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Report for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment System Sites

Applicability: **DOE EM Programs and Projects** **Revision 0 - FINAL**

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ACRONYMS

ACM	asbestos containing materials
Alliant	Alliant Corporation
ASTM	American Society for Testing and Materials
bgs	below ground surface
C	Celsius
CAP	Consolidated Audit Program
CCV	continuing calibration verification
CoC	chain of custody
cpm	counts per minute
DOE	U.S. Department of Energy
DPT	direct-push technology
DQO	data quality objective
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ft.	feet
g	gram
GEOS	GEOServices, LLC
GPS	global positioning system
Hg	mercury
H&S	health and safety
ID	identification
Jerome meter	Jerome Mercury Vapor Analyzer
Kg	kilogram
L	liter
m^3	cubic meter
mg	milligram
Misc.	Miscellaneous
MWD	M&W Drilling, LLC
N/A	Not applicable
ORAU	Oak Ridge Associated Universities
ORR	Oak Ridge Reservation
oz	Ounce
PCB	polychlorinated biphenyls
pCi/g	picocuries per gram
PCT	percent
PID	photoionization detector
PLM	Polarized Light Microscopy

ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QCP	Quality Control Plan
R	rejected
RRF	Relative response factors
RCRA	Resource Conservation and Recovery Act of 1976
RPD	relative percent difference
SDG	Sample Delivery Groups
SOW	Statement of Work
SSHP	Site Safety and Health Plan
Strata-G	Strata-G, LLC
SVOC	semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TLI	TLI Solutions, Incorporated
TOC	total organic carbon
TSDF	treatment, storage, and disposal facility
TSS	total suspended solids
UEFPC	Upper East Fork of Poplar Creek
VOC	volatile organic compound
WAC	waste acceptance criteria
WMP	Waste Management Plan
Y-12	Y-12 National Security Complex

1. INTRODUCTION

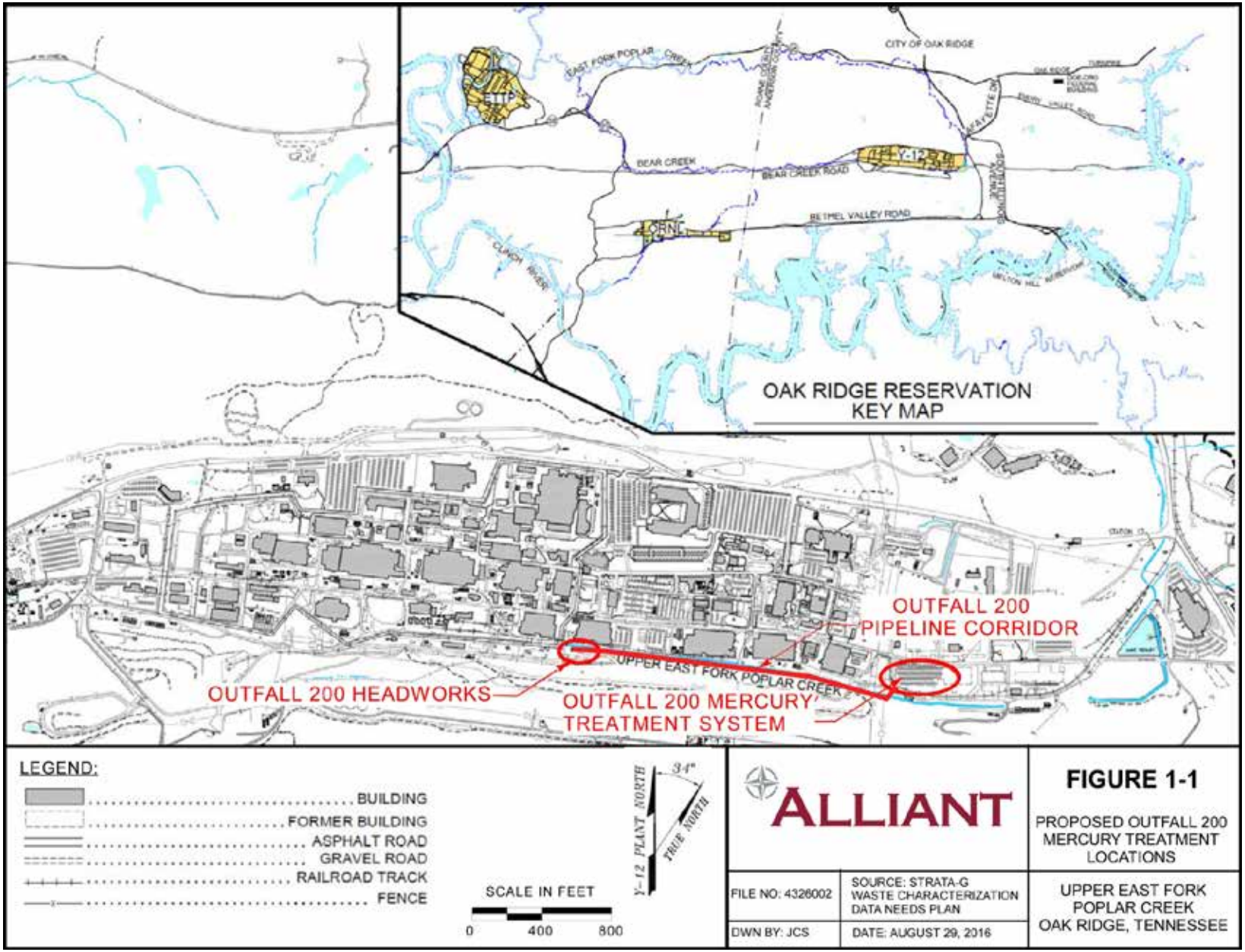
This *Report for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment System Sites* presents the results of the waste characterization activities conducted at the proposed Outfall 200 Mercury Treatment Facility located at the Y-12 National Security Complex (Y-12). The waste characterization activities were conducted to provide information on areas of potential contamination where construction activities will be performed to support waste disposal pathway determination and potential controls for worker protection. Figure 1-1 shows the location of the proposed Outfall 200 Treatment System with respect to the Y-12 facility.

Alliant Corporation (Alliant) was contracted to perform the waste characterization activities under U.S. Department of Energy (DOE) Contract No. DE-SC0003846. This Report was prepared to fulfill the reporting requirements listed in the *Statement of Work (SOW)* (DOE, 2016).

1.1 REPORT ORGANIZATION

This *Report* provides background information for the proposed Outfall 200 Waste Treatment Facility, presents the project objectives, briefly discusses the sampling approach and strategy, presents the nature and extent of contamination at the project Sites, assesses project limitations and assumptions, discusses lessons learned during the project, and lists the project references. This *Report* is organized in the following sections and appendices:

1.0 Introduction
1.1 Report Organization (this section)
1.2 Background
1.3 Purpose and Project Objectives
2.0 Sampling Approach and Strategy
3.0 Nature and Extent of Contamination Assessment and Investigation Results
4.0 Limitations and Assumptions
5.0 Lessons Learned
6.0 References
Appendix A: Radiological Surveying Results
Appendix B: Field Screening Results
Appendix C: Field Logbooks
Appendix D: Boring Logs
Appendix E: Data Validation Reports
Appendix F: Level II Analytical Laboratory Data Reports
Appendix G: Level IV Analytical Laboratory Data Reports


OAK RIDGE RESERVATION
KEY MAP
CITY OF OAK RIDGE
EAST FORK POPLAR CREEK
BEAR CREEK
BEAR CREEK ROAD
BETHEL VALLEY ROAD
Y-12
ORNL
ETTP
OUTFALL 200
PIPELINE CORRIDOR
UPPER EAST FORK POPLAR CREEK
OUTFALL 200 HEADWORKS
OUTFALL 200 MERCURY
TREATMENT SYSTEM
LEGEND:
BUILDING
FORMER BUILDING
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
FENCE
SCALE IN FEET
0
400
800
Y-12 PLANT NORTH
TRUE NORTH
34°
ALLIANT
FIGURE 1-1
PROPOSED OUTFALL 200
MERCURY TREATMENT
LOCATIONS
FILE NO: 4326002
SOURCE: STRATA-G
WASTE CHARACTERIZATION
DATA NEEDS PLAN
DWN BY: JCS
DATE: AUGUST 29, 2016
UPPER EAST FORK
POPLAR CREEK
OAK RIDGE, TENNESSEE

1.2 BACKGROUND

The DOE Oak Ridge Reservation (ORR) is located within and adjacent to the corporate limits of the city of Oak Ridge, Tennessee. The area proposed for construction of the Outfall 200 Mercury Treatment Facility is located in the south-central portion of the Y-12 site as previously depicted in Figure 1-1.

Historical missions at Y-12 have resulted in the release of mercury to the environment and contamination has been identified in soil, sediment, surface water, groundwater, buildings, drains, and sumps. Discharges from the West End Mercury Area at Y-12 are primary point source contributors to mercury flux into the Upper East Fork of Poplar Creek (UEFPC) which flows from the south-central portion of Y-12 and eventually through the city of Oak Ridge. Mercury is released into UEFPC via Outfall 200 through direct erosion of contaminated soil, migration of dissolved mercury through storm drains and several outfalls, and through shallow groundwater. Currently, the mercury contamination is considered the greatest environmental risk on the DOE ORR. The primary pathway of concern is surface water because the UEFPC flows directly from Y-12 through the city of Oak Ridge (Strata-G, LLC [Strata-G], 2015a). DOE intends to address the UEFPC mercury discharge by constructing the Outfall 200 Mercury Treatment Facility, a water treatment system, which will collect and treat the mercury-impacted surface water in the vicinity of Outfall 200. Construction of the Outfall 200 Mercury Treatment Facility is anticipated to begin in late 2017.

The proposed Outfall 200 Mercury Treatment Facility will include a headworks area (a weir intake structure, grit removal chamber, storage tanks, and pumping station) located adjacent to Outfall 200, an above grade pipeline extending several hundred feet along the south side of UEFPC, and a treatment facility (equalization tank, chemical reaction tanks, inclined plate clarifiers, clarifier effluent tank, treatment building, treated water tank, chemical storage, and utilities) located at the 9720-8 slab (Figure 1-1). The characterization activities discussed in this *Report* were conducted in three areas including the:

- proposed Headworks Area,
- proposed Pipeline Corridor, and the
- proposed Treatment Facility (9720-8 Slab).

1.3 PURPOSE AND PROJECT OBJECTIVES

The purpose of project was to support waste disposal pathway determination and potential controls for worker protection at the Sites where excavation, demolition, and construction activities will be conducted for the Outfall 200 Mercury Treatment Facility to provide data to determine if waste generated during the construction phase of the proposed treatment facility can be disposed of at the Y-12 Industrial Landfill.

The primary objective of this project was to conduct radiological surveys and collect samples to adequately characterize materials at the Sites such as concrete slabs, soils, liquids, and other structures (i.e., sumps, steam piping, Dechlorination Shed, etc.) that will require removal and

disposition prior to construction of the proposed Outfall 200 Treatment Facility. The waste characterization activities were conducted to:

- support the determination of a candidate treatment, storage and disposal facility (TSDF) to receive materials that will be removed during construction for the proposed treatment facility;
- generate data of sufficient quality to satisfy applicable waste acceptance criteria (WAC) for disposition of materials at the candidate TSDF; and to
- provide data for use in evaluating health and safety (H&S) concerns during construction of the treatment facility.

2. SAMPLING APPROACH AND STRATEGY

The field work for this project included conducting radiological walkover surveys, sediment sampling, concrete core sampling, direct-push technology (DPT) soil sampling, shallow groundwater sampling, sludge and liquid sampling, and asbestos sampling. Additionally, screening such as performing radiological scans of each sample, conducting visual inspections for the presence of free mercury, mercury vapor screening with a Jerome mercury vapor analyzer (Jerome meter), and screening with a photoionization detector (PID) were conducted. Field activities were conducted in accordance with the following documents:

- *Waste Characterization Data Needs Plan for the Outfall 200 Mercury Treatment Facility Area at the Y-12 National Security Complex, Oak Ridge, Tennessee* (Strata-G, September 2015a);
- *SOW for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites* (DOE, 2016);
- *Work Plan for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites* (Alliant, 2016a)
- *Quality Control Plan (QCP) for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites* (Alliant, 2016b);
- *Waste Management Plan (WMP) for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites* (Alliant, 2016c) and the
- *Site Safety and Health Plan (SSHP) for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites* (Alliant, 2016d).

The following sections discuss the data quality objectives (DQOs), field mobilization, the methods and procedures that were used to collect the waste characterization samples, chain-of-custody procedures, the analytical methods used for analysis of the samples, and the data assessment and validation requirements for analytical data generated during the sampling effort.

2.1 DATA QUALITY OBJECTIVES

The DQO process provides guidance on applying systematic planning to generate performance and acceptance criteria for collecting environmental data, and consists of a series of logical steps that guide the acquisition of environmental data. DQOs are used to establish performance and acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the project.

A DQO workshop for the waste characterization sampling was conducted with DOE, U.S. Environmental Protection Agency (EPA), and the Tennessee Department of Environment and Conservation [TDEC]), and other project personnel on September 2, 2015. The overall purpose of the DQO workshop was to help ensure that the waste characterization activities would provide data of the appropriate type, quality, and quantity to satisfy the WAC of the appropriate waste disposal facilities. The DQO process evaluated existing characterization data and process knowledge to identify potential contaminants of concern, data needs and data gaps, and discussed potential problems that might occur during the field activities in order to properly address these problems prior to initiating field activities. The DQO process workshop was conducted following the seven steps identified in the EPA guidance document *Guidance on Systematic Planning Using the Data Quality Objective Process* (EPA, 2006). A summary of the seven step DQO process and the evaluations conducted during the workshop are briefly discussed below. Refer to the *Data Needs Plan* (Strata-G, 2015a) for more a complete discussion on the DQO process and evaluations conducted during the workshop.

- **Step 1** - State the Problem. The workshop attendees stated that the problem was to remove and dispose of the slabs, asphalt, soil, liquids and other materials from the proposed construction area in a manner protective of human health and the environment. They determined that all waste would be expected to meet the requirements of DOE Order 5400.5, the Y-12 Industrial Landfill, or other approved off-site disposal facilities, and that any regulated asbestos would be managed according to disposal site acceptance criteria. While DOE Order 5400.5 has been cancelled and replaced by DOE Order 458.1, Order 458.1 authorizes the continued use of the surface contamination limits in Order 5400.5. Additionally, the Y-12 Industrial Landfill waste profiles currently reference DOE Order 5400.5.
- **Step 2** – Identify the Decisions. Stakeholders identified decisions as determining, through a sufficient evaluation of the characterization data, the portions of slabs, below-grade structures, soil, and other construction debris that could be disposed of onsite at the Y-12 Landfill, and what materials would need to be disposed of at another waste disposal facility, and the level of potential H&S concerns from contaminants. The stakeholders decided that information needed to address potential construction H&S concerns would be generated as a part of the data gathering to address waste disposal, and that no additional data collection would be necessary.

- **Step 3** – Identify Inputs to the Decisions. The workshop identified inputs for the decisions identified in step 2 as follows: (1) available process knowledge, (2) current survey/sampling data, (3) receiving facility's WAC, and (4) additional characterization data that will be gathered to fill data gaps and to characterize anomalous material. Stakeholders determined that the data should be representative and defensible and listed references for approved analytical methods (e.g., EPA SW-846 Methods) and EPA protocols for data assessment. They also discussed Y-12 landfill WAC for radionuclides, requirements for disposal of hazardous wastes regulated under the Resource Conservation and Recovery Act of 1976 (RCRA) such as radioactive waste and polychlorinated biphenyls (PCBs), and requirements for obtaining TDEC special waste permits.
- **Step 4** – Define the Study Boundaries. Stakeholders determined that the target population consisted of all historical and newly generated radiological surveys and analytical data for the proposed construction areas (i.e., Sites 4 and 5, the 9720-8 Slab, and the proposed Pipeline Corridor). They determined that visual inspections, radiological surveys, and radiological/chemical analysis would be used to fill data gaps, detect anomalous conditions, determine quantities of media requiring removal, ensure compliance with the applicable WAC, and identify potential construction H&S concerns. Workshop attendees defined the spatial boundary of the study area as the outline of the Outfall 200 proposed construction areas down to the necessary depth of excavation for construction of the treatment plant facilities.
- **Step 5** – Develop a Decision Rule. The workshop stated that the parameters of interest and action levels were dependent on the disposal options. They determined the preliminary decision rules as (1) if process knowledge and existing survey/sampling results meet the required levels, then certify the waste meets the Y-12 Landfill WAC or DOE approved off-site TSDF WAC. Otherwise, gather additional data, (2) if anomalies are detected during construction activities, segregate, and characterize the anomalous material to determine if it fits within the waste profile or is part of a separate population, and (3) if any of the waste material does not meet the requirements for disposition at the Y-12 Landfill, dispose of the waste at a DOE-approved off-site facility. Stakeholders stated that for the Y-12 Sanitary Landfill, the waste debris must meet the requirements of DOE Order 5400.5. In addition, waste must meet the requirements contained in ORR Landfill Profiles S-010 (construction/demolition wastes), S-020 (sanitary/industrial wastes), S-030 (classified wastes), S-040 (special wastes), or S-050 (spoil materials).
- **Step 6** – Specify Tolerable Limits on Design Errors. The acceptance criteria for the waste requiring disposition were given as the WAC for the individual disposal options (i.e., the Y-12 Industrial Landfill or approved off-site TSDF).
- **Step 7** – Optimize the Design for Obtaining Data. Stakeholders stated that the sample design and rationale were described in Section 3 of the *Data Needs Plan* (Strata-G, 2015a). They determined that samples would be collected and analyzed in accordance with SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*

(EPA Latest revision), DOE-developed radiological analytical methods, and applicable and appropriate American Standards for Testing of Materials (ASTM) methods. Workshop attendees stated that data quality assessment would be performed in accordance with EPA's data quality assessment guidance documents QA/G-9R and QA/G-9S (EPA 2006b, EPA 2006c).

2.2 MOBILIZATION

The waste characterization activities were completed in a single mobilization from August 3rd to August 16th, 2016 within a time span of approximately 2 weeks. A readiness check was conducted by the Alliant Project Manager and DOE representative just prior to mobilization. The primary mobilization activities included obtaining site access (i.e., badging, etc.), site orientation, completing an initial site safety briefing, conducting inspections of the DPT rig and project vehicles, receiving the Excavation Permit for the Sites (release date of July 21, 2016), coordinating utility clearances with Tennessee 811, and locating staging areas for storage of supplies and equipment. Underground utilities at the Sites had been located and marked before mobilization. In addition, the majority of the sampling locations had been previously surveyed by a Land Surveyor and marked.

2.3 RADIOLOGICAL SURVEYS

Radiological (gamma) walkover surveys were conducted at the proposed Headworks Area, proposed Pipeline Corridor, and north of the proposed Headworks Area in a small location where the steam/condensate line will be relocated during construction of the proposed treatment facility. Additionally, radiological surveys were conducted at the proposed Headworks Area for the overhead steam/condensate lines using an overhead lift, and at the Dechlorination Shed (includes an associated above ground 4,400-gallon tank). The steam/condensate lines, and Dechlorination Shed and tank were also visually inspected for the presence of asbestos by an Alliant state of Tennessee-accredited Asbestos Inspector during the radiological surveys.

The radiological surveys were conducted by team members from Oak Ridge Associated Universities (ORAU). The purpose of the radiological surveys was to survey the concrete slabs, asphalt areas, overhead steam/condensate lines and Dechlorination Shed for radiological contamination and to identify any "hot spots" to assist in characterization of the materials for removal and disposition during construction for the proposed treatment facility. The surveys were performed by obtaining a high density of field radiation measurements over the locations since they will be removed, and at the steam/condensate lines since they will be relocated prior to construction. The surveys also were conducted for H&S purposes. No radiological survey was conducted at the 9720-8 Slab as the original slab had been converted into a parking lot, and a radiological survey was completed at the area prior to it being covered with asphalt.

The radiological walkover survey commenced at the proposed Headworks Area and vicinity, and continued along the full distance of the proposed Pipeline Corridor. The survey along the Pipeline Corridor was conducted in accessible areas on the south side of the UEFPC, approximately 50 feet in width from the top of the creek bank, and on the north side of UEFPC

in the location where the steam/condensate line will be rerouted. The radiological surveys of the steam/condensate line and Dechlorination Shed and tank were conducted following the walkover surveys. The surveys were conducted using a field instrument for detection of low-energy radiation (e.g., sodium iodide detector, or similar instrument) capable of detecting gamma radiation, coupled with a data logger and global positioning system (GPS) device (uranium-238 was used as the target radionuclide). The action level for the radiation detector was twice the background radiation level. During the surveys, radiation measurements were recorded as count rates approximately 6 in. above the surfaces. A floor monitor was used on slabs and in asphalt areas when available for the walkover survey. The count rate data and coordinate information for each measurement were recorded in a data file.

2.4 SAMPLE SURVEYING AND SCREENING

ORAU Technicians screened all of the sampling areas via radiological surveys at the proposed Headworks Area and the proposed Pipeline Corridor. Sampling areas at the 9720-8 Slab were not screened for radiological contamination since the concrete pad was previously surveyed and subsequently surfaced with asphalt. Technicians scanned the DPT soil cores and waste characterization sample containers (e.g., soil, sludge, liquid, concrete, etc.) for the presence of radiological contamination. Alliant personnel screened the samples for the presence of volatile organic compounds (VOCs) with a PID, and for the presence of mercury vapor using a Jerome Mercury Vapor Analyzer (Jerome meter). Additionally, Alliant personnel visually inspected the samples for the presence of mercury. The purpose of the surveying and screening activities were to monitor for H&S concerns and environmental conditions during the sampling operations. Screening results for the PID and Jerome meter and visual observations were recorded in the field logbook and/or on field forms.

2.5 SEDIMENT SAMPLING

Sediment samples were collected with a decontaminated stainless-steel hand auger from locations within the bed and channel of UEFPC. The objective of the sediment sampling was to collect samples from locations where historical data had indicated “hot spots,” and to obtain additional data in areas planned for excavation during construction of the treatment facility. Sediment sampling activities were conducted concurrently with the radiological walkover surveys. Upon collection, sediment samples were placed in a decontaminated stainless-steel bowl and composited by mixing with a new, disposable stainless-steel spoon. The sediments were scanned for radiological contamination, scanned with a PID for the presence of VOCs, scanned for the presence of mercury with a Jerome meter, and visually inspected for the presence of mercury. Screening results were documented in the field logbook. Larger than pea-sized gravels and any roots present in the sediments were removed, water present in the sediment (if any) was decanted, and the sediment samples were placed in the appropriate sample containers as listed in the *Work Plan* (Alliant, 2016a). Sample containers were then wiped with a paper towel, labeled, placed in a cooler with water ice, and submitted to the laboratory via overnight courier for analysis of radionuclides, PCBs, Toxicity Characteristic Leaching Procedure (TCLP) VOCs,

TCLP semivolatile organic compounds (SVOCs), TCLP herbicides, and TCLP metals. Analytical methods for each analysis are presented in Section 2.12.

2.6 CONCRETE SAMPLING

Concrete samples were collected from concrete slabs in the proposed Headworks Area and from the 9720-8 Slab, which is currently surfaced with asphalt and serves as a parking lot. Concrete/asphalt coring activities were performed by M&W Drilling, LLC (MWD) personnel using a concrete core machine with a decontaminated 4-inch core bit. The core bits were cooled with small quantities of water to minimize dust and ensure that no puddling or soil erosion occurred during the concrete coring process. The objective of the concrete/asphalt coring was to obtain biased concrete samples, and in some cases to allow access for collection of soil samples beneath the surface at those locations. Concrete coring was initiated in the proposed Headworks Area following completion of the associated Radiological Walkover Survey (Section 2.3). After being cut, any attached asphalt was removed (at the 9720-8 pad only), and the concrete cores were broken up into fragments of approximately 1-inch in size with a decontaminated hammer and chisel. The concrete cores were scanned for radiological contamination, scanned with a PID for the presence of VOCs, scanned for the presence of mercury with a Jerome meter, and visually inspected for the presence of mercury. The concrete fragments were placed in sealing plastic bags (i.e., double, 1-gallon freezer bags), labeled, placed in a cooler with water ice and submitted to the laboratory via overnight courier for analysis of radionuclides, PCBs, and TCLP metals. The upper 3-inches of the concrete core were separated, fragmented, and reserved for analysis of PCBs with the remaining concrete being used for all of the other analyses. Analytical methods for each analysis are presented in Section 2.12.

Core holes were patched/ abandoned with non-shrinking cement grout (SikaGrout©) to reduce expansion so as to not create a tripping hazard, especially in the area of the parking lot overlaying the 9720-8 slab (area of the proposed Treatment Facility).

2.7 SUMP SLUDGE AND LIQUID SAMPLING

Both liquid and sludge samples were collected from sumps in the proposed Headworks Area. The purpose of the sump sampling was to obtain data for use in characterizing the contents of the sumps since they will be removed during the construction activities for the proposed treatment facility. Sumps were accessed either through a lid in the concrete slab or through a pre-existing core hole. A PID was used to ensure that atmospheric conditions within the sumps were safe before proceeding with the sampling activities. Field personnel did not allow any extremity to enter the sump/vault at any time during sampling activities. A visual inspection of the inside of the sump was performed with a flashlight to estimate sump depth and to evaluate the sump contents. Sump sludge and liquid samples were collected from the sumps after the inspections, and after determining that the atmospheres of the sumps/vaults were safe.

Sludge samples were collected from the sumps using a new, pre-cleaned, disposable sample container affixed to a telescoping pole. The sampling apparatus was lowered to the bottom of the sump, and sludge at the bottom of the sump was scooped into the sampling container. The sludge

sample was raised to the surface, placed into a decontaminated stainless-steel bowl, and composited with a new, disposable stainless-steel spoon. This process was repeated until a sufficient quantity of material (if available) was obtained for the samples. The sludge samples were scanned for radiological contamination, scanned with a PID for the presence of VOCs, scanned for the presence of mercury with a Jerome meter, and visually inspected for the presence of mercury. Water present in the sludge samples was decanted, any metal or wood objects were removed, and the sludge was placed into sample containers with the stainless-steel spoon. Sample containers were wiped with a paper towel, labeled, placed in a cooler with water ice, and submitted to the laboratory for analysis of radionuclides, PCBs, and total metals. Samples were analyzed for total metals rather than TCLP metals due to insufficient volume of material. Analytical methods for each analysis are presented in Section 2.12.

Sump liquid samples were collected using a peristaltic pump fitted with new, disposable polyethylene tubing. The tubing was lowered into the sump liquid slowly to avoid stirring up the sediments at the bottom of the sump. The tubing was properly positioned and secured in the sump, and the pump was turned on at the lowest setting necessary to pump liquid to the ground surface. Once the liquid began to flow at the surface, the sample was collected from the tubing into the appropriate sample containers in accordance with the *Work Plan* (Alliant, 2016a). Sample containers were wiped with a paper towel, labeled, placed in a cooler with water ice, and submitted to the laboratory via overnight courier for analysis of radionuclides, PCBs, TCLP VOCs, TCLP SVOCs, TCLP herbicides, and TCLP metals. Analytical methods for each analysis are presented in Section 2.12.

2.8 SOIL AND GROUNDWATER SAMPLING

Biased soil sampling began in the proposed Headworks Area shortly after initiating the concrete coring activities, and continued along the proposed Pipeline Corridor, and onto the 9720-8 slab. Groundwater samples were collected from DPT borings containing sufficient water. The purpose of the soil and groundwater sampling was to obtain samples to characterize soil and groundwater in areas to be excavated for construction of the proposed treatment facility.

