquishing and receiving samples shall sign, date, and record the time on the chain-of-custody forms.

### 3.1 Sample Identification

Blank sample labels will be supplied by the analytical laboratory and affixed to the sample container. Sample labels will be completed using waterproof permanent markers or ink. The labels will be filled out at the time of sample collection by the field sampling personnel. The following identifying sample information will be included on the label:

- Client/Site
- Unique sample identification alpha-numeric code as specified in the Sampling and Analysis Plan
- Sample collector's initials
- Date and time (military) of sample collection
- Analytical method
- Laboratory analysis to be performed

### 3.2 Chain-of-Custody Forms

Once the sample containers have been filled with the sampled media and properly labeled, they will be prepared for shipment to the receiving analytical laboratory. Coolers containing samples will be accompanied by a chain-of-custody form (see example COC form in Attachment 1).

The field team leader (or designee) shall complete a chain-of-custody form for each lot of packaged samples (*e.g.,* each cooler). COC forms shall be completed in ink. Any transcription errors shall be corrected by striking the erroneous information with a single horizontal line. The corrected information shall be added immediately adjacent to the strikeout. The sampler should initial the correction.

The following information will be recorded on the COC form:

- Client/Site
- Name(s) of sampler(s)
- Sample identification alpha-numeric code
- Date and time (military) of sample collection
- Type of sample (*e.g.*, soil, groundwater)
- Number of containers per sample location
- Requested analyses
- Type of preservatives used

- Name and address for the completed laboratory reports
- Name and address for laboratory invoices
- Specific instructions/notes for the laboratory, as necessary

Any area of the COC, where sample information is not completed should have a diagonal line initialed by the sampler to show that this portion of the COC will not be completed.

Each COC will be placed in a waterproof zip lock plastic bag and affixed to the underside of the shipping container lid. Samples will be packaged properly for shipment as described in *SOP 23 – Sample Handling, Preservation, Packaging and Shipping*, and dispatched to the appropriate laboratory for analysis. Shipping containers will be padlocked or otherwise sealed for shipment to the laboratory, including the placement of custody seals that would indicate a container has been tampered with.

All shipments should be accompanied by the completed Chain-of-Custody Record. The original record will accompany the shipment to the laboratory, and a copy will be retained by the field team leader for the project file. Shipping bills and receipts must be retained as part of the chain-of-custody documentation. These documents should be scanned weekly and will become part of the permanent project files. Paper copies will be maintained in the project files in the office.

Upon receipt of the samples by the laboratory, the laboratory person assigned to log-in samples will confirm that the shipping container seals are in good condition and have not been disturbed. If a disturbance is noted, the laboratory shall notify the Key Project Manager at once. The original chain-of-custody form is to be signed and dated by the laboratory person logging in the samples. In addition, the receiving laboratory is to inspect each sample and indicate the condition of the sample on the COC. The receiving laboratory is to retain a copy of each chain-of-custody form along with the shipping bill. Internal laboratory chain-of-custody procedures will be followed once samples are logged in by the receiving laboratory.

## 4.0 QUALITY ASSURANCE/QUALITY CONTROL

Prior to shipment, the Field Supervisor shall check to ensure that sample numbers are correct, sample paperwork is complete, field logbooks are maintained, and that the Sampling and Analysis Plan has been followed. If a particular sample location is inaccessible or if a sample could not be collected for any reason, the Project Manager is to be notified immediately. Such information must be included in the field logbook.

## 5.0 DATA RECORDING/MANAGEMENT

All sampling activities are to be documented in the field logbook. As discussed in Section 3.0, information related to tracking environmental samples will be recorded on the COC forms which will be retained in the project files.

All pages of the field logbooks relevant to sampling, as well as copies of all paperwork (COC forms, shipping labels, etc.) are to be scanned. Both paper copies and the digital copies become part of the permanent project file.

## 6.0 REFERENCES

U.S. Environmental Protection Agency, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document: Office of Waste Programs Enforcement, Washington, D.C., EPA/530/Sw-86/055.

U.S. Environmental Protection Agency, 1986, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 3rd Edition (with revisions): Washington, D.C.

U.S. Environmental Protection Agency, 1987, A Compendium of Superfund Field Operations Methods, Part 1: Washington, D.C., EPA/540/P-87/001.

U.S. Environmental Protection Agency, 1991, Compendium of ERT Groundwater Sampling Procedures: Washington, D.C., EPA/540/P-91/007.

# Attachment 1
# Example Chain-of-Custody Form

ENVIRONMENTAL INCORPORATED

**CHAIN OF COUSTODY**

*200 Third Avenue*
*Carnegie, PA 15106*
*Phone (412) 279-3363*
*Fax (412) 279-4332*

**Project No.:** | **Project Name:**

**Samplers:**
(signatures)

| Sample I.D. | Date | Time | Comp | Grab | Sample Location Description | Number of Containers | | | | | | | | | | | Requested Analyses |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

| Relinquish By: (signature) | Date | Time | Received By: (signature) | Date | Time | Notes: |
|---|---|---|---|---|---|---|
| Relinquish By: (signature) | Date | Time | Received By: (signature) | Date | Time | |
| Relinquish By: (signature) | Date | Time | Received By: (signature) | Date | Time | |

**Distribution: Original to Accompany samples; Copy Returned with Report**

C:\Users\sali\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\6G9XX3WL\COC form
Revised 8/13/2012
Form # 3

# CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

Please print. See back of COC for instructions/terms and conditions.

2019 9th Ave.
P.O. Box 1925
Altoona, PA 16602
Phone: (814) 946-4306
Fax: (814) 946-8791

FAIRWAY LABORATORIES
*Environmental Laboratory*

89 Kristi Rd
Pennsdale, PA 17756
Phone: (570) 494-6380

COC # ______

Page _____ of _____

Client Name: ______________________
Address: ______________________
______________________
Contact: ______________________
Phone #: ______________________
Fax #: ______________________
Project Name: ______________________
Quote/PO #: ______________________

Received on ice? Y N

Sample Temp: ________

Reportable to PADEP?
Yes ☐
PWSID # ________

TAT: Normal ☐ Rush ☐
Rush TAT subject to pre-approval and surcharge.
Date Required: ____/____/____

**LAB USE ONLY**

FedEx USPS
UPS Other

Tracking # ______________

| Sample Description/Location | GRAB | Composite | Composite Start: Start Date | Composite Start: Start Time | GRAB -or- Composite End: End Date | GRAB -or- Composite End: End Time | Matrix: Solid | Matrix: Water | Matrix: Other ____ | # of Containers | Analyses Requested | | | | | | | Bottle Type/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

| | Date | Time | | Date | Time |
|---|---|---|---|---|---|
| Sampled by: | | | Received by: | | |
| Relinquished by: | | | Received by: | | |
| Relinquished by: | | | Received by: | | |
| Relinquished by: | | | Received by: | | |

Remarks

By relinquishing my sample to Fairway Laboratories, Inc., I hereby agree to the terms and conditions printed on the reverse.

White Original - FLI File Canary - FLI Copy Pink - Customer Receipt Copy

# 25 - EQUIPMENT DECONTAMINATION

## 1.0 SCOPE AND PURPOSE

This Standard Operating Procedure (SOP) presents general guidelines and step-by-step methods for on-site decontamination of sampling equipment, heavy equipment, and personal protective equipment. Decontamination is performed as a quality assurance measure and a safety precaution. Decontamination prevents cross-contamination between samples, minimizes contaminant transport, and also helps to maintain a clean working environment for the safety of the field personnel.

Although this SOP defines on-site decontamination procedures, it is highly recommended that (1) dedicated disposable sampling implements are used whenever possible, and (2) sufficient dedicated sampling implements are taken to the field so that the need for field decontamination is eliminated or reduced. For example, in collecting groundwater samples, dedicated, disposable bailers should be used, where practicable.

Decontamination is mainly achieved by washing and rinsing with liquids which include; soap and/or detergent solutions, tap water, distilled water, acetone, hexane, and nitric acid. The actual procedure will vary depending on project-specific requirements as listed in the Quality Assurance Project Plan (QAPjP), the type of equipment to be used, and the analytical parameters of interest.

### 1.1 Referenced SOPs

05 – Management of Investigation-Derived Wastes

### 1.2 Definitions

(Reserved)

## 2.0 REQUIRED MATERIALS

This section contains a general list of materials that may be required to conduct field decontamination of sampling equipment. A particular project may have slightly different requirements; the QAPjP should be consulted prior to gathering and shipping equipment to the site.

- Concrete or lined decontamination pad (as required by project planning documents)
- Plastic sheeting
- Garden-type water sprayers
- Pressure washer, if required
- Portable steam cleaner, if required
- Cleaning brushes
- Distilled water
- Phosphate-free detergent (e.g., Liquinox® or Alconox®)

- Potable water supply
- Hexane
- Acetone
- Isopropanol
- 10% Nitric acid
- Chemical-free paper towels or shop cloths
- Cleaning brushes and scrapers
- Aluminum foil
- Drop cloth or plastic sheeting
- Gloves; safety glasses, protective clothing as specified in the Health and Safety Plan
- Cleaning containers (e.g., buckets, basins, pans)
- Chemically-compatible dedicated squirt or spray bottles for each solvent above and/or distilled water

Additional supplies such as those listed below could be required for waste disposal:

- Trash bags
- Trash containers
- 55-Gallon drums
- Metal or plastic buckets with lids for storage and disposal of decontamination liquids

## 3.0 METHODOLOGIES

Where feasible, all sampling equipment should be cleaned prior to use and dedicated to one sampling location for each sampling event, to minimize the need for cleaning equipment in the field. In some instances, the use of dedicated sampling equipment may not be a practical option, depending on the scope of the project.

In general, decontamination is accomplished by manually scrubbing, washing, or spraying equipment with one or more of the following: detergent solutions, tap water, distilled/deionized water, steam, acids, or solvents. Equipment can be allowed to air dry after being decontaminated or may be wiped dry with chemical-free paper towels, if immediate use is necessary.

The field decontamination methods and agents are to be determined on a project-specific basis and should be stated in the project planning documents. Decontamination plans should be based on a conservative, worst-case scenario, using all available information about a work area. An initial assumption is usually made that all protective clothing and equipment that leave the actual work location are contaminated. Based on this assumption, all nondisposable equipment is washed and rinsed, and disposable equipment and clothing are handled appropriately.

It is the primary responsibility of the field team leader to assure that the proper decontamination procedures are followed. Project-specific decontamination procedures are to be included in the field SAP. It is the responsibility of the project safety officer (or designee) to develop and implement safety measures which provide protection for all persons involved directly with decontamination.

A decontamination plan will be developed in the Health and Safety Plan. A decontamination line should be set up before any personnel or equipment enters areas of potential exposure. The decontamination plan should include

- The layout of decontamination stations and methods
- Disposal methods for contaminated clothing, equipment and solutions
- Procedures to minimize the potential for contamination, including work practices, the use of remote sampling techniques, the use of disposable or dedicated equipment; and avoiding laying down equipment in areas of obvious contamination

The contaminants encountered and type of equipment used will dictate the type of field decontamination procedures required.

At a minimum, the following procedures will be used:

1. Remove adhered material from the sampling equipment by brushing and/or rinsing with tap water.

2. Wash with non-phosphate detergent and tap water.

3. Rinse with distilled tap water.

4. Repeat the first three steps as necessary until all residue is removed.

5. Rinse with appropriate solvent specified in the Sampling and Analysis Plan, if organic constituents are of interest.

6. Rinse with distilled tap water to remove solvent.

7. Rinse with 10% nitric acid, if metals are a constituent of interest.

8. Rinse with distilled tap water.

9. Air dry or dry with clean, chemical free paper towels or shop cloths.

If metals are not a constituent of interest, the nitric acid rinse and the subsequent distilled water rinse steps can be eliminated.

### 3.1 Decontamination Area

During the project planning activities, a localized decontamination area will be identified for large equipment such as drill rigs and earthmoving equipment. This decontamination area should be located such that fluids and solids wastes can be managed in a controlled area with minimal risk to the surrounding environment.

In some cases, an existing concrete pad can be used. In other cases, one may need to be constructed. This determination will be made following an initial site visit. Decontamination areas may be lined with heavy-gauge plastic sheeting and include a collection system to capture decontamination Investigation Derived Waste (IDW).

Smaller decontamination tasks, such as the cleaning of soil or water sampling equipment, may take place at the sampling location. In this case, all required decontamination supplies and equipment must be mobilized to the site. These small decontamination areas may include basins or tubs to capture the decontamination IDW, which can be transferred to larger containers as needed.