Soil sampling was conducted using a DPT rig and a hand auger in accordance with Alliant Procedure AC-ENV-08. DPT operations were conducted using a track-mounted Geoprobe© rig operated by a Tennessee state-licensed driller provided by MWD. Soil samples from the DPT rig were collected in samplers lined with new, disposable, polyvinyl chloride (PVC) sleeves. The PVC sleeves were extruded from the samplers, cut open, and the soils were placed into a decontaminated stainless-steel bowl. Additionally, soils from the hand auger were deposited into a decontaminated stainless-steel bowl after reaching the ground surface. Soils were geologically logged, scanned for the presence of radiological contamination, scanned with a PID for the presence of VOCs, scanned for the presence of mercury with a Jerome meter, and visually inspected for the presence of mercury. Soil descriptions and the results of scanning and visual observations were recorded on boring logs. Soil sampling was conducted in accordance with the following procedure:

1. Remove cover material (gravel, concrete, asphalt). Inspect for visible mercury.
2. Push sample tube (or hand auger) and recover first 2 ft. soil interval below cover material. The initial 2 ft. interval must contain at least 50% recoverable soil to be considered for sampling.
3. Cut open the PVC sleeve and perform a visual inspection, or dump the soil in a decontaminated stainless-steel bowl if sampling with a hand auger. If visible mercury is present, record the depth interval on boring log. Cap and tape the PVC sleeve, (or containerize the soil from the hand auger) and take appropriate actions to control and containerize the mercury contaminated soil.
4. After visual inspection and no indication of visible mercury, screen all of the material for the presence of VOCs using a PID, and for mercury with a portable mercury vapor analyzer. Record PID and mercury vapor detector results in the field logbook and/or on field forms.
5. Scan the soil sample for radioactivity using an appropriate alpha and beta/gamma radiation detection instrument. Document the survey results in field logbook and/or on field forms.
6. All sample locations with detected unusual field readings or observations will be flagged and noted in the logbook and/or on field forms so that future construction/excavation crews will know in advance of the potential to encounter anomalous items or contamination.
7. Composite recovered material, if required.
8. Fill sample containers and apply pre-printed labels. Perform radiological control surveys of each container.
9. Place filled soil waste characterization sample containers in cooler. Maintain sample chain of custody (CoC) until relinquished.
10. Push and recover next soil sample interval, if necessary.
11. Repeat Steps 3 through 10. (Note: The screening level for the PID will be 5 parts per million [ppm]. If a PID reading of 5 ppm or greater is detected, a VOC sample will be taken from the area having the highest reading.) After the sampling is completed, backfill the boring using bentonite pellets with a tremie pipe.

Larger than pea-sized gravels, roots, and other materials (e.g., brick fragments, charcoal, etc.) present in the soils were removed, the soils were composited with a new disposable stainless-steel spoon as described above, and were placed into the appropriate sample containers as listed in the *Work Plan* (Alliant, 2016a). Sample containers were then wiped with a paper towel, labeled, placed in a cooler with water ice, and submitted by overnight courier to the laboratory for analysis of radionuclides, PCBs, TCLP VOCs, TCLP SVOCs, TCLP herbicides, and TCLP metals. Geotechnical samples were collected from select locations and submitted for analysis of soil corrosivity. Analytical methods for each analysis are presented in Section 2.12.

Groundwater grab samples were collected from soil borings containing a sufficient quantity of water. After soil sampling was complete, a new, disposable length of polyethylene tubing was inserted into the boreholes, and the borings were allowed sufficient time to fill with water and stabilize at a maximum level. Groundwater stabilization was confirmed by periodically checking the boreholes with a decontaminated electronic water level indicator. Once the boreholes had sufficiently filled with groundwater, samples were collected using a peristaltic pump. The pump was turned on at the lowest setting necessary to pump water to the ground surface. Upon reaching the surface, groundwater was collected into the appropriate sample containers as listed in the *Work Plan* (Alliant, 2016a) while being careful not to over agitate the water. Groundwater samples were collected as necessary as long as the water continued to flow. When the water stopped flowing, sufficient time was allowed for the borehole to recharge with water, and an attempt was made to finish collecting the samples. Upon collection, groundwater sample containers were wiped with a paper towel, labeled, placed in a cooler with water ice, and submitted to the laboratory for analysis acidity, anions, cyanide, pH, phenolics, oil and grease, radionuclides, PCBs, VOCs, SVOCs, pesticides, total suspended solids (TSS), total organic carbon (TOC), and metals. Analytical methods for each analysis are presented in Section 2.12.

Borings were abandoned with bentonite pellets. Borings in paved areas were patched with non-shrinking grout (SikaGrout©) to reduce expansion so as to not create a tripping hazard at the parking lot on the 9720-8 Slab.

2.9 SLAB EXPANSION JOINT MATERIAL SAMPLING

Biased samples of the slab expansion joint material were collected at the former 9720-8 slab, which is currently surfaced with asphalt and serves as a parking lot. The purpose of the expansion joint sampling was to obtain data for use in characterizing the contents of the expansion joint material. The expansion joint samples were collected by using a core saw to cut through the asphalt/concrete and retrieve a portion of the expansion joint material. Once the asphalt/concrete and expansion material was cored and removed from the slab, the asphalt was separated from the concrete, and then the expansion joint material was removed from the concrete by hand to obtain a sample of the expansion joint material. Expansion joint material was scanned for radiological contamination, scanned with a PID for the presence of VOCs, scanned for the presence of mercury with a Jerome meter, and visually inspected for the presence of mercury. The scanning results were recorded in the field logbook. As discussed in the *Data Needs Plan* (Strata-G, 2015a), cracks in the asphalt correlated with the location of the expansion joints in the slab. Therefore, the actual locations for the expansion joint samples were relocated from the original surveyed locations to adjacent cracks in the asphalt. Upon collection, the expansion joint material was placed in sealing plastic bags (i.e., double, 1-gallon freezer bags), labeled, placed in a cooler with water ice and submitted to the laboratory via overnight courier for analysis of radionuclides, PCBs, total metals, and asbestos containing materials (ACM). Samples were analyzed for total metals rather than TCLP metals due to insufficient volume of material. Analytical methods for each analysis are presented in Section 2.12.

Core holes were patched/ abandoned with non-shrinking cement grout (SikaGrout©) to reduce expansion so as to not create a tripping hazard in the parking lot.

2.10 OVERHEAD STEAM LINE SAMPLING

The overhead steam and condensate lines in the vicinity of the proposed Headworks Area were surveyed for radiological contamination (Section 2.3), and were also visually inspected for the presence of ACM. The radiological survey was conducted by a team member from ORAU while an Alliant state of Tennessee-accredited asbestos inspector operated the overhead lift, and provided asbestos inspection and sampling services. The objective of the biased sampling and surveying was to provide data for use in characterization of the steam and condensate line materials since the lines will either be removed or relocated during the construction activities for the proposed treatment facility. Samples were collected from the lines in suspect areas identified as possibly consisting of ACM during the visual inspection. Three types of different material were identified as sheathing/covering the steam and condensate lines and each was sampled along with the area containing mudding. The samples were collected using a coring device based on the condition and type of the materials to be sampled. The sample material was placed in sealing plastic bags (i.e., double, 1-gallon freezer bags), labeled, placed in a box and submitted to the laboratory for analysis of ACM via overnight courier. Analytical methods for each analysis are presented in Section 2.12.

2.11 DECHLORINATION SHED SAMPLING

Samples were collected from the Dechlorination Shed roof (Building 9417-10), from one of the shed walls, and from the insulation of the shed's adjacent 4,400-gallon tank. Additionally, the shed and the associated tank were radiologically surveyed using standard methods for surface contamination. The objective of the biased sampling was to provide data for use in characterization of the shed and tank materials for removal and disposition during the construction activities for the treatment facility. An Alliant state of Tennessee-accredited Asbestos Inspector collected the samples using a powered drill based on the condition and type of the materials to be collected. The sample material was placed in sealing plastic bags (i.e., double, 1-gallon freezer bags), labeled, placed in a box and submitted to the laboratory for analysis of asbestos. The analytical method for asbestos is listed in Section 2.12.

2.12 ANALYTICAL METHODS

Laboratory chemical analyses were conducted by TestAmerica, a Sample Management Office-approved laboratory, and a DOE Consolidated Audit Program (CAP) laboratory. Additionally, geotechnical sample analyses were conducted by GEOServices, LLC (GEOS). Table 2-1 lists the target analytes, analytical methods, and the specific laboratory for each type of media that were sampled during the waste characterization activities.

Table 2-1 Outfall 200 Analytical Methods

Analyte	Analytical Method	Protocol	Laboratory
Sediment Samples (0 – 1 ft. bgs)			
TCLP VOCs	1311/8260C	EPA	TestAmerica St. Louis, MO
TCLP SVOCs	1311/8270D	EPA	
PCBs	8082A	EPA	
TCLP Herbicides	1311/8151A	EPA	
TCLP Metals	1311/6010C	EPA	
TCLP Mercury	1311/7470A	EPA	
Radionuclides:			
o Radium-226	ST-RC-0301	TAL-STL	
o Isotopic Neptunium	A-01-R	DOE	
o Isotopic Curium and/or Americium	A-01-R	DOE	
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	
o Total Beta Strontium	SR-04-RC	DOE	
o Technetium-99	TC-02-RC	DOE	
o C-14	General Method	None	TestAmerica Richland, WA
Soil Samples – Deep Borings (0 – 30 ft. bgs)1			
TCLP VOCs	1311/8260C	EPA	TestAmerica St. Louis, MO
TCLP SVOCs	1311/8270D	EPA	
PCBs	8082A	EPA	
TCLP Herbicides	1311/8151A	EPA	
TCLP Metals	1311/6010C	EPA	
TCLP Mercury	1311/7470A	EPA	
Radionuclides:			
o Radium-226	ST-RC-0301	TAL-STL	
o Isotopic Neptunium	A-01-R	DOE	
o Isotopic Curium and/or Americium	A-01-R	DOE	
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	
o Total Beta Strontium	SR-04-RC	DOE	
o Technetium-99	TC-02-RC	DOE	
o C-14	General Method	None	TestAmerica Richland, WA
Soil Samples – Shallow Borings (0 – 2 ft. bgs, 0 – 5 ft. bgs, and 0 - 10 ft. bgs)			
PCBs	8082A	EPA	TestAmerica St. Louis, MO
TCLP Metals	1311/6010C	EPA	
TCLP Mercury	1311/7470A	EPA	
Radionuclides:			
o Radium-226	ST-RC-0301	TAL-STL	
o Isotopic Neptunium	A-01-R	DOE	

Table 2-1 Outfall 200 Analytical Methods (Continued)

Analyte	Analytical Method	Protocol	Laboratory
o Isotopic Curium and/or Americium	A-01-R	DOE	TestAmerica St. Louis, MO (Continued)
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	
o Total Beta Strontium	SR-04-RC	DOE	
o Technetium-99	TC-02-RC	DOE	
o C-14	General Method	None	TestAmerica Richland, WA
Geotechnical Soil Samples (5 Select Deep and Shallow Borings)			
Soil Corrosivity:			GEO Services, LLC, Knoxville, TN
o Chloride	D 512-12	ASTM	
o Sulfates	C 1580-15	ASTM	
o Sulfides	D 4658-15	ASTM	
o Soil Resistivity	G 187-12a	ASTM	
o Moisture	D 2216-10	ASTM	
o Redox Potential	G 200-09	ASTM	
o pH	G 51-95	ASTM	
Groundwater Samples			
VOCs	624/8260C	EPA	TestAmerica St. Louis, MO
SVOCs	625/8270D	EPA	
PCBs	8082A	EPA	
Pesticides	608	EPA	
Phenolics	420.4	EPA	
Oil & Grease	1664A	EPA	
Metals	6020A	EPA	
Mercury	7470A	EPA	
Anions	300	EPA	
Acidity	2310B	SM	TestAmerica Denver, CO
pH	150.1	EPA	TestAmerica St. Louis, MO
Cyanide	9012B	EPA	
TSS	160.2	EPA	
TOC	9060	EPA	
Radionuclides:			
o Isotopic Neptunium	A-01-R	DOE	
o Isotopic Curium and/or Americium	A-01-R	DOE	
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	
o Total Beta Strontium	SR-04-RC	DOE	
o Technetium-99	TC-02-RC	DOE	

Table 2-1 Outfall 200 Analytical Methods (Continued)

Analyte	Analytical Method	Protocol	Laboratory
o Gross Alpha & Beta	900.0	EPA	TestAmerica St. Louis, MO (Continued)
o Cesium 137 & Other Gamma Emitters	901.1	EPA	
o C-14	General Method	None	TestAmerica Richland, WA
Concrete Samples (Thickness of Concrete)			
PCBs	8082A	EPA	TestAmerica St. Louis, MO
TCLP Metals	1311/6010C	EPA	
TCLP Mercury	1311/7470A	EPA	
Radionuclides:			
o Radium-226	ST-RC-0301	TAL-STL	
o Isotopic Neptunium	A-01-R	DOE	
o Isotopic Curium and/or Americium	A-01-R	DOE	
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	
o Total Beta Strontium	SR-04-RC	DOE	
o Technetium-99	TC-02-RC	DOE	
o C-14	General Method	None	TestAmerica Richland, WA
Sump Liquid Samples			
VOCs	8260C	EPA	TestAmerica St. Louis, MO
SVOCs	625/8270D	EPA	
PCBs	8082A	EPA	
Pesticides	608	EPA	
Phenolics	420.4	EPA	TestAmerica Denver, CO
Oil & Grease	1664A	EPA	
Metals	6020A	EPA	TestAmerica St. Louis, MO
Mercury	7470A	EPA	
Anions	300	EPA	
Acidity	2310B	SM	TestAmerica Denver, CO
pH	150.1	EPA	TestAmerica St. Louis, MO
Cyanide	9012B	EPA	
TSS	160.2	EPA	
TOC	9060	EPA	
Radionuclides:			
o Isotopic Neptunium	A-01-R	DOE	
o Isotopic Curium and/or Americium	A-01-R	DOE	
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	

Table 2-1 Outfall 200 Analytical Methods (Continued)

Analyte	Analytical Method	Protocol	Laboratory
o Total Beta Strontium	SR-04-RC	DOE	TestAmerica St. Louis, MO (Continued)
o Technetium-99	TC-02-RC	DOE	
o Gross Alpha & Beta	900.0	EPA	
o Cesium 137 & Other Gamma Emitters	901.1	EPA	
o C-14	General Method	None	TestAmerica Richland, WA
Sump Sludge Samples			
PCBs	8082A	EPA	TestAmerica St. Louis, MO
Total Metals[2]	6010C	EPA	
Total Mercury[2]	7470A	EPA	
Radionuclides:			
o Radium-226	ST-RC-0301	TAL-STL	
o Isotopic Neptunium	A-01-R	DOE	
o Isotopic Curium and/or Americium	A-01-R	DOE	
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	
o Total Beta Strontium	SR-04-RC	DOE	
o Technetium-99	TC-02-RC	DOE	
o C-14	General Method	None	TestAmerica Richland, WA
Expansion Joint Material Samples			
Asbestos	9002 (PLM)	NIOSH	TestAmerica Richland, WA
PCBs	8082A	EPA	TestAmerica St. Louis, MO
Total Metals[2]	6010C	EPA	
TCLP Mercury	1311/7470A	EPA	
Radionuclides:			
o Radium-226	ST-RC-0301	TAL-STL	
o Isotopic Neptunium	A-01-R	DOE	
o Isotopic Curium and/or Americium	A-01-R	DOE	
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	
o Total Beta Strontium	SR-04-RC	DOE	
o Technetium-99	TC-02-RC	DOE	
o C-14	General Method	None	TestAmerica Richland, WA
Steam Line Wrap and Mudding Samples			
Asbestos	9002 (PLM)	NIOSH	TestAmerica Richland, WA
Condensate Line Insulation Material Samples			
Asbestos	9002 (PLM)	NIOSH	TestAmerica Richland, WA

Table 2-1 Outfall 200 Analytical Methods (Continued)

Analyte	Analytical Method	Protocol	Laboratory
Dechlorination Shed Roofing Material Samples			
Asbestos	9002 (PLM)	NIOSH	TestAmerica Richland, WA
Dechlorination Shed Wall Material Samples			
Asbestos	9002 (PLM)	NIOSH	TestAmerica Richland, WA
QA/QC Samples[3]			
VOCs	8260C	EPA	TestAmerica St. Louis, MO
SVOCs	8270D	EPA	
PCBs	8082A	EPA	
Pesticides	608	EPA	
Phenolics	420.4	EPA	TestAmerica Denver, CO
Oil & Grease	1664A	EPA	
Metals	6020A	EPA	TestAmerica St. Louis, MO
Mercury	7470A	EPA	
Anions	300	EPA	
Acidity	2310B	SM	TestAmerica Denver, CO
pH	150.1	EPA	TestAmerica St. Louis, MO
Cyanide	9012B	EPA	
TSS	160.2	EPA	
TOC	9060	EPA	
Radionuclides:			
o Isotopic Neptunium	A-01-R	DOE	
o Isotopic Curium and/or Americium	A-01-R	DOE	
o Isotopic Plutonium	A-01-R	DOE	
o Isotopic Uranium	A-01-R	DOE	
o Isotopic Thorium	A-01-R	DOE	
o Tritium	H3-04-RC	DOE	
o Total Beta Strontium	SR-04-RC	DOE	
o Technetium-99	TC-02-RC	DOE	
o C-14	General Method	None	TestAmerica Richland, WA

1. Five of the soil samples were also submitted to the laboratory for analysis of soil corrosivity (chloride, sulfates, sulfides, soil resistivity, moisture, redox potential, and pH).
2. Total metals consist of arsenic, barium, cadmium, chromium, lead, selenium, silver and mercury.
3. QA/QC samples include Field Blanks, Equipment Blanks and Trip Blanks. Trip Blanks were analyzed for VOCs only.

ASTM	American Society for Testing and Materials	bgs	Below ground surface
C-14	Carbon-14	DOE	Department of Energy
EPA	U. S. Environmental Protection Agency	ft.	Feet
PCB	Polychlorinated biphenyls	PLM	Polarized Light Microscopy
QA/QC	Quality Assurance/Quality Control	Redox	Oxidation – Reduction Potential
SM	Standard Methods	SVOC	Semivolatile organic compounds
TAL-STL	TestAmerica St. Louis	TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon	TSS	Total Suspended Solids

2.13 CHAIN-OF-CUSTODY

CoC procedures were implemented during the waste characterization sampling so that a record of sample collection, sample shipping, and laboratory receipt was maintained. A CoC form was used to track the custody of the samples from collection to the analytical laboratory, and included the following information:

a. Site name, project name, and project number;
b. Field sample number;
c. Date of sample collection (for each individual sample);
d. Time of sample collection (for each individual sample);
e. Indication whether sample is a grab or composite sample (for each individual sample);
f. Total number of containers per sample;
g. The analyses requested for each sample container;
h. The type of preservative, if any, in each container;
i. Name of analytical laboratory;
j. Name and signature of sample team leader; and
k. Date and time samples were relinquished, signature of person who relinquished samples, and, if possible, signature of person accepting samples (not necessary if relinquished to national carrier service).

Upon completing the COC form, it was placed inside a sealing plastic bag, and taped to the inside lid of the sample cooler.

2.14 DATA MANAGEMENT AND DATA VALIDATION

Project analytical data from TestAmerica and GEOS were filed electronically on the Alliant server and will be subsequently submitted to DOE. TestAmerica provided the data in three formats including an electronic data deliverable (EDD), an EPA level II data package, and an EPA level IV package for use in formal data validation. The EDDs are compatible with the DOE Environmental Management System.

Data were reviewed and qualified by the laboratory prior to submission. Additionally, Alliant assessed the data for completeness, correctness, consistency, and conformance to the analytical procedures and contractual agreements and ensured that holding times for the analyses had been met. Formal data validation was conducted on the analytical data by independent validators, TLI Solutions, Incorporated (TLI), and Williams Engineering in accordance with the following EPA data quality assessment guidance:

- *Data Quality Assessment: A Reviewer's Guide, EPA QA/G-9R* (EPA 2006a); and
- *Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S.* (EPA 2006b).

The data were validated to assist in evaluating if the results support the particular data needs for this project as determined by stakeholders during the DQO process (Section 2.1).

3. NATURE AND EXTENT OF CONTAMINATION ASSESSMENT AND INVESTIGATION RESULTS

This section presents the results of the waste characterization activities for the proposed Outfall 200 Mercury Treatment Facility. The waste characterization activities included:

- radiological walkover surveys;
- steam line surveying;
- sample screening;
- waste characterization sampling (e.g., sediment, concrete, sump sludge, sump liquids, slab expansion joint material, soil and groundwater, overhead steam/condensate line insulation, and Dechlorination Shed and tank insulation);
- QA/QC sampling; and
- data assessment and formal data validation activities.

Table 3-1 presents a tabulated log of the waste characterization samples with respect to sampling station, sample identification (ID), analytical parameters, media, sample depth (if appropriate), and date and time of collection as well as notes and field observations.

Based on the results of the formal data validation activities, qualifiers and/or results may have been revised and/or added to the data summary tables and associated text as appropriate. Footnotes in the individual data summary tables document revisions to data qualifiers and/or results. Data validation results are discussed and summarized in tabular form in Section 3.11.

3.1 RADIOLOGICAL SURVEY RESULTS

Radiological walkover surveys were conducted at the proposed Headworks Area, and at accessible portions of the proposed Pipeline Corridor. The overhead steam/condensate lines and the Dechlorination Shed (includes an associated 4,400-gallon tank) at the proposed Headworks Area also were surveyed for the presence of radiological contamination. Figure 3-1 and Figure 3-2 show the locations for the radiological surveys.

The walkover surveys resulted in the identification of three previously unknown “hot spots” in the vicinity of the proposed Pipeline Corridor. One of the “hot spots” was detected just west of Building 9767-8 at 8,000 counts per minute (cpm). The two remaining “hot spots” were identified south of Building 9201-3 at 26,000 cpm and 35,000 cpm, respectively. No other “hot spots” were identified during the walkover survey. An aerial photo of the identified “hot spots” and the radiological walkover survey results (ORAU deliverables) are presented in Appendix A. No radiological contamination or “hot spots” were identified on the overhead steam/condensate lines, or at the Dechlorination Shed or tank.

Table 3-1 Outfall 200 Sample Log

Sampling Station	Sample ID	Analytical Parameters	Media	Depth	Date/Time Collected	Notes and Observations
A-32E	YMTFA32 SO 010	Radionuclides, PCBs, TCLP Metals (Additional analyses for Soil Corrosivity: Chlorides, Sulfates, Sulfides, Soil Resistivity, Moisture, Redox Potential, pH)	Soil	10 ft. bgs	8-04-16 @1448	
A-33E	YMTFA33 SO 002	Radionuclides, PCBs, TCLP Metals	Soil	2 ft. bgs	8-10-16 @0900	
A-34E	YMTFA34 SO 002	Radionuclides, PCBs, TCLP Metals	Soil	2 ft. bgs	8-09-16 @1510	Petroleum-like odor.
A-35E	YMTFA35 SO 002	Radionuclides, PCBs, TCLP Metals	Soil	2 ft. bgs	8-09-16 @1401	
A-36E	YMTFA36 SO 002	Radionuclides, PCBs, TCLP Metals	Soil	2 ft. bgs	8-09-16 @1305	
A-39E[1]	YMTFA39 SE 001	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Sediment	1 ft.	8-04-16 @0900	Sample collected from creek bank.
A-40E	YMTFA40 SE 001	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Sediment	1 ft.	8-04-16 @1240	Sample collected from creek bank.
A-41E	YMTFA41 SE 001	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Sediment	1 ft.	8-04-16 @1325	Sample collected from creek bank.
A-42E	YMTFA42 SO 030	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides, (Additional analyses for Soil Corrosivity: Chlorides, Sulfates, Sulfides, Soil Resistivity, Moisture, Redox Potential, pH)	Soil	Refusal @ 28 ft. bgs	8-09-16 @0920	Paused drilling on 8/8 after radiological screening reading of 152 counts/min (cpm) @7-10 ft bgs. Continued drilling on 8/9 after elevated count determined to be due to radon.
	YMTFA42 SO 030D	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Soil	Refusal @ 28 ft. bgs	8-09-16 @0920	Duplicate sample.
	YMTFA42 GW	Acidity, Anions, Cyanide, pH, Phenolics, Oil and Grease, TSS, PCBs, Pesticides, VOCs, SVOCs, Radionuclides, Metals (incl. Hg)	Groundwater[2]	N/A	8-11-16 @1500	Groundwater encountered at approximately 20 ft bgs. Full radiological suite not collected due to insufficient volume of water. pH measured beyond holding time.[3]
A-43E	YMTFA43 SO 030	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Soil	Refusal @ 23 ft. bgs	8-09-16 @1050	
	YMTFA43 SO 030D	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Soil	Refusal @ 23 ft. bgs	8-09-16 @1050	Duplicate sample.
	YMTFA43 GW	Acidity, Anions, Cyanide, pH, Phenolics, Oil and Grease, TSS, PCBs, Pesticides, VOCs, SVOCs, Radionuclides, Metals (incl. Hg)	Groundwater[2]	N/A	8-11-16 @1300	Groundwater encountered at approximately 20 ft bgs. pH measured beyond holding time.[3]
A-44E	YMTFA44 SO 005	Radionuclides, PCBs, TCLP Metals	Soil	5 ft. bgs	8-10-16 @0848	
A-45E	YMTFA45 SO 005	Radionuclides, PCBs, TCLP Metals	Soil	5 ft. bgs	8-10-16 @0950	Petroleum-like odor at 4.2-5.0 ft bgs.
A-46E	YMTFA46 SO 005	Radionuclides, PCBs, TCLP Metals	Soil	Refusal @ 4 ft. bgs	8-10-16 @1005	
A-47E	YMTFA47 SO 005	Radionuclides, PCBs, TCLP Metals	Soil	5 ft. bgs	8-10-16 @1053	Petroleum-like odor at 2.9 ft bgs.
A-48E	YMTFA48 SO 005	Radionuclides, PCBs, TCLP Metals	Soil	5 ft. bgs	8-10-16 @1112	

Table 3-1 Outfall 200 Sample Log (continued)

Sampling Station	Sample ID	Analytical Parameters	Media	Depth	Date/Time Collected	Notes and Observations
A-49E	YMTFA49 SO 005	Radionuclides, PCBs, TCLP Metals	Soil	Refusal @ 4.5 ft. bgs	8-09-16 @1300	
A-50E	YMTFA50 SO 005	Radionuclides, PCBs, TCLP Metals	Soil	5 ft. bgs	8-10-16 @1045	Petroleum-like odor at 2.8 ft bgs.
A-51E	YMTFA51 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-12-16 @1425	
A-52E[a]	YMTFA52 EJ	Radionuclides, PCBs, TCLP Metals, Asbestos	Expansion Joint Material	Grab sample of material	8-15-16 @1537	Analyzed for total metals rather than TCLP metals, and no tritium analysis conducted due to insufficient volume of material. Lead result failed EPA Rule of 20.
A-53E[a]	YMTFA53 EJ	Radionuclides, PCBs, TCLP Metals, Asbestos	Expansion Joint Material	Grab sample of material	8-15-16 @1513	Analyzed for total metals rather than TCLP metals, and no tritium analysis conducted due to insufficient volume of material. Collected from cracked asphalt adjacent to original surveyed location.
A-54E	YMTFA54 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-11-16 @1335	
	YMTFA54 SO 010	Radionuclides, PCBs, TCLP Metals	Soil	10 ft bgs	8-12-16 @0840	Soil sample received above temperature at laboratory.[3]
	YMTFA54 SO 010D	Radionuclides, PCBs, TCLP Metals	Soil	10 ft bgs	8-12-16 @0840	Duplicate soil sample. Received above temperature at laboratory.[3]
A-55E	YMTFA55 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-15-16 @1445	
A-56E	YMTFA56 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-15-16 @1438	
A-57E	YMTFA57 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-15-16 @1428	
A-58E	YMTFA58 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-15-16 @1423	
	YMTFA58 SO 010	Radionuclides, PCBs, TCLP Metals	Soil	Refusal @ 9 ft bgs	8-12-16 @1135	Soil sample received above temperature at laboratory.[3]
A-59E	YMTFA59 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-11-16 @1530	
A-60E	YMTFA60 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-11-16 @1330	
	YMTFA60 SO 010	Radionuclides, PCBs, TCLP Metals	Soil	10 ft. bgs	8-11-16 @1450	
A-61E	YMTFA61 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-11-16 @1328	
	YMTFA61 SO 010	Radionuclides, PCBs, TCLP Metals (Additional analyses for Soil Corrosivity: Chlorides, Sulfates, Sulfides, Soil Resistivity, Moisture, Redox Potential, pH)	Soil	10 ft. bgs	8-11-16 @1330	

Table 3-1 Outfall 200 Sample Log (continued)

Sampling Station	Sample ID	Analytical Parameters	Media	Depth	Date/Time Collected	Notes and Observations
A-62E	YMTFA62 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-11-16 @1325	
	YMTFA62 SO 010	Radionuclides, PCBs, TCLP Metals	Soil	Refusal @ 6 ft. bgs	8-11-16 @1240	
A-63E	YMTFA63 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-10-16 @1425	Concrete sample received above temperature at laboratory.[3]
	YMTFA63 SO 010	Radionuclides, PCBs, TCLP Metals	Soil	Refusal @ 6 ft. bgs	8-10-16 @1345	
A-64E	YMTFA64 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-10-16 @1435	Concrete sample received above temperature at laboratory.[3]
	YMTFA64 SO 010	Radionuclides, PCBs, TCLP Metals	Soil	Refusal @ 7 ft. bgs	8-10-16 @1455	
A-65E	YMTFA65 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-15-16 @1455	
A-66E	YMTFA66 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-11-16 @1630	
A-67E	YMTFA67 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-12-16 @1415	
	YMTFA67 SO 010	Radionuclides, PCBs, TCLP Metals	Soil	10 ft. bgs	8-11-16 @1043	
A-68E	YMTFA68 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-12-16 @1420	
A-69E	YMTFA69 C	Radionuclides, PCBs, TCLP Metals, Additional analysis	Concrete	Concrete Thickness	8-12-16 @1412	
	YMTFA69 SO 010	Radionuclides, PCBs, TCLP Metals, (Additional analyses for Soil Corrosivity: Chlorides, Sulfates, Sulfides, Soil Resistivity, Moisture, Redox Potential, pH)	Soil	10 ft. bgs	8-11-16 @0934	
A-70E	YMTFA70 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-12-16 @1445	
	YMTFA70 SO 010	Radionuclides, PCBs, TCLP Metals, (Additional analyses for Soil Corrosivity: Chlorides, Sulfates, Sulfides, Soil Resistivity, Moisture, Redox Potential, pH)	Soil	10 ft. bgs	8-11-16 @0855	Petroleum-like odor at 4.0-4.5 ft bgs.
A-71E	YMTFA71 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-12-16 @1450	
A-72E	YMTFA72 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-15-16 @1505	
A-73E	YMTFA73 SE 001	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Sediment	1 ft.	8-04-2016 @1400	Sample collected from creek channel.
A-74E	YMTFA74 SE 001	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Sediment	1 ft.	8-05-16 @0750	Sample collected from creek channel.