## 3.2 Health and Safety Precautions

Decontamination procedures may involve:

- Potential exposure to constituents within the medium being investigated or solvents employed
- Physical hazards associated with the operation of the decontamination equipment

When decontamination is performed on equipment which has been in contact with the constituents of interest or when the quality assurance objectives of the project require decontamination with chemical solvents, the measures necessary to protect personnel should be addressed in the Health and Safety Plan. The Health and Safety Plan must be approved by the project Health and Safety Officer before work commences, must be distributed to all personnel performing equipment decontamination and must be adhered to as field activities are performed. Material Safety Data Sheets for any solvents stored or used on-Site should be should be available at the Site.

At a minimum, eye protection, safety shoes, and gloves are to be worn. There are several types of gloves that may be worn, depending on equipment being cleaned, type and extent of equipment contamination, and cleaning solutions or solvents being used.

Polyvinyl gloves may be worn when the equipment to be decontaminated is not heavily coated with constituents such as tars/oils. In cases where heavy accumulations of tars/oils are present on the equipment, neoprene or similar chemically compatible gloves are recommended. If a potential for skin contact exists, protective clothing should be worn.

## 3.3 Equipment Decontamination Planning Considerations

Decontamination methods, solutions, and frequencies must be considered and addressed during the formulation of a decontamination strategy, and should be outlined in the project plans. Each are dependent on site logistics, site-specific parameters of interest, the nature of the sample media, and the objectives of the study.

There are several factors which should be considered when deciding upon a decontamination solution or solvent:

- The solution or solvent should not contain any of the analytes of interest
- The solvent or solution must be effective at removing the constituents of interest
- The solvent must be relatively stable so that it can be handled and stored in the field without special handling requirements
- All sampling equipment must be resistant to the solvent or solution

Regulatory agencies may have specific requirements regarding decontamination solvents.

Methanol, acetone, and hexane are typical solvents of choice for equipment decontamination for general organic analyses. A 10% nitric acid and deionized water solution is the typical solvent of choice for sampling equipment decontamination for general metals analyses. If used on metal equipment, nitric acid may corrode the metal and lead to the introduction of metals to the collected samples. If it is necessary to use metal sampling equipment to collect samples for metals analysis, consideration of the aforementioned should be included during the evaluation of field and laboratory QA/QC samples.

Decontamination should be performed far enough away from the source of contamination so as not to be affected by the source, but close enough to the sampling site to keep decontaminated equipment handling to a minimum.

If heavy equipment, such as drill rigs or backhoes, is to be decontaminated, then a central decontamination station should be considered. Power may be required to run steam generators or high pressure water pumps. A potable water source may also be necessary. The construction of a suitable temporary structure to contain sprays and splashes may be necessary. Rinse and wash solutions should be collected and contained until the materials are characterized to identify appropriate management options, or, if available and appropriate, conveyed directly to an on-Site treatment facility for management.

Depending on the nature of the sample media or the solvents utilized, it may be necessary to collect, contain, and manage all particulate matter and wash solutions. If containment is necessary, it may be achieved by performing the decontamination in large galvanized tubs or over plastic sheeting.

## 3.4 General Equipment Decontamination Procedures

All sampling equipment must be decontaminated before use to ensure that contaminants have not been introduced to the sample during the sampling process through contact with the sampling device. Heavy equipment such as trucks, drilling rigs and backhoes should be decontaminated upon arrival at the site to prevent the introduction of road chemicals or constituents from a previous site. Monitoring well riser pipes, screens and drilling augers must also be decontaminated, as appropriate, to prevent the introduction of constituents.

Unless the decontaminated sampling devices are to be used immediately, they should be wrapped in aluminum foil, shiny side out, and stored in a designated “clean” area. Field equipment can also be stored in plastic bags to eliminate the potential for contamination. Larger size equipment, such drill rods, augers, backhoe buckets, etc. need not be wrapped or covered. This equipment should be stored on horses or otherwise, kept from storage directly on the ground surface. Field equipment should be inspected and decontaminated prior to use if the equipment has been stored for long periods of time.

If specific procedures are not stated in the project plans, the standard procedures specified herein should be followed.

1. Determine from the project plans the method of containment for the particulate and wash solution generated during decontamination.

2. Typically, smaller equipment will be decontaminated in a plastic or galvanized tub.

3. The brush and container used for the decontamination process should be new or decontaminated prior to use.

4. Remove all solid particles from the equipment or material by brushing and then rinsing with available tap water. This initial step is performed to remove gross materials. Depending on the size of the equipment being decontaminated, this step may be preceded and/or followed by a steam or high pressure water rinse to remove solids and/or residual oil or grease.

### 3.5 Personnel and Personal Protective Equipment (PPE)

Decontamination of personnel and PPE prevents undesired human-health exposure to contaminants via ingestion, absorption, and inhalation. All personnel and PPE will be decontaminated as outlined in the Health and Safety Plan (HASP). Any further concerns regarding personnel and PPE decontamination procedures may be addressed directly with the Health and Safety Officer and/or Project Manager.

### 3.6 Decontamination of Sampling Equipment

Conduct consistent decontamination of sampling equipment to ensure the quality of the samples collected. Decontaminate all equipment that comes into contact with potentially contaminated samples. Disposable equipment intended for one-time use that is factory-wrapped generally does not need to be decontaminated before use, unless evidence of contamination is present.

Disposable equipment, such as disposable bailers, spoons, TerraCore® or Encore® VOC samplers, is preferred over reusable equipment; use wherever appropriate. Decontaminate sampling equipment, including split-barrel samplers, hand augers, reusable bailers, spoons, trowels, shovels, and pumps used to collect samples for chemical analyses before each use and before sampling at a new sampling location. Decontamination personnel will wear the appropriate PPE as required by the HASP.

Take the following steps to decontaminate non-dedicated sampling equipment:

1. Remove as much gross contamination (such as pieces of soil) as possible off equipment at the sampling site.

2. If heavy petroleum residuals are encountered during sampling, an appropriate solvent such as methanol will be used to remove any petroleum residues from sampling equipment. If a solvent is used, it must be properly used, collected, stored, and disposed of according to the HASP and the project-specific planning documents. If heavy petroleum residuals are not encountered, this step should be omitted.

3. Wash water-resistant equipment thoroughly and vigorously with potable water containing non-phosphate laboratory-grade detergent such as Liquinox®, Alconox®, or equivalent, and using a bristle brush or similar utensil to remove any remaining residual contamination.

4. Rinse equipment thoroughly with potable water ($1^{st}$ rinse).

5. Rinse equipment thoroughly with distilled or deionized water ($2^{nd}$ rinse).

6. For sensitive field instruments, rinse equipment with distilled, deionized, or American Society for Testing and Materials (ASTM) reagent grade water ($3^{rd}$ rinse).

7. Air dry at a location where dust or other fugitive contaminants may not contact the sample equipment. Alternatively, wet equipment maybe dried with a clean, disposable paper towel to assist the drying process. All equipment should be dry before reuse.

8. If the equipment is not used soon after decontamination, it should be covered or wrapped in new, oil-free aluminum foil or new, unused plastic bags to protect the decontaminated equipment from fugitive contaminants before reuse.

9. Store decontaminated equipment at a secure, unexposed location out of the weather and any potential contaminant exposure.

## 3.7 Decontamination of Groundwater Sampling Equipment

*(Note: This procedure does not apply to dedicated submersible pumps which have been permanently installed in groundwater extraction wells.)*

Proper decontamination between wells is essential to avoid introduction contaminants from the sampling equipment to another well. If peristaltic pumps are being used, it is necessary only to replace the pump head tubing after sampling each well. If sampling with submersible pumps or reusable bailers that come into direct contact with groundwater, the equipment must be decontaminated. The following procedure will be used to decontaminate submersible pumps before and between groundwater sample collection points, as well as the end of each day of use.

1. During decontamination, the submersible pump will be placed on a clean surface, such as a new plastic sheet.

2. When removing the submersible pump from each well, the power cord and discharge line will be wiped dry using chemical-free disposable towels. Should the pump be fitted with a disposable discharge line, disconnect the line for proper disposal.

3. Clean an upright plastic-nalgene cylinder first with a methanol, 10% nitric acid, or other specified solvent and then a distilled/deionized water rinse, wiping the free liquids after each.

4. For reversible pumps, reverse the pump to backwash all removable residual water present in the pump tubing. The pump should be shut off as soon as intermittent flow is observed from the reverse discharge.

5. Rinse the stainless steel submersible down hole pump section with a detergent solution followed by a water rinse and the specified solvent.

6. Place the submersible pump section upright in the cylinder and fill the cylinder with tap water, adding 50-100 ml of specified solvent for every one liter of water.

7. Activate the pump in the forward mode, withdrawing water from the cylinder.

8. Continue pumping until the water in the cylinder is pumped down and air is drawn through the pump. At this time air pockets will be observed in the discharge line. Shut off the pump immediately.

9. Remove the pump from the cylinder and place the pump in the reverse mode to discharge all removable water into a disposal container.

10. Using the water remaining in the cylinder, rinse the sealed portion of the power cord and discharge tube by pouring the water carefully over the coiled lines.

11. On reaching the next monitoring well, place the pump in the well casing and wipe dry both the power and discharge lines with a chemical-free paper towel as the pump is lowered.

## 3.8 Decontamination of Measurement Devices and Monitoring Equipment

For water quality instruments, oil-water interface indicators, water level indicators, continuous water level dataloggers, and other field instruments that have the potential to come into contact with site media, at a minimum, wash with dilute laboratory-grade detergent (Liquinox® or similar) and double rinse with potable and distilled/deionized water before and after each use using a similar procedure as discussed in Section 3.6. If heavy petroleum residuals are encountered during sampling, use an appropriate solvent such as methanol to remove petroleum residues per the manufacturer’s maintenance guidelines.

## 3.9 Decontamination of Drilling and Subsurface Soil Sampling Equipment

Drilling equipment and associated materials will be decontaminated by the drilling contractor prior to any drilling operations and between borings. Decontaminate tools used for soil sampling (for example, split spoon samplers) before and between collecting any analytical samples, as outlined in Section 3.6. Thoroughly clean external and internal surfaces of drilling equipment (that is, drill bits, auger, drilling stem, and hand tools) before beginning any drilling operations and between borings using the following basic sequence:

1. Remove as much gross contamination as possible off equipment at the sampling site.

2. Wash equipment thoroughly and vigorously with high-temperature potable water using a high-pressure washer and/or steam cleaner. A bristle brush is also suggested to remove any persistent gross contamination.

3. Rinse equipment twice thoroughly with potable water (1$^{st}$ and 2$^{nd}$ rinse).

4. Air dry at a location where dust or other fugitive contaminants may not contact the sample equipment. All equipment should be dry before reuse.

5. Store decontaminated equipment at a location away from any potential exposure from fugitive contamination.

## 3.10 Decontamination of Heavy Equipment

Wash earthwork equipment (such as excavators, back-hoes, and trucks) with high-pressure potable water, if possible, before leaving a contaminated area, using similar steps as outlined in Section 3.9. Portable steam-cleaners and hand washing with a brush and detergent, followed by a potable water rinse, can also be used. In some instances, tires and tracks of equipment maybe only need to be thoroughly brushed with a dry brush. Take particular care with the components in direct contact with contaminants, such as tires and backhoe buckets. Any part of earthwork equipment that may come in direct contact with analytical samples (that is, sampling from the excavator bucket) must be thoroughly decontaminated before excavation activities and between sample locations.

# 4.0 QUALITY ASSURANCE/QUALITY CONTROL

To ensure that sampling equipment is cleaned properly and sample cross-contamination does not occur, field rinsate blanks will be collected as required by the Sampling and Analysis Plan. A rinsate blank will consist of pouring deionized organic-free water over the specific sampling device or pouring it through the device after it has been cleaned. The rinsate sample is collected in the field under the same conditions as occurred for the sampling activity, and is handled exactly like any other samples collected that day.

Generally, one rinsate blank is collected each day of sampling or at a rate of 1 per 20 for each parameter, whichever is less, for each matrix being sampled or for each type of sampling instrument decontaminated and reused per day. The rinsate samples are analyzed for the specific parameters of concern (for each matrix). Rinsate blanks should be labeled like a routine environmental sample, and laboratory analysis instructions should be included on the chain-of-custody form.

Rinsate blanks are not required if dedicated sampling equipment is used. Additional quality assurance samples may be collected if deemed necessary by project specific requirements. All project specific quality assurance sampling will be defined in the sampling and analysis plan (SAP) or QAPjP prior to initiation of the field work.

## 5.0 DOCUMENTATION AND RECORD KEEPING

The field team leader will maintain a record of the decontamination procedures. Notations shall be made in the field logbook concerning the decontamination procedures and which equipment was decontaminated. An Equipment Decontamination Record form shall be completed for all rental equipment (see Attachment 1).