Table 3-1 Outfall 200 Sample Log (continued)

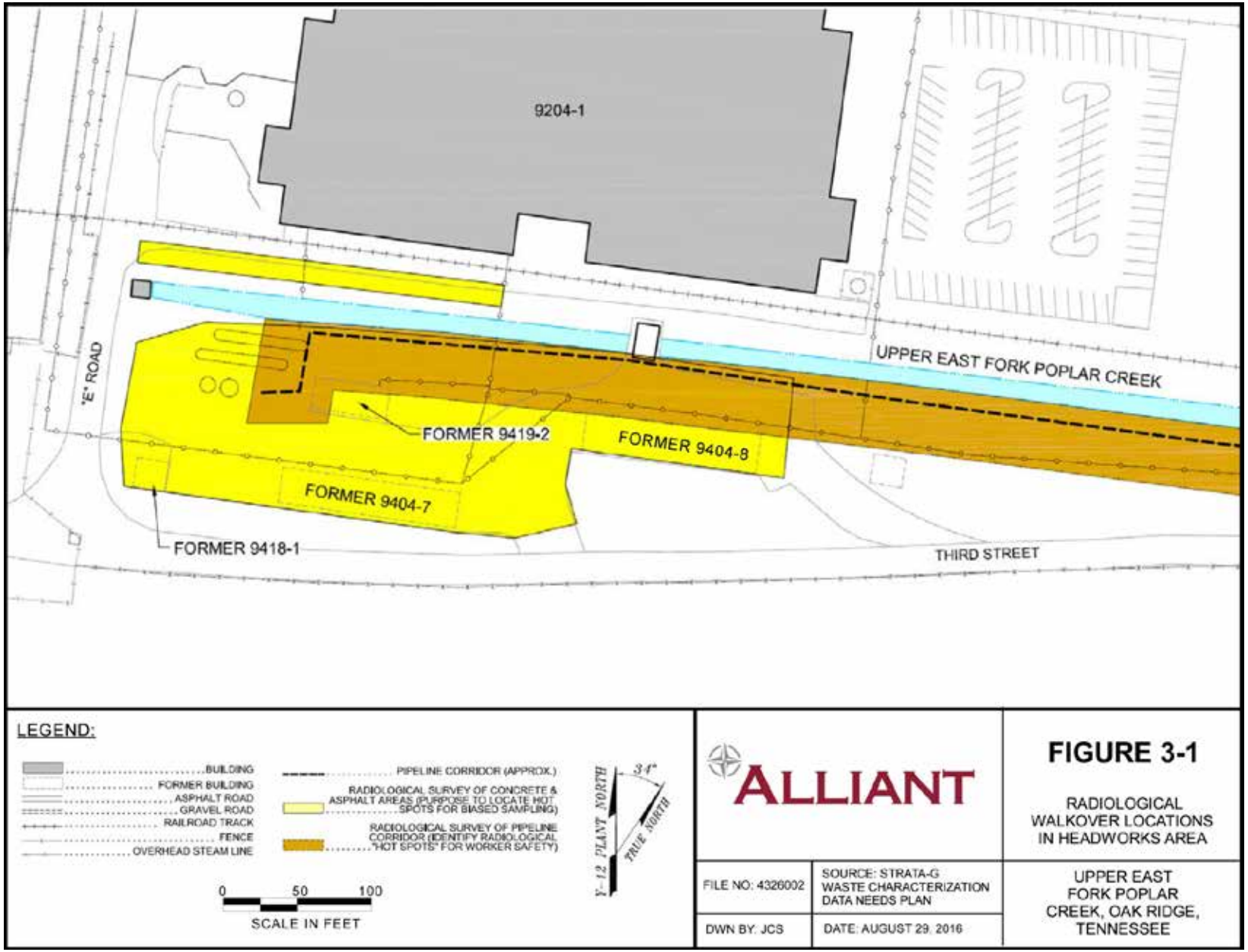
Sampling Station	Sample ID	Analytical Parameters	Media	Depth	Date/Time Collected	Notes and Observations
A-75E[1]	YMTFA75 SE 001	Radionuclides, PCBs, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP Herbicides	Sediment	1 ft.	8-05-2016 @0925	Sample collected from creek bank.
Additional (AD HOC) Samples						
A-80E	YMTFA80 9418 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-09-16 @1550	9418-1 Concrete slab >2ft. in thickness and had been reportedly filled with grout. Therefore, no sludge or liquid samples were collected. Concrete sample received above temperature at laboratory.[3]
A-81E	YMTFA81 9404-1 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-09-16 @1530	9404-7 Concrete slab (location 1 of 3). Concrete sample received above temperature at laboratory.[3]
	YMTFA81 9404-2 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-09-16 @1536	9404-7 Concrete slab (location 2 of 3). Concrete sample received above temperature at laboratory.[3]
	YMTFA81 9404-3 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-09-16 @1540	9404-7 Concrete slab (location 3 of 3). Concrete sample received above temperature at laboratory[3]
	YMTFA81 9404 G	Radionuclides, PCBs, TCLP Metals	Sump Sludge	N/A	8-15-16 @0830	9404-7 Sump. Analyzed for total metals rather than TCLP metals, and no tritium analysis conducted due to insufficient volume of sludge.
	YMTFA81 9404 L	Acidity, Anions, Cyanide, pH, Phenolics, Oil and Grease, TSS, PCBs, Pesticides, VOCs, SVOCs, Radionuclides, Metals	Sump Liquid	N/A	8-15-16 @0900	9404-7 Sump. Very little water present in sump. pH measured beyond holding time. [3]
A-82E	YMTFA82 UNK1 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-09-16 @1600	9419-2 Concrete slab. Concrete sample received above temperature at laboratory.[3]
A-83E	YMTFA83 UNK2 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-10-16 @1530	Rectangular unnamed concrete slab approximately 75 ft. west of 9419-2 slab. Concrete sample received above temperature at laboratory.[3]
A-84E	YMTFA84 UNK3 C	Radionuclides, PCBs, TCLP Metals	Concrete	Concrete Thickness	8-12-16 @1516	Round unnamed concrete slab northeast of 9419-2 slab.
A-85E	YMTFA85 IN	Asbestos	Insulation	N/A	8-12-16 @1040	Sample collected from condensate line.
A-86E	YMTFA86 IN	Asbestos	Wrap/Sheathing Material	N/A	8-12-16 @1045	Sample collected from steam line #1 wrap.
A-87E	YMTFA87 IN	Asbestos	Mudding	N/A	8-12-16 @1100	Sample collected from steam line mudding around Valve #2.
A-88E	YMTFA88 RF	Asbestos	Insulation/ Sheathing Material	N/A	8-15-16/0800	Sample collected from Dechlorination Shed roof.
A-89E	YMTFA89 IN	Asbestos	Insulation/ Sheathing Material	N/A	8-12-16 @1330	Sample collected from Dechlorination Shed wall.
A-90E	YMTFA90 IN	Asbestos	Insulation	N/A	8-15-16 @0900	Sample collected from Dechlorination Shed tank.
A-92E[1]	YMTFA92 IN	Asbestos	Insulation	N/A	8-12-16 @1105	Sample collected from Steam Line #3 insulation.

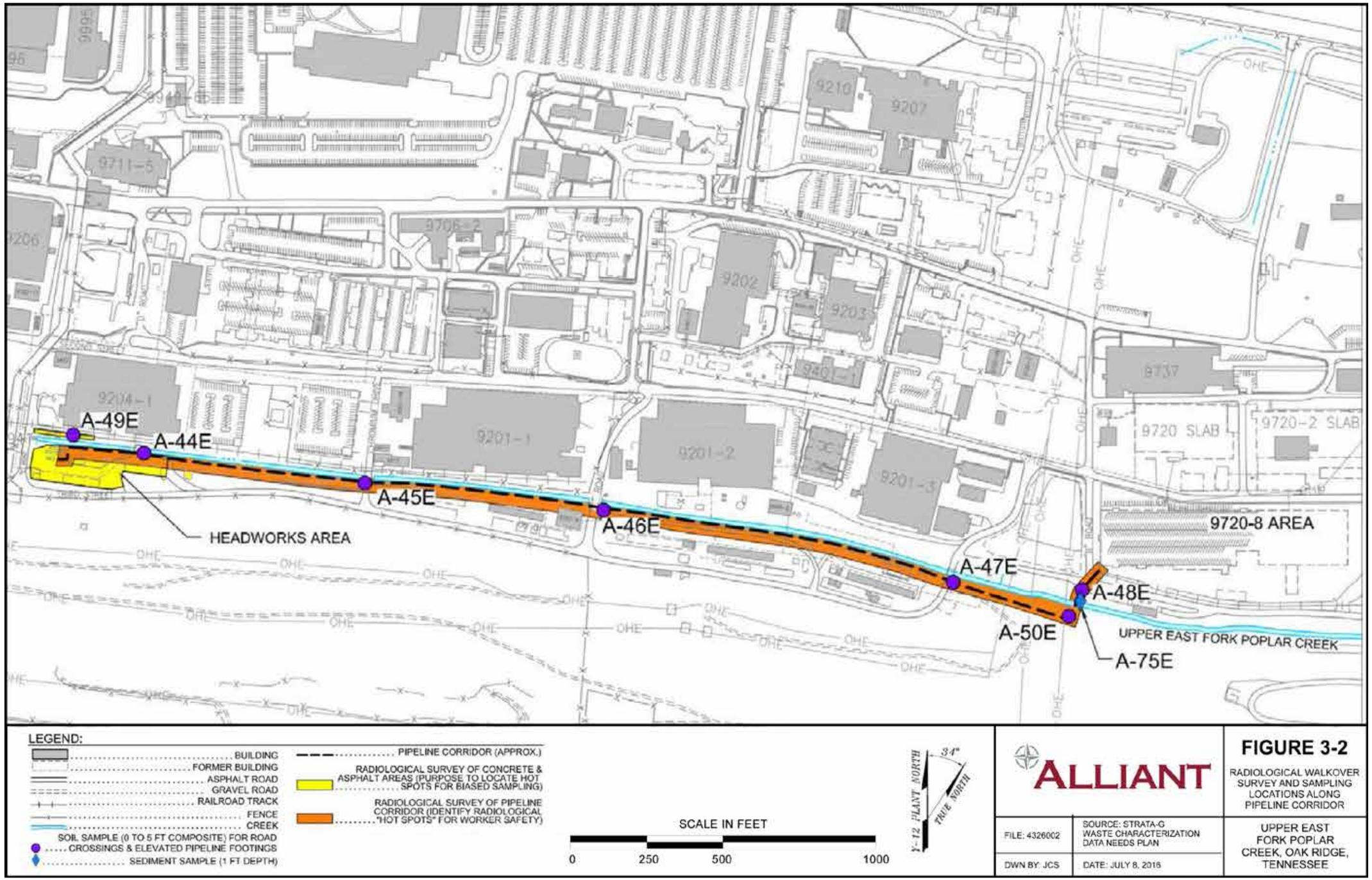
Table 3-1 Outfall 200 Sample Log (continued)

Sampling Station	Sample ID	Analytical Parameters	Media	Depth	Date/Time Collected	Notes and Observations
A-93E	YMTFA93 9404-8G	Radionuclides, PCBs, TCLP Metals	Sump Sludge	N/A	8-15-16 @1300	Sample collected from 9404-8 Sump. Analyzed for total metals rather than TCLP metals, and no tritium analysis due to insufficient volume of sludge.
	YMTFA93 9404-8L	Acidity, Anions, Cyanide, pH, Phenolics, Oil and Grease, TSS, PCBs, Pesticides, VOCs, SVOCs, Radionuclides, Metals	Sump Liquid	N/A	8-15-16 @1020	Sample collected from 9404-8 Sump. pH measured beyond holding time.[3]
QA/QC Samples						
N/A	YMTFA 9720 FB	Acidity, Anions, Cyanide, pH, Phenolics, Oil and Grease, TSS, PCBs, Pesticides, VOCs, SVOCs, Radionuclides, Metals	Water	N/A	8-11-16 @1520	Field Blank (Material Blank) of ASTM Type II water used for decontamination prepared at 9720-8 slab. pH measured beyond holding time.
N/A	YMTFA 9404 FB	Acidity, Anions, Cyanide, pH, Phenolics, Oil and Grease, TSS, PCBs, Pesticides, VOCs, SVOCs, Radionuclides, Metals	Water	N/A	8-16-16 @1015	Field Blank (Material Blank) of ASTM Type II water used for decontamination prepared at 9404-7 slab. pH measured beyond holding time..[3]
N/A	YMTFA 9720 TB	VOCs	Water	N/A	8-11-16	Trip Blank (prepared at the laboratory).
N/A	YMTFA 42 TB	VOCs	Water	N/A	8-11-16	Trip Blank (prepared at the laboratory). Not listed on chain-of-custody.
N/A	YMTFA 43 TB	VOCs	Water	N/A	8-11-16	Trip Blank (prepared at the laboratory). Not listed on chain-of-custody.
N/A	YMTFA 9404 TB-1	VOCs	Water	N/A	8-15-16	Trip Blank (prepared at the laboratory).
N/A	YMTFA 9404 TB-2	VOCs	Water	N/A	8-16-16	Trip Blank (prepared at the laboratory).
N/A	YMTFA 9404 EB	Acidity, Anions, Cyanide, pH, Phenolics, Oil and Grease, TSS, PCBs, Pesticides, VOCs, SVOCs, Radionuclides, Metals	Water	N/A	8-15-16 @1330	Equipment Blank (Prepared by collecting decontamination rinse water into sampling containers). pH and nitrate analyzed beyond holding time.[3]
N/A	YMTFA 9720 EB	Acidity, Anions, Cyanide, pH, Phenolics, Oil and Grease, TSS, PCBs, Pesticides, VOCs, SVOCs, Radionuclides, Metals	Water	N/A	8-16-16 @0910	Equipment Blank (Prepared by collecting decontamination rinse water into sampling containers). pH measured beyond holding time.[3]

(1) There was no sampling station A-37E, A-38E, A-76E, A-77E, A-78E, A-79E or A-91E.
(2) Groundwater was only encountered in A-42E and A-43E which were drilled to depths of 28 and 23 ft. bgs, respectively.
(3) Impact on analytical data due to analyzing samples beyond holding time and samples arriving at the laboratory above temperature is discussed in Section 3.11.

ASTM	American Society for Testing and Materials	bgs	Below ground surface	C	Concrete	D	Duplicate
EJ	Expansion joint material	EB	Equipment blank	FB	Field Blank	ft.	feet
G	Sump sludge	IN	Insulation	L	Sump Liquid	N/A	Not applicable
PCBs	Polychlorinated biphenyls	QA/QC	Quality assurance/quality control	RF	Roofing	SO	Soil
SVOCs	Semivolatile organic compounds	TCLP	Toxicity Characteristic Leaching Procedure	TB	Trip blank	TSS	Total suspended solids
UNK	Unknown (unnamed slab)	VOCs	Volatile organic compounds	YMTF	Y-12 Mercury Treatment Facility		


9204-1
UPPER EAST FORK POPLAR CREEK
"E" ROAD
FORMER 9419-2
FORMER 9404-8
FORMER 9404-7
FORMER 9418-1
THIRD STREET
LEGEND:
BUILDING
FORMER BUILDING
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
FENCE
OVERHEAD STEAM LINE
PIPELINE CORRIDOR (APPROX.)
RADIOLOGICAL SURVEY OF CONCRETE & ASPHALT AREAS (PURPOSE TO LOCATE HOT SPOTS FOR BIASED SAMPLING)
RADIOLOGICAL SURVEY OF PIPELINE CORRIDOR (IDENTIFY RADIOLOGICAL "HOT SPOTS" FOR WORKER SAFETY)
0 50 100
SCALE IN FEET
Y-12 PLANT NORTH
34°
TRUE NORTH
ALLIANT
FIGURE 3-1
RADIOLOGICAL WALKOVER LOCATIONS IN HEADWORKS AREA
FILE NO: 4326002
SOURCE: STRATA-G WASTE CHARACTERIZATION DATA NEEDS PLAN
DWN BY: JCS
DATE: AUGUST 29, 2016
UPPER EAST FORK POPLAR CREEK, OAK RIDGE, TENNESSEE


A-49E
A-44E
A-45E
A-46E
A-47E
A-48E
A-50E
A-75E
HEADWORKS AREA
9720-8 AREA
UPPER EAST FORK POPLAR CREEK
9720 SLAB
9720-2 SLAB
9207
9210
9202
9203
9201-1
9201-2
9201-3
9204-1
9711-5
9737
OHE
LEGEND:
BUILDING
FORMER BUILDING
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
FENCE
CREEK
SOIL SAMPLE (0 TO 5 FT COMPOSITE) FOR ROAD CROSSINGS & ELEVATED PIPELINE FOOTINGS
SEDIMENT SAMPLE (1 FT DEPTH)
PIPELINE CORRIDOR (APPROX.)
RADIOLOGICAL SURVEY OF CONCRETE & ASPHALT AREAS (PURPOSE TO LOCATE HOT SPOTS FOR BIASED SAMPLING)
RADIOLOGICAL SURVEY OF PIPELINE CORRIDOR (IDENTIFY RADIOLOGICAL "HOT SPOTS" FOR WORKER SAFETY)
SCALE IN FEET
0
250
500
1000
Y-12 PLANT NORTH
34°
TRUE NORTH
ALLIANT
FIGURE 3-2
RADIOLOGICAL WALKOVER SURVEY AND SAMPLING LOCATIONS ALONG PIPELINE CORRIDOR
FILE: 4326002
SOURCE: STRATA-G WASTE CHARACTERIZATION DATA NEEDS PLAN
DWN BY: JCS
DATE: JULY 8, 2016
UPPER EAST FORK POPLAR CREEK, OAK RIDGE, TENNESSEE

3.2 SAMPLE SCREENING RESULTS

Sample screening consisted of:

- scanning sample material and sample containers for the presence of radiological contamination;
- scanning sample material with a PID for the presence of VOCs;
- scanning sample material with a Jerome meter for the presence of mercury vapor; and
- visually inspecting sample material for the presence of mercury.

Liquid samples (e.g., groundwater and sump liquids) were not scanned for radiological contamination. Sump atmospheres were scanned for the presence of VOCs and mercury vapor upon gaining inside access and none were detected. Concrete pads and the steam/condensate lines in the proposed Headworks Area, and accessible areas of the proposed Pipeline Corridor were scanned for the presence of radiological contamination prior to sample collection (Section 3.1).

After being filled, waste characterization sample containers were scanned for radiological contamination prior to shipment to the laboratory for analysis. None of the containers were found to have radiological surface contamination. Additionally, DPT soil cores and sump sludge samples were scanned for the presence of radiological contamination. No evidence of radiological contamination was found on the soil cores or in any of the sludge samples based on the scanning results. During drilling for DPT boring A-42E, one elevated count reading of 152 cpm was obtained from a soil core at approximately 7-10 ft. below ground surface (bgs). The core was kept in the PVC sleeve, covered with plastic, allowed to sit overnight, and was re-scanned the following morning. The elevated count from the day before was not confirmed, and the elevated count of 152 cpm from the day before was attributed to the presence of radon.

Field screening results for sediment samples, soil samples, groundwater samples, sump liquid and sludge samples, concrete samples, and field observations were recorded in field logbooks and/or on field forms. The field screening results are tabulated in Appendix B. The field logbooks are presented in Appendix C. Boring logs for the DPT soil sampling are presented in Appendix D.

The highest PID reading was detected in sludge from the 9404-8 sump (sampling station A-93E) while the highest Jerome meter reading was obtained in soil from boring A-47E. The specific field screening results and field observations are discussed in the following paragraphs.

No VOCs or only low levels of VOCs were detected in the samples with the PID. PID detections of VOCs ranged from a low of 0.1 ppm in soil sample A-54E (2.t ft. to 5.0 ft. bgs) to a high of 11.1 ppm in sump sludge sample A-93E (9404-8 sump). Additionally, only low levels of mercury vapor were detected in any of the samples with the Jerome meter. The lowest mercury vapor detection at 0.003 milligrams/ cubic meter (mg/m^3) mercury (Hg) was measured in several concrete samples including A-51E, A-54E, A-64E, A-68E, A-69E, A-70E, A-71E, A-73E, and A-83E, and in soil samples A-67E (5 to 10 ft. bgs) and A-69E (5 to 10 ft. bgs), and in sediment

sample A-73E. The highest mercury vapor reading was detected in sample A-47E (0 to 5 ft. bgs) at 0.21 mg/m^3 Hg.

No visible mercury was observed in any of the samples. Dark gray staining associated with petroleum-like odors were observed in soil samples from borings A-34E (0 to 2 ft. bgs), A-45E (0 to 5 ft. bgs), A-47 (0 to 5 ft. bgs), A-50E (2.8 ft. bgs), A-60E (3.5 to 5 ft. bgs), and A-70E (1.9 to 5 ft. bgs). PID readings associated with the odors were not elevated (or were mostly zero) which did not support the origin of the odors as being petroleum.

3.3 SEDIMENT SAMPLING RESULTS

Sediment samples were collected with a decontaminated stainless-steel hand auger to a depth of approximately 1 ft. bgs from six locations within the bed and channel of UEFPC (Figures 3-2 and 3-3). Sediment samples were submitted to the laboratory for analysis of radionuclides, PCBs, TCLP VOCs, TCLP SVOCs, TCLP herbicides, and TCLP metals. Table 3-2 summarizes the analytical results. EPA Level II Analytical data reports are provided in Appendix F.

The highest concentrations of constituents in the sediment samples were generally detected at sampling station A-41E. The following paragraphs discuss the analytical results.

No TCLP VOCs, TCLP SVOCs, or TCLP herbicides were detected in any of the sediment samples. Two PCBs including PCB-1254 and PCB-1260 were detected in all six of the sediment samples.

- PCB-1254 ranged from a low of 0.028 mg/kilogram (Kg) (estimated) at A-75E to a high of 0.81 mg/Kg at A-41E.
- PCB-1260 ranged from a low of 0.081 mg/Kg at A-75E to a high of 0.36 mg/Kg at A-41E.

Several TCLP metals were detected in the sediment samples.

- Barium was detected in all six sediment samples ranging in concentration from 0.69 mg/liter (L) at A-75E to 1.2 mg/L at A-41E.
- Cadmium was detected in five of the sediment samples from a low of 0.0048 mg/L (estimated) at A-40E to a high of 0.026 mg/L at A-41E.
- Chromium was detected in a single location (A-41E) at a concentration of 0.0098 mg/L.
- Lead was detected in two of the sediment samples from a low of 0.013 mg/L (estimated) at A-40E to a high of 0.24 mg/L at A-41E.
- Mercury was detected in four of the sediment samples from a low of 0.0011 mg/L at A-40E to a high of 0.0042 mg/L at A-39E.

Additionally, several radionuclides were detected in the sediment samples.

- Radium-226 was detected in all six sediment samples ranging in concentration from a low of 0.710 picocuries per gram (pCi/g) (estimated) at A-73E to a high of 84.4 pCi/g at A-75E.

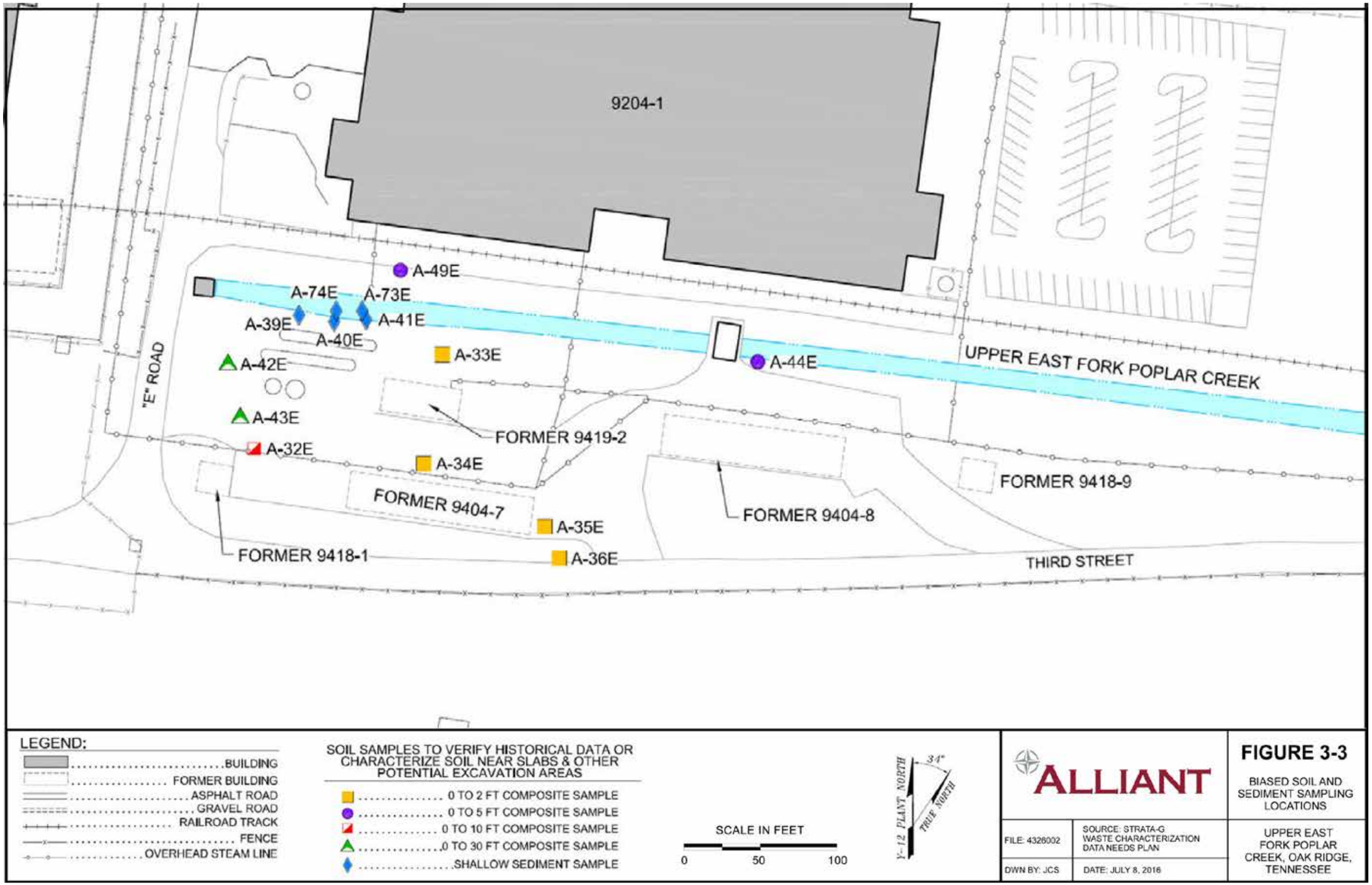

9204-1
A-49E
A-74E
A-73E
A-39E
A-41E
A-40E
A-33E
A-44E
A-42E
A-43E
A-32E
A-34E
A-35E
A-36E
"E" ROAD
UPPER EAST FORK POPLAR CREEK
FORMER 9419-2
FORMER 9404-7
FORMER 9404-8
FORMER 9418-9
FORMER 9418-1
THIRD STREET
LEGEND:
BUILDING
FORMER BUILDING
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
FENCE
OVERHEAD STEAM LINE
SOIL SAMPLES TO VERIFY HISTORICAL DATA OR CHARACTERIZE SOIL NEAR SLABS & OTHER POTENTIAL EXCAVATION AREAS
0 TO 2 FT COMPOSITE SAMPLE
0 TO 5 FT COMPOSITE SAMPLE
0 TO 10 FT COMPOSITE SAMPLE
0 TO 30 FT COMPOSITE SAMPLE
SHALLOW SEDIMENT SAMPLE
SCALE IN FEET
0
50
100
Y-12 PLANT NORTH
TRUE NORTH
34°
ALLIANT
FIGURE 3-3
BIASED SOIL AND SEDIMENT SAMPLING LOCATIONS
FILE: 4326002
SOURCE: STRATA-G WASTE CHARACTERIZATION DATA NEEDS PLAN
DWN BY: JCS
DATE: JULY 8, 2016
UPPER EAST FORK POPLAR CREEK, OAK RIDGE, TENNESSEE

Table 3-2 Outfall 200 Analytical Results Summary – Sediment Samples

Analyte	Reporting Limit	Units	Analytical Results					
			YMTF A39 SE 001[1] (0 – 1 ft. bgs)	YMTF A40 SE 001 (0 – 1 ft. bgs)	YMTF A41 SE 001 (0 – 1 ft. bgs)	YMTF A73 SE 001 (0 – 1 ft. bgs)	YMTF A74 SE 001 (0 – 1 ft. bgs)	YMTF A75 SE 001 (0 – 1 ft. bgs)
TCLP VOCs								
N/A	N/A	mg/L	ND	ND	ND	ND	ND	ND
TCLP SVOCs								
N/A	N/A	mg/L	ND	ND	ND	ND	ND	ND
PCBs								
PCB-1254	0.033	mg/Kg	0.30	0.43	0.81	0.66	0.17 J	0.028 J
PCB-1260	0.033	mg/Kg	0.17	0.29	0.36	0.32	0.24	0.081
PCBs, Total	0.033	mg/Kg	0.47	0.73	1.2	0.99	0.41	0.11
TCLP Herbicides								
N/A	N/A	mg/L	ND	ND	ND	ND	ND	ND
TCLP Metals								
Barium	0.13	mg/L	0.95	1.0	1.2	0.93	0.93	0.69
Cadmium	0.013	mg/L	0.006 J	0.0048 J	0.026	0.010 J	0.0078 J	ND
Chromium	0.025	mg/L	ND	ND	0.0098 J	ND	ND	ND
Lead	0.025	mg/L	ND	0.013 J	0.24	ND	ND	ND
Mercury	0.0010	mg/L	0.0042	0.0011	0.0024	0.0016	0.0022 B	ND
Radionuclides								
Radium-226	1.0	pCi/g	0.772 J[2]	1.21 J[2]	0.923 J[2]	0.710 J[2]	0.712	84.4
Americium-241	1.0	pCi/g	0.123	ND	0.298	0.192	0.140	0.0434
Neptunium-237	1.0	pCi/g	ND	ND	0.0643	ND	0.0461	ND
Plutonium-238	1.0	pCi/g	0.313	0.168	0.373	0.770	0.771	ND
Plutonium-239/240	1.0	pCi/g	0.0669	ND	0.0448	0.0616	0.0860	ND

Table 3-2 Outfall 200 Analytical Results Summary – Sediment Samples (Continued)

Analyte	Reporting Limit	Units	Analytical Results					
			YMTF A39 SE 001[1] (0 – 1 ft. bgs)	YMTF A40 SE 001 (0 – 1 ft. bgs)	YMTF A41 SE 001 (0 – 1 ft. bgs)	YMTF A73 SE 001 (0 – 1 ft. bgs)	YMTF A74 SE 001 (0 – 1 ft. bgs)	YMTF A75 SE 001 (0 – 1 ft. bgs)
Thorium-228	1.0	pCi/g	1.79	1.93	5.71	1.01 J[2]	3.72	1.10
Thorium-230	1.0	pCi/g	1.70	1.79	3.60	0.772 J[2]	2.60	0.773
Thorium-232	1.0	pCi/g	1.63	1.85	5.93	0.972 J[2]	4.65	1.11
Uranium-233/234	1.0	pCi/g	7.92	6.73	17.1	9.65	44.5	1.71
Uranium-235/236	1.0	pCi/g	0.600	0.424	1.34	0.887	5.05	ND
Uranium-238	1.0	pCi/g	23.4	13.5	30.1	27.4	299	2.04

1. Sample YMTF A39 SE 001 represents Y-12 Mercury Treatment Facility, sample station A-39E, sediment sample from 0-1 ft. (feet) below ground surface (bgs).
2. 'J' qualifiers have been added to several results on this data table based on the outcome of the formal data validation activities (Section 3.11).

B	detected in blank	J	estimated
mg/Kg	milligram per kilogram	mg/L	milligram per liter
N/A	not applicable	ND	not detected
PCB	polychlorinated bipheny	pCi/g	picocuries per gram
SVOCs	semivolatile organic compound	TCLP	toxicity characteristic leaching procedure
VOCs	volatile organic compounds		

- Americium-241 was detected in five of the sediment samples in concentrations ranging from 0.0434 pCi/g (A-75E) to 0.298 pCi/g (A-41E).
- Neptunium was detected in A-41E and A-74E at concentrations of 0.643 pCi/g and 0.0461 pCi/g, respectively.
- Plutonium-238 was detected in five of the sediment samples in concentrations ranging from 0.168 pCi/g at A-40E to 0.771 pCi/g at A-74E.
- Plutonium-239/240 was detected in four of the sediment samples ranging in concentration from a low of 0.0448 pCi/g (A-41E) to a high of 0.0860 pCi/g (A-74E).
- Thorium-228 was detected in all six of the sediment in samples in concentrations ranging from 1.01 pCi/g (estimated) at A-73E to 5.71 pCi/g at A-41E.
- Thorium-230 was detected in all six of the sediment in samples at concentrations ranging from a low of 0.773 pCi/g (estimated) at A-75E to a high of 3.60 pCi/g at A-41E.
- Thorium-232 was detected in all six of the sediment in samples at concentrations ranging from 0.972 pCi/g (estimated) at A-73E to 5.93 pCi/g at A-41E.
- Uranium-233/234 was detected in all six of the sediment samples at concentrations ranging from 1.71 pCi/g (A-75E) to 44.5 pCi/g (A-74E).
- Uranium-235/236 was detected in five of the sediment samples ranging at concentration from a low of 0.424 pCi/g at A-40E to a high of 5.05 pCi/g at A-74E.
- Uranium-238 was detected in all six of the sediment in samples at concentrations ranging from 2.04 pCi/g (A-75E) to 299 pCi/g (A-74E).

3.4 CONCRETE SAMPLING RESULTS

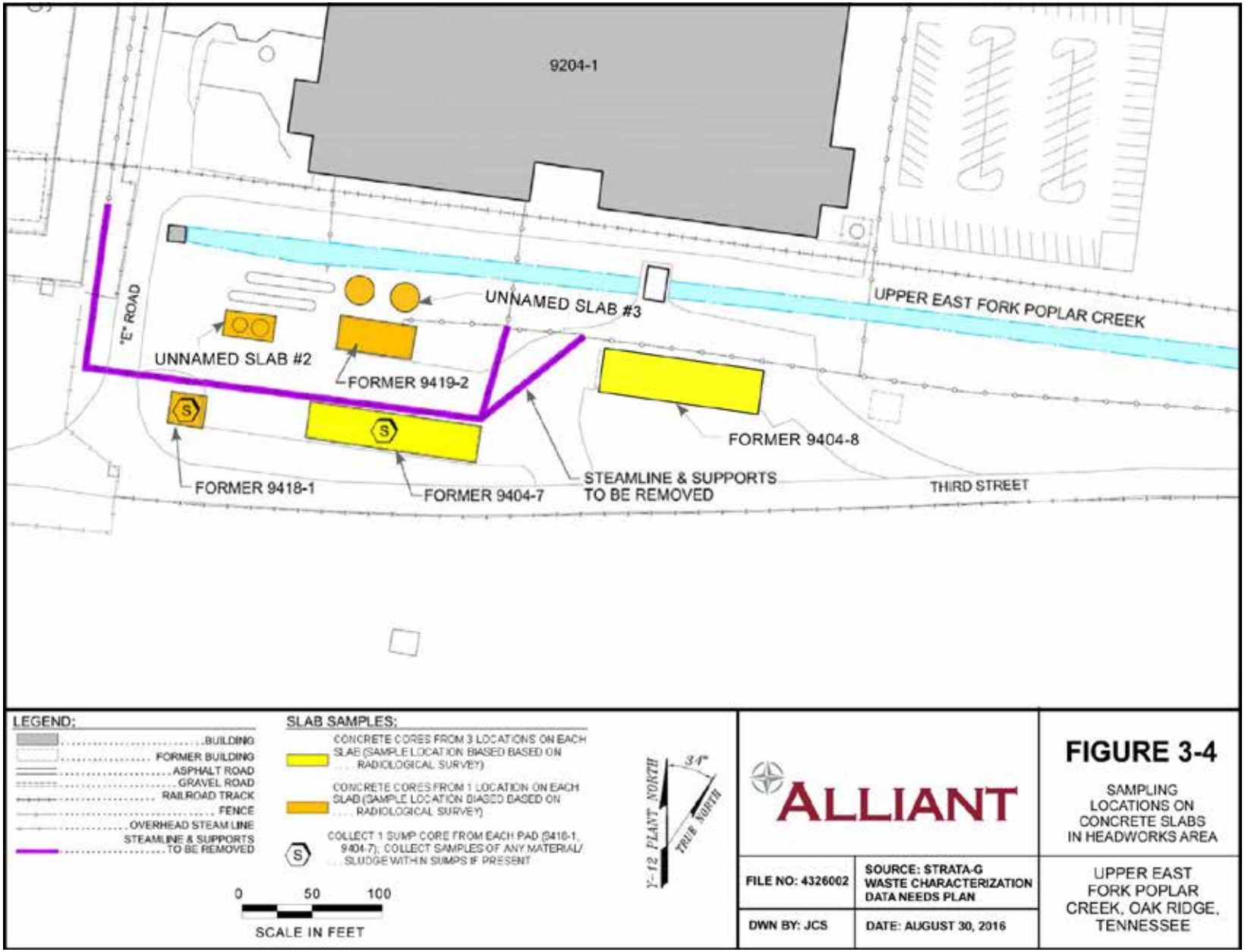
Concrete samples were collected from seven locations in the proposed Headworks Area, and from 20 locations at the 9720-8 Slab. Figures 3-4 and 3-5 show the concrete sample locations. Table 3-3 summarizes the analytical results. EPA Level II Analytical data reports are provided in Appendix F.

The highest concentrations of constituents were generally detected in concrete from sampling station A-68E. The following paragraphs discuss the analytical results.

Three PCBs including PCB-1016, PCB-1254 and PCB-1260 were detected in the concrete samples.

- PCB-1016 ranged from a low of 0.011 mg/Kg (estimated) at A-54E to a high of 1.7 mg/Kg at A-81E C2.
- PCB-1254 was detected in A-67E at a concentration of 0.0081 mg/Kg (estimated) and in A-68E at 0.016 mg/Kg (estimated).
- PCB-1260 ranged from a low of 0.0090 mg/Kg (estimated) at A-70E to a high of 0.069 mg/Kg (estimated) at A-81E C2.

Non-detects for nine PCBs (PCB-1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268) in the concrete sample at A-66E were rejected based on the results of formal data validation (Section 3.11).


9204-1
"E" ROAD
UNNAMED SLAB #3
UPPER EAST FORK POPLAR CREEK
UNNAMED SLAB #2
FORMER 9419-2
FORMER 9404-8
FORMER 9418-1
FORMER 9404-7
STEAMLINE & SUPPORTS
TO BE REMOVED
THIRD STREET
LEGEND:
BUILDING
FORMER BUILDING
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
FENCE
OVERHEAD STEAM LINE
STEAMLINE & SUPPORTS
TO BE REMOVED
SLAB SAMPLES:
CONCRETE CORES FROM 3 LOCATIONS ON EACH SLAB (SAMPLE LOCATION BIASED BASED ON RADIOLOGICAL SURVEY)
CONCRETE CORES FROM 1 LOCATION ON EACH SLAB (SAMPLE LOCATION BIASED BASED ON RADIOLOGICAL SURVEY)
COLLECT 1 SUMP CORE FROM EACH PAD (9418-1, 9404-7); COLLECT SAMPLES OF ANY MATERIAL/ SLUDGE WITHIN SUMPS IF PRESENT
0 50 100
SCALE IN FEET
Y-12 PLANT NORTH
TRUE NORTH
34°
ALLIANT
FIGURE 3-4
SAMPLING LOCATIONS ON CONCRETE SLABS IN HEADWORKS AREA
FILE NO: 4326002
SOURCE: STRATA-G WASTE CHARACTERIZATION DATA NEEDS PLAN
DWN BY: JCS
DATE: AUGUST 30, 2016
UPPER EAST FORK POPLAR CREEK, OAK RIDGE, TENNESSEE

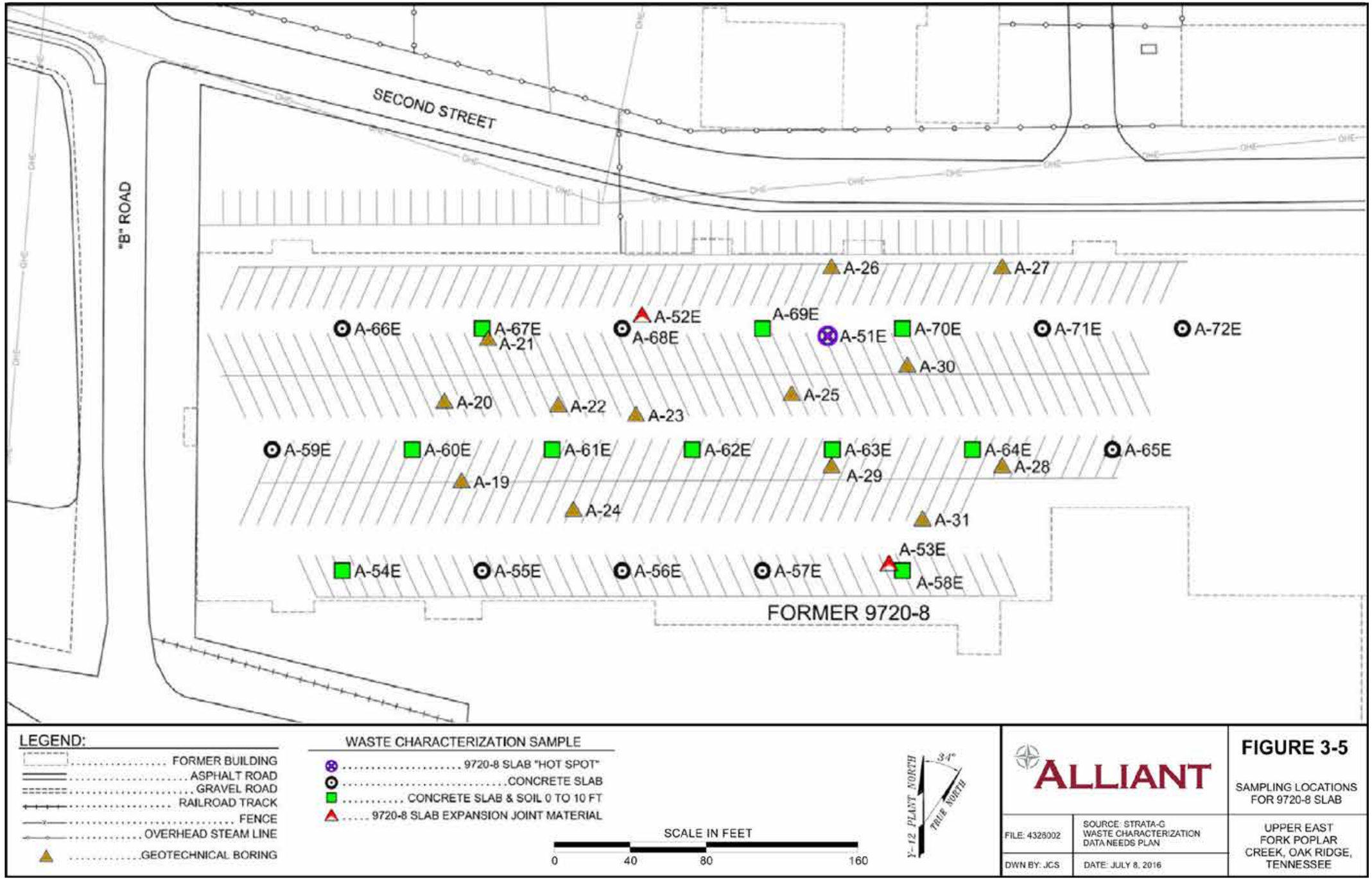

SECOND STREET
"B" ROAD
A-26
A-27
A-66E
A-67E
A-21
A-52E
A-68E
A-69E
A-51E
A-70E
A-71E
A-72E
A-30
A-20
A-22
A-23
A-25
A-59E
A-60E
A-61E
A-62E
A-63E
A-29
A-64E
A-28
A-65E
A-19
A-24
A-31
A-53E
A-54E
A-55E
A-56E
A-57E
A-58E
FORMER 9720-8
LEGEND:
FORMER BUILDING
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
FENCE
OVERHEAD STEAM LINE
GEOTECHNICAL BORING
WASTE CHARACTERIZATION SAMPLE
9720-8 SLAB "HOT SPOT"
CONCRETE SLAB
CONCRETE SLAB & SOIL 0 TO 10 FT
9720-8 SLAB EXPANSION JOINT MATERIAL
SCALE IN FEET
0
40
80
160
Y-12 PLANT NORTH
34°
TRUE NORTH
ALLIANT
FIGURE 3-5
SAMPLING LOCATIONS FOR 9720-8 SLAB
FILE: 4326002
SOURCE: STRATA-G WASTE CHARACTERIZATION DATA NEEDS PLAN
DWN BY: JCS
DATE: JULY 8, 2016
UPPER EAST FORK POPLAR CREEK, OAK RIDGE, TENNESSEE

Table 3-3 Outfall 200 Analytical Results Summary – Concrete Samples

Analyte	Reporting Limit	Units	Analytical Results								
			YMTF A51 C[1]	YMTF A54 C	YMTF A55 C	YMTF A56 C	YMTF A57 C	YMTF A58 C	YMTF A59 C	YMTF A60 C	YMTF A61 C
PCBs											
PCB-1016	0.033	mg/Kg	ND	0.011 J	ND	ND	ND	ND	ND	ND	ND
PCB-1260	0.033	mg/Kg	ND	ND	0.0096 J	0.027 J	ND	ND	ND	0.052	ND
PCBs, Total	0.033	mg/Kg	ND	0.011 J	0.0096 J	0.027 J	ND	ND	ND	0.052	ND
TCLP Metals											
Barium	0.13	mg/L	0.19	0.27 J	0.34 J	0.33 J	0.25 J	0.45 J	0.36 J	0.20 J	0.28 J
Chromium	0.025	mg/L	0.0098 J	ND	ND	ND	ND	ND	ND	0.040 J	ND
Mercury	0.0010	mg/L	ND[3]	0.00019 J	ND	ND	ND	ND	0.00020 J	ND	ND
Radionuclides											
Radium-226	1.0	pCi/g	0.617 J[3]	118	0.691 J[3]	0.557 J[3]	0.469 J[3]	0.411 J[3]	3.96	0.746 J[3]	0.634 J[3]
Tritium	1.0	pCi/g	0.400 J[3]	ND	ND	ND	ND	ND	ND	ND	ND
Thorium-228	1.0	pCi/g	0.165	0.253	0.126	0.110	0.116	0.195	0.175	0.103	0.258
Thorium-230	1.0	pCi/g	0.110 J[3]	0.115	0.159 J[3]	0.135 J[3]	0.0983 J[3]	0.187 J[3]	0.152	0.149	0.253
Thorium-232	1.0	pCi/g	0.223	0.141	0.245	0.179	0.201	0.241	0.219	0.126	0.287
Uranium-233/234	1.0	pCi/g	0.152 J[3]	0.136	0.180	0.154	0.127	0.253	1.01	0.190	0.282
Uranium-238	1.0	pCi/g	0.212	0.163	0.0209 J[3]	0.0910 J[3]	0.0772 J[3]	0.209 J[3]	0.180	0.158	0.123
Analyte	**Reporting Limit**	**Units**	**YMTF A62 C**	**YMTF A63 C**	**YMTF A64 C**	**YMTF A65 C**	**YMTF A66 C**	**YMTF A67 C**	**YMTF A68 C**	**YMTF A69 C**	**YMTF A70 C**
PCBs											
PCB-1016	0.033	mg/Kg	ND	ND	ND	0.022 J	R[3]	ND	ND	ND	ND
PCB-1254	0.033	mg/Kg	ND	ND	ND	ND	R[3]	0.0081 J	0.016 J	ND	ND
PCB-1260	0.033	mg/Kg	ND	ND	ND	0.012 J	R[3]	ND	0.014 J[3]	ND	0.0090 J
PCBs, Total	0.033	mg/Kg	ND	ND	ND	0.034	R[3]	0.0081 J	0.030 J[3]	ND	0.0090 J
TCLP Metals											
Barium	0.13	mg/L	0.29 J	0.31 J	0.30 J	0.52 J	0.33 J	0.26	0.21	0.30	0.25

Table 3-3 Outfall 200 Analytical Results Summary – Concrete Samples (Continued)

Analyte	Reporting Limit	Units	Analytical Results								
			YMTF A62 C	YMTF A63 C	YMTF A64 C	YMTF A65 C	YMTF A66 C	YMTF A67 C	YMTF A68 C	YMTF A69 C	YMTF A70 C
Chromium	0.025	mg/L	ND	ND	ND	ND	0.051 J	0.032	ND	0.0075 J	ND
Mercury	0.0010	mg/L	0.00018 J	0.00019 J	0.00020 J	ND	0.00020 J	ND	ND	ND	ND[3]
Radionuclides											
Radium-226	1.0	pCi/g	0.506 J[3]	0.589 J[3]	0.466 J[3]	0.392 J[3]	0.723 J[3]	1.02 J[3]	1.41 J[3]	0.671 J[3]	0.943 J[3]
Strontium 89/90	3.0	pCi/g	ND	ND	ND	0.162 J[3]	ND	ND	0.290	ND	ND
Thorium-228	1.0	pCi/g	0.375	0.253	0.279	ND	0.175	0.282	0.321	0.281	0.263
Thorium-230	1.0	pCi/g	0.168	0.155	0.159	0.102 J[3]	0.0607	0.137 J[3]	0.144 J[3]	0.136 J[3]	0.106 J[3]
Thorium-232	1.0	pCi/g	0.297	0.241	0.218	ND	0.170	0.116	0.210	0.210	0.213
Uranium-233/234	1.0	pCi/g	0.223	0.140	ND	0.130	0.161	0.233 J[3]	0.173 J[3]	0.267 J[3]	0.210 J[3]
Uranium-238	1.0	pCi/g	0.185	0.181	0.270	0.197 J[3]	0.177	0.140	0.162	0.217	0.157

Analyte	Reporting Limit	Units	Analytical Results								
			YMTF A71 C	YMTF A72 C	YMTF A80 9418 C[2]	YMTF A81 9404 C1	YMTF A81 9404 C2	YMTF A81 9404 C3	YMTF A82 UNK1 C[2]	YMTF A83 UNK2 C[2]	YMTF A84 UNK3 C[2]
PCBs											
PCB-1016	0.095-1.7	mg/Kg	ND	ND	0.013 J	ND	1.7	0.095	ND	ND	ND
PCB-1260	0.033		ND	ND	ND	ND	0.069 J[3]	ND	ND	ND	ND
PCBs, Total	0.033		ND	ND	0.013 J	ND	1.6	0.095	ND	ND	ND
TCLP Metals											
Barium	0.13	mg/L	0.35	0.57 J	0.38 J	0.27 J	0.28 J	0.32 J	0.37 J	0.45 J	0.35
Mercury	0.0010	mg/L	ND[3]	ND	0.00023 J	0.00021 J	0.00021 J	0.00020 J	0.00021 J	0.00020 J	ND[3]

Table 3-3 Outfall 200 Analytical Results Summary – Concrete Samples (Continued)

Analyte	Reporting Limit	Units	Analytical Results								
			YMTF A71 C	YMTF A72 C	YMTF A80 9418 C[2]	YMTF A81 9404-C1	YMTF A81 9404-C2	YMTF A81 9404-C3	YMTF A82 UNK1 C[2]	YMTF A83 UNK2 C[2]	YMTF A84 UNK3 C[2]
Radionuclides											
Radium-226	1.0	pCi/g	0.606 J[3]	0.402 J[3]	0.354 J[3]	0.734 J[3]	0.566 J[3]	0.736 J[3]	0.632 J[3]	0.743 J[3]	0.738 J[3]
Americium-241	1.0	pCi/g	ND	ND	ND	ND	ND	ND	ND	0.15	ND
Strontium 89/90	3.0	pCi/g	ND	0.240 J[3]	ND	ND	ND	ND	ND	0.271	ND
Thorium-228	1.0	pCi/g	0.162	0.166	0.210	0.602	0.146	0.367	0.233	0.291	0.210
Thorium-230	1.0	pCi/g	0.171 J[3]	0.0741 J[3]	0.230	0.243	0.218	0.174	0.170	0.373	0.339 J[3]
Thorium-232	1.0	pCi/g	0.0923	0.117	0.217	0.467	0.202	0.254	0.307	0.311	0.182
Uranium-233/234	1.0	pCi/g	0.376 J[3]	0.190	0.374	0.255	0.275	0.103	0.122	0.528	0.205 J[3]
Uranium-238	1.0	pCi/g	0.278	0.108 J[3]	0.319	0.146	0.110	0.154	0.196	0.372	0.273

1. Sample YMTF A51 C represents Y-12 Mercury Treatment Facility, sample station A-51E, concrete sample
2. Sample YMTF A80 9418 C represents Y-12 Mercury Treatment Facility, AD HOC sample A-80, from concrete slab at 9418 sump. Sample YMTF A82 UNK1 C represents AD HOC sample collected from 9419-2 slab. Sample YMTF A82 UNK2 C and UNK3 C indicate AD HOC concrete samples from unnamed concrete slabs.
3. 'J' qualifiers have been added to several results on this data table based on the outcome of the formal data validation activities (Section 3.11). Additionally, one result for Radium-226 (A-83 UNK2) was revised from ND to an estimated value, and four results for mercury (A-51E, A-70E, A-71E and A-84 UNK3) were revised from estimated values to ND. Also, ND results for nine PCBs (PCB-1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262 and 1268) were rejected (R).