The following information should be recorded in the Field Logbook:

- Decontamination personnel
- Decontamination solutions used
- Start and finish date and time
- Location of decontamination activities
- General methods used, tools used, and observations, including any deviations from this SOP
- Equipment identification numbers
- Manufacturer names and lot numbers of decontamination solutions
- Location and amount of decontamination IDW collected, stored, and/or disposed, including the sources (e.g., well or boring numbers) of the IDW (see SOP *05 – Management of Investigation-Derived Wastes*)
- Any spills or releases, and associated corrective actions taken

## 6.0 REFERENCES

United States Environmental Protection Agency, January 1991, Compendium of ERT Groundwater Sampling Procedures: Washington, D.C., EPA 540/P-91/007.

United States Environmental Protection Agency, December 1987, A Compendium of Superfund Field Operations Methods: Washington, D.C., EPA 540/P-87/001.

**ATTACHMENT 1**
**SOP 25 – EQUIPMENT DECONTAMINATION**
**EQUIPMENT DECONTAMINATION RECORD**

# EQUIPMENT DECONTAMINATION RECORD

HS-15

This form must be completed for all rental equipment.

A copy of this form should accompany all returned equipment.

## EQUIPMENT IDENTIFICATION

Type of equipment: ______________________

Model: ______________________

Serial Number: ______________________

Rented From (Name & Address): ______________________

## DECONTAMINATION

Decontamination Method: ______________________

Date of Decontamination: ______________________

Site Name: ______________________

Project Number: ______________________

## DECONTAMINATION CERTIFICATION

To be signed by the Site Supervisor or Site Health and Safety Officer.

Name: ______________________

Title: ______________________

Signature: ______________________

Date:

# 31 - SEDIMENT SAMPLING

## 1.0 SCOPE AND PURPOSE

Sediment sampling defines the process of collecting saturated unconsolidated sedimentary material from the base of a water body (*e.g.,* stream or lake). Sediment samples are usually collected in that section of the water body that displays sediment accumulation such as a sand bar or the inside of a meander. Bottom sediments act as a sink for various types of contaminants and hence can provide a historical or cumulative record of contamination. For this reason, sediment samples are of importance in waste site evaluations where potential surface water contamination (both past and present) and/or contaminated groundwater discharge are of concern.

Sediment samples are collected for a variety of reasons including supporting the chemical, physical, toxicological and biological evaluation of aquatic environments. Choosing the most appropriate sampling device and technique depends on the purpose of the sampling, the location of the sediment, and the characteristics of the sediment. Most commonly, sediment samples are used to locate and define the range of impacts associated with both point and non-point source discharges to a body of water. However, sediment samples may also be collected to support biotoxicity assessments, dredging and dredge-spoil management, evaluation of historical trends in chemical deposition, and modeling deposition and resuspension processes

### 1.1 Referenced SOPs

03 – Field Logbook
22 – Environmental Sample Preparation
23 – Sample Handling, Preservation, Packaging and Shipping
24 – Chain of Custody
25 – Equipment Decontamination

### 1.2 Definitions

**Disturbed Sample:** A sample in which various layers or areas within the matrix are mixed upon collection.

**Undisturbed Sample:** A sample collected in such a manner that natural layering created by depositional pattern is maintained during sample collection.

## 2.0 REQUIRED MATERIALS

Most sediment sampling is completed with the use of simple tools. The deeper the water column above the sediment, the more difficult it is to obtain a sediment sample. The following sampling devices are commonly used to collect sediment samples:

- Scoop samples
- Core samplers

- Hand-operated gravity samplers
- Dredge samplers

In addition to the actual sampling tools selected, the following equipment will also be required:

- HASP
- Work Plan
- Field Sampling and Analysis Plan
- Personal protective equipment (including gloves, waders, hard hat, steel-toed boots, etc.)
- Sample logbook
- Indelible ink pen
- Field screening equipment (e.g., PID)
- Decontamination supplies or an adequate number of disposal scoops, etc. for all sample locations
- Chain of custody forms
- Sample logsheets (Attachment 1)
- Sample packaging and shipping supplies (coolers, laboratory-provided bottles/jars, sample labels, pens, packing supplies such as bubble wrap, zip-lock bags, ice, etc.)
- Digital camera
- Tape measure
- Stakes or flags to mark sample locations and marking implement

## 3.0 METHODOLOGIES

Prior to collecting sediment samples, the water body flow, depth, gradient, type, location, etc. should be logged. As with aqueous sampling, a determination of tidal influences on the water body being sampled should be completed and its effect on sample collection should be detailed in the work plan/sampling plan. At a minimum, the stage of the tide at the time of sample collection should be recorded. Consideration should be given to sampling at varied tidal stages.

Sediment samples are usually collected with the same precautions taken for surface water samples. Sediment samples should be collected beginning at the most downstream location to avoid possible cross-contamination from upstream locations. While collecting the sample, field personnel should stand on the downstream side of the sample location to prevent disturbed sediment from being incorporated into the sample matrix. Care should be taken to create the least disturbance of the sampling site as possible, especially from wading or disturbance of the sediment from currents induced by wading.

If using a boat, all engines should be turned off and samples should be collected upstream of the engine or other machinery that may release exhaust fumes or fuel into the water.

If surface water samples are to be collected from the same location, the surface water sample should be collected first to minimize sediment resuspension in the area.

In general, the finest-grained sediments should be collected. Sampling in areas containing vegetation or roots should be avoided. Sampling personnel should decant as much water as possible from the sample, but avoid the loss of the extremely fine components of the sediment.

In collecting sediment samples from any source, care must be taken to minimize disturbance and sample washing as it is retrieved through the liquid column above. Sediment fines may be carried out of the sample during collection if the liquid above is flowing or deep. This may result in collection of a non-representative sample due to the loss of materials associated with these fines. While a sediment sample is usually expected to be a solid matrix, sampling personnel should avoid placing the sample in the bottle, and decanting off the excess liquid. Decantation promotes the loss of water soluble compounds and volatile organics present in the sediment. If the sample is collected properly, any liquid that makes it into the bottle is representative of sediment conditions.

## 3.1 Scoop Samplers

If liquid flow and depth are minimal and sediment is easy to reach, a trowel or scoop may be used to collect the sediment. Scoops and spoons are inexpensive, widely available, non-mechanical and portable tools for many types of sediment sampling. Scoops are used to collected sediment samples from shallow waters. Attaching the scoop to telescoping poles permits sample collection from deeper water.

The scoop is lowered through the water column and gently pushed into the sediment at the base of the water body. Care should be taken when the scoop is raised to minimize the loss of fine-grained material. The water-laden sediment is then manually transferred into an appropriate sample jar.

## 3.2 Core Samplers

Core samplers may be used in lieu of scoops in shallow or near shore sampling locations if water flow rates are likely to wash sample material from a scoop. However, for the most part, core samplers are used when deeper or depth-specific sampling is required.

Depth-specific, undisturbed sampling of sediment is completed with the use of a core sample. Core samples, in addition to providing a vertical profile for chemical analysis, allow the sedimentary record to be observed (for characteristics such as bedding, bioturbation, etc.). A core sampler is usually constructed of a metal outer barrel and a clear glass or Teflon® inner barrel. The inner tube diameter is approximately 2 inches. The sampler is normally pushed into the sediment and the sediment forced into the inner barrel.

The inner barrel is then removed from the outer tube and usually sent intact to the analytical laboratory. This methodology has several limitations including relative density of sediment and grain size. If the sediment is too water-laden, it will not remain inside the inner tube; similarly, if the grain size is too coarse, no sample will be retained by the inner tube. Disposable inserts may be used in these instances to capture the core. Likewise, many commercial corers are constructed with one-way valves to allow the sample to enter the tube and hold it in place.
Plastic or thin-walled metal corers (or core liners) can be cut, the ends capped and secured with

tape for shipment to the laboratory.

## 3.3 Gravity Corers

Hand operated gravity corers are similar to core samplers but possess a sediment trap in the inner tube, and the leading edge of the sample is designed for rotation of the cylinder. This design allows the sampler to take a disturbed sample of sediment not likely to be retained by the core sampler. When removed, water should be decanted from the top of the inner barrel before removing it. Clean sand should be placed at the top and bottom of the tube if there is any empty space at either end and plastic caps should be placed over each end.

## 3.4 Dredge Samplers

Sediment dredges such as Eckman or Ponar dredges are utilized when the sediment is not readily obtainable (*i.e.,* at great depths or partially consolidated). The dredge consists of two clamshell-shaped metal buckets operated by a control hinge and line. Dredges should never be allowed to free fall into the substrate, but rather be carefully lowered to minimize dispersal of fine-grained material.

Once the Ponar and attached retrieval line have contacted the bottom, allow the line to slack. In a heavy current, much slack may be needed to allow the Ponar to penetrate and to release the mechanism. After allowing the dredge to sink into the sediment, slowly raise the sampler clear of the surface. Drain the excess fluid through the screen provided on top of the dredge and place the dredge over a collection tray, decontaminated container, and/or sample container. Only "successful grabs" (i.e., consisting of complete closure of sampling device jaws and devoid of large quantities of gravel, rocks, sticks, leaves, and detritus) will be retained for analysis. Dredges should be decontaminated between sample locations.

Most dredges are very heavy and need to be operated with a winch and crane. This is the least likely methodology to be used because of cost and logistical concerns.

# 4.0 QUALITY ASSURANCE/QUALITY CONTROL

Decontamination of sampling equipment between sample locations is to be performed as outlined in *SOP 25 - Equipment Decontamination*. Sample preparation will follow *SOP 22 – Environmental Sample Preparation*. Sampling handling, preservation, packaging and shipping will follow *SOP 23 – Sample Handling, Preservation, Packaging and Shipping*. Chain of custody will be maintained at all times, following *SOP 24 – Chain of Custody*.

# 5.0 DOCUMENTATION AND RECORD KEEPING

All sampling activities are to be documented on appropriate sample log sheets and in the field logbook (*SOP 03 – Field Logbook*). At the end of each week, or at the end of the field activity, all log sheets and the appropriate pages of the logbook are to be scanned for inclusion in the digital files. In addition, the hard copies of all documents are to be retained in the site files.

## 6.0 REFERENCES

State-specific guidance documents may be available and should be used where appropriate.

ASTM E1391 - 03(2008) Standard Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing and for Selection of Samplers Used to Collect Benthic Invertebrates

Mudroch, A. and MacKnight, S.D., 1994, Handbook of Techniques for Aquatic Sediments Sampling: New York, CRC Press, 256 p.

# ATTACHMENT 1
# SOP 31 – SEDIMENT SAMPLING
# SEDIMENT SAMPLE LOGSHEET

**Sample No.** ________________

KEY ENVIRONMENTAL INCORPORATED

## SEDIMENT SAMPLE LOG

**Project Number:** ________________ **Date:** ________________

**Project Location:** ________________ **Time:** ________________

**Client:** ________________ **Weather Conditions:** ________________

**Collected By:** ________________

**Sample Point Description:** ________________

________________

(Include nearby landmarks, designation from a map layout of the site, measurements, or any other locating information.)

**SAMPLE COLLECTION:**

**Equipment Used:** ________________

________________

**Required Analyses:** ________________

________________

**No. of Sample Containers and Sizes:** ________

________________

**Figure 1: Sample Point**

| **Collection Depths** | **Soil Description** |
|---|---|
| | |
| | |
| | |
| | |

**Comments:** ________________

________________

________________

**ATTACHMENT B**

**Analytical Data Package**

May 15, 2017

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

## ANALYTICAL REPORT FOR SAMPLES

| Sample ID | Laboratory ID | Matrix | Sample Type | Date Sampled | Date Received |
|---|---|---|---|---|---|
| BULGER CLARIFIER SLUDGE | 7E16171-01 | Solid | Grab | 05/15/17 11:00 | 05/16/17 18:15 |
| 101 | 7E16171-02 | Water | Grab | 05/15/17 11:00 | 05/16/17 18:15 |
| TRIP BLANK | 7E16171-03 | Water | Trip Blank | 05/15/17 00:00 | 05/16/17 18:15 |

Per client Project & Sample 01 name revised. This report replaces report issued on 06/01/17 10:26. 07/20/17 bjh

Fairway Laboratories, Inc.

Reviewed and Submitted by:

Michael P. Tyler
Laboratory Director

*Fairway Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.*

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

Max Environmental
233 Max Lane
Yukon PA, 15698
Project Manager: Carl Spadaro

Project: BULGER
Project Number: [none]
Collector: CLIENT
Number of Containers: 24

**Reported:**
07/20/17 17:36

**Client Sample ID:** **BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID:** **7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Analyses to be performed immediately upon sampling. See Definition indicated by: #** | | | | | | | | |
| **# pH @ 21°C** | 8.51 | | | pH Units | 05/22/17 13:20 | SW846-9045 D | elb | |
| **Calculated Analytes** | | | | | | | | |
| Amenable Cyanide | <2.29 | | 2.29 | mg/kg dry | 05/23/17 12:52 | SM20-4500 CN-C+E+G | caa | |
| **Chlorinated Herbicides by EPA Method 8151A** | | | | | | | | |
| 2,4-D | <15.7 | | 15.7 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| Acifluorfen | <15.7 | | 15.7 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| 2,4-DB | <15.7 | | 15.7 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| 2,4,5-T | <15.7 | | 15.7 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| 2,4,5-TP (Silvex) | <15.7 | | 15.7 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| Dalapon | <158 | | 158 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| Dicamba | <15.7 | | 15.7 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| Dichloroprop | <15.7 | | 15.7 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| Dinoseb | <15.7 | | 15.7 | ug/kg dry | 05/24/17 01:05 | EPA 8151A | rsr | |
| *Surrogate: 2,4-DCAA* | | *70 %* | *40.6-150* | | *05/24/17 01:05* | *EPA 8151A* | rsr | |
| **Conventional Chemistry Parameters by SM/EPA Methods** | | | | | | | | |
| **Fluoride** | 536 | | 204 | mg/kg dry | 05/23/17 21:03 | EPA 9056A | bdw | I |

Fairway Laboratories, Inc.

*Fairway Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.*

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Conventional Chemistry Parameters by SM/EPA Methods** | | | | | | | | |
| **% Solids** | 21.0 | | 0.100 | % | 05/18/17 20:00 | SM 2540 G-97 | pra | |
| Sulfide | <89.7 | | 89.7 | mg/kg dry | 05/16/17 19:30 | EPA SW846 9030/9034 | pra | |
| **Cyanide by Preparation Method EPA 9010** | | | | | | | | |
| Cyanide (total) | <2.29 | | 2.29 | mg/kg dry | 05/23/17 12:52 | EPA 9014 | caa | |
| **Metals by EPA 6000/7000 Series Methods** | | | | | | | | |
| Silver | <1.23 | 1.23 | 9.13 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | G |
| Arsenic | <6.16 | 6.16 | 18.3 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | I |
| **Barium** | 9140 | 283 | 456 | mg/kg dry | 05/22/17 15:04 | EPA 6010B/2.0 | sr | I, L |
| **Beryllium** | 7.88 | | 4.56 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | |
| **Cadmium** | 3.66 J | 3.24 | 9.13 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | |
| **Chromium** | 215 | 1.66 | 11.4 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | I |
| **Mercury** | 0.139 | 0.0137 | 0.137 | mg/kg dry | 05/18/17 10:16 | EPA 7471B | jks | |
| **Nickel** | 765 | | 114 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | I |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

Max Environmental
233 Max Lane
Yukon PA, 15698
Project Manager: Carl Spadaro

Project: BULGER
Project Number: [none]
Collector: CLIENT
Number of Containers: 24

**Reported:**
07/20/17 17:36

**Client Sample ID:** **BULGER CLARIFIER SLUDGE**  **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID:** **7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Metals by EPA 6000/7000 Series Methods** | | | | | | | | |
| **Lead** | 125 | 2.98 | 18.3 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | I |
| Antimony | <22.8 | | 22.8 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | I, L |
| Selenium | <22.4 | 22.4 | 45.6 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | I |
| Thallium | <45.6 | | 45.6 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | I |
| **Vanadium** | 46.0 | | 45.6 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | |
| **Zinc** | 1480 | | 45.6 | mg/kg dry | 05/22/17 14:59 | EPA 6010B/2.0 | sr | I |
| **Organochlorine Pesticides by EPA Extraction Method 3541** | | | | | | | | |
| Aldrin | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| alpha-BHC | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| beta-BHC | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| delta-BHC | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| gamma-BHC (Lindane) | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Chlordane (tech) | <2050 | | 2050 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| 4,4´-DDD | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

FAIRWAY LABORATORIES

State Certifications: MD 275, WV 364

www.fairwaylaboratories.com

Max Environmental
233 Max Lane
Yukon PA, 15698
Project Manager: Carl Spadaro

Project: BULGER
Project Number: [none]
Collector: CLIENT
Number of Containers: 24

**Reported:**
07/20/17 17:36

**Client Sample ID: BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Organochlorine Pesticides by EPA Extraction Method 3541** | | | | | | | | |
| 4,4´-DDE | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| 4,4´-DDT | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Dieldrin | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Endosulfan I | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Endosulfan II | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Endosulfan sulfate | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Endrin | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Endrin aldehyde | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Heptachlor | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | D |
| Heptachlor epoxide | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Methoxychlor | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Toxaphene | <2050 | | 2050 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| alpha-Chlordane | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| gamma-Chlordane | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| Endrin ketone | <41.0 | | 41.0 | ug/kg dry | 05/18/17 11:02 | EPA 8081B | RSR | |
| *Surrogate: Tetrachloro-meta-xylene* | | *60.3 %* | *40-157* | | *05/18/17 11:02* | *EPA 8081B* | RSR | |
| *Surrogate: Decachlorobiphenyl* | | *107 %* | *57.1-153* | | *05/18/17 11:02* | *EPA 8081B* | RSR | |
| **Polychlorinated Biphenyls by EPA Extraction Method 3541** | | | | | | | | |

Fairway Laboratories, Inc.

*Fairway Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.*

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID:** **BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID:** **7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Polychlorinated Biphenyls by EPA Extraction Method 3541** | | | | | | | | |
| PCB-1016 | <0.023 | 0.023 | 0.041 | mg/kg dry | 05/19/17 07:14 | EPA 8082 | rsr | |
| PCB-1221 | <0.033 | 0.033 | 0.041 | mg/kg dry | 05/19/17 07:14 | EPA 8082 | rsr | |
| PCB-1232 | <0.034 | 0.034 | 0.041 | mg/kg dry | 05/19/17 07:14 | EPA 8082 | rsr | |
| PCB-1242 | <0.011 | 0.011 | 0.041 | mg/kg dry | 05/19/17 07:14 | EPA 8082 | rsr | |
| PCB-1248 | <0.007 | 0.007 | 0.041 | mg/kg dry | 05/19/17 07:14 | EPA 8082 | rsr | |
| PCB-1254 | <0.025 | 0.025 | 0.041 | mg/kg dry | 05/19/17 07:14 | EPA 8082 | rsr | |
| PCB-1260 | <0.024 | 0.024 | 0.041 | mg/kg dry | 05/19/17 07:14 | EPA 8082 | rsr | |
| *Surrogate: Tetrachloro-meta-xylene* | | *103 %* | *11-140* | | *05/19/17 07:14* | *EPA 8082* | rsr | |
| *Surrogate: Decachlorobiphenyl* | | *114 %* | *24.4-140* | | *05/19/17 07:14* | *EPA 8082* | rsr | |
| **Semivolatile Organic Compounds by EPA Extraction Method 3541** | | | | | | | | A7 |
| Benzidine | <46.8 | | 46.8 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | F |
| Pyridine | <18.7 | | 18.7 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Diphenylamine | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Acenaphthene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Acenaphthylene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Anthracene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Benzoic acid | <93.6 | | 93.6 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Benzo (a) anthracene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organic Compounds by EPA Extraction Method 3541** | | | | | | | | A7 |
| Benzo (b) fluoranthene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Benzo (k) fluoranthene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Benzo (g,h,i) perylene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Benzo (a) pyrene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Benzyl alcohol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Bis(2-chloroethoxy)methane | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Bis(2-chloroethyl)ether | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Bis(2-chloroisopropyl)ether | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Bis(2-ethylhexyl)phthalate | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 4-Bromophenyl phenyl ether | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Butyl benzyl phthalate | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 4-Chloroaniline | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 4-Chloro-3-methylphenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2-Chloronaphthalene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2-Chlorophenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 4-Chlorophenyl phenyl ether | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Chrysene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Dibenz (a,h) anthracene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID:** **BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID:** **7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organic Compounds by EPA Extraction Method 3541** | | | | | | | | A7 |
| Dibenzofuran | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Di-n-butyl phthalate | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 1,2-Dichlorobenzene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 1,3-Dichlorobenzene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 1,4-Dichlorobenzene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 3,3´-Dichlorobenzidine | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2,4-Dichlorophenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Diethyl phthalate | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | F |
| 2,4-Dimethylphenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Dimethyl phthalate | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 4,6-Dinitro-2-methylphenol | <46.8 | | 46.8 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2,4-Dinitrophenol | <46.8 | | 46.8 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | F |
| 2,4-Dinitrotoluene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2,6-Dinitrotoluene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Di-n-octyl phthalate | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Aniline | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Naphthalene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| N-Nitrosodimethylamine | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |

Max Environmental
233 Max Lane
Yukon PA, 15698
Project Manager: Carl Spadaro

Project: BULGER
Project Number: [none]
Collector: CLIENT
Number of Containers: 24

**Reported:** 07/20/17 17:36

**Client Sample ID: BULGER CLARIFIER SLUDGE**

**Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organic Compounds by EPA Extraction Method 3541** | | | | | | | | A7 |
| 3 & 4-Methylphenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Acetophenone | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 1,2-Diphenylhydrazine | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Fluoranthene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Fluorene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Hexachlorobenzene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Hexachlorobutadiene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Hexachlorocyclopentadiene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Hexachloroethane | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Indeno (1,2,3-cd) pyrene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Isophorone | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2-Methylnaphthalene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2-Methylphenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2-Nitroaniline | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 3-Nitroaniline | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 4-Nitroaniline | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Nitrobenzene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2-Nitrophenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organic Compounds by EPA Extraction Method 3541** | | | | | | | | A7 |
| 4-Nitrophenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| N-Nitrosodi-n-propylamine | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Pentachlorophenol | <46.8 | | 46.8 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Phenanthrene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Phenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| Pyrene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 1,2,4-Trichlorobenzene | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2,4,5-Trichlorophenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| 2,4,6-Trichlorophenol | <9.36 | | 9.36 | mg/kg dry | 05/19/17 01:13 | EPA 8270D | rsr | |
| *Surrogate: 2-Fluorophenol* | | *91 %* | *10-169* | | *05/19/17 01:13* | *EPA 8270D* | rsr | |
| *Surrogate: Phenol-d6* | | *93 %* | *10-166* | | *05/19/17 01:13* | *EPA 8270D* | rsr | |
| *Surrogate: Nitrobenzene-d5* | | *87 %* | *18.8-170* | | *05/19/17 01:13* | *EPA 8270D* | rsr | |
| *Surrogate: 2-Fluorobiphenyl* | | *92 %* | *35.1-154* | | *05/19/17 01:13* | *EPA 8270D* | rsr | |
| *Surrogate: 2,4,6-Tribromophenol* | | *100 %* | *20-158* | | *05/19/17 01:13* | *EPA 8270D* | rsr | |
| *Surrogate: Terphenyl-d14* | | *87 %* | *52.1-160* | | *05/19/17 01:13* | *EPA 8270D* | rsr | |
| **TCLP Extraction by EPA 1311** | | | | | | | | |
| **# pH @ 21.2°C** | 8.37 | | | pH Units | 05/18/17 08:36 | EPA 1311 | spp | |
| **TCLP Metals extracted by EPA 1311** | | | | | | | | |

Fairway Laboratories, Inc.

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID:** **BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID:** **7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **TCLP Metals extracted by EPA 1311** | | | | | | | | |
| Silver | <0.0200 | | 0.0200 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| Arsenic | <0.0400 | | 0.0400 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| **Barium** | 0.607 | | 0.0500 | mg/l | 05/21/17 15:39 | EPA 6010B/2.0 | sr | |
| Beryllium | <0.0100 | | 0.0100 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| Cadmium | <0.0200 | | 0.0200 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| Chromium | <0.0250 | | 0.0250 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| Mercury | <0.00200 | | 0.00200 | mg/l | 05/22/17 13:41 | EPA 7471B | jks | K, Q |
| Nickel | <0.250 | | 0.250 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| Lead | <0.0400 | | 0.0400 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| **Antimony** | 0.0732 | | 0.0500 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| Selenium | <0.100 | | 0.100 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| Thallium | <0.100 | | 0.100 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **TCLP Metals extracted by EPA 1311** | | | | | | | | |
| Vanadium | <0.100 | | 0.100 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| Zinc | <0.100 | | 0.100 | mg/l | 05/21/17 15:41 | EPA 6010B/2.0 | sr | |
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | I4 |
| Acrolein | <18.3 | | 18.3 | mg/kg dry | 05/25/17 19:49 | EPA 8260B | mtc | |
| 2-Chloroethylvinyl ether | <18.3 | | 18.3 | mg/kg dry | 05/25/17 19:49 | EPA 8260B | mtc | |
| Benzene | <0.0090 | | 0.0090 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Toluene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Ethylbenzene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Xylenes (total) | <0.0449 | | 0.0449 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Naphthalene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Acrylonitrile | <0.0449 | | 0.0449 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Bromodichloromethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Bromoform | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Bromomethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| **2-Butanone** | 0.0673 | | 0.0449 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Carbon disulfide | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Carbon tetrachloride | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |

Fairway Laboratories, Inc.