		J	estimated
mg/Kg	milligram per kilogram	mg/L	milligram per liter
N/A	not applicable	ND	not detected
PCB	polychlorinated biphenyl	pCi/g	picocuries per gram
R	Result Rejected	SVOCs	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure	VOCs	volatile organic compounds

Table 3-4 Outfall 200 Analytical Results Summary – Sump Liquid and Sludge

Analyte	Sludge		Analytical Results		Liquid		Analytical Results	
	Reporting Limit	Units	YMTF A81 9404 G[1]	YMTF A93 9404 8G	Reporting Limit	Units	YMTF A81 9404 L	YMTF A93 9404 8L
TCLP VOCs								
N/A	N/A	N/A	--	--	N/A	µg/L	R[2]	R[2]
TCLP SVOCs								
N/A	N/A	N/A	--	--	N/A	µg/L	ND	ND
Pesticides								
N/A	N/A	N/A	--	--	N/A	µg/L	ND	ND
PCBs								
PCB-1254	0.033	mg/Kg	0.030	0.38	N/A	µg/L	ND	ND
PCB-1260	0.033	mg/Kg	0.024	ND	N/A	µg/L	ND	ND
PCB, Total	0.033	mg/Kg	0.054	0.38	N/A	µg/L	ND	ND
Anions								
Bromide	N/A	N/A	--	--	0.25	mg/L	ND	0.12 J
Nitrate as N	N/A	N/A	--	--	0.020	mg/L	0.26	0.088 J
Fluoride	N/A	N/A	--	--	0.10	mg/L	0.14	0.094 J
Sulfate	N/A	N/A	--	--	0.50	mg/L	14	7.9
Chloride	N/A	N/A	--	--	4.0	mg/L	6.9	2.5
Metals								
Aluminum	N/A	N/A	ND	ND	0.050	mg/L	0.61 B	ND[2]
Arsenic	5.8 – 7.4	mg/Kg	21	15	0.010	mg/L	0.0020	ND
Barium	29 – 37	mg/Kg	560	170	0.0020	mg/L	0.074	0.031
Boron	N/A	N/A	ND	ND	0.10	mg/L	ND[2]	ND[2]
Cadmium	3.7	mg/Kg	ND	1.6 J	0.00050	mg/L	0.00016 J	ND
Calcium	N/A	N/A	ND	ND	0.10	mg/L	99	78
Chromium	5.8 – 7.4	mg/Kg	25	29	0.010	mg/L	0.0024 J	ND

Table 3-4 Outfall 200 Analytical Results Summary – Sump Liquid and Sludge (Continued)

Analyte	Sludge		Analytical Results		Liquid		Analytical Results	
	Reporting Limit	Units	YMTF A81 9404 G[1]	YMTF A93 9404 8G	Reporting Limit	Units	YMTF A81 9404 L	YMTF A93 9404 8L
Copper	N/A	N/A	ND	ND	0.0010	mg/L	0.018 B	ND[2]
Iron	N/A	N/A	ND	ND	0.050	mg/L	0.64	0.088
Lead	5.8 – 7.4	mg/Kg	62	68	0.0030	mg/L	0.0063 B	0.0015 J B
Lithium	N/A	N/A	ND	ND	0.0050	mg/L	ND[2]	0.032 B
Nickel	N/A	N/A	ND	ND	0.0050	mg/L	0.0014 J	ND
Potassium	N/A	N/A	ND	ND	0.10	mg/L	12	16
Selenium	N/A	N/A	ND	ND	0.0050	mg/L	0.0020 J	ND
Sodium	N/A	N/A	ND	ND	0.050	mg/L	14 B	6.7 B
Uranium	N/A	N/A	ND	ND	0.0010	mg/L	0.0021	0.0011
Zinc	N/A	N/A	ND	ND	0.020	mg/L	ND[2]	ND
Mercury	0.037 – 2.2	mg/Kg	0.11	58	0.0002	mg/L	0.00019 J	ND
General Chemistry								
pH	N/A	N/A	--	--	0.1	Standard	7.2 HF	7.6 HF
TSS	N/A	N/A	--	--	4.0	mg/L	31	ND
HEM	N/A	N/A	--	--	9.8	mg/L	5.1 J	ND
Phenols, Total	N/A	N/A	--	--	0.010	mg/L	ND	ND
Cyanide, Total	N/A	N/A	--	--	0.010	mg/L	ND	ND
Total Organic Carbon	N/A	N/A	--	--	1.0	mg/L	4.3	3.3
Acidity	N/A	N/A	--	--	10	mg/L	ND	ND
Gross Alpha & Beta								
Gross Alpha	N/A	N/A	--	--	3.00	pCi/L	5.11	ND
Gross Beta	N/A	N/A	--	--	4.00	pCi/L	5.79	11.2

Table 3-4 Outfall 200 Analytical Results Summary – Sump Liquid and Sludge (Continued)

Analyte	Sludge		Analytical Results		Liquid		Analytical Results	
	Reporting Limit	Units	YMTF A81 9404 G[1]	YMTF A93 9404 8G	Reporting Limit	Units	YMTF A81 9404 L	YMTF A93 9404 8L
Radionuclides								
Radium-226	1.00	pCi/g	1.68 J[2]	1.83 J[2]	N/A	N/A	--	--
Strontium 89/90	3.00	pCi/g	ND	0.272	N/A	N/A	ND	ND
Thorium-228	1.00	pCi/g	1.28	0.118	1.00	pCi/L	ND	ND
Thorium-230	1.00	pCi/g	1.17 J[2]	0.313 J[2]	N/A	N/A	ND	ND[2]
Thorium-232	1.00	pCi/g	1.22	0.155	N/A	N/A	ND	ND
Uranium-233/234	1.00	pCi/g	1.44	1.81	1.00	pCi/L	3.74	0.750
Uranium-235/236	N/A	pCi/g	ND	0.0775	1.00	pCi/L	0.131	ND
Uranium-238	1.00	pCi/g	1.06	1.12	1.00	pCi/L	0.646	0.367

1. Sample YMTF A81 9404 G represents Y-12 Mercury Treatment Facility, AD HOC sample station A-81, sludge (G) sample from 9404-7 sump. 9404-8 L indicates liquid sample from 9404-8 sump.
2. 'J' qualifiers have been added to several results on this data table based on the outcome of the formal data validation activities (Section 3.11). Additionally, several results were revised from estimated or detected values to ND. Also, ND results for several VOCs were rejected (R).

-- Not analyzed.

B analyte detected in blank sample
J estimated
mg/L milligram per liter
ND not detected
pCi/g picocuries per gram
TCLP toxicity characteristic leaching procedure
HEM n-Hexane Extractable Material (Oil & Grease)
mg/Kg milligram per kilogram
N/A not applicable
PCB polychlorinated biphenyl
SVOCs semivolatile organic compound
VOCs volatile organic compounds

Several TCLP metals were detected in the sediment samples.

- Barium was detected in all of the concrete samples ranging in concentration from 0.19 mg/L at A-51E to 0.57 mg/L (estimated) at A-72E.
- Chromium was detected in the concrete samples from a low of 0.0075 mg/L (estimated) at A-69E to a high of 0.051 mg/L (estimated) at A-66E.
- Mercury was detected from a low of 0.00018 mg/L (estimated) at A-62E to a high of 0.00023 mg/L (estimated) at A-80E.

Additionally, several radionuclides were detected in the concrete samples.

- Radium-226 was detected in the concrete samples ranging in concentration from a low of 0.29 pCi/g (estimated) at A-68E to a high of 118 pCi/g at A-54E.
- Americium-241 was detected in one of the concrete samples at a concentration of 0.15 pCi/g (A-83E).
- Tritium was detected in one of the concrete samples at a concentration of 0.400 pCi/g (estimated) at A-51E.
- Strontium 89/90 was detected in four of the concrete samples in concentrations ranging from 0.162 pCi/g at A-65E to 0.290 pCi/g at A-68E.
- Thorium-228 was detected in all of the concrete samples in concentrations ranging from 0.103 pCi/g at A-60E to 0.602 pCi/g at A-81E C1.
- Thorium-230 was detected in all of the concrete samples at concentrations ranging from a low of 0.0607 pCi/g (A-66E) to a high of 0.373 pCi/g (A-83E).
- Thorium-232 was detected in the concrete samples at concentrations ranging from 0.0923 pCi/g at A-71E to 0.467 pCi/g at A-81E C1.
- Uranium-233/234 was detected in the majority of the concrete samples at concentrations ranging from 0.103 pCi/g (A-81E C3) to 1.01 pCi/g (A-59E).
- Uranium-238 was detected in all of the concrete samples at concentrations ranging from a low of 0.0209 pCi/g (estimated) in A-55E to 0.372 pCi/g in A-83E.

3.5 SUMP SLUDGE AND LIQUID SAMPLING RESULTS

Sludge samples were collected from two sumps beneath the 9404-7 slab, and the 9404-8 slab in the Headworks Area (Figure 3-1 and Figure 3-4). The sump beneath the 9404-7 slab was accessed through a pre-existing core hole in the slab. Very little water and a small quantity of sludge were present in 9404-7 sump. The sump beneath the 9404-8 slab was accessed through a vault lid on the north-central portion of the slab. A small quantity of sludge was intermittently dispersed in the bottom of the 9404-8 sump with approximately 4 ft of liquid/water being present. Additionally, a slight, unidentifiable odor emanated from the 9404-8 sump and an oily sheen was present on the surface of the water.

After sampling of the sumps was finished, a steel plate was placed over the pre-existing core hole on the 9404-7 slab, and the vault lid at the 9404-8 slab was placed back over the opening and secured by bolts.

Sump sludge samples were submitted to the laboratory for analysis of PCBs, TCLP metals and radionuclides. The sludge samples were analyzed for total metals rather than TCLP metals due to an insufficient quantity of material. Sump liquid samples were submitted to the laboratory for analysis of VOCs, SVOCs, pesticides, PCBs, anions, metals, acidity, cyanide, pH, TOC, phenolics, oil and grease, TSS, and radionuclides. The highest concentrations of constituents were generally detected in the contents from the 9404-7 sump. Table 3-4 summarizes the analytical results. EPA Level II Analytical data reports are provided in Appendix F. The following paragraphs discuss the analytical results.

Two PCBs were detected in sludge from the two sumps.

- PCB-1254 was detected in 9404-7 at 0.030 mg/Kg, and in 9404-8 at 0.38 mg/Kg.
- PCB-1260 was detected in 9404-7 at 0.024 mg/Kg.

Several total metals were detected in the sludge samples collected from the sumps.

- Arsenic was detected in 9404-7 at a concentration of 21 mg/Kg, and in 9404-8 at a concentration of 15 mg/Kg.
- Barium was detected in sump sludge from both 9404-7 and 9404-8 at concentrations of 560 mg/Kg, and 170 mg/Kg, respectively.
- Cadmium was detected in 9404-8 at 1.6 mg/Kg (estimated).
- Chromium was detected in 9404-7 at a concentration of 25 mg/Kg, and in 9404-8 at a concentration of 29 mg/Kg.
- Lead was detected in sludge from both 9404-7 and 9404-8 at concentrations of 62 mg/Kg, and 68 mg/Kg, respectively.
- Mercury was detected in 9404-7 at a concentration of 0.11 mg/Kg, and in 9404-8 at a concentration of 58 mg/Kg.

Several Radionuclides were detected in the sludge samples.

- Radium-226 was detected in sludge sump samples from both 9404-7 and 9404-8 at concentrations of 1.68 pCi/g (estimated), and 1.83 pCi/g (estimated), respectively.
- Strontium 89/90 was detected in 9404-8 at 0.272 pCi/g.
- Thorium-228 was detected in 9404-7 at a concentration of 1.28 pCi/g, and in 9404-8 at a concentration of 0.118 pCi/g.
- Thorium-230 was detected in sludge from both 9404-7 and 9404-8 at concentrations of 1.17 pCi/g (estimated), and 0.313 pCi/g (estimated), respectively.
- Thorium-232 was detected in 9404-7 at a concentration of 1.22 pCi/g, and in 9404-8 at a concentration of 0.155 pCi/g.
- Uranium-233/234 was detected in 9404-7 at a concentration of 1.44 pCi/g, and in 9404-8 at a concentration of 1.81 pCi/g.
- Uranium-235/236 was detected in sludge from 9404-8 at a concentration of 0.0775 pCi/g.

- Uranium-238 was detected in 9404-7 at a concentration of 1.06 pCi/g, and in 9404-8 at a concentration of 1.12 pCi/g.

No TCLP VOCs, TCLP SVOCs, pesticides or PCBs were detected in the liquid samples from sumps 9404-7 and 9404-8. Several anions were detected in the liquid sump samples.

- Bromide was detected in the liquid sump sample from 9404-8 at a concentration of 0.12 mg/L (estimated).
- Nitrate was detected at a concentration of 0.26 mg/L in 9404-7 and at 0. 088 mg/L (estimated) in 9404-8.
- Fluoride was detected at 0.14 mg/L in 9404-7, and at 0.094 mg/L (estimated) in 9404-8.
- Sulfate was detected in 9404-7 and 9404-8 at concentrations of 14 mg/L and at 7.9 mg/L, respectively.
- Chloride was detected in the liquid sample at a concentration of 6.9 mg/L in 9404-7 and at 2.5 mg/L in 9404-8.

Several metals were detected in the liquid samples from the sumps.

- Aluminum was detected at 0.61 mg/L in 9404-7.
- Arsenic was detected in 9404-7 at a concentration of 0.0020 mg/L.
- Barium was detected in both sump liquid samples at concentrations of 0.074 mg/L (9404-7) and 0.031 mg/L (9404-8).
- Cadmium was detected in 9404-7 at a concentration of 0.00016 mg/L (estimated).
- Calcium was detected at 99 mg/L in 9404-7 and at 78 mg/L in 9404-8.
- Chromium was detected in 9404-7 at a concentration of 0.0024 mg/L (estimated).
- Copper was detected at 0.018 mg/L (9404-7).
- Iron was detected in 9404-7 and 9404-8 at concentrations of 0.64 mg/L (estimated) and 0.088 mg/L, respectively.
- Lead was detected at 0.0063 mg/L in 9404-7 and at 0.0015 mg/L (estimated) in 9404-8.
- Lithium was detected in 9404-8 at 0.032 mg/L.
- Nickel was detected in 9404-7 at a concentration of 0.0014 mg/L (estimated).
- Potassium was detected in both sump liquid samples at concentrations of 12 mg/L (9404-7) and 16 mg/L (9404-8).
- Selenium was detected in 9404-7 at a concentration of 0.0020 mg/L (estimated).
- Sodium was detected in 9404-7 and 9404-8 at concentrations of 14 mg/L and 6.7 mg/L, respectively.
- Uranium was detected in 9404-7 at 0.0021 mg/L and in 9404-8 at 0.0011 mg/L.
- Mercury was detected in 9404-7 at a concentration of 0.0019 mg/L (estimated).

The general chemistry parameter pH was measured in liquid from 9404-7 at 7.2 and from 9404-8 at 7.6.

- TSS was detected in 9404-7 at 31 mg/L.

- Oil and grease hexane extractable material (HEM) was detected at 5.1 mg/L (estimated) in liquid from sump 9404-7.
- TOC was detected at 4.3 mg/L in 9404-7 and at 3.3 mg/L in 9404-8.

Several radionuclides were detected in the sump liquid samples; samples were also screened for gross alpha and gross beta.

- Gross alpha was detected at 5.11 mg/L in 9404-7.
- Gross alpha was detected in 9404-7 and 9404-8 at concentrations of 5.79 pCi/L and 11.2 pCi/L, respectively.
- Uranium-233/234 was detected in 9404-7 at 3.74 pCi/L and in 9404-8 at 0.750 pCi/L.
- Uranium -235/236 was detected in 9404-7 at a concentration of 0.131 pCi/L.
- Uranium-238 was detected in 9404-7 and 9404-8 at concentrations of 0.646 pCi/L and 0.367 pCi/L, respectively.

3.6 SOIL AND GROUNDWATER SAMPLING RESULTS

At total of 24 DPT soil borings were advanced at the site. Twenty-two of the borings were advanced to shallow depths of 10 ft. bgs or less, while the two remaining borings were advanced to 23 ft. and 28 ft. bgs and are identified as deep borings in this *Report*. Soil samples, duplicate soil samples, geotechnical soil samples, and groundwater samples were collected from the borings. Figures 3-2, 3-3 and 3-5 show the sampling locations. Boring logs are presented in Appendix D.

Nine of the borings were slightly relocated or offset from their original locations and are listed in Table 3-5 along with rationales for relocating them. Several of the borings required relocating due to their vicinity to the sloping grade near UEFPC while others were relocated due to obstructions such as reinforcing bar (rebar) or concrete footers at the 9720-8 Slab. The following subsections discuss the analytical results for the shallow and deep soil samples, the geotechnical soil samples, and the groundwater samples.

3.6.1 Shallow Soil Sample Results

Twenty-two shallow soil borings were advanced to depths of 2 ft., 5 ft., or 10 ft. bgs at the Sites. The shallow borings included A-32E to A-36E, A-44E to A-50E, A-54E, A-58E, A- 60E to A-64E, A-67E, A-69E and A-70E. Five shallow soil borings were advanced at the proposed Headworks Area, seven were advanced at the proposed Pipeline Corridor, and the remaining ten were advanced at the 9720-8 Slab. Figures 3-2, 3-3 and 3-5 depict the soil sampling stations. Neither groundwater nor bedrock was encountered in any of the shallow soil borings. Boring logs are presented in Appendix D.

Composite soil samples were collected from the twenty-two shallow borings, and were submitted to TestAmerica for analysis of PCBs, radionuclides, and TCLP metals. Table 3-6 summarizes the analytical results. EPA Level II Analytical data reports are provided in Appendix F.

Table 3-5 Outfall 200 Soil Boring Offset Information

Soil Boring ID	Boring Offset[1]	Rationale for Boring Offset
A-42E	4 ft Southeast	Refusal at 7 ft bgs in two locations (original & 2 feet south) before final location 4 ft southeast of original
A-44E	4 ft South	Grade of original location sloped too steeply toward UEFPC
A-45E	4 ft South	Grade of original location sloped too steeply toward UEFPC
A-46E	4 ft South	Grade of original location sloped too steeply toward UEFPC
A-49E	4 ft North	Grade of original location sloped too steeply toward UEFPC
A-54E	2 ft Northeast	Rebar obstruction
A-58E	10 ft Northwest	Either rebar obstruction present or concrete thickness greater than length of Star bit and rod (> 3 ft)
A-60E	3 ft Northeast	Rebar obstruction
A-64E	3 ft Northwest	Likely footer

1. Some borings were relocated more than once (i.e., boring A-58E was relocated six times). The listed boring offset is for the final location.

bgs Below ground surface ft feet
Rebar Reinforcing bar

The highest concentrations of constituents were generally detected in the shallow soils from sampling station A-33E. Results from the shallow soil samples are discussed in the following paragraphs.

Two PCBs were detected in soil from three of the shallow soil borings.

- PCB-1260 was detected in A-33E at 0.051 mg/Kg, in A-63E at 0.015 mg/Kg (estimated), and in A-64E at 0.017 mg/Kg (estimated).
- Additionally, PCB-1254 was detected in A-64E at 0.014 mg/Kg (estimated).

Several TCLP metals were detected in the shallow soil borings.

- Arsenic was detected in A-58E and A-63E at concentrations of 0.59 mg/L and 0.096 mg/L (estimated), respectively.
- Barium was detected in all 22 shallow borings at concentrations ranging from a low of 0.17 mg/L (A-33E) to a high of 1.0 mg/L (A-63E).
- Cadmium was detected in A-58E and A-63E at concentrations of 0.25 mg/L and 0.010 mg/L, respectively.
- Additionally, chromium was detected in A-58E and A-63E at concentrations of 0.78 mg/L and 0.34 mg/L, respectively.
- Lead was detected in five of the shallow borings at concentrations ranging from a low of 0.012 mg/L (estimated) in A-34E to a high of 2.9 mg/L in A-58E.
- Selenium was detected in one shallow boring (A-58E) at a concentration of 0.69 mg/L.
- Mercury was detected in six of the borings at concentrations ranging from 0.00012 mg/L (estimated) in A-67E and A-69E to 0.00015 mg/L (estimated) in A-60E.

Table 3-6 Outfall 200 Analytical Results Summary – Shallow Soil Samples

Analyte	Reporting Limit	Units	Analytical Results							
			YMTF A32 SO 010[1] (0 – 10 ft. bgs)	YMTF A33 SO 002 (0 –2 ft. bgs)	YMTF A34 SSO 002 (0 – 2 ft. bgs)	YMTF A35 SO 002 (0 – 2 ft. bgs)	YMTF A36 SO 002 (0 – 2 ft. bgs)	YMTF A44 SO 005 (0 –5 ft. bgs)	YMTF A45 SSO 005 (0 – 5 ft. bgs)	YMTF A46 SO 005[1] (0 – 5 ft. bgs)
PCBs										
PCB-1260	0.051	mg/Kg	ND	0.051	ND	ND	ND	ND	ND	ND
PCBs, Total	0.051	mg/Kg	ND	0.051	ND	ND	ND	ND	ND	ND
TCLP Metals										
Arsenic	0.13	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
Barium	0.13	mg/L	0.20	0.17	0.59	0.37	1.8	0.36	0.65	0.54
Lead	0.025	mg/L	ND	ND	0.012 J	ND	ND	ND	ND	ND
Mercury	0.0010	mg/L	ND	ND[2]	ND	ND	ND	ND[2]	ND[2]	ND[2]
Radionuclides										
Radium-226	1.0	pCi/g	1.72 J[2]	1.15 J[2]	1.25 J[2]	1.83 J[2]	0.537 J[2]	1.41	1.35	1.17
Strontium 89/90	3.0	pCi/g	ND	ND	ND	0.594	ND	ND	ND	ND
Uranium-233/234	1.0	pCi/g	0.528	1.14	0.273	0.652	0.121	0.883	0.472	0.554
Uranium-235/236	1.0	pCi/g	ND	ND	ND	ND	ND	ND	0.0138	ND
Uranium-238	1.0	pCi/g	0.279	0.608	0.240	0.230	0.123	0.494	0.229	0.185
Thorium-228	1.0	pCi/g	0.440	0.274	0.402	0.641	ND	0.514	0.530	0.463
Thorium-230	1.0	pCi/g	0.546	0.206	0.215	0.376	0.230	0.392	0.266	0.290
Thorium-232	1.0	pCi/g	0.409	0.241	0.301	0.375	ND	0.464	0.400	0.273
Technetium-99	1.0	pCi/g	ND	ND	ND	ND	ND	ND	ND	ND

Table 3-6 Outfall 200 Analytical Results Summary – Shallow Soil Samples (Continued)

Analyte	Reporting Limit	Units	Analytical Results							
			YMTF A47 SO 005 (0 –5 ft. bgs)	YMTF A48 SO 005[1] (0 – 5 ft. bgs)	YMTF A49 SO 005 (0 –5 ft. bgs)	YMTF A50 SSO 005 (0 – 5 ft. bgs)	YMTF A54 SO 010 (0 – 10 ft. bgs)	YMTF A54 SSO 005D (0 – 5 ft. bgs)	YMTF A58 SO 010 (0 – 10 ft. bgs)	YMTF A60 SO 010 (0 –10 ft. bgs)
PCBs										
N/A	N/A	mg/Kg	ND	ND	ND	ND	ND	ND	ND	ND
TCLP Metals										
Arsenic	0.13	mg/L	ND	ND	ND	ND	ND	ND	0.59	ND
Barium	0.63	mg/L	0.38 J	0.92	0.40	0.35	0.25 J	0.32 J	0.94	0.26 J
Cadmium	0.063	mg/L	ND	ND	ND	ND	ND	ND	0.25	ND
Chromium	0.13	mg/L	ND	ND	ND	ND	ND	ND	0.78	ND
Lead	0.13	mg/L	ND	ND	ND	0.020 J	ND	ND	2.9	ND
Selenium	0.19	mg/L	ND	ND	ND	ND	ND	ND	0.69	ND
Mercury	0.0010	mg/L	ND[2]	ND[2]	ND	ND[2]	ND[2]	ND[2]	ND[2]	0.00015 J B
Radionuclides										
Radium-226	1.0	pCi/g	1.55	1.21	1.48 J[2]	1.83	1.74 J[2]	1.64 J[2]	0.972 J[2]	1.20
Tritium	1.0	pCi/g	ND	ND	ND	0.937	ND	ND	ND	ND
Uranium-233/234	1.0	pCi/g	0.195	0.479	0.399	0.758	0.431	0.519	0.262	0.219
Uranium-235/236	1.0	pCi/g	ND	ND	ND	ND	ND	ND	ND	0.0435
Uranium-238	1.0	pCi/g	0.353	0.174	0.348	0.205	0.236	0.426	0.328	0.155
Thorium-228	1.0	pCi/g	0.567	0.646	0.387	0.531	0.614	0.656	0.943	0.484
Thorium-230	1.0	pCi/g	0.530	0.308	0.330	0.660	0.334 J[2]	0.536 J[2]	0.179 J[2]	0.246
Thorium-232	1.0	pCi/g	0.545	0.376	0.330	0.450	0.501	0.699	0.579	0.656
Technetium-99	1.0	pCi/g	ND	ND	ND	ND	ND	ND	ND	ND

Table 3-6 Outfall 200 Analytical Results Summary – Shallow Soil Samples (Continued)

Analyte	Reporting Limit	Units	YMTF A61 SSO 010 (0 – 10 ft. bgs)	YMTF A62 SO 010 (0 – 10 ft. bgs)	YMTF A63 SO 010 (0 – 10 ft. bgs)	YMTF A64 SO 010 (0 – 10 ft. bgs)	YMTF A67 SO 010 (0 – 10 ft. bgs)	YMTF A69 SO 010 (0 –10 ft. bgs)	YMTF A70 SSO 010 (0 – 10 ft. bgs)	
PCBs										
PCB-1254	0.033	mg/Kg	ND	ND	ND	0.014 J	ND	ND	ND	
PCB-1260	0.033	mg/Kg	ND	ND	0.015 J	0.017 J	ND	ND	ND	
PCBs, Total	0.033	mg/Kg	ND	ND	0.015 J	0.031 J	ND	ND	ND	
TCLP Metals										
Arsenic	0.13	mg/L	ND	ND	0.096 J	ND	ND	ND	ND	
Barium	0.13	mg/L	0.50 J	0.54 J	1.0	0.52 J	0.91	0.46 J	0.98	
Cadmium	0.063	mg/L	ND	ND	0.10	ND	ND	ND	ND	
Chromium	0.13	mg/L	ND	ND	0.34	ND	ND	ND	ND	
Lead	0.13	mg/L	ND	ND	1.4	ND	0.045 J	ND	ND	
Mercury	0.0010	mg/L	0.00014 J B	0.00013 J B	ND[2]	ND[2]	0.00012 J B	0.00012 J B	0.00013 J B	
Radionuclides										
Radium-226	1.0	pCi/g	1.33	1.19	0.913	1.16 J	1.42	0.576	1.58	
Strontium 89/90	3.0	pCi/g	ND	0.280	ND	ND	ND	ND	ND	
Uranium-233/234	1.0	pCi/g	0.242	0.124	0.345	0.124	0.253	0.371	0.381	
Uranium-235/236	1.0	pCi/g	ND	ND	ND	ND	ND	ND	ND	
Uranium-238	1.0	pCi/g	0.256	0.156	0.400	0.205	0.234	0.185	0.340	
Thorium-228	1.0	pCi/g	0.719	0.693	0.390	0.656	0.474	0.258	0.542	
Thorium-230	1.0	pCi/g	0.0875	0.161	0.285	0.174	0.355	0.249	0.271	
Thorium-232	1.0	pCi/g	0.443	0.334	0.406	0.259	0.356	0.368	0.366	
Technetium-99	1.0	pCi/g	ND	ND	ND	ND	ND	ND	ND	

Table 3-6 Outfall 200 Analytical Results Summary – Shallow Soil Samples (Continued)

1. Sample YMTF A32 SO 010 represents Y-12 Mercury Treatment Facility, sample station A-32E, soil sample from 0-10 ft. (feet) below ground surface (bgs).

2. 'J' qualifiers have been added to several results on this data table based on the outcome of the formal data validation activities (Section 3.11). Additionally, several results for mercury were revised from an estimated value to ND.