*Fairway Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.*

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | I4 |
| Chlorobenzene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Chloroethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Chloroform | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,2-Dibromo-3-chloropropane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Dibromochloromethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,2-Dibromoethane (EDB) | <0.0090 | | 0.0090 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Dibromomethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,2-Dichlorobenzene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,4-Dichlorobenzene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,3-Dichlorobenzene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Dichlorodifluoromethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | G |
| 1,2-Dichloroethane | <0.0090 | | 0.0090 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,1-Dichloroethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| trans-1,2-Dichloroethene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,1-Dichloroethene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,2-Dichloropropane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| trans-1,3-Dichloropropene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| cis-1,3-Dichloropropene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID:** **BULGER CLARIFIER SLUDGE** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID:** **7E16171-01 (Solid/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | I4 |
| Hexachlorobutadiene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Iodomethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Methylene chloride | <0.0897 | | 0.0897 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,1,2,2-Tetrachloroethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,1,1,2-Tetrachloroethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Tetrachloroethene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,2,4-Trichlorobenzene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,1,1-Trichloroethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,1,2-Trichloroethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Trichloroethene | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Trichlorofluoromethane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| 1,2,3-Trichloropropane | <0.0224 | | 0.0224 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| Vinyl chloride | <0.0090 | | 0.0090 | mg/kg dry | 05/25/17 05:44 | EPA 8260B | MTC | |
| *Surrogate: 4-Bromofluorobenzene* | | *98 %* | *70-130* | | *05/25/17 05:44* | *EPA 8260B* | MTC | |
| *Surrogate: 1,2-Dichloroethane-d4* | | *109 %* | *70-130* | | *05/25/17 05:44* | *EPA 8260B* | MTC | |
| *Surrogate: Fluorobenzene* | | *99 %* | *70-130* | | *05/25/17 05:44* | *EPA 8260B* | MTC | |

| | | | | | |
|---|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** | |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 | |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | | |

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Calculated Analytes** | | | | | | | | |
| Amenable Cyanide | <0.0100 | | 0.0100 | mg/l | 05/23/17 12:29 | SM20-4500 CN-C+E+G | caa | |
| **Chlorinated Herbicides by EPA Method 8151A** | | | | | | | | |
| 2,4-D | <0.200 | | 0.200 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| Acifluorfen | <0.200 | | 0.200 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| 2,4-DB | <0.200 | | 0.200 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| 2,4,5-T | <0.200 | | 0.200 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| 2,4,5-TP (Silvex) | <0.200 | | 0.200 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| Dalapon | <2.00 | | 2.00 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| Dicamba | <0.200 | | 0.200 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| Dichloroprop | <0.200 | | 0.200 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| Dinoseb | <0.200 | | 0.200 | ug/l | 05/23/17 14:08 | EPA 8151A | rsr | |
| *Surrogate: 2,4-DCAA* | | *80.1 %* | *57.3-151* | | *05/23/17 14:08* | *EPA 8151A* | rsr | |
| **Conventional Chemistry Parameters by SM/EPA Methods** | | | | | | | | |
| Cyanide (total) | <0.0100 | | 0.0100 | mg/l | 05/23/17 12:29 | SM 4500 CN C+E-11 | caa | |
| Fluoride | <2.00 | | 2.00 | mg/l | 05/17/17 17:11 | EPA 300.0/2.1 | bdw | |
| Sulfide | <2.00 | | 2.00 | mg/l | 05/17/17 13:00 | SM 4500 S2 F-11 | pra | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Metals by EPA 245.1** | | | | | | | | |
| Mercury | <0.000200 | | 0.000200 | mg/l | 05/18/17 12:19 | EPA 245.1/3.0 | jks | |
| **Metals by Prep Method EPA 200.2** | | | | | | | | |
| Silver | <0.00400 | | 0.00400 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| Arsenic | <0.00800 | | 0.00800 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| **Barium** | 0.348 | | 0.0100 | mg/l | 05/21/17 18:53 | EPA 200.7/4.4 | sr | |
| Beryllium | <0.00200 | | 0.00200 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| Cadmium | <0.00400 | | 0.00400 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| **Chromium** | 0.0179 | | 0.00500 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| **Nickel** | 0.416 | | 0.0500 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| Lead | <0.00800 | | 0.00800 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| Antimony | <0.0100 | | 0.0100 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| Selenium | <0.0200 | | 0.0200 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| Thallium | <0.0200 | | 0.0200 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| Vanadium | <0.0200 | | 0.0200 | mg/l | 05/21/17 18:55 | EPA 200.7/4.4 | sr | |
| **Organochlorine Pesticides by EPA Extraction Method 3510C** | | | | | | | | |
| Aldrin | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| alpha-BHC | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| beta-BHC | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Organochlorine Pesticides by EPA Extraction Method 3510C** | | | | | | | | |
| delta-BHC | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | F |
| gamma-BHC (Lindane) | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Chlordane (tech) | <1.00 | | 1.00 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| 4,4´-DDD | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| 4,4´-DDE | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| 4,4´-DDT | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Dieldrin | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Endosulfan I | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Endosulfan II | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Endosulfan sulfate | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Endrin | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Endrin aldehyde | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Heptachlor | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Heptachlor epoxide | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Methoxychlor | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Toxaphene | <1.00 | | 1.00 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| alpha-Chlordane | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Isodrin | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

Max Environmental
233 Max Lane
Yukon PA, 15698
Project Manager: Carl Spadaro

Project: BULGER
Project Number: [none]
Collector: CLIENT
Number of Containers: 24

**Reported:**
07/20/17 17:36

**Client Sample ID:** **101**

**Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID:** **7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Organochlorine Pesticides by EPA Extraction Method 3510C** | | | | | | | | |
| gamma-Chlordane | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| Endrin ketone | <0.020 | | 0.020 | ug/l | 05/17/17 18:23 | EPA 8081B | RSR | |
| *Surrogate: Tetrachloro-meta-xylene* | | *66.0 %* | *24-119* | | *05/17/17 18:23* | *EPA 8081B* | RSR | |
| *Surrogate: Decachlorobiphenyl* | | *31.8 %* | *13.2-124* | | *05/17/17 18:23* | *EPA 8081B* | RSR | |
| **Polychlorinated Biphenyls by EPA Extraction Method 3510C** | | | | | | | | |
| PCB-1016 | <0.100 | | 0.100 | ug/l | 05/19/17 12:09 | EPA 8082 | rsr | |
| PCB-1221 | <0.100 | | 0.100 | ug/l | 05/19/17 12:09 | EPA 8082 | rsr | |
| PCB-1232 | <0.100 | | 0.100 | ug/l | 05/19/17 12:09 | EPA 8082 | rsr | |
| PCB-1242 | <0.100 | | 0.100 | ug/l | 05/19/17 12:09 | EPA 8082 | rsr | |
| PCB-1248 | <0.100 | | 0.100 | ug/l | 05/19/17 12:09 | EPA 8082 | rsr | |
| PCB-1254 | <0.100 | | 0.100 | ug/l | 05/19/17 12:09 | EPA 8082 | rsr | |
| PCB-1260 | <0.100 | | 0.100 | ug/l | 05/19/17 12:09 | EPA 8082 | rsr | |
| *Surrogate: Tetrachloro-meta-xylene* | | *63.7 %* | *10-139* | | *05/19/17 12:09* | *EPA 8082* | rsr | |
| *Surrogate: Decachlorobiphenyl* | | *47.7 %* | *10-144* | | *05/19/17 12:09* | *EPA 8082* | rsr | |
| **Semivolatile Organic Compounds by EPA Extraction Method 3510C** | | | | | | | | |
| Benzidine | <250 | | 250 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D, F |
| Pyridine | <100 | | 100 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Diphenylamine | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

**Semivolatile Organic Compounds by EPA Extraction Method 3510C**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| Acenaphthene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Acenaphthylene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Anthracene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Benzoic acid | <500 | | 500 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| Benzo (a) anthracene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Benzo (b) fluoranthene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Benzo (k) fluoranthene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | G |
| Benzo (g,h,i) perylene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Benzo (a) pyrene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Benzyl alcohol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Bis(2-chloroethoxy)methane | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Bis(2-chloroethyl)ether | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Bis(2-chloroisopropyl)ether | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Bis(2-ethylhexyl)phthalate | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| 4-Bromophenyl phenyl ether | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Butyl benzyl phthalate | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| 4-Chloroaniline | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 4-Chloro-3-methylphenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID:** **101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID:** **7E16171-02 (Water/Grab)**

**Semivolatile Organic Compounds by EPA Extraction Method 3510C**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| 2-Chloronaphthalene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 2-Chlorophenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 4-Chlorophenyl phenyl ether | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Chrysene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Dibenz (a,h) anthracene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Dibenzofuran | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| **Di-n-butyl phthalate** | 79.5 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| 1,2-Dichlorobenzene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 1,3-Dichlorobenzene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 1,4-Dichlorobenzene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 3,3´-Dichlorobenzidine | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| 2,4-Dichlorophenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Diethyl phthalate | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 2,4-Dimethylphenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Dimethyl phthalate | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 4,6-Dinitro-2-methylphenol | <250 | | 250 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| 2,4-Dinitrophenol | <250 | | 250 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| 2,4-Dinitrotoluene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organic Compounds by EPA Extraction Method 3510C** | | | | | | | | |
| 2,6-Dinitrotoluene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Di-n-octyl phthalate | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| Naphthalene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Aniline | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| N-Nitrosodimethylamine | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Acetophenone | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 3 & 4-Methylphenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 1,2-Diphenylhydrazine | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Fluoranthene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Fluorene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Hexachlorobenzene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Hexachlorobutadiene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Hexachlorocyclopentadiene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Hexachloroethane | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Indeno (1,2,3-cd) pyrene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Isophorone | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 2-Methylnaphthalene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 2-Methylphenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

Max Environmental
233 Max Lane
Yukon PA, 15698
Project Manager: Carl Spadaro

Project: BULGER
Project Number: [none]
Collector: CLIENT
Number of Containers: 24

**Reported:**
07/20/17 17:36

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organic Compounds by EPA Extraction Method 3510C** | | | | | | | | |
| 2-Nitroaniline | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| 3-Nitroaniline | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 4-Nitroaniline | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Nitrobenzene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 2-Nitrophenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| 4-Nitrophenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| N-Nitrosodi-n-propylamine | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | D |
| Pentachlorophenol | <250 | | 250 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Phenanthrene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Phenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| Pyrene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 1,2,4-Trichlorobenzene | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 2,4,5-Trichlorophenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| 2,4,6-Trichlorophenol | <50.0 | | 50.0 | ug/l | 05/18/17 18:28 | EPA 8270D | rsr | |
| *Surrogate: 2-Fluorophenol* | | *50.3 %* | *30.6-66.8* | | *05/18/17 18:28* | *EPA 8270D* | rsr | |
| *Surrogate: Phenol-d6* | | *36.8 %* | *17.9-51.5* | | *05/18/17 18:28* | *EPA 8270D* | rsr | |
| *Surrogate: Nitrobenzene-d5* | | *88.4 %* | *30.6-140* | | *05/18/17 18:28* | *EPA 8270D* | rsr | |
| *Surrogate: 2-Fluorobiphenyl* | | *92.4 %* | *40.6-121* | | *05/18/17 18:28* | *EPA 8270D* | rsr | |
| *Surrogate: 2,4,6-Tribromophenol* | | *108 %* | *50.4-131* | | *05/18/17 18:28* | *EPA 8270D* | rsr | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organic Compounds by EPA Extraction Method 3510C** | | | | | | | | |
| *Surrogate: Terphenyl-d14* | | *91.4 %* | *10-185* | | *05/18/17 18:28* | *EPA 8270D* | rsr | |
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | |
| Benzene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Toluene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Ethylbenzene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Xylenes (total) | <2.00 | | 2.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Naphthalene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| **Acetone** | 36.6 | | 10.0 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Acrolein | <50.0 | | 50.0 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Bromodichloromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Bromoform | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Bromomethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 2-Butanone | <10.0 | | 10.0 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Carbon disulfide | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Carbon tetrachloride | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Chlorobenzene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Chloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 2-Chloroethylvinyl ether | <50.0 | | 50.0 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | |
|---|---|---|---|
| Max Environmental | Project: | BULGER | |
| 233 Max Lane | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | |
| Chloroform | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Chloromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,2-Dibromo-3-chloropropane | <5.00 | | 5.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Dibromochloromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,2-Dibromoethane (EDB) | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Dibromomethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Dichlorodifluoromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,2-Dichloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,1-Dichloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| trans-1,2-Dichloroethene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,1-Dichloroethene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,2-Dichloropropane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| trans-1,3-Dichloropropene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| cis-1,3-Dichloropropene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Hexachlorobutadiene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Iodomethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Methylene chloride | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 4-Methyl-2-pentanone | <10.0 | | 10.0 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID: 101** **Date/Time Sampled:** 05/15/17 11:00