B	analyte detected in blank sample	J	estimated
mg/Kg	milligram per kilogram	mg/L	milligram per liter
N/A	not applicable	ND	not detected
PCB	polychlorinated biphenyl	pCi/g	picocuries per gram
SVOCs	semivolatile organic compounds	TCLP	toxicity characteristic leaching procedure
VOCs	volatile organic compounds		

Several radionuclides were detected in the shallow soil samples.

- Radium-226 was detected in all of the borings at concentrations ranging from a low of 0.537 pCi/g (estimated) at A-36E to a high of 1.83 pCi/g (estimated) at A-35E.
- Strontium 89/90 was detected at a concentration of 0.594 pCi/g in A-35E and at 0.280 in A-62E.
- Tritium was detected at a concentration of 0.937 pCi/g in A-50E.
- Uranium-233/234 was detected in a majority of the borings at concentrations ranging from 0.121 pCi/g in A-36E to 1.14 pCi/g in A-33E.
- Uranium-235/236 was detected in A-45E at 0.0138 pCi/g, and in A-60E at 0.0435 pCi/g.
- Uranium-238 was detected at concentrations from a low of 0.123 pCi/g (A-36E) to a high of 0.608 pCi/g (A-33E).
- Thorium-228 was detected in a majority of the borings at concentrations ranging from 0.258 pCi/g in A-69E to 0.943 pCi/g in A-58E.
- Thorium-230 was detected in all of the borings at concentrations from a low of 0.0875 pCi/g in A-61E to high of 0.660 pCi/g in A-50E.
- Thorium-232 was detected in all of the borings at concentrations from a low of 0.241 pCi/g (A-33E) to a high of 0.699 pCi/g (A-54E).

3.6.2 Deep Soil Sample Results

Two deep borings were advanced in the proposed Headworks Area (A-42E and A-43E). The deep soil sampling locations were previously shown on Figure 3-3. The planned depth of both borings was 30 ft. bgs, but refusal was reached in boring A-42E at 28 ft. bgs, and in boring A-43E at 23 ft. bgs. Refusal at both locations was likely due to encountering bedrock but this was not confirmed during drilling operations. Boring logs are presented in Appendix D. Groundwater was encountered in both deep borings during drilling at approximately 20 ft. bgs. Groundwater analytical results are discussed in Section 3.6.4.

Composite soil samples were collected from both of the deep borings and submitted to TestAmerica for analysis of TCLP VOCs, TCLP SVOCs, PCBs, TCLP herbicides, TCLP metals, and radionuclides. Table 3-7 summarizes the analytical results. EPA Level II Analytical data reports are provided in Appendix F. The highest concentrations of constituents were generally detected in soils from deep boring A-42E. The following paragraphs discuss the analytical results.

No TCLP VOCs, TCLP SVOCs, PCBs, or TCLP herbicides were detected in any of the deep soil samples. Two TCLP metals (barium and mercury) were detected.

- Barium was detected at A-42E in the original and duplicate sample at concentrations of 0.59 mg/L and 0.77 mg/L, respectively.
- Barium was detected in A-43E in both the original and duplicate sample at concentrations of 0.26 mg/L and 0.34 mg/L, respectively.

Table 3-7 Outfall 200 Analytical Results Summary – Deep Soil Samples

Analyte	Reporting Limit	Units	Analytical Results			
			YMTF A42 SO 030[1] (0 – 28 ft. bgs)	YMTF A42 SO 030D (0 –28 ft. bgs)	YMTF A43 SSO 030 (0 – 23 ft. bgs)	YMTF A43 SO 030D (0 – 23 ft. bgs)
TCLP VOCs						
N/A	N/A	mg/L	ND	ND	ND	ND
TCLP SVOCs						
N/A	N/A	mg/L	ND	ND	ND	ND
PCBs						
N/A	N/A	mg/Kg	ND	ND	ND	ND
TCLP Herbicides						
N/A	N/A	mg/L	ND	ND	ND	ND
TCLP Metals						
Barium	0.13	mg/L	0.59	0.77	0.26	0.34
Mercury	0.0010	mg/L	ND	ND	ND[2]	ND[2]
Radionuclides						
Radium-226	1.0	pCi/g	1.66 J[2]	1.53 J[2]	1.57 J[2]	1.62 J[2]
Strontium 89/90	3.0	pCi/g	0.258	ND	ND	ND
Uranium-233/234	1.0	pCi/g	0.467	0.528	0.651	0.679
Uranium-238	1.0	pCi/g	0.263	0.303	0.311	0.548
Americium-241	1.0	pCi/g	ND	ND	ND	0.582
Thorium-228	1.0	pCi/g	0.771	0.589	0.503	0.531
Thorium-230	1.0	pCi/g	0.535	0.526	0.366	0.523
Thorium-232	1.0	pCi/g	0.508	0.437	0.681	0.509
Technetium-99	1.0	pCi/g	ND	ND	ND	ND

1. Sample YMTF A42 SO 030 represents Y-12 Mercury Treatment Facility, sample station A-42E, soil sample from 0-30 ft. (feet) below ground surface (bgs). D indicates a duplicate sample.
2. 'J' qualifiers have been added to several results on this data table based on the outcome of the formal data validation activities (Section 3.11). Additionally, two results for mercury (A-43E and duplicate) were revised from estimated values to ND.

B	analyte detected in blank sample	J	estimated
mg/Kg	milligram per kilogram	mg/L	milligram per liter
N/A	not applicable	ND	not detected
PCB	polychlorinated biphenyl	pCi/g	picocuries per gram
SVOC	semivolatile organic compound	TCLP	toxicity characteristic leaching procedure
VOC	volatile organic compounds		

No TCLP VOCs, TCLP SVOCs, PCBs, or TCLP herbicides were detected in any of the deep soil samples. Two TCLP metals (barium and mercury) were detected.

- Barium was detected at A-42E in the original and duplicate sample at concentrations of 0.59 mg/L and 0.77 mg/L, respectively.
- Barium was detected in A-43E in both the original and duplicate sample at concentrations of 0.26 mg/L and 0.34 mg/L, respectively.
- Mercury was detected in A-43E at a concentration of 0.00011 mg/L (estimated) in the original sample, and at 0.00012 mg/L (estimated) in the duplicate sample.

No other TCLP metals were detected in the deep soil samples. Several radionuclides were detected in both borings.

- Radium-226 was detected (including the duplicate samples) at a concentration of 1.66 pCi/g (estimated) in A-42E, and at 1.57 pCi/g (estimated) in A-43E.
- Strontium 89/90 was detected in A-42E at a concentration of 0.258 pCi/g.
- Uranium-233/234 was detected in both borings at a low of 0.467 pCi/g in A-42E to a high of 6.79 pCi/g in A-43E (duplicate sample).
- Uranium-238 was detected from a low of 0.263 pCi/g (A-42E) to a high of 0.548 pCi/g (A-43E, duplicate).
- Americium-241 was detected in the duplicate sample from A-43E at a concentration of 0.582 pCi/g.
- Thorium-228 was detected at a concentration of 0.771 pCi/g in A-42E, and at 0.503 pCi/g in A-43E.
- Thorium-230 was detected in A-42E at 0.535 pCi/g and in A-42E at 0.366 pCi/g.
- Thorium-232 was detected at concentrations from a low of 0.437 pCi/g (A-42E, duplicate) to a high of 0.681 pCi/g (A-43E).

3.6.3 Geotechnical Sample Results

Five soil samples were collected from select locations (A-32E, A-42E, A-61E, A-69E, and A-70E), and submitted to GEOS for analysis of soil corrosivity. Sampling locations were previously shown on Figures 3-3 and 3-5. Seven parameters were measured to evaluate the corrosion potential of site soils including chloride, sulfate, sulfide, resistivity, moisture content, oxidation-reduction potential (redox), and pH. Table 3-8 summarizes the analytical results. The soil corrosivity data report is provided in Appendix F.

No sulfates were detected in any of the samples.

- Chloride was detected in all five locations at concentrations ranging from a low of 29.5 mg/Kg (A-61E) to a high of 51.5 mg/Kg (A-42E).
- Sulfide was detected in two locations including A-32E at 325 mg/Kg, and A-69E at 50 mg/Kg.

- Resistivity ranged from a low of 2,052 ohms-cm (or 0.000487 mho per centimeter [mho/cm]) at A-70E to a high of 4,682 ohms-cm (or 0.000214 mho/cm) at A-32E.
- Moisture content was measured at a low of 16.4 percent (%) at A-61E to a high of 22.2 % at A-42E.
- Redox ranged from 159.4 @ 25.5 ˚C (A-32E) to 168.6 @ 25.3 ˚C (A-69E).
- pH ranged from 5.95 (A-32E) to 7.02 (A-61E) indicating that the soils were neutral to mildly acidic.

Table 3-8 Outfall 200 Analytical Results Summary – Soil Geotechnical Samples

Analyte	Detection Limit	Units	Analytical Results				
			YMTF A32 SO 010[1] (0 – 10 ft. bgs)	YMTF A42 SO 030 (0 –28 ft. bgs)	YMTF A61 SSO 010 (0 – 10 ft. bgs)	YMTF A69 SO 010 (0 – 10 ft. bgs)	YMTF A70 SO 010 (0 – 10 ft. bgs)
Soil Corrosivity Tests							
Chloride	10.0	mg/Kg	50	51.5	29.5	43	32
Sulfate	10.0	mg/Kg	ND	ND	ND	ND	ND
Sulfide	20.0	µg/Kg	325	ND	ND	50	ND
Resistivity	N/A	ohms-cm	4,682	3,089	2,268	2,078	2,052
	N/A	mho/cm	0.000214	0.000324	0.000441	0.000481	0.000487
Moisture Content	0.01	%	16.9	22.2	16.4	16.7	16.6
Oxidation-Reduction Potential	0.1	mV	159.4 @ 25.5 ˚C	161.5 @ 25.1 ˚C	164.1 @ 25.7 ˚C	168.6 @ 25.3 ˚C	167.3 @ 25.3 ˚C
pH	0.01	Standard	5.95	6.99	7.02	6.41	6.29

1. Sample YMTF A32 SO 010 represents Y-12 Mercury Treatment Facility, sample station A-32E, soil sample from 0-10 ft. (feet) below ground surface (bgs).

˚C	degrees Celcius	mg/Kg	milligram per kilogram
µg/Kg	microgram per kilogram	mho/cm	mho per centimeter
N/A	not applicable	ND	not detected
ohm/cm	ohm per centimeter	%	percent

3.6.4 Groundwater Sample Results

Groundwater samples were collected from the two deep borings (A-42E and A-43E). Groundwater was not encountered in any of the shallow borings. Groundwater sampling locations were previously shown on Figure 3-3 (A-42E and A-43E). The groundwater samples

were analyzed for VOCs, SVOCs, pesticides, PCBs, anions, metals, acidity, cyanide, pH, TOC, phenolics, oil and grease, TSS, and radionuclides. Table 3-9 summarizes the groundwater analytical results. EPA Level II Analytical data reports are provided in Appendix F. The highest concentrations of constituents were generally detected in groundwater from boring A-42E. Groundwater data are discussed in the following paragraphs.

No pesticides or PCBs were detected in the groundwater samples. Several VOCs were detected in the groundwater samples from A-42E and A-43E.

- 1,1-Dichloroethane was detected in the groundwater sample from A-43E at a concentration of 0.35 µg/L.
- 1,2-Dichloroethane (total) was detected in both groundwater samples at 230 µg/L in A-42E and at 140 µg/L in A-43E.
- Chloroform was detected in A-43E at a concentration of 0.14 µg/L (estimated).
- Tetrachloroethene was detected in A-42E and A-43E at 63 µg/L and 25 µg/L, respectively.
- Toluene was detected in A-43E at a concentration of 0.26 µg/L (estimated).
- Trans-1,2-Dichloroethene was detected in A-42E and A-43E at concentrations of 3.7 µg/L (estimated), and 3.0 µg/L, respectively.
- Trichlorethene was detected in both groundwater samples at 48 µg/L in A-42E and at 15 µg/L in A-43E.
- Vinyl chloride was detected in A-42E and A-43E at concentrations of 5.3 µg/L (estimated) and 1.6 µg/L (estimated), respectively.

The SVOC di-n-butyl phthalate was detected in A-42E at a concentration of 1.2 µg/L (estimated). No other SVOCs were detected in the groundwater samples.

Several anions were detected in the groundwater samples.

- Bromide was detected in A-42E and A-43E at concentrations of 0.32 mg/L and 0.30 mg/L, respectively.
- Nitrate was detected at a concentration of 0.020 mg/L in A-42E and at 0. 014 mg/L (estimated) in A-43E.
- Fluoride was detected at 0.062 mg/L (estimated) in A-42E, and at 0.054 mg/L (estimated) in A-43E.
- Nitrite was detected at a concentration of 0.071 mg/L in A-42E.
- Sulfate was detected in A-42E and A-43E at concentrations of 35 mg/L and at 33 mg/L, respectively.
- Chloride was detected at a concentration of 23 mg/L in both A-42E and A-43E.

Table 3-9 Outfall 200 Analytical Results Summary – Groundwater

Analyte	Reporting Limit	Units	Analytical Results	
			YMTF A42 GW[1]	YMTF A43 GW
VOCs				
1,1-Dichloroethane	1.0	µg/L	ND	0.35 J
1,2-Dichoroethane, Total	20	µg/L	230	140
Chloroform	1.0	µg/L	ND	0.14 J
Tetrachloroethene	1.0	µg/L	63	25
Toluene	1.0	µg/L	ND	0.26 J
Trans-1,2-Dichloroethene	1.0	µg/L	3.7 J	3.0
Trichloroethene	1.0	µg/L	48	15
Vinyl Chloride	2.0	µg/L	5.3 J	1.6 J
SVOCs				
Di-n-butyl phthalate	2.3	µg/L	1.2 J	ND
Pesticides				
N/A	N/A	µg/L	ND	ND
PCBs				
N/A	N/A	µg/L	ND	ND
Anions				
Bromide	0.25	mg/L	0.32	0.30
Nitrate as N	0.020	mg/L	0.020	0.014 J
Fluoride	0.10	mg/L	0.062 J	0.054 J
Nitrite as N	0.020	mg/L	0.071	ND
Sulfate	5.0	mg/L	35	33
Chloride	2.0	mg/L	23	23
Metals				
Aluminum	0.050	mg/L	1.7	13
Arsenic	0.010	mg/L	ND	0.0047 J
Barium	0.0020	mg/L	0.10	0.35
Beryllium	0.00050	mg/L	ND	0.0014
Boron	0.10	mg/L	0.11 B	0.10 B
Cadmium	0.00050	mg/L	ND	0.00047 J
Calcium	0.10	mg/L	68 B	200 B
Chromium	0.010	mg/L	0.0022 J	0.019
Copper	0.0010	mg/L	0.0019	0.017
Iron	0.050	mg/L	1.4	13
Lead	0.0030	mg/L	0.0012 J	0.026

Table 3-9 Outfall 200 Analytical Results Summary – Groundwater (Continued)

Analyte	Reporting Limit	Units	Analytical Results	
			YMTF A42 GW[1]	YMTF A43 GW
Lithium	0.0050	mg/L	0.0030 J	0.028
Nickel	0.0050	mg/L	0.0017 J	0.019
Potassium	0.10	mg/L	2.7	5.3
Selenium	0.0050	mg/L	ND	0.0025 J
Sodium	0.050	mg/L	12	10
Uranium	0.0010	mg/L	0.0011	0.0055
Zinc	0.020	mg/L	ND	0.096
Mercury	0.0002	mg/L	ND	0.00063
General Chemistry				
pH	0.1	Standard	6.7 J[2]	6.8 J[2]
TSS	4.0	mg/L	16	560
HEM	9.8	mg/L	ND	ND
Phenols, Total	0.010	mg/L	ND	0.0079 J
Cyanide, Total	0.010	mg/L	ND	ND
Total Organic Carbon	1.0	mg/L	1.9	2.2
Acidity	10	mg/L	ND	ND
Gross Alpha & Beta				
Gross Alpha	3.00	pCi/L	ND	ND
Gross Beta	4.00	pCi/L	3.24	ND
Radionuclides				
Thorium-230	1.00	pCi/L	0.381	1.48
Uranium-238	1.00	pCi/L	0.448	2.42

1. Sample YMTF A42 GW represents Y-12 Mercury Treatment Facility, sample station A-42E, groundwater sample.
2. 'J' qualifiers have been added to pH results on this data table based on the outcome of the formal data validation activities (Section 3.11).

B	analyte detected in blank sample	HEM	n-Hexane Extractable Material (Oil & Grease)
J	estimated	mg/Kg	milligram per kilogram
mg/L	milligram per liter	N/A	not applicable
ND	not detected	PCB	polychlorinated biphenyl
pCi/L	picocuries per liter	SVOCs	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure	VOCs	volatile organic compounds

Several metals were detected in the groundwater samples.

- Aluminum was detected at 1.7 mg/L in A-42E and at 13 mg/L in A-43E.
- Arsenic was detected in A-43E at a concentration of 0.047 mg/L (estimated).

- Barium was detected in both groundwater samples at concentrations of 0.10 mg/L (A-42E) and 0.35 mg/L (A-43E).
- Beryllium was detected in A-43E at a concentration of 0.0014 mg/L.
- Boron was detected in A-42E and A-43E at concentrations of 0.11 mg/L and 0.010 mg/L, respectively.
- Cadmium was detected in A-43E at a concentration of 0.00047 mg/L (estimated).
- Calcium was detected in both groundwater samples at concentrations of 68 mg/L (A-42E) and 200 mg/L (A-43E).
- Chromium was detected in A-42E and A-43E at concentrations of 0.0022 mg/L and at 0.019 mg/L, respectively.
- Copper was detected in both groundwater samples at concentrations of 0.0019 mg/L (A-42E) and 0.017 mg/L (A-43E).
- Iron was detected at 1.4 mg/L in A-42E and at 13 mg/L in A-43E.
- Lead was detected in A-42E and A-43E at concentrations of 0.0012 mg/L (estimated) and at 0.026 mg/L, respectively.
- Lithium was detected in both groundwater samples at concentrations of 0.0030 mg/L (estimated) (A-42E) and 0.028 mg/L (A-43E).
- Nickel was detected at 0.0017 mg/L (estimated) in A-42E and at 0.019 mg/L in A-43E.
- Potassium was detected in A-42E and A-43E at concentrations of 2.7 mg/L and 5.3 mg/L, respectively.
- Selenium was detected in A-43E at a concentration of 0.0025 mg/L (estimated).
- Sodium was detected in both groundwater samples at concentrations of 12 mg/L (A-42E) and 10 mg/L (A-43E).
- Uranium was detected at 0.0011 mg/L in A-42E and at 0.0055 mg/L in A-43E.
- Zinc and mercury were detected in A-43E at concentrations of 0.096 mg/L and 0.00063 mg/L, respectively.

The general chemistry parameter pH was measured in A-42E and A-43E at 6.7 and 6.8, respectively.

- TSS was detected in A-42E at 16 mg/L and in A-43E at 560 mg/L.
- Phenols (total) were detected in A-43E at 0.0079 mg/L (estimated).
- TOC was detected at 1.9 mg/L in A-42E and at 2.2 mg/L in A-43E.

Several radionuclides were detected in the groundwater samples.

- Gross beta was detected at 3.24 mg/L in A-42E.
- Thorium-230 was detected in A-42E and A-43E at concentrations of 0.381 pCi/L and 1.48 pCi/L, respectively.
- Uranium-238 was detected in A-42E at 0.448 pCi/L and in A-43E at 2.42 pCi/L.

3.7 SLAB EXPANSION JOINT MATERIAL SAMPLING RESULTS

Two expansion joint material samples were collected from the 9720-8 slab as previously shown on Figure 3-5. The samples were submitted to the laboratory for analysis of PCBs, TCLP metals, radionuclides, and asbestos. The samples were analyzed for total metals rather than TCLP metals due to an insufficient quantity of material (Table 3-1). EPA Level II Analytical data reports are provided in Appendix F. Table 3-10 summarizes the analytical results.

The highest concentrations of constituents were generally detected in expansion joint material from sampling station A-52E. The results are discussed in the following paragraphs.

Asbestos was not detected in either of the expansion joint material samples. One PCB was detected in the samples.

- PCB-1260 was detected in both samples at concentrations of 0.61 mg/Kg (estimated) in A-52E and at 0.053mg/Kg (estimated) in A-53E.

Several metals were detected in the expansion joint material samples.

- Silver was detected in A-52E at 2.1 mg/Kg (estimated).
- Arsenic was detected in both samples at concentrations of 4.1 mg/Kg (estimated) in A-52E and at 3.9 mg/Kg (estimated) in A-53E.
- Barium was detected in A-52E and A-53E at concentrations of 84 mg/Kg (estimated) and 24 mg/Kg (estimated), respectively.
- Cadmium was detected in both samples at concentrations of 16 mg/Kg (estimated) in A-52E and 13 mg/Kg (estimated) in A-53E.
- Chromium was detected at a concentration of 55 mg/Kg in A-52E and at 20 mg/Kg in A-53E.
- Lead was detected in A-52E and A-53E at concentrations of 180 mg/Kg (estimated) and 41 mg/Kg (estimated), respectively.
- Mercury was detected in both samples at concentrations of 0.87 mg/Kg (A-52E) and 1.4 mg/Kg (A-53E.)

Several radionuclides were detected in the expansion joint material samples.

- Radium-226 was detected at a concentration of 0.683 pCi/g (estimated) in A-52E and at 0.527 pCi/g (estimated) in A-53E.
- Plutonium-239/240 was detected in A-52E at a concentration of 0.123 pCi/g.
- Uranium-233/234 was detected at 2.26 pCi/g in A-52E and at 0.527 pCi/g in A-53E.
- Uranium-235 was detected at 0.104 pCi/g in A-52E.
- Uranium-238 was detected at 2.81 pCi/g in A-52E and at 0.345 in A-53E pCi/g.
- Thorium-228 detected in A-52E and A-53E at concentrations of 0.0742 pCi/g and 0.0771 pCi/g, respectively.
- Thorium-230 was detected in A-52E at 0.107 pCi/g (estimated).

Table 3-10 Outfall 200 Analytical Results Summary – Asbestos Samples

Analyte	Reporting Limit	Units	Analytical Results			
			YMTF A52 EJ	YMTF A53 EJ	YMTF A85 IN	YMTF A86 IN
Asbestos						
Asbestos, Total	N/A	PCT	ND	ND	ND	43
PCBs						
PCB-1260	0.033	mg/Kg	0.61 NJ[2]	0.053 NJ[2]	--	--
PCBs, Total	0.033	mg/Kg	0.61 J	0.053 J	--	--
Metals						
Silver	4.4	mg/Kg	2.1 J	ND	--	--
Arsenic	4.4 - 4.7	mg/Kg	4.1 J	3.9 J	--	--
Barium	22 - 24	mg/Kg	84 J[2]	24 J[2]	--	--
Cadmium	2.2 - 2.4	mg/Kg	16 J[2]	13 J[2]	--	--
Chromium	4.4 – 4.7	mg/Kg	55	20	--	--
Lead	4.4 - 4.7	mg/Kg	180 J[2]	41 J[2]	--	--
Mercury	0.029 – 0.032	mg/Kg	0.87	1.4	--	--
Radionuclides						
Radium-226	1.00	pCi/g	0.683 J[2]	0.527 J[2]	--	--
Plutonium-239/240	1.00	pCi/g	0.123	ND	--	--
Uranium-233/234	1.00	pCi/g	2.26	0.527	--	--
Uranium-235/236	1.00	pCi/g	0.104	ND	--	--
Uraniium-238	1.00	pCi/g	2.81	0.345	--	--
Thorium-228	1.00	pCi/g	0.0742	0.0771	--	--
Thorium-230	1.00	pCi/g	0.107 J[2]	ND	--	--

Analyte	Reporting Limit	Units	Analytical Results				
			YMTF A87 IN	YMTF A88 RF	YMTF A89 IN	YMTF A90 IN	YMTF A92 IN
Asbestos							
Asbestos, Total	N/A	PCT	24	ND	ND	ND	33

1. Sample YMTF A52 EJ represents Y-12 Mercury Treatment Facility, sample station A-52E, from concrete expansion joint material. A-85E to A-90E and A-92E were AD HOC samples.
2. 'J' qualifiers have been added to several results on this data table based on the outcome formal data validation activities (Section 3.11).

-- Not analyzed.

J estimated
mg/L milligram per liter
ND not detected
pCi/g picocuries per gram
TCLP toxicity characteristic leaching procedure
mg/Kg milligram per kilogram
N/A not applicable
PCB polychlorinated biphenyl
PCT percent
NJ The analyte has been "tentatively identified" as present and is estimated.

3.8 OVERHEAD STEAM LINE SAMPLING RESULTS

A total of four asbestos samples were collected including one sample from the condensate line and three from the steam line. One of the samples was collected from mudding on the steam line, two were collected from suspect areas on the steam line wrap/insulation, and the forth and remaining sample was collected from the condensate line insulation. Figures 3-3 and 3-4 show the location of the steam/condensate line at the proposed Headworks Area. EPA Level II Analytical data reports are provided in Appendix F. Table 3-10 presents the results of the steam/condensate line sampling.

Three of the four samples from the steam line contained asbestos.

- Sample A-86E from the steam line #1 wrap contained asbestos at 43%.
- Sample A-87E from the steam line mudding around valve #2 contained asbestos at 24%.
- Sample A-92E from the steam line #3 insulation contained asbestos at 33%.

Sample A-85E from the condensate line did not contain asbestos.

3.9 DECHLORINATION SHED SAMPLING RESULTS

Radiological surveying was conducted on the Dechlorination Shed and associated tank located at the proposed Headworks Area prior to sampling and no radiological “hot spots” were detected on either the shed or the tank (Section 3.1).

Two asbestos samples were obtained from the shed insulation including one from the shed roof and one from the shed wall. A third sample was collected from the insulation of the associated tank at the Dechlorination Shed. Upon collection, the samples were submitted to the laboratory for analysis of ACM. The Dechlorination Shed and tank are located at the proposed Headworks Area just east of “E” Road (Figure 3-4). EPA Level II Analytical data reports are provided in Appendix F. Table 3-10 presents the results of the sampling.

None of the samples collected from the Dechlorination Shed nor the associated tank contained asbestos.

3.10 QA/QC SAMPLE RESULTS

The QA/QC samples consisted of field duplicates, field blanks, equipment blanks, and trip blanks. Field QA/QC was performed to document the precision and accuracy of the sampling effort. Analytical data are not to be altered or corrected for any results obtained from field QC samples. The field blank and equipment blank samples were analyzed for VOCs, SVOCs, pesticides, PCBs, anions, metals, acidity, cyanide, pH, TOC, phenolics, oil and grease, TSS, and radionuclides. Field duplicate samples are analyzed for the same constituents as the original samples.

Soil sample duplicate results were previously discussed in Section 3. Table 3-11 summarizes the field QA/QC analytical results for trip blanks, equipment blanks, and field blanks. The EPA Level II Analytical data reports are provided in Appendix F.

Field duplicate results are compared to the original sample results to provide a measure of the precision or reproducibility of results based on the sampling process. Field duplicates were collected simultaneously with the original samples.

Trip blanks are used to evaluate contamination from VOCs originating from the transport of the samples. Trip blanks were prepared by the laboratory and consisted of laboratory-grade water in 40-mL vials.

Equipment blanks or rinsates are used to check the adequacy of the decontamination of non-disposable sampling equipment (i.e., stainless-steel bowls, hand auger bucket) used to collect the samples. Equipment blanks consisted of ASTM Type II water and were prepared by collecting the final rinse of decontaminated field equipment into pre-preserved sample containers.

A field blank or material blank is a sample of the potable source water used in the decontamination process. Field blanks were prepared by pouring the decontamination source water (ASTM Type II water) directly into pre-preserved sample containers. Field blank sample results are used to demonstrate that decontamination source water is contaminant free.

Field Duplicate Results. Field duplicate precision was evaluated by calculating and evaluating the relative percent difference (RPD) between the results of the original and duplicate soil samples. The RPDs were calculated using the following equation:

RPD (%) = [(XA-XB)/XM] * 100

where:

XA and XB are duplicate analyses, and XM is the mean value [(XA + XB)/2] of the duplicate analyses. The RPD was calculated for those analytes which were detected in both samples of the duplicate pair. Table 3-12 presents the calculated RPDs.

Acceptable precision control criteria for soil samples generally range from 0 to 35% RPD for soil samples (EPA, 2004). The RPDs for the waste characterization soil samples ranged from a low of 1% to a high of 57%. Only two analytes from the duplicate pairs exceeded the acceptable criterion of 35% for soil samples.

- Uraniuim-238 exceeded the acceptable RPD in the duplicate pair from A-43E at 55% and in the duplicate pair from A-54E at 57%.
- Thorium-230 exceeded the acceptable RPD in the duplicate pair from A-54E at 46%.

The majority of the calculated RPD values met the precision control criterion indicating that precision between the original and duplicate samples was acceptable.

Table 3-11 Outfall 200 Analytical Results Summary – QA/QC Samples

Analyte	Reporting Limit	Units	Analytical Results			
			YMTF A9720 FB[1, 2]	YMTF A9404 FB[2]	YMTF A9720 EB[2]	YMTF A9404 EB[2]
TCLP VOCs						
Chloroform	1.0	µg/L	0.11 J	0.13 J	ND	ND
Methylene Chloride	1.0	µg/L	ND	15	ND	ND
TCLP SVOCs						
N/A	N/A	µg/L	ND	ND	ND	ND
Pesticides						
N/A	N/A	µg/L	ND	ND	ND	ND
PCBs						
N/A	N/A	µg/L	ND	ND	ND	ND
Anions						
Bromide	0.25	mg/L	ND	ND	0.028 J	ND
Nitrate as N	0.020	mg/L	0.061	0.039	0.0070 J	0.032 J
Fluoride	0.10	mg/L	ND	ND	ND	ND
Sulfate	0.50	mg/L	ND	ND	ND	ND
Chloride	4.0	mg/L	ND	ND	0.027 J	0.026 J
Metals						
Aluminum	0.050	mg/L	ND	ND	ND	ND
Arsenic	0.010	mg/L	ND	ND	ND	ND
Barium	0.0020	mg/L	ND	ND	0.00038 J	0.00043 J
Boron	0.10	mg/L	0.045 J	ND	ND	ND
Cadmium	0.00050	mg/L	ND	ND	ND	ND
Calcium	0.10	mg/L	ND	ND	ND	0.15
Chromium	0.010	mg/L	ND	ND	ND	ND
Copper	0.0010	mg/L	ND	ND	ND	ND
Iron	0.050	mg/L	ND	ND	ND	ND
Lead	0.0030	mg/L	ND	ND	ND	0.00021 J B
Lithium	0.0050	mg/L	ND	ND	ND	ND
Nickel	0.0050	mg/L	ND	ND	ND	ND
Potassium	0.10	mg/L	ND	ND	0.077 J	ND
Selenium	0.0050	mg/L	ND	ND	ND	ND
Sodium	0.050	mg/L	ND	0.071	0.072	0.095 B
Uranium	0.0010	mg/L	ND	ND	ND	ND
Zinc	0.020	mg/L	ND	ND	ND	0.012 J
Mercury	0.0002	mg/L	ND	ND	ND	ND

Table 3-11 Outfall 200 Analytical Results Summary – QA/QC Samples (Continued)

Analyte	Reporting Limit	Units	Analytical Results			
			YMTF A9720 FB[1]	YMTF A9404 FB	YMTF A9720 EB[2]	YMTF A9404 EB[2]
General Chemistry						
pH	0.1	Standard	3.7 HF	4.5 HF	4.7 HF	5.7 HF
TSS	4.0	mg/L	ND	ND	ND	ND
HEM	9.8	mg/L	ND	ND	ND	ND
Phenols, Total	0.010	mg/L	ND	ND	ND	ND
Cyanide, Total	0.010	mg/L	0.0043 J	ND	ND	ND
Total Organic Carbon	1.0	mg/L	ND	ND	ND	ND
Acidity	10	mg/L	ND	8.0 J	2.0 J	ND
Gross Alpha & Beta						
Gross Alpha	3.00	pCi/L	ND	ND	ND	ND
Gross Beta	4.00	pCi/L	ND	ND	ND	ND
Radionuclides						
Thorium-230	1.00	pCi/L	ND	ND	ND	0.215
Uranium-233/234	1.00	pCi/L	ND	ND	ND	ND
Uranium-235/236	1.00	pCi/L	ND	ND	ND	ND
Uranium-238	1.00	pCi/L	ND	ND	ND	ND

Analyte	Reporting Limit	Units	YMTF A9720 TB[1]	YMTF A42 TB	YMTF A43 TB	YMTF A9404 TB-1[2]	YMTF A9404 TB-2[2]
VOCs							
Tetrahydrofuran	10	µg/L	6.1 J	6.8 J	7.0 J	ND	6.8 J

1. Sample YMTF A9720 FB represents Y-12 Mercury Treatment Facility, field blank (FB) sample of American Society for Testing and Materials Type II water used in decontamination of stainless-steel bowls and hand auger. EB represents equipment blank. TB represents trip blank.
2. Several results were revised from estimated values to ND based on the outcome of the formal data validation activities (Section 3.11). Additionally, the qualifier for nitrate (A 9404 EB) was revised from 'H' to 'J' and the value for thorium-230 (A 9720 EB) was revised from a detected concentration to ND.

B	analyte detected in blank sample	H	Analyzed beyond holding time
HEM	n-Hexane Extractable Material (Oil & Grease)	HF	Anaylzed beyond holding time of 15 minutes
J	estimated	mg/Kg	milligram per kilogram
mg/L	milligram per liter	N/A	not applicable
ND	not detected	PCB	polychlorinated biphenyl
pCi/L	picocuries per liter	SVOCs	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure	VOCs	volatile organic compounds

Table 3-12 Outfall 200 Field Duplicate Results – Relative Percent Difference

Analyte	A-42E Original Sample Result	A-42E Duplicate Sample Result	RPD	A-43E Original Sample Result	A-43E Duplicate Sample Result	RPD	A-54E Original Sample Result	A-54E Duplicate Sample Result	RPD
Barium (mg/L)	0.59	0.77	27%	0.26	0.34	27%	0.25	0.32	25%
Mercury (mg/L	N/A	N/A	N/A	N/A	N/A	N/A	0.00011	0.00012	9%
Radium-226 (pCi/g)	1.66	1.53	8%	1.57	1.62	3%	1.74	1.64	6%
Uranium-233/234 (pCi/g)	0.467	0.528	12%	0.651	0.679	4%	0.431	0.519	19%
Uranium-238 (pCi/g)	0.263	0.303	14%	0.311	0.548	55%	0.236	0.426	57%
Thorium-228 (pCi/g)	0.771	0.589	27%	0.503	0.531	5%	0.614	0.656	7%
Thorium-230 (pCi/g)	0.535	0.526	2%	0.366	0.523	35%	0.334	0.536	46%
Thorium-232 (pCi/g)	0.508	0.437	15%	0.681	0.509	29%	0.501	0.699	33%

B analyte detected in blank sample
mg/L milligram per liter
pCi/g picocuries per gram
J estimated
N/A not applicable
RPD relative percent difference

Trip Blank Results. A total of five trip blanks were shipped with the waste characterization samples over the course of the field operations. Trip blanks were submitted to the laboratory for analysis of VOCs only. The VOC tetrahydrofuran was detected in four of the five trip blanks at concentrations ranging from a low of 6.1 µg/L (A9720 TB) to a high of 7.0 µg/L (A43 TB). Tetrahydrofuran was not detected in any of the waste characterization samples indicating that these concentrations are laboratory artifacts. Based on the results of the trip blanks, cross-contamination of samples during shipping did not occur.

Field Blank Results. Two field blanks were collected during this field effort. Field blanks were submitted to the laboratory for analysis of TCLP VOCs, TCLP VOCs, pesticides, PCBs, anions, metals, general chemistry parameters, and radionuclides. One anion, low level concentrations of two metals, and one VOC were detected in the field blanks. The single anion present in the field blank (nitrate) is likely naturally occurring and would not have a noteworthy impact on the waste characterization sample results.

One metal (boron) was detected in field blank sample A9720 FB at 0.045 mg/L (estimated).The majority of the waste characterization samples did not contain boron.

The VOC chloroform was detected in both field blank samples at a high of 0.13 mg/L (estimated). Chloroform was not detected in any other sample except for one groundwater sample at a similar concentration as in the blank, and chloroform is a common laboratory contaminant. Therefore, these concentrations of chloroform in the field blanks are likely laboratory artifacts.

The field blank results indicate that the decontamination source water was generally contaminant-free and did not adversely affect the waste characterization samples.

Equipment Blank Results. Two equipment blanks were prepared during this field effort. Equipment blanks were submitted to the laboratory for analysis of TCLP VOCs, TCLP VOCs, pesticides, PCBs, anions, metals, general chemistry parameters, and radionuclides. Several anions, low level concentrations of metals, and one radionuclide were detected in the equipment blanks. Anions present in the equipment blank were likely naturally occurring and would not have a noteworthy impact on the waste characterization sample results. Additionally, several metals were detected in the equipment blanks.

- Barium was detected at a high of 0.00043 mg/L (estimated).
- Calcium was detected at a high of 0.15 mg/L.
- Lead was detected at a 0.00021 mg/L (estimated).
- Sodium was detected at a high of 0.095 mg/L.
- Zinc was detected at 0.012 mg/L (estimated).

All of the metals except zinc were detected at concentrations much lower than those detected in the waste characterization samples. Zinc was detected at a concentration similar to those found in the waste characterization samples.

Thorium-230 was detected at 0.215 pCi/L in the equipment blank sample associated with samples from the Headworks Area (A9404 EB). Thorium-230 was generally detected at similar or higher concentrations in samples collected from the proposed Headworks Area. Thorium-230 was also detected at similar concentrations in samples from the 9720 Slab, and from the proposed Pipeline Corridor which were not associated with sample A9404 EB. This indicates that the waste characterization samples were not negatively impacted by the thorium-230 detection in the equipment blank.

Overall, the equipment blank results indicate that decontamination procedures were adequate and that the waste characterization sample results were not adversely affected due to improper decontamination of equipment.

3.11 DATA VERIFICATION AND DATA VALIDATION RESULTS

Data verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, and contractual requirements. Data validation is an analyte-specific and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set. All of the analytical data were verified. Level III data validation was conducted on 90% of the analytical data with the exception of the geotechnical data. Geotechnical data were not validated. Level IV data validation was conducted on 10% of the data. Data validation was conducted in accordance with the following EPA data quality assessment guidance:

- *Data Quality Assessment: A Reviewer's Guide, EPA QA/G-9R* (EPA 2006a); and
- *Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S.* (EPA 2006b).

Data verification and data validation were performed by TLI and Williams Engineering, independent data validators. As a separate check, Alliant also conducted data verification activities. The Data Validation Reports along with the Data Verification Summary tables from TLI and Alliant are presented in Appendix E, and are organized based on Sample Delivery Groups (SDGs). There were a total of fifteen SDGs. Analytical data reports are provided in Appendix F. The following subsections discuss the results of the data verification and data validation activities.

3.11.1 Data Verification Results

Data verification was conducted to ensure and document that the samples were submitted to the laboratory and analyzed with a documented and uninterrupted chain of custody, and to verify that the proper procedures were followed. All of the samples were analyzed within holding times except for the pH samples, and one nitrate sample. The holding time for analysis of pH is 15 minutes. The pH samples were analyzed beyond the specified holding time and all results were flagged as either H or HF. The nitrate sample for equipment blank A9404 EB was analyzed

beyond the holding time, and the result was flagged as H by the laboratory. No deficiencies outside of analyzing pH and nitrate beyond holding times were identified in the data based on the data verification process.

3.11.2 Data Validation Results

A total of 52 results were qualified as rejected after undergoing formal data validation. Additionally, there were 36 results that were originally reported as detected, but were modified to be "not detected" based on the formal data validation results. Furthermore, several results that were originally reported without qualifiers had qualifiers added, or had their original qualifiers amended based on the data validation activities.

The results of the data validation activities are discussed in the following paragraphs. Data validation results are summarized and presented in Table 3-13.

Level IV data validation was conducted on data from four SDGs and resulted in no modifications or amendments to the results over those originally reported.

Several concrete samples were received at the laboratory at elevated temperatures due to being shipped without ice. The data validation report (Appendix E) stated that the elevated cooler temperatures had little or no effect on the results for the required analytes (i.e., PCBs, metals, and radionuclides), and therefore, no qualification of the results was required.

Rejected Results. A total of 52 results were rejected based on the outcome of the formal data validation activities. All 52 of the rejected results were for analytes that were initially reported as "not detected," and the majority of the rejected results were for VOCs in the QA/QC samples (i.e., trip blanks, equipment blanks, field blanks).

- Non-detected results for several VOCs in trip blanks 9404 TB-1 and 9404 TB-2 were rejected.
- Non-detected results for three VOCs in equipment blank samples YMTFA 9404 EB and YMTFA 9720 EB were rejected.
- Non-detected results for three VOCs in field blank sample YMTFA 9404 FB were rejected.

These results were qualified as unusable (R) due to low relative response factors (RRFs) in the initial and continuing calibration verification (CCV) standards. None of the analyte results that were rejected in the QA/QC samples were detected in any of the waste characterization samples. Therefore, the rejected data associated with the QA/QC samples will have no negative impact on the data.

The remaining rejected results were from waste characterization samples including one concrete sample and two liquid sump samples.

- Non-detected results for three VOCs in sump liquid samples YMTFA 81 9404 L and YMTFA 93 9404 8L were rejected.

- Non-detected results for nine PCBs in concrete sample YMTFA 66 C were rejected.

The VOC results in the sump liquid samples were qualified as unusable to low RRFs in the initial and CCV standards. The PCBs results were qualified as unusable due to low surrogate recoveries. Therefore, it is not certain whether or not low levels of these constituents exist in the subject samples. The rejected data for the VOCs and PCBs in the two sump liquid samples and the single concrete sample will have a nominal negative impact on the data due to the uncertainty of the results.

Modified Results. There were 36 results that were amended or modified based on the outcome of the formal data validation activities. These amended results had been originally reported as detected, but were determined to be "not detected."

- Mercury results for deep soil sample YMTFA 43 SO 030 (and duplicate) were modified from estimated concentrations to "not detected."
- Mercury results for shallow soil samples YMTFA 54 SO 010 (and duplicate), and YMTFA 58 SO 010 were modified from estimated concentrations to "not detected."
- Mercury results for shallow soil samples YMTFA 33 SO 002, YMTFA 44 SO 005, YMTFA 44 SO 005, YMTFA 45 SO 005, YMTFA 46 SO 005, YMTFA 47 SO 005, YMTFA 48 SO 005, YMTFA 50 SO 005, YMTFA 63 SO 010, YMTFA 64 SO 010 were modified from estimated concentrations to "not detected."
- Mercury results for concrete samples YMTFA 51 C, YMTFA 70 C, YMTFA 71 C, and YMTFA 84 UNK3 C were modified from estimated concentrations to "not detected."
- Boron results for sump liquid samples YMTFA 81 9404 L and YMTFA 93 9404-8L were modified from estimated concentrations to "not detected."
- Lithium result for sump liquid sample YMTFA 81 9404 L was modified from an estimated concentration to "not detected."
- Aluminum result for sump liquid sample YMTFA 93 9404-8L was modified from an estimated concentration to "not detected."
- Copper result for sump liquid sample YMTFA 93 9404-8L was modified from an estimated concentration to "not detected."
- Zinc result for sump liquid sample YMTFA 93 9404-8L was modified from an estimated concentration to "not detected."
- Lead result for equipment blank sample YMTFA 9404 EB was modified from an estimated concentration to "not detected."
- Sodium result for equipment blank sample YMTFA 9404 EB was modified from an estimated concentration to "not detected."
- Thorium-230 result for sump liquid sample YMTFA 93 9404-8L was modified from a detected concentration to "not detected."
- Thorium-230 result for equipment blank sample YMTFA 9404 EB was modified from a detected concentration to "not detected."

Boron, lithium, aluminum, copper and sodium detected in the equipment blanks and sump liquid samples were also detected in their associated method blanks so the results were qualified as “not detected.” Zinc detected in the liquid sump sample was also detected in the associated equipment blank so the result was qualified as “not detected.” Lead detected in the equipment blank sample was detected in the continuing calibration blank so the result was qualified as “not detected.” Thorium-230 results in the equipment blank and sump liquid sample were qualified as “not detected” since thorium-230 was also detected in the associated method blank. Mercury results in the soil samples were qualified as “not detected” since mercury also was detected in the associated method blanks. Additionally, mercury results in the concrete samples were qualified as “not detected” since mercury also was detected in the associated method blanks.

Overall, the net effect of the analytical results being modified from detected to “not detected” has a positive impact as the waste characterization samples have been shown to contain less target constituents than originally indicated.

In addition to the rejected and the modified results, several analytical results that were originally reported without qualifiers had qualifiers added, or had their original qualifiers amended based on the outcome of the data validation activities. Results for pH and nitrate that were analyzed beyond holding times (Section 3.11.1) were qualified as estimated. These amendments to the pH data, nitrate data and the remaining amendments to the results were minor and are included in Table 3-13.

Qualifiers have been revised and/or added to the data summary tables and text in this *Report* as applicable based on the outcome of the formal data validation activities. In addition, data that were originally reported as detected in the data tables and text have been revised to reflect that they are “not detected” or deleted as appropriate.

Table 3-13 Data Validation Qualifiers Summary Table

SDG 160-18504-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA73SE001	Thorium-228	1.01	1.01	pCi/g	None	J
YMTFA73SE001	Thorium-230	0.772	0.772	pCi/g	None	J
YMTFA73SE001	Thorium-232	0.972	0.972	pCi/g	None	J
YMTFA39SE001	Tritium	0.168	0.354	pCi/g	U	UJ
YMTFA40SE001	Tritium	0.128	0.348	pCi/g	U	UJ
YMTFA41SE001	Tritium	0.104	0.380	pCi/g	U	UJ
YMTFA73SE001	Tritium	0.0547	0.355	pCi/g	U	UJ

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18504-2

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA39SE001	Radium-226	0.772	0.772	pCi/g	None	J
YMTFA40SE001	Radium-226	1.21	1.21	pCi/g	None	J
YMTFA41SE001	Radium-226	0.923	0.923	pCi/g	None	J
YMTFA73SE001	Radium-226	0.710	0.710	pCi/g	None	J

SDG 160-18570-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 43 SO 030	Mercury	0.00011 J	0.0010 U	mg/L	J	U
YMTFA 43 SO 030D	Mercury	0.00012 J	0.0010 U	mg/L	J	U

SDG 160-18570-2

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 42 SO 030	Radium-226	1.66	1.66 J	pCi/g	None	J
YMTFA 42 SO 030D	Radium-226	1.53	1.53 J	pCi/g	None	J
YMTFA 43 SO 030	Radium-226	1.57	1.57 J	pCi/g	None	J
YMTFA 43 SO 030D	Radium-226	1.62	1.62 J	pCi/g	None	J
YMTFA 49 SO 005	Radium-226	1.48	1.48 J	pCi/g	None	J
YMTFA 36 SO 002	Radium-226	0.537	0.537 J	pCi/g	None	J
YMTFA 35 SO 002	Radium-226	1.83	1.83 J	pCi/g	None	J
YMTFA 32 SO 002	Radium-226	1.72	1.72 J	pCi/g	None	J
YMTFA 34 SO 002	Radium-226	1.25	1.25 J	pCi/g	None	J

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18571-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA81 9404 C1	PCB-1016	0.0096	0.0096	mg/Kg	U	UJ
YMTFA81 9404 C1	PCB-1221	0.0096	0.0096	mg/Kg	U	UJ
YMTFA81 9404 C1	PCB-1232	0.0096	0.0096	mg/Kg	U	UJ
YMTFA81 9404 C1	PCB-1242	0.0096	0.0096	mg/Kg	U	UJ
YMTFA81 9404 C1	PCB-1248	0.0096	0.0096	mg/Kg	U	UJ
YMTFA81 9404 C1	PCB-1254	0.0080	0.0080	mg/Kg	U	UJ
YMTFA81 9404 C1	PCB-1260	0.0080	0.0080	mg/Kg	U	UJ
YMTFA81 9404 C1	PCB-1262	0.0080	0.0080	mg/Kg	U	UJ
YMTFA81 9404 C1	PCB-1268	0.0080	0.0080	mg/Kg	U	UJ
YMTFA81 9404 C1	Tritium	0.178	0.178	pCi/g	U	UJ
YMTFA81 9404 C1	Radium-226	**0.734**	**0.734**	pCi/g	None	J
YMTFA81 9404 C1	Tc-99	0.0971	0.0971	pCi/g	U	UJ
YMTFA81 9404 C1	Carbon-14	5.09E-03±9.5E-02	5.09E-03±9.5E-02	pCi/g	U	UJ
YMTFA81 9404 C2	PCB-1260	**0.069**	**0.069**	mg/Kg	None	J
YMTFA81 9404 C2	Tritium	0.184	0.184	pCi/g	U	UJ
YMTFA81 9404 C2	Radium-226	**0.566**	**0.566**	pCi/g	None	J
YMTFA81 9404 C2	Tc-99	0.390	0.390	pCi/g	U	UJ
YMTFA81 9404 C2	Carbon-14	-9.56E-02 ± 9.3E-02	-9.56E-02 ± 9.3E-02	pCi/g	U	UJ
YMTFA81 9404 C3	Tritium	0.186	0.186	pCi/g	U	UJ
YMTFA81 9404 C3	Radium-226	**0.736**	**0.736**	pCi/g	None	J
YMTFA81 9404 C3	Tc-99	-0.0396	-0.0396	pCi/g	U	UJ
YMTFA81 9404 C3	Carbon-14	-1.09E-01 ± 9.1E-02	-1.09E-01 ± 9.1E-02	pCi/g	U	UJ
YMTFA80 9418 C	PCB-1016	**0.013**	**0.013**	mg/Kg	J	J
YMTFA80 9418 C	Tritium	0.132	0.132	pCi/g	U	UJ
YMTFA80 9418 C	Radium-226	**0.354**	**0.354**	pCi/g	None	J
YMTFA80 9418 C	Tc-99	0.0207	0.0207	pCi/g	U	UJ
YMTFA80 9418 C	Carbon-14	-4.36E-02 ± 9.0E-02	-4.36E-02 ± 9.0E-02	pCi/g	U	UJ
YMTFA82 UNK1 C	Tritium	0.213	0.213	pCi/g	U	UJ
YMTFA82 UNK1 C	Radium-226	**0.632**	**0.632**	pCi/g	None	J
YMTFA82 UNK1 C	Tc-99	0.127	0.127	pCi/g	U	UJ
YMTFA82 UNK1 C	Carbon-14	3.50E-02 ± 1.0E-01	3.50E-02 ± 1.0E-01	pCi/g	U	UJ

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18590-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA63C	Tritium	0.190	0.190	pCi/g	U	UJ
YMTFA63C	Radium-226	**0.589**	**0.589**	pCi/g	None	J
YMTFA63C	Tc-99	-0.223	-0.223	pCi/g	U	UJ
YMTFA63C	Carbon-14	-3.49E-02	-3.49E-02	pCi/g	U	UJ
YMTFA64C	Tritium	0.0948	0.0948	pCi/g	U	UJ
YMTFA64C	Radium-226	**0.466**	**0.466**	pCi/g	None	J
YMTFA64C	Tc-99	-0.126	-0.126	pCi/g	U	UJ
YMTFA64C	Carbon-14	3.24E-02	3.24E-02	pCi/g	U	UJ
YMTFA83 UNK2C	Tritium	0.0505	0.0505	pCi/g	U	UJ
YMTFA83 UNK2C	Radium-226	**0.734**	**0.734**	pCi/g	None	J
YMTFA83 UNK2C	Tc-99	0.148	0.148	pCi/g	U	UJ
YMTFA83 UNK2C	Carbon-14	6.79E-02	6.79E-02	pCi/g	U	UJ

SDG 160-18591-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA63SO010	PCB-1260	0.015	0.015	mg/kg	J	J
YMTFA63SO010	Total PCBs	0.015	0.015	mg/kg	J	J
YMTFA64SO010	PCB-1260	0.017	0.017	mg/kg	J	J
YMTFA64SO010	Total PCBs	0.030	0.017	mg/kg	J	J
YMTFA44SO005	Mercury	0.00013	0.0010	mg/L	JB	U
YMTFA33SO002	Mercury	0.00013	0.0010	mg/L	JB	U
YMTFA45SO005	Mercury	0.00014	0.0010	mg/L	JB	U
YMTFA46SO005	Mercury	0.00015	0.0010	mg/L	JB	U
YMTFA50SO005	Mercury	0.00015	0.0010	mg/L	JB	U
YMTFA47SO005	Mercury	0.00013	0.0010	mg/L	JB	U
YMTFA48SO005	Mercury	0.00014	0.0010	mg/L	JB	U
YMTFA63SO010	Mercury	0.00010	0.0010	mg/L	JB	U
YMTFA64SO010	Mercury	0.00011	0.0010	mg/L	JB	U

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18591-2

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 33 SO 002	Radium-226	**1.15**	**1.15**	pCi/g	None	J
YMTFA 64 SO 010	Radium-226	**1.16**	**1.16**	pCi/g	None	J

SDG 160-18613-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA54 C	PCB-1016	0.011	0.011	mg/kg	J	J
YMTFA54 C	Total PCBs	0.011	0.011	mg/kg	J	J
YMTFA66 C	PCB-1016	0.0096	0.033	mg/kg	U	R
YMTFA66 C	PCB-1221	0.0096	0.033	mg/kg	U	R
YMTFA66 C	PCB-1232	0.0096	0.033	mg/kg	U	R
YMTFA66 C	PCB-1242	0.0096	0.033	mg/kg	U	R
YMTFA66 C	PCB-1248	0.0096	0.033	mg/kg	U	R
YMTFA66 C	PCB-1254	0.0096	0.033	mg/kg	U	R
YMTFA66 C	PCB-1260	0.0096	0.033	mg/kg	U	R
YMTFA66 C	PCB-1262	0.0096	0.033	mg/kg	U	R
YMTFA66 C	PCB-1268	0.0096	0.033	mg/kg	U	R
YMTFA60 C	Lead	0.038	0.13	mg/L	U	UJ
YMTFA61 C	Lead	0.038	0.13	mg/L	U	UJ
YMTFA62 C	Lead	0.038	0.13	mg/L	U	UJ
YMTFA54 C	Lead	0.038	0.13	mg/L	U	UJ
YMTFA59 C	Lead	0.038	0.13	mg/L	U	UJ
YMTFA66 C	Lead	0.038	0.13	mg/L	U	UJ
YMTFA60 C	Radium-226	0.746	0.746	pCi/g	None	J
YMTFA61 C	Radium-226	0.634	0.634	pCi/g	None	J
YMTFA62 C	Radium-226	0.506	0.506	pCi/g	None	J
YMTFA66 C	Radium-226	0.723	0.723	pCi/g	None	J