**Laboratory Sample ID: 7E16171-02 (Water/Grab)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,1,1,2-Tetrachloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Tetrachloroethene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,2,4-Trichlorobenzene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,1,1-Trichloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| 1,1,2-Trichloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Trichloroethene | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Trichlorofluoromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| Vinyl chloride | <1.00 | | 1.00 | ug/l | 05/17/17 20:02 | EPA 8260B | bag | |
| *Surrogate: 4-Bromofluorobenzene* | | *91.4 %* | *70-130* | | *05/17/17 20:02* | *EPA 8260B* | bag | |
| *Surrogate: 1,2-Dichloroethane-d4* | | *97.7 %* | *70-130* | | *05/17/17 20:02* | *EPA 8260B* | bag | |
| *Surrogate: Fluorobenzene* | | *96.3 %* | *70-130* | | *05/17/17 20:02* | *EPA 8260B* | bag | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

Max Environmental
233 Max Lane
Yukon PA, 15698
Project Manager: Carl Spadaro

Project: BULGER
Project Number: [none]
Collector: CLIENT
Number of Containers: 24

**Reported:**
07/20/17 17:36

**Client Sample ID:** **TRIP BLANK** **Date/Time Sampled:** 05/15/17 00:00

**Laboratory Sample ID:** **7E16171-03 (Water/Trip Blank)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | |
| Benzene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Toluene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Ethylbenzene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Xylenes (total) | <2.00 | | 2.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Naphthalene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Acetone | <10.0 | | 10.0 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Acrolein | <50.0 | | 50.0 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Bromodichloromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Bromoform | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Bromomethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 2-Butanone | <10.0 | | 10.0 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Carbon disulfide | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Carbon tetrachloride | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Chlorobenzene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Chloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 2-Chloroethylvinyl ether | <50.0 | | 50.0 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Chloroform | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Chloromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |

Max Environmental
233 Max Lane
Yukon PA, 15698
Project Manager: Carl Spadaro

Project: BULGER
Project Number: [none]
Collector: CLIENT
Number of Containers: 24

**Reported:** 07/20/17 17:36

**Client Sample ID:** **TRIP BLANK** **Date/Time Sampled:** 05/15/17 00:00

**Laboratory Sample ID:** **7E16171-03 (Water/Trip Blank)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | |
| 1,2-Dibromo-3-chloropropane | <5.00 | | 5.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Dibromochloromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,2-Dibromoethane (EDB) | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Dibromomethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Dichlorodifluoromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,2-Dichloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,1-Dichloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| trans-1,2-Dichloroethene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,1-Dichloroethene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,2-Dichloropropane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| trans-1,3-Dichloropropene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| cis-1,3-Dichloropropene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Hexachlorobutadiene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Iodomethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Methylene chloride | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 4-Methyl-2-pentanone | <10.0 | | 10.0 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,1,2,2-Tetrachloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,1,1,2-Tetrachloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Client Sample ID:** **TRIP BLANK** **Date/Time Sampled:** 05/15/17 00:00

**Laboratory Sample ID:** **7E16171-03 (Water/Trip Blank)**

| Analyte | Result | MDL | RL | Units | Date / Time Analyzed | Analytical Method | * Analyst | Note |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds by EPA Method 8260B** | | | | | | | | |
| Tetrachloroethene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,2,4-Trichlorobenzene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,1,1-Trichloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| 1,1,2-Trichloroethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Trichloroethene | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Trichlorofluoromethane | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| Vinyl chloride | <1.00 | | 1.00 | ug/l | 05/17/17 20:40 | EPA 8260B | bag | |
| *Surrogate: 4-Bromofluorobenzene* | | *91.1 %* | *70-130* | | *05/17/17 20:40* | *EPA 8260B* | bag | |
| *Surrogate: 1,2-Dichloroethane-d4* | | *102 %* | *70-130* | | *05/17/17 20:40* | *EPA 8260B* | bag | |
| *Surrogate: Fluorobenzene* | | *100 %* | *70-130* | | *05/17/17 20:40* | *EPA 8260B* | bag | |

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Notes**

| | |
|---|---|
| A7 | A reduced amount of sample was used during the preparation step due to the matrix of the sample. |
| D | A Continuing Calibration Verification (CCV) analyzed with the analytical batch recovered above the acceptance range for the noted analyte. |
| F | The Laboratory Control Sample (LCS) analyzed with this preparation batch recovered above the acceptance range for the noted analyte. |
| G | The Laboratory Control Sample (LCS) analyzed with this preparation batch recovered below the acceptance range for the noted analyte. |
| I | The spike recovery was below the acceptance range for the Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) sample analyzed with the preparation batch. |
| I4 | Vials were prepared at the laboratory from the received container. |
| J | Detected between the Method Detection Limit (MDL) and the Reporting Limit (RL); therefore, the result is an estimated value. |
| K | The RPD result exceeded the quality control limits for the duplicate, Laboratory Control Sample Duplicate (LCSD), or Matrix Spike Duplicate (MSD) sample analyzed with the preparation batch. |
| L | The noted analyte was detected in the method blank. |
| Q | Sample was analyzed at a dilution. Reporting limits were adjusted accordingly. |

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Definitions**

If surrogate values are not within the indicated range, then the results are considered to be estimated.

Reporting limits are adjusted accordingly when samples are analyzed at a dilution due to the matrix.

MBAS, calculated as LAS, mol wt 348

If the solid sample weight for VOC analysis does not fall within the 3.5-6.5 gram range, the results are considered estimated values.

Unless otherwise noted, all results for solids are reported on a dry weight basis.

Samples collected by Fairway Laboratories' personnel are done so in accordance with Standard Operating Procedures established by Fairway Laboratories.

| | |
|---|---|
| # | The following analyses are to be performed immediately upon sampling: pH, sulfite, chlorine residual, dissolved oxygen, filtration for ortho phosphorus, and ferrous iron. The date and time reported reflect the time the samples were analyzed at the laboratory; and should be considered as analyzed outside the EPA holding time. |
| * | P indicates analysis performed by Fairway Laboratories, Inc. at the Pennsdale location. This location is PaDEP Chapter 252 certified. |
| * | G indicates analysis performed by Fairway Laboratories, Inc. at the Greensburg location PaDEP: 65-00392. This location is PaDEP Chapter 252 certified. |
| < | Represents "less than" - indicates that the result was less than the reporting limit. |
| MDL | Method Detection Limit - is the lowest or minimum level that provides 99% confidence level that the analyte is detected. Any reported result values that are less than the RL are considered estimated values. |
| RL | Reporting Limit - is the lowest or minimum level at which the analyte can be quantified. |

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

| | | | | |
|---|---|---|---|---|
| Max Environmental | | Project: | BULGER | |
| 233 Max Lane | | Project Number: | [none] | **Reported:** |
| Yukon PA, 15698 | | Collector: | CLIENT | 07/20/17 17:36 |
| Project Manager: | Carl Spadaro | Number of Containers: | 24 | |

**Terms & Conditions**

**Services provided by Fairway Laboratories Inc. are limited to the terms and conditions stated herein, unless otherwise agreed to in a formal contract**.

**CHAIN OF CUSTODY** Fairway Laboratories Inc. ("Fairway," "us" or "we") will initiate a chain-of-custody/request for analysis upon sample receipt unless the client includes a completed form with the received sample(s). Upon request, Fairway will provide chain-of-custody forms for use.

**CONFIDENTIALITY** Fairway maintains confidentiality in all of our client interactions. The client's consent will be required before releasing information about the services provided.

**CONTRACTS** All contracts are subject to review and approval by Fairway's legal council. Each contract must be signed by a corporate officer.

**PAYMENT/BILLING** Unless otherwise set forth in a signed contract or purchase order, terms of payment are "NET 30 Days." The time allowed for payment shall begin based on the invoice date. A 1.5% per month service charge may be added to all unpaid balances beyond the initial 30 days. In its sole discretion, Fairway reserves the right to request payment before services and hold sample results for payment of due balances. We will not bill a third party without prior agreement among all parties acknowledging and accepting responsibility for payment.

**SAMPLE COLLECTION AND SUBMISSION** Clients not requesting collection services from Fairway are responsible for proper collection, preservation, packaging, and delivery of samples to the laboratory in accordance with current law and commercial practice. Fairway shall have no responsibility for sample integrity prior to the receipt of the sample(s) and/or for any inaccuracy in test or analyses results as a result of the failure of the client or any third party to maintain the integrity of samples prior to delivery to Fairway. All samples submitted must be accompanied by a completed chain of custody or similar document clearly noting the requested analyses, dates/time sampled, client contact information, and trail of custody.

**SUBCONTRACTING** Some analyses may require subcontracting to another laboratory. Unless the client indicates otherwise, this decision will be made by Fairway. Subcontracted work will be identified on the final report in accordance with NELAC requirements.

**RETURN OF RESULTS** Fairway routinely provides faxed or verbal results within 10 working days of receipt of sample(s) and a hard copy of the data results is routinely received via US Postal Service within 15 working days. At the request of the client, Fairway may offer expedited return of sample results. Surcharges may apply to rush requests. All rush requests must be pre-approved by Fairway. We reserve the right to charge an archive retrieval fee for results older than one (1) year from the date of the request. All records will be maintained by Fairway for 5 years, after which, they will be destroyed.

**SAMPLE DISPOSAL** Fairway will maintain samples for four (4) weeks after the sample receipt date. Fairway will dispose of samples which are not and/or do not contain hazardous wastes (as such term is defined by applicable federal or state law), unless prior arrangements have been made for long-term storage. Fairway reserves the right to charge a disposal fee for the proper disposal of samples found or suspected to contain hazardous waste. A return shipping charge will be invoiced for samples returned to the client at their request.

**HAZARD COMMUNICATION** The client has the responsibility to inform the laboratory of any hazardous characteristics known or suspected about the sample, and to provide information on hazard prevention and personal protection as necessary or otherwise required by applicable law.

**WARRANTY AND LIMITATION OF LIABILITY** For services rendered, Fairway warrants that it will apply its best scientific knowledge and judgment and to employ its best level of effort consistent with professional standards within the environmental testing industry in performing the analytical services requested by its clients. We disclaim any other warranties, expressed or implied by law. Fairway does not accept any legal responsibility for the purposes for which client uses the test results.

**LITIGATION** All costs associated with compliance to any subpoena for documents, for testimony in a court of law, or for any other purpose relating to work performed by Fairway Laboratories, Inc. shall be invoiced by Fairway and paid by client. These costs shall include, but are not limited to, hourly charges for the persons involved, travel, mileage, and accommodations and for any and all other expenses associated with said litigation.



*Fairway Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.*

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

# CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

Please print. See back of COC for instructions/terms and conditions.

2019 9th Ave.
P.O. Box 1925
Altoona, PA 16602
Phone: (814) 946-4306
Fax: (814) 946-8791

**FAIRWAY LABORATORIES** *Environmental Laboratory*

89 Kristi Rd
Pennsdale, PA 17756
Phone: (570) 494-6380

7E16171 #1
COC #

Page 1 of 2

Client Name: Max Environmental
Address: 200 Max Dr
Yukon Pa 15019
Contact: Rob Buttermore
Phone #: 412-400-1062
Fax #:
Project Name: Clarifier Sludge
Quote/PO #:

TAT: Normal ☐ Rush ☐
Rush TAT subject to pre-approval and surcharge.
Date Required: __/__/__

Received on ice? Y N
Sample Temp:

Reportable to PADEP? Yes ☐
PWSID #

LAB USE ONLY
FedEx USPS
UPS Other
Tracking #

| Sample Description/Location | GRAB | Composite | Composite Start: Start Date | Composite Start: Start Time | GRAB -or- Composite End: End Date | GRAB -or- Composite End: End Time | Matrix: Solid | Matrix: Water | Matrix: Other | # of Containers | Analyses Requested | Bottle Type/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clarifier Sludge | | X | 5-15 | 11:00 | | | X | | | 6 | See attached | |
| 101 | | X | 5-15 | 11:00 | | | | X | | 13 | | |

| | Date | Time | | Date | Time |
|---|---|---|---|---|---|
| Sampled by: Robert Buttermore | | | Received by: [signature] | 5/16/17 | 1425 |
| Relinquished by: [signature] | 5/16/17 | 1815 | Received by: | | |
| Relinquished by: | | | Received by: | | |
| Relinquished by: | | | Received by: [signature] | 5/16/17 | 1815 |

Remarks
Report Results to David thomas at Yukon facility

By relinquishing my sample to Fairway Laboratories, Inc., I hereby agree to the terms and conditions printed on the reverse.

White Original - FLI File Canary - FLI Copy Pink - Customer Receipt Copy

# Chain of Custody Receiving Document

Page 2 of 2

Receiver: CM

Date/Time of this check: 5/16/22 21:20 Client: May Links Lab # 7E16171 #2

**Received on ICE?** y ☐ * **Sample Temperature when delivered to the Lab:** 1.1 **Acceptable?** y ☐ * **or In cool down process?** ☐ *
***(Not applicable for WV compliance)***

Custody Seals? y Intact? y

COC/Labels on bottles agree? y ☐* Correct containers for all the analysis requested? y ☐ * Matrix: Water + Solid

| COC # | Poly Non-Pres. | Poly H2SO4 | Poly HNO3 | Amber H2SO4 | Amber Non-Pres. | Poly NaOH | VOCS (Head space?) | Other ☐ * | Properly Preserved ☑ * | Bacti | Comments: ☐ * Internal notification completed for deviations. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ZnAce | | | | | |
| 1 | | | | | 6 | | | | plw | | Solid |
| 2 | 1 | | 1 | | 5 | 1 | 3 no Vol | 250ml NaOH | y | | |
| TB | | | | | | | HCL | | plw | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| *** DEVIATION PRESENT:** | **CLIENT CALLED:** | **CLIENT RESPONSE:** |
|---|---|---|
| ☹ **No Ice** ( ) | **YES** ( ) | **Proceed with analysis; qualify data** ( ) |
| ☹ **Not at Proper Temperature** ( ) | **By Whom:** | **Will Resample** ( ) |
| ☹ **Wrong Container** ( ) | | **Provided Information** ( ) |
| ☹ **Missing Information:** ( ) | ____ Date: ____ | **No Response; Proceed and qualified** ( ) |
| | | **Client Contact:** ____ **Date:** ____ |

* Comments: ____

This is a date sensitive document and may not be current after May 12, 2017.

7E76171 #3

§ 268.48 Universal treatment standards.

(a) Table UTS identifies the hazardous constituents, along with the nonwastewater and wastewater treatment standard levels, that are used to regulate most prohibited hazardous wastes with numerical limits. For determining compliance with treatment standards for underlying hazardous constituents as defined in § 268.2(i), these treatment standards may not be exceeded. Compliance with these treatment standards is measured by an analysis of grab samples, unless otherwise noted in the following Table UTS.

Universal Treatment Standards

[Note: NA means not applicable]

| Regulated constituent common name | CAS [1] number | Wastewater standard Concentration [2] in mg/l | Nonwastewater standard Concentration [3] in mg/kg unless noted as "mg/l TCLP" |
|---|---|---|---|
| Organic Constituents | | | |
| Acenaphthylene | 208-96-8 | 0.059 | 3.4 |
| Acenaphthene | 83-32-9 | 0.059 | 3.4 |
| Acetone | 67-64-1 | 0.28 | 160 |
| Acetonitrile | 75-05-8 | 5.6 | 38 |
| Acetophenone | 96-86-2 | 0.010 | 9.7 |
| ~~2-Acetylaminofluorene~~ | 53-96-3 | 0.059 | 140 |
| Acrolein | 107-02-8 | 0.29 | NA |
| ~~Acrylamide~~ | 79-06-1 | 19 | 23 |
| ~~Acrylonitrile~~ | 107-13-1 | 0.24 | 84 |
| Aldrin | 309-00-2 | 0.021 | 0.066 |
| ~~4-Aminobiphenyl~~ | 92-67-1 | 0.13 | NA |
| Aniline | 62-53-3 | 0.81 | 14 |
| ~~o-Anisidine (2-methoxyaniline)~~ | 90-04-0 | 0.010 | 0.66 |
| Anthracene | 120-12-7 | 0.059 | 3.4 |
| ~~Aramite~~ | 140-57-8 | 0.36 | NA |
| alpha-BHC | 319-84-6 | 0.00014 | 0.066 |

7E76171 #4

| | | | |
|---|---|---|---|
| beta-BHC | 319-85-7 | 0.00014 | 0.066 |
| delta-BHC | 319-86-8 | 0.023 | 0.066 |
| gamma-BHC | 58-89-9 | 0.0017 | 0.066 |
| Benzene | 71-43-2 | 0.14 | 10 |
| Benz(a)anthracene | 56-55-3 | 0.059 | 3.4 |
| ~~Benzal chloride~~ | 98-87-3 | 0.055 | 6.0 |
| Benzo(b)fluoranthene (difficult to distinguish from benzo(k)fluoranthene) | 205-99-2 | 0.11 | 6.8 |
| Benzo(k)fluoranthene (difficult to distinguish from benzo(b)fluoranthene) | 207-08-9 | 0.11 | 6.8 |
| Benzo(g,h,i)perylene | 191-24-2 | 0.0055 | 1.8 |
| Benzo(a)pyrene | 50-32-8 | 0.061 | 3.4 |
| Bromodichloromethane | 75-27-4 | 0.35 | 15 |
| Bromomethane/Methyl bromide | 74-83-9 | 0.11 | 15 |
| 4-Bromophenyl phenyl ether | 101-55-3 | 0.055 | 15 |
| n-Butyl alcohol | 71-36-3 | 5.6 | 2.6 |
| Butyl benzyl phthalate | 85-68-7 | 0.017 | 28 |
| 2-sec-Butyl-4,6-dinitrophenol/Dinoseb | 88-85-7 | 0.066 | 2.5 |
| Carbon disulfide | 75-15-0 | 3.8 | 4.8 mg/l TCLP |
| Carbon tetrachloride | 56-23-5 | 0.057 | 6.0 |
| Chlordane (alpha and gamma isomers) | 57-74-9 | 0.0033 | 0.26 |
| p-Chloroaniline | 106-47-8 | 0.46 | 16 |
| Chlorobenzene | 108-90-7 | 0.057 | 6.0 |
| ~~Chlorobenzilate~~ | 510-15-6 | 0.10 | NA |
| ~~2-Chloro-1,3-butadiene~~ | 126-99-8 | 0.057 | 0.28 |
| Chlorodibromomethane | 124-48-1 | 0.057 | 15 |
| Chloroethane | 75-00-3 | 0.27 | 6.0 |
| bis(2-Chloroethoxy)methane | 111-91-1 | 0.036 | 7.2 |

7E16 171 #5

| | | | |
|---|---|---|---|
| bis(2-Chloroethyl)ether | 111-44-4 | 0.033 | 6.0 |
| Chloroform | 67-66-3 | 0.046 | 6.0 |
| bis(2-Chloroisopropyl)ether | 39638-32-9 | 0.055 | 7.2 |
| p-Chloro-m-cresol | 59-50-7 | 0.018 | 14 |
| 2-Chloroethyl vinyl ether | 110-75-8 | 0.062 | NA |
| Chloromethane/Methyl chloride | 74-87-3 | 0.19 | 30 |
| 2-Chloronaphthalene | 91-58-7 | 0.055 | 5.6 |
| 2-Chloropchenol | 95-57-8 | 0.044 | 5.7 |
| 3-Chloropropylene | 107-05-1 | 0.036 | 30 |
| Chrysene | 218-01-9 | 0.059 | 3.4 |
| ~~p-Cresidine~~ | 120-71-8 | 0.010 | 0.66 |
| o-Cresol | 95-48-7 | 0.11 | 5.6 |
| m-Cresol (difficult to distinguish from p-cresol) | 108-39-4 | 0.77 | 5.6 |
| p-Cresol (difficult to distinguish from m-cresol) | 106-44-5 | 0.77 | 5.6 |
| ~~Cyclohexanone~~ | 108-94-1 | 0.36 | 0.75 mg/l TCLP |
| o,p′-DDD | 53-19-0 | 0.023 | 0.087 |
| p,p′-DDD | 72-54-8 | 0.023 | 0.087 |
| o,p′-DDE | 3424-82-6 | 0.031 | 0.087 |
| p,p′-DDE | 72-55-9 | 0.031 | 0.087 |
| o,p′-DDT | 789-02-6 | 0.0039 | 0.087 |
| p,p′-DDT | 50-29-3 | 0.0039 | 0.087 |
| Dibenz(a,h)anthracene | 53-70-3 | 0.055 | 8.2 |
| ~~Dibenz(a,e)pyrene~~ | 192-65-4 | 0.061 | NA |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | 0.11 | 15 |
| 1,2-Dibromoethane/Ethylene dibromide | 106-93-4 | 0.028 | 15 |
| Dibromomethane | 74-95-3 | 0.11 | 15 |
| m-Dichlorobenzene | 541-73-1 | 0.036 | 6.0 |

7E16171 #6

| | | | |
|---|---|---|---|
| o-Dichlorobenzene | 95-50-1 | 0.088 | 6.0 |
| p-Dichlorobenzene | 106-46-7 | 0.090 | 6.0 |
| Dichlorodifluoromethane | 75-71-8 | 0.23 | 7.2 |
| 1,1-Dichloroethane | 75-34-3 | 0.059 | 6.0 |
| 1,2-Dichloroethane | 107-06-2 | 0.21 | 6.0 |
| 1,1-Dichloroethylene | 75-35-4 | 0.025 | 6.0 |
| trans-1,2-Dichloroethylene | 156-60-5 | 0.054 | 30 |
| 2,4-Dichlorophenol | 120-83-2 | 0.044 | 14 |
| 2,6-Dichlorophenol | 87-65-0 | 0.044 | 14 |
| 2,4-Dichlorophenoxyacetic acid/2,4-D | 94-75-7 | 0.72 | 10 |
| 1,2-Dichloropropane | 78-87-5 | 0.85 | 18 |
| cis-1,3-Dichloropropylene | 10061-01-5 | 0.036 | 18 |
| trans-1,3-Dichloropropylene | 10061-02-6 | 0.036 | 18 |
| Dieldrin | 60-57-1 | 0.017 | 0.13 |
| Diethyl phthalate | 84-66-2 | 0.20 | 28 |
| ~~p-Dimethylaminoazobenzene~~ | 60-11-7 | 0.13 | NA |
| ~~2,4-Dimethylaniline (2,4-xylidine)~~ | 95-68-1 | 0.010 | 0.66 |
| 2,4-Dimethyl phenol | 105-67-9 | 0.036 | 14 |
| Dimethyl phthalate | 131-11-3 | 0.047 | 28 |
| Di-n-butyl phthalate | 84-74-2 | 0.057 | 28 |
| 1,4-Dinitrobenzene | 100-25-4 | 0.32 | 2.3 |
| 4,6-Dinitro-o-cresol | 534-52-1 | 0.28 | 160 |
| 2,4-Dinitrophenol | 51-28-5 | 0.12 | 160 |
| 2,4-Dinitrotoluene | 121-14-2 | 0.32 | 140 |
| 2,6-Dinitrotoluene | 606-20-2 | 0.55 | 28 |
| Di-n-octyl phthalate | 117-84-0 | 0.017 | 28 |
| ~~Di-n-propylnitrosamine~~ | 621-64-7 | 0.40 | 14 |

7E16171 #7

| | | | |
|---|---|---|---|
| ~~1,4-Dioxane~~ | 123-91-1 | 12.0 | 170 |
| Diphenylamine (difficult to distinguish from diphenylnitrosamine) | 122-39-4 | 0.92 | 13 |
| ~~Diphenylnitrosamine (difficult to distinguish from diphenylamine)~~ | 86-30-6 | 0.92 | 13 |
| 1,2-Diphenylhydrazine | 122-66-7 | 0.087 | NA |
| ~~Disulfoton~~ | 298-04-4 | 0.017 | 6.2 |
| Endosulfan I | 959-98-8 | 0.023 | 0.066 |
| Endosulfan II | 33213-65-9 | 0.029 | 0.13 |
| Endosulfan sulfate | 1031-07-8 | 0.029 | 0.13 |
| Endrin | 72-20-8 | 0.0028 | 0.13 |
| Endrin aldehyde | 7421-93-4 | 0.025 | 0.13 |
| ~~Ethyl acetate~~ | 141-78-6 | 0.34 | 33 |
| Ethyl benzene | 100-41-4 | 0.057 | 10 |
| ~~Ethyl cyanide/Propanenitrile~~ | 107-12-0 | 0.24 | 360 |
| ~~Ethyl ether~~ | 60-29-7 | 0.12 | 160 |
| bis(2-Ethylhexyl)phthalate | 117-81-7 | 0.28 | 28 |
| ~~Ethyl methacrylate~~ | 97-63-2 | 0.14 | 160 |
| ~~Ethylene oxide~~ | 75-21-8 | 0.12 | NA |
| ~~Famphur~~ | 52-85-7 | 0.017 | 15 |
| Fluoranthene | 206-44-0 | 0.068 | 3.4 |
| Fluorene | 86-73-7 | 0.059 | 3.4 |
| Heptachlor | 76-44-8 | 0.0012 | 0.066 |
| ~~1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)~~ | 35822-46-9 | 0.000035 | .0025 |
| ~~1,2,3,4,6,7,8-Heptachlorodibenzofluran (1,2,3,4,6,7,8-HpCDF)~~ | 67562-39-4 | 0.000035 | .0025 |

7E16171 #8

| | | | |
|---|---|---|---|
| ~~1,2,3,4,7,8,9-Heptachlorodibenzofluran (1,2,3,4,7,8,9-HpCDF)~~ | 55673-89-7 | 0.000035 | .0025 |
| Heptachlor epoxide | 1024-57-3 | 0.016 | 0.066 |
| Hexachlorobenzene | 118-74-1 | 0.055 | 10 |
| Hexachlorobutadiene | 87-68-3 | 0.055 | 5.6 |
| Hexachlorocyclopentadiene | 77-47-4 | 0.057 | 2.4 |
| ~~HxCDDs (All Hexachlorodibenzo-p-dioxins)~~ | NA | 0.000063 | 0.001 |
| ~~HxCDFs (All Hexachlorodibenzofurans)~~ | NA | 0.000063 | 0.001 |
| Hexachloroethane | 67-72-1 | 0.055 | 30 |
| ~~Hexachloropropylene~~ | 1888-71-7 | 0.035 | 30 |
| Indeno(1,2,3-c,d) pyrene | 193-39-5 | 0.0055 | 3.4 |
| Iodomethane | 74-88-4 | 0.19 | 65 |
| ~~Isobutyl alcohol~~ | 78-83-1 | 5.6 | 170 |
| Isodrin | 465-73-6 | 0.021 | 0.066 |
| ~~Isosafrole~~ | 120-58-1 | 0.081 | 2.6 |
| ~~Kepone~~ | 143-50-0 | 0.0011 | 0.13 |
| ~~Methacrylonitrile~~ | 126-98-7 | 0.24 | 84 |
| ~~Methanol~~ | 67-56-1 | 5.6 | 0.75 mg/l TCLP |
| ~~Methapyrilene~~ | 91-80-5 | 0.081 | 1.5 |
| Methoxychlor | 72-43-5 | 0.25 | 0.18 |
| ~~3-Methylcholanthrene~~ | 56-49-5 | 0.0055 | 15 |
| 4,4-Methylene bis(2-chloroaniline) | 101-14-4 | 0.50 | 30 |
| Methylene chloride | 75-09-2 | 0.089 | 30 |
| Methyl ethyl ketone | 78-93-3 | 0.28 | 36 |
| Methyl isobutyl ketone | 108-10-1 | 0.14 | 33 |
| ~~Methyl methacrylate~~ | 80-62-6 | 0.14 | 160 |
| ~~Methyl methanesulfonate~~ | 66-27-3 | 0.018 | NA |

7E16171 #9

| | | | |
|---|---|---|---|
| ~~Methyl parathion~~ | 298-00-0 | 0.014 | 4.6 |
| Naphthalene | 91-20-3 | 0.059 | 5.6 |
| ~~2-Naphthylamine~~ | 91-59-8 | 0.52 | NA |
| o-Nitroaniline | 88-74-4 | 0.27 | 14 |
| p-Nitroaniline | 100-01-6 | 0.028 | 28 |
| Nitrobenzene | 98-95-3 | 0.068 | 14 |
| ~~5-Nitro-o-toluidine~~ | 99-55-8 | 0.32 | 28 |
| o-Nitrophenol | 88-75-5 | 0.028 | 13 |
| p-Nitrophenol | 100-02-7 | 0.12 | 29 |
| ~~N-Nitrosodiethylamine~~ | 55-18-5 | 0.40 | 28 |
| N-Nitrosodimethylamine | 62-75-9 | 0.40 | 2.3 |
| ~~N-Nitroso-di-n-butylamine~~ | 924-16-3 | 0.40 | 17 |
| ~~N-Nitrosomethylethylamine~~ | 10595-95-6 | 0.40 | 2.3 |
| ~~N-Nitrosomorpholine~~ | 59-89-2 | 0.40 | 2.3 |
| ~~N-Nitrosopiperidine~~ | 100-75-4 | 0.013 | 35 |
| ~~N-Nitrosopyrrolidine~~ | 930-55-2 | 0.013 | 35 |
| ~~1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)~~ | 3268-87-9 | 0.000063 | 0.005 |
| ~~1,2,3,4,6,7,8,9-Octachlorodibenzofluran (OCDF)~~ | 39001-02-0 | 0.000063 | 0.005 |
| ~~Parathion~~ | 56-38-2 | 0.014 | 4.6 |
| Total PCBs (sum of all PCB isomers, or all Aroclors) [8] | 1336-36-3 | 0.10 | 10 |
| ~~Pentachlorobenzene~~ | 608-93-5 | 0.055 | 10 |
| ~~PeCDDs (All Pentachlorodibenzo-p-dioxins)~~ | NA | 0.000063 | 0.001 |
| ~~PeCDFs (All Pentachlorodibenzofurans)~~ | NA | 0.000035 | 0.001 |
| ~~Pentachloroethane~~ | 76-01-7 | 0.055 | 6.0 |
| ~~Pentachloronitrobenzene~~ | 82-68-8 | 0.055 | 4.8 |
| Pentachlorophenol | 87-86-5 | 0.089 | 7.4 |
| ~~Phenacetin~~ | 62-44-2 | 0.081 | 16 |

7E16 171 #10

| | | | |
|---|---|---|---|
| Phenanthrene | 85-01-8 | 0.059 | 5.6 |
| Phenol | 108-95-2 | 0.039 | 6.2 |
| ~~1,3-Phenylenediamine~~ | 108-45-2 | 0.010 | 0.66 |
| ~~Pherate~~ | 298-02-2 | 0.021 | 4.6 |
| ~~Phthalic acid~~ | 100-21-0 | 0.055 | 28 |
| ~~Phthalic anhydride~~ | 85-44-9 | 0.055 | 28 |
| ~~Pronamide~~ | 23950-58-5 | 0.093 | 1.5 |
| Pyrene | 129-00-0 | 0.067 | 8.2 |
| Pyridine | 110-86-1 | 0.014 | 16 |
| ~~Safrole~~ | 94-59-7 | 0.081 | 22 |
| Silvex/2,4,5-TP | 93-72-1 | 0.72 | 7.9 |
| ~~1,2,4,5-Tetrachlorobenzene~~ | 95-94-3 | 0.055 | 14 |
| TCDDs (All Tetrachlorodibenzo-p-dioxins) | NA | 0.000063 | 0.001 |
| TCDFs (All Tetrachlorodibenzofurans) | NA | 0.000063 | 0.001 |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 0.057 | 6.0 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 0.057 | 6.0 |
| Tetrachloroethylene | 127-18-4 | 0.056 | 6.0 |
| 2,3,4,6-Tetrachlorophenol | 58-90-2 | 0.030 | 7.4 |
| Toluene | 108-88-3 | 0.080 | 10 |
| Toxaphene | 8001-35-2 | 0.0095 | 2.6 |
| Tribromomethane/Bromoform | 75-25-2 | 0.63 | 15 |
| 1,2,4-Trichlorobenzene | 120-82-1 | 0.055 | 19 |
| 1,1,1-Trichloroethane | 71-55-6 | 0.054 | 6.0 |
| 1,1,2-Trichloroethane | 79-00-5 | 0.054 | 6.0 |
| Trichloroethylene | 79-01-6 | 0.054 | 6.0 |
| Trichlorofluoromethane | 75-69-4 | 0.020 | 30 |
| 2,4,5-Trichlorophenol | 95-95-4 | 0.18 | 7.4 |

7ET16171 #11

| | | | |
|---|---|---|---|
| 2,4,6-Trichlorophenol | 88-06-2 | 0.035 | 7.4 |
| 2,4,5-Trichlorophenoxyacetic acid/2,4,5-T | 93-76-5 | 0.72 | 7.9 |
| 1,2,3-Trichloropropane | 96-18-4 | 0.85 | 30 |
| ~~1,1,2-Trichloro-1,2,2-trifluoroethane~~ | 76-13-1 | 0.057 | 30 |
| ~~tris-(2,3-Dibromopropyl) phosphate~~ | 126-72-7 | 0.11 | 0.10 |
| Vinyl chloride | 75-01-4 | 0.27 | 6.0 |
| Xylenes-mixed isomers (sum of o-, m-, and p-xylene concentrations) | 1330-20-7 | 0.32 | 30 |
| Inorganic Constituents | | | |
| Antimony | 7440-36-0 | 1.9 | 1.15 mg/l TCLP |
| Arsenic | 7440-38-2 | 1.4 | 5.0 mg/l TCLP |
| Barium | 7440-39-3 | 1.2 | 21 mg/l TCLP |
| Beryllium | 7440-41-7 | 0.82 | 1.22 mg/l TCLP |
| Cadmium | 7440-43-9 | 0.69 | 0.11 mg/l TCLP |
| Chromium (Total) | 7440-47-3 | 2.77 | 0.60 mg/l TCLP |
| Cyanides (Total) [4] | 57-12-5 | 1.2 | 590 |
| Cyanides (Amenable) [4] | 57-12-5 | 0.86 | 30 |
| Fluoride [5] | 16984-48-8 | 35 | NA |
| Lead | 7439-92-1 | 0.69 | 0.75 mg/l TCLP |
| Mercury - Nonwastewater from Retort | 7439-97-6 | NA | 0.20 mg/l TCLP |
| Mercury - All Others | 7439-97-6 | 0.15 | 0.025 mg/l TCLP |
| Nickel | 7440-02-0 | 3.98 | 11 mg/l TCLP |
| Selenium [7] | 7782-49-2 | 0.82 | 5.7 mg/l TCLP |
| Silver | 7440-22-4 | 0.43 | 0.14 mg/l TCLP |
| Sulfide [5] | 18496-25-8 | 14 | NA |

#12

7E16171

| | | | |
|---|---|---|---|
| Thallium | 7440-28-0 | 1.4 | 0.20 mg/l TCLP |
| Vanadium [5] | 7440-62-2 | 4.3 | 1.6 mg/l TCLP |
| Zinc [5] | 7440-66-6 | 2.61 | 4.3 mg/l TCLP |

Footnotes to Table UTS

1 CAS means Chemical Abstract Services. When the waste code and/or regulated constituents are described as a combination of a chemical with it's salts and/or esters, the CAS number is given for the parent compound only.

2 Concentration standards for wastewaters are expressed in mg/l and are based on analysis of composite samples.

3 Except for Metals (EP or TCLP) and Cyanides (Total and Amenable) the nonwastewater treatment standards expressed as a concentration were established, inpart, based upon incineration in units operated in accordance with the technical requirements of 40 CFR part 264 , subpart O or 40 CFR part 265 , subpart O, or based upon combustion in fuel substitution units operating in accordance with applicable technical requirements. A facility may comply with these treatment standards according to provisions in 40 CFR 268.40(d) . All concentration standards for nonwastewaters are based on analysis of grab samples.

4 Both Cyanides (Total) and Cyanides (Amenable) for nonwastewaters are to be analyzed using Method 9010C or 9012B, found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, as incorporated by reference in 40 CFR 260.11 , with a sample size of 10 grams and a distillation time of one hour and 15 minutes.

5 These constituents are not "underlying hazardous constituents" in characteristic wastes, according to the definition at § 268.2(i).

6 [Reserved]

7 This constituent is not an underlying hazardous constituent as defined at § 268.2(i) of this Part because its UTS level is greater than its TC level, thus a treatment selenium waste would always be characteristically hazardous, unless it is treated to below its characteristic level.

8 This standard is temporarily deferred for soil exhibiting a hazardous characteristic due to D004-D011 only.

[59 FR 48103, Sept. 19, 1994, as amended at 60 FR 302, Jan. 3, 1995; 61 FR 15654, Apr. 8, 1996; 61 FR 33690, June 28, 1996; 62 FR 7596, Feb. 19, 1997; 63 FR 24626, May 4, 1998; 63 FR 28739, May 26, 1998; 63 FR 47417, Sept. 4, 1998; 64 FR 25417, May 11, 1999; 65 FR 14475, Mar. 17, 2000; 70 FR 34590, June 14, 2005; 70 FR 9178, Feb. 24, 2005; 71 FR 40279, July 14, 2006; 75 FR 13008, Mar. 18, 2010; 76 FR 34156, June 13, 2011]