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18632-1

Sample ID	Parameter	Lab Result	Qualified Result	Units	Lab Qualifier	Validation Qualifier
YMTFA69C	Radium-226	**0.671**	**0.671**	pCi/g	None	J
YMTFA69C	Tritium	0.0102	0.0102	pCi/g	U	UJ
YMTFA69C	Tc-99	0.119	0.119	pCi/g	U	UJ
YMTFA69C	Thorium-230	**0.136**	**0.136**	pCi/g	None	J
YMTFA69C	U-233/234	**0.267**	**0.267**	pCi/g	None	J
YMTFA69C	Carbon-14	-0.0876	-0.0876	pCi/g	U	UJ
YMTFA68C	PCB-1260	**0.014**	**0.014**	mg/Kg	J	J
YMTFA68C	Total PCBs	**0.030**	**0.030**	mg/Kg	J	J
YMTFA68C	Radium-226	**1.41**	**1.41**	pCi/g	None	J
YMTFA68C	Tritium	-0.011	-0.011	pCi/g	U	UJ
YMTFA68C	Tc-99	-0.0324	-0.0324	pCi/g	U	UJ
YMTFA68C	Thorium-230	**0.144**	**0.144**	pCi/g	None	J
YMTFA68C	U-233/234	**0.173**	**0.173**	pCi/g	None	J
YMTFA68C	Carbon-14	0.0368	0.0368	pCi/g	U	UJ
YMTFA67C	PCB-1260	**0.0081**	**0.0081**	mg/Kg	J	J
YMTFA67C	Total PCBs	**0.0081**	**0.0081**	mg/Kg	J	J
YMTFA67C	Radium-226	**1.02**	**1.02**	pCi/g	None	J
YMTFA67C	Tritium	-0.0516	-0.0516	pCi/g	U	UJ
YMTFA67C	Tc-99	0.177	0.177	pCi/g	U	UJ
YMTFA67C	Thorium-230	**0.137**	**0.137**	pCi/g	None	J
YMTFA67C	U-233/234	**0.233**	**0.233**	pCi/g	None	J
YMTFA67C	Carbon-14	0.1	0.1	pCi/g	U	UJ
YMTFA51C	Radium-226	**0.617**	**0.617**	pCi/g	None	J
YMTFA51C	Tritium	**0.4**	**0.4**	pCi/g	None	J
YMTFA51C	Tc-99	0.116	0.116	pCi/g	U	UJ
YMTFA51C	Thorium-230	**0.11**	**0.11**	pCi/g	None	J
YMTFA51C	U-233/234	**0.152**	**0.152**	pCi/g	None	J
YMTFA51C	Carbon-14	0.101	0.101	pCi/g	U	UJ
YMTFA51C	Mercury	**0.0001**	0.0001	mg/L	JB	U
YMTFA70C	PCB-1260	**0.009**	**0.009**	mg/Kg	J	J
YMTFA70C	Total PCBs	**0.009**	**0.009**	mg/Kg	J	J
YMTFA70C	Radium-226	**0.943**	**0.943**	pCi/g	None	J
YMTFA70C	Tritium	0.0366	0.0366	pCi/g	U	UJ
YMTFA70C	Tc-99	0.104	0.104	pCi/g	U	UJ
YMTFA70C	Thorium-230	**0.106**	**0.106**	pCi/g	None	J
YMTFA70C	U-233/234	**0.21**	**0.21**	pCi/g	None	J
YMTFA70C	Carbon-14	-0.0665	-0.0665	pCi/g	U	UJ
YMTFA70C	Mercury	**0.00014**	0.00014	mg/L	JB	U
YMTFA71C	Radium-226	**0.606**	**0.606**	pCi/g		J
YMTFA71C	Tritium	-0.0546	-0.0546	pCi/g	U	UJ
YMTFA71C	Tc-99	-0.0221	-0.0221	pCi/g	U	UJ
YMTFA71C	Thorium-230	**0.171**	**0.171**	pCi/g	None	J
YMTFA71C	U-233/234	**0.376**	**0.376**	pCi/g	None	J

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18632-1 (Continued)

Sample ID	Parameter	Lab Result	Qualified Result	Units	Lab Qualifier	Validation Qualifier
YMTFA71C	Carbon-14	0.0301	0.0301	pCi/g	U	UJ
YMTFA71C	Mercury	**0.00013**	0.00013	mg/L	JB	U
YMTFA84 UNK3 C	Radium-226	**0.738**	**0.738**	pCi/g	None	J
YMTFA84 UNK3 C	Tritium	-0.0828	-0.0828	pCi/g	U	UJ
YMTFA84 UNK3 C	Tc-99	0.118	0.118	pCi/g	U	UJ
YMTFA84 UNK3 C	Thorium-230	**0.339**	**0.339**	pCi/g	None	J
YMTFA84 UNK3 C	U-233/234	**0.205**	**0.205**	pCi/g	None	J
YMTFA84 UNK3 C	Carbon-14	-0.0662	-0.0662	pCi/g	U	UJ
YMTFA84 UNK3 C	Mercury	**0.00014**	0.00014	mg/L	JB	U

SDG 160-18633-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA54 SO 010	Mercury	0.00011 J	0.0010 U	mg/L	J	U
YMTFA54 SO 010D	Mercury	0.00012 J	0.0010 U	mg/L	J	U
YMTFA58 SO 010	Mercury	0.00016 J	0.0010 U	mg/L	J	U

SDG 160-18633-2

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA54 SO 010	Radium-226	1.74	1.74 J	pCi/g	None	J
YMTFA54 SO 010D	Radium-226	1.64	1.64 J	pCi/g	None	J
YMTFA58 SO 010	Radium-226	0.972	0.972 J	pCi/g	None	J
YMTFA54 SO 010	Thorium-230	0.334	0.334 J	pCi/g	None	J
YMTFA54 SO 010D	Thorium-230	0.536	0.536 J	pCi/g	None	J
YMTFA58 SO 010	Thorium-230	0.179	0.179 J	pCi/g	None	J

SDG 160-18638-1

No qualifiers assigned

SDG 160-18639-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA81 9404 G	Thorium-230	1.17	1.17 J	pCi/g	None	J
YMTFA93 9404-8G	Thorium-230	0.313	0.313 J	pCi/g	None	J
YMTFA81 9404 G	Radium-226	1.68	1.68 J	pCi/g	None	J
YMTFA93 9404-8G	Radium-226	1.83	1.83 J	pCi/g	None	J

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18640-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 9404 TB-1	Acetone	0.55	2.0	µg/L	U	R
YMTFA 9404 TB-1	1,4-Dioxane	11	80	µg/L	U	R
YMTFA 9404 TB-1	Methyl acetate	0.76	25	µg/L	U	R
YMTFA 9404 TB-1	2-Butanone	0.47	5.0	µg/L	U	R
YMTFA 9404 TB-1	2-Chloroethyl vinyl ether	0.24	2.0	µg/L	U	R
YMTFA 9404 TB-1	2-Nitropropane	0.40	10	µg/L	U	R
YMTFA 9404 TB-1	Acetonitrile	3.7	10	µg/L	U	R
YMTFA 9404 TB-1	Acrolein	2.8	10	µg/L	U	R
YMTFA 9404 TB-1	Acrylonitrile	0.73	10	µg/L	U	R
YMTFA 9404 TB-1	Cyclo-hexanone	5.8	20	µg/L	U	R
YMTFA 9404 TB-1	Ethyl ether	0.18	2.0	µg/L	U	R
YMTFA 9404 TB-1	Isobutanol	8.3	80	µg/L	U	R
YMTFA 9404 TB-1	1-Butanol	12	50	µg/L	U	R
YMTFA 9404 TB-1	Propionitrile	1.4	10	µg/L	U	R
YMTFA81 9404 L	2-chloroethyl vinyl ether	0.24	2.0	µg/L	U	R
YMTFA81 9404 L	Acrolein	2.8	10	µg/L	U	R
YMTFA81 9404 L	Acrylonitrile	0.73	10	µg/L	U	R
YMTFA93 9404 8L	2-chloroethyl vinyl ether	0.24	2.0	µg/L	U	R
YMTFA93 9404 8L	Acrolein	2.8	10	µg/L	U	R
YMTFA93 9404 8L	Acrylonitrile	0.73	10	µg/L	U	R
YMTFA 9404 EB	2-chloroethyl vinyl ether	0.24	2.0	µg/L	U	R
YMTFA 9404 EB	Acrolein	2.8	10	µg/L	U	R
YMTFA 9404 EB	Acrylonitrile	0.73	10	µg/L	U	R
YMTFA81 9404 L	Boron	0.046	0.10	mg/L	J	U
YMTFA81 9404 L	Lithium	0.0048	0.0050	mg/L	JB	U
YMTFA 93 9404 8L	Aluminum	0.054	0.054	mg/L	B	UJ
YMTFA 93 9404-8L	Boron	0.043	0.10	mg/L	J	U
YMTFA 93 9404-8L	Copper	0.0021	0.0021	mg/L	B	U
YMTFA 81 9404 L	Zinc	0.056	0.056	mg/L	None	U
YMTFA 9404 EB	Lead	0.00021	0.0030	mg/L	JB	U
YMTFA 9404 EB	Sodium	0.095	0.095	mg/L	B	U
YMTFA 9404 EB	Nitrite as N	0.032	0.032	mg/L	H	J
YMTFA 93 9404-8L	Thorium-230	0.201	1.0	pCi/L	None	U
YMTFA 9404 EB	Thorium-230	0.215	1.0	pCi/L	None	U

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18646-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA72C	Radium-226	**0.402**	**0.402**	pCi/g	None	J
YMTFA72C	Thorium-230	**0.0741**	**0.0741**	pCi/g	None	J
YMTFA72C	Uranium-238	**0.108**	**0.108**	pCi/g	None	J
YMTFA72C	Total β Sr	**0.240**	**0.240**	pCi/g	None	J
YMTFA65C	Radium-226	**0.392**	**0.392**	pCi/g	None	J
YMTFA65C	Thorium-230	**0.102**	**0.102**	pCi/g	None	J
YMTFA65C	Uranium-238	**0.197**	**0.197**	pCi/g	None	J
YMTFA65C	Total β Sr	**0.162**	**0.162**	pCi/g	None	J
YMTFA58C	Radium-226	**0.411**	**0.411**	pCi/g	None	J
YMTFA58C	Thorium-230	**0.187**	**0.187**	pCi/g	None	J
YMTFA58C	Uranium-238	**0.209**	**0.209**	pCi/g	None	J
YMTFA57C	Radium-226	**0.469**	**0.469**	pCi/g	None	J
YMTFA57C	Thorium-230	**0.0983**	**0.0983**	pCi/g	None	J
YMTFA57C	Uranium-238	**0.0772**	**0.0772**	pCi/g	None	J
YMTFA56C	PCB-1260	**0.027**	**0.027**	mg/Kg	J	J
YMTFA56C	Total PCBs	**0.027**	**0.027**	mg/Kg	J	J
YMTFA56C	Radium-226	**0.557**	**0.557**	pCi/g	None	J
YMTFA56C	Thorium-230	**0.135**	**0.135**	pCi/g	None	J
YMTFA56C	Uranium-238	**0.0910**	**0.0910**	pCi/g	None	J
YMTFA55C	Radium-226	**0.691**	**0.691**	pCi/g	None	J
YMTFA55C	Thorium-230	**0.159**	**0.159**	pCi/g	None	J
YMTFA55C	Uranium-238	**0.0209**	**0.0209**	pCi/g	None	J

SDG 160-18646-2

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA52EJ	PCB-1260	0.61 J	0.61 NJ	mg/Kg	J	NJ
YMTFA53EJ	PCB-1260	0.053 J	0.053 NJ	mg/Kg	J	NJ
YMTFA52EJ	Barium	84	84 J	mg/Kg	None	J
YMTFA53EJ	Barium	24	24 J	mg/Kg	None	J
YMTFA52EJ	Cadmium	16	16 J	mg/Kg	None	J
YMTFA53EJ	Cadmium	13	13 J	mg/Kg	None	J
YMTFA52EJ	Lead	180	180 J	mg/Kg	None	J
YMTFA53EJ	Lead	41	41 J	mg/Kg	None	J

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18646-3

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA53EJ	Radium-226	0.527	0.527 J	pCi/g	None	J
YMTFA52EJ	Radium-226	0.683	0.683 J	pCi/g	None	J
YMTFA52EJ	Thorium-230	0.107	0.107 J	pCi/g	None	J

SDG 160-18665-1

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 9720 EB	2-chloroethyl vinyl ether	0.24	2.0	µg/L	U	R
YMTFA 9720 EB	Acrolein	2.8	10	µg/L	U	R
YMTFA 9720 EB	Acrylonitrile	0.73	10	µg/L	U	R
YMTFA 9404 TB-2	1,1,1,2-Tetrachloroethane	0.12	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,1,1-Trichloroethane	0.17	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,1,2,2-Tetrachloro ethane	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,1,2-Trichlor-1,2,2-trifluoroethane	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,1,2-Trichloroethane	0.13	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,1-Dichloroethene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,1-Dichloroethane	0.070	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,1-Dichloropropene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2,3-Trichlorobenzene	0.17	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2,3-Trichloropropane	0.18	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2,4-Trichlorobenzene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2,4-Trimethylbenzene	0.17	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2-Dibomo-3-Chloropropane	0.41	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.18	4.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2-Dichlorobenzene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2-Dichloroethane	0.22	1.0	µg/L	U	UJ

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18665-1 (Continued)

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 9404 TB-2	1,2-Dichloroethene, Total	0.14	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2-Dichloropropane	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,3,5-Trimethylbenzene	0.16	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,3-Dichlorobenzene	0.11	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,3-Dichloropropane	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,4-Dichlorobenzene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,4-Dioxane	11	80	µg/L	U	R
YMTFA 9404 TB-2	2,2-Dichloropropane	0.18	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	2-Butanone	0.47	5.0	µg/L	U	R
YMTFA 9404 TB-2	2-Chloro-1,3-butadiene	0.16	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	2-Chloroethyl vinyl ether	0.24	2.0	µg/L	U	R
YMTFA 9404 TB-2	2-Chlorotoluene	0.14	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	2-Hexanone	0.25	5.0	µg/L	U	UJ
YMTFA 9404 TB-2	2-Nitropropane	0.40	10	µg/L	U	R
YMTFA 9404 TB-2	Allyl chloride	0.10	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	4-Chlorotoluene	0.15	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	4-Methyl-2-pentanone	0.17	5.0	µg/L	U	UJ
YMTFA 9404 TB-2	Acetone	0.55	2.0	µg/L	U	R
YMTFA 9404 TB-2	Acetonitrile	3.7	10	µg/L	U	R
YMTFA 9404 TB-2	Acrolein	2.8	10	µg/L	U	R
YMTFA 9404 TB-2	Acrylonitrile	0.73	10	µg/L	U	R
YMTFA 9404 TB-2	Benzene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Bromobenzene	0.12	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Bromoform	0.17	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Bromomethane	0.25	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Carbon disulfide	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Carbon tetrachloride	0.18	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Chlorobenzene	0.11	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Bromochloro-methane	0.14	1.0	µg/L	U	UJ

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18665-1 (Continued)

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 9404 TB-2	Dibromochloro-methane	0.14	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Chloroethane	0.16	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Chloroform	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Chloromethane	0.10	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	cis-1,2-Dichloroethene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	cis-1,3-Dichloropropene	0.16	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Cyclohexane	0.14	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Cyclohexanone	5.8	20	µg/L	U	R
YMTFA 9404 TB-2	Dibromomethane	0.21	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Dichlorobromo-methane	0.14	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Dichlorodifluoro-methane	0.14	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Methyl acetate	0.26	2.0	µg/L	U	R
YMTFA 9404 TB-2	Ethyl ether	0.18	1.0	µg/L	U	R
YMTFA 9404 TB-2	Ethyl methacrylate	0.17	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Ethylbenzene	0.12	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1,2-Dibromoethane	0.13	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Hexachlorobuta-diene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Hexane	0.15	4.0	µg/L	U	UJ
YMTFA 9404 TB-2	Iodomethane	0.10	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Isobutanol	8.3	80	µg/L	U	R
YMTFA 9404 TB-2	Isopropylbenzene	0.17	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Methacrylonitrile	1.2	10	µg/L	U	UJ
YMTFA 9404 TB-2	Methyl acetate	0.76	25	µg/L	U	UJ
YMTFA 9404 TB-2	Methyl methacrylate	0.27	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Methyl tert-butyl ether	0.15	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Methylcyclohexane	0.16	4.0	µg/L	U	UJ
YMTFA 9404 TB-2	Methylene chloride	0.27	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	m-Xylene & p-xylene	0.15	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Naphthalene	0.21	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	1-Butanol	12	50	µg/L	U	R
YMTFA 9404 TB-2	n-Butylbenzene	0.18	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	n-Propylbenzene	0.16	1.0	µg/L	U	UJ

Table 3-13 Data Validation Qualifiers Summary Table (Continued)

SDG 160-18665-1 (Continued)

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 9404 TB-2	o-Xylene	0.13	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Propiomitrile	1.4	10	µg/L	U	R
YMTFA 9404 TB-2	sec-Butylbenzene	0.16	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Styrene	0.13	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	tert-Butylbenzene	0.18	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Tetrachloroethene	0.18	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Tetrahydrofuran	6.8	6.8	µg/L	J	J
YMTFA 9404 TB-2	Toluene	0.14	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	trans-1,2-Dichloroethene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	trans-1,3-Dichloropropene	0.10	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	trans-1,2-Dichloro-2-butene	0.29	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Trichloroethene	0.25	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Trichlorofluoro-methane	0.11	1.0	µg/L	U	UJ
YMTFA 9404 TB-2	Vinyl acetate	0.18	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Vinyl chloride	0.19	2.0	µg/L	U	UJ
YMTFA 9404 TB-2	Xylenes, Total	0.26	3.0	µg/L	U	UJ
YMTFA 9404 TB-2	Nonanal	0.41	5.0	µg/L	U	UJ
YMTFA 9404 FB	2-chloroethyl vinyl ether	0.24	2.0	µg/L	U	R
YMTFA 9404 FB	Acrolein	2.8	10	µg/L	U	R
YMTFA 9404 FB	Acrylonitrile	0.73	10	µg/L	U	R
YMTFA 9720 EB	Boron	0.031	0.10	mg/L	J	U
YMTFA 9720 EB	Calcium	0.12	0.12	mg/L	B	U
YMTFA 9720 EB	Lead	0.00021	0.0030	mg/L	JB	U
YMTFA 9720 EB	Lithium	0.0017	0.0050	mg/L	JB	U
YMTFA 9404 FB	Boron	0.022	0.10	mg/L	J	U
YMTFA 9404 FB	Lithium	0.0014	0.0050	mg/L	JB	U
YMTFA 9720 EB	Thorium-230	0.189	1.0	pCi/L	None	U

Qualifier	Definition
U	analyte is not detected at, or above the stated reporting limit.
UJ	analyte is not detected but there is uncertainty about the reporting limits.
J	result is estimated.
N	The analyte has been “tentatively identified“ as present.
R	result is rejected and data are not usable.

Notes:
1. Yellow shading indicates that data were rejected based on the formal data validation results.
2. Maroon shading indicates that data were originally reported as detected but were determined to be not detected based on the formal data validation results.
3. Data from SDGs 160-18521-1, 160-18521-2, 160-18615-1 and 160-18615-2 underwent Level 4 data validation and the outcome resulted in no modifications or amendments to the results over those originally reported.

A	placeholder	β Sr	Beta strontium	C	concrete
D	duplicate	EB	equipment blank	EJ	expansion joint material
FB	field blank	G	sump sludge	L	sump liquid
mg/Kg	milligram per kilogram	µg/L	micrograms per liter	mg/L	milligram per liter
PCB	polychlorinated biphenyl	pCi/g	picocuries per gram	pCi/L	picocuries per liter
SDG	Sample Delivery Group	SE	sediment	SO	soil
TB	trip blank	Tc-99	technetium-99	UNK	unknown
YMTF	Y-12 Mercury Treatment Facility				

4. LIMITATIONS AND ASSUMPTIONS

Limited volumes of sludge and liquid were present in the sumps at the proposed Headworks Area. Therefore, the quantities necessary for the required analyses were not available for some of the samples. Very little liquid was present in the 9404-7 sump (Figure 3-1). Consequently, some of the liquid samples from 9404-7 were combined in the same sample containers to fulfil the analytical requirements. Specifically, the phenols and TOC samples were combined, and several of the nitric acid preserved radionuclides were combined. Additionally, the full volume of sludge necessary for the required radionuclide analyses for the 9404-7 sump was not obtained due to the limited quantity of sludge present. Impacts to the analytical data due to the limited quantity of sludge and liquid in the 9404-7 sump included analyzing sludge samples for total metals rather than TCLP metals, and elevation of reporting limits for sump liquid samples. None of the validated sump sludge or sump liquid sample results were modified or qualified because of the limited sample volumes.

A concrete sample was collected from the slab covering the 9418-1 sump (Figure 3-1), and sludge and liquid samples also were to be collected from the sump. However, the concrete slab for 9418-1 was found to be greater than 2 ft. in thickness and had been reportedly filled with grout. Therefore, due to having been previously filled with grout, no sludge or liquid samples were collected from the 9418-1 sump.

Groundwater was only encountered in two of the 24 borings advanced at the Sites (A-42E and A-43E). The locations of the two borings were previously shown on Figure 3-3. One of the borings (A-42E) had only a limited quantity of groundwater present so samples were not collected for all of the required radionuclide analyses. Reporting limits for several of the

analyses were not met due to the reduced sample volumes. Impacts to the analytical data due to the limited quantity of groundwater in the borings were negligible. The limited quantity of groundwater resulted in elevated reporting limits for the analyses but none of the validated groundwater data were modified or qualified..

5. LESSONS LEARNED

Lessons learned may be either positive or negative depending upon the impact to the project. Field operations at the Sites resulted in two lessons learned which resulted in negative impacts.

The first lesson learned was in the category of project training. In the beginning of field operations, several concrete samples were submitted to the laboratory without being properly preserved. Field team members assumed that concrete samples did not require field preservation although the Work Plan specifically stated that concrete samples be cooled to 4 ˚Celsius (C). The root causes for this discrepancy were identified as (1) field personnel's lack of experience with concrete sampling, and (2) inadequate training since all field requirements had not been discussed during the pre-mobilization meeting. The impact was that several of the initially collected concrete samples did not meet temperature requirements upon arrival at the laboratory. Two recommendations were made to resolve the problem during the ongoing field operations and also for future field operations. The first recommendation was that all field requirements, especially for sample collection and preservation, be discussed with field team members. This recommendation was actually implemented as soon as the field team leader was informed of the problem. The second recommendation was that team members demonstrate familiarity with sample collection and preservation requirements prior to mobilization for future projects.

The root cause for the second lesson learned was similar to that of the first occurrence as it also involved project training. The field team submitted concrete expansion joint material to the laboratory in too small a quantity for analysis of all required parameters. The root causes for this discrepancy were identified as (1) field personnel's lack of experience with expansion joint material sampling, and (2) that the Work Plan did not specifically identify the volume of material required for analysis. The impact was that the laboratory had to analyze the expansion joint material samples for total metals rather than TCLP metals as the TCLP method required a greater volume of material than was submitted. The recommendations for resolving the problem were that all field requirements, especially for sample collection and preservation, be discussed with field team members, and that they demonstrate familiarity with the requirements.

This insufficient quantity of material from A-52E resulted in the total lead concentration failing the TCLP Rule of 20. The TCLP Rule of 20 states that if a total analysis of a solid sample is less than 20 times the TCLP limit (for lead the limit is 5 mg/Kg), then the total analysis can be used to show that a material is non-hazardous. The concentration for lead in A-52E was 180 mg/Kg. Based on the Rule of 20 (180 mg/Kg ÷ 20 =9 mg/Kg), the TCLP result for lead would be 9 mg/Kg which fails the limit of 5 mg/Kg. Therefore, the results for lead cannot be used to show that the expansion joint material is non-hazardous.

6. REFERENCES

Alliant Corporation, July 2016a. *Work Plan for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites.*

Alliant Corporation, July 2016b. *Quality Control Plan (QCP) for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites.*

Alliant Corporation, July 2016c. *Waste Management Plan (WMP) for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites.*

Alliant Corporation, July 2016d. *Site Safety and Health Plan (SSHP) for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites.*

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Strata-G, LLC, September 2015b. *Outfall 200 Process Knowledge Description of Structures, Items, Solutions and Soil at the Revised Proposed Outfall 200 Treatment System Sites, (EMCHAR-002-R1).*

Department of Energy, September 2016. *Statement of Work for Characterization of Structures, Items, Solutions, and Soil at the Proposed Outfall 200 Treatment Sites*.

Department of Energy. *Outfall 200 Mercury Treatment Facility Area Sampling and Analysis Plan /Quality Assurance Project Plan for Geotechnical and Waste Characterization (DOE/OR/01-2657&D1).*

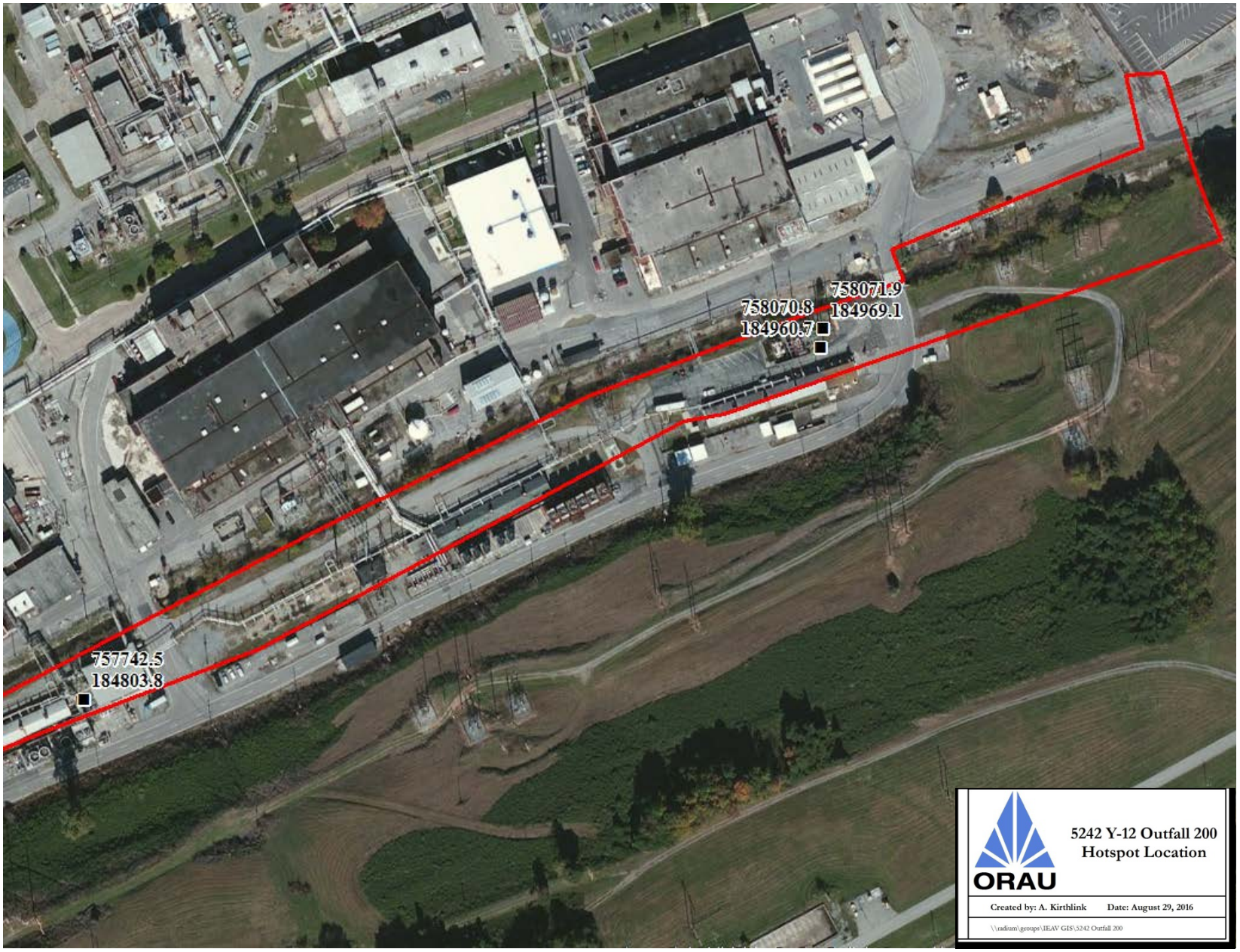
U.S. Environmental Protection Agency, July 2014. *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods Compendium (SW-846).*

U.S. Environmental Protection Agency, February 2006a. *Data Quality Assessment: A Reviewer's Guide, EPA QA/G-9R.*

U.S. Environmental Protection Agency, February 2006b. *Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S.*

U.S. Environmental Protection Agency, October 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, Final, EPA 540-R-04-004.*

APPENDIX A
RADIOLOGICAL SURVEYING RESULTS



ORAU

5242 Y-12 Outfall 200
Hotspot Location

Created by: A. Kirthlink Date: August 29, 2016

\\radium\groups\IEAV GIS\5242 Outfall 200

Hotspot Results

Comment	Rcvr_Type	GPS_Date	GPS_Time	Feat_Name	Datafile	Data_Dicti	GNSS_Heigh	Northing	Easting	Point_ID
35k	GeoXH 6000	8/8/2016	08:38:15am	Point_ge	5242-HOTSPOTS.cor	Generic	252.6	184960.7	758070.8	1330
26k	GeoXH 6000	8/8/2016	08:39:09am	Point_ge	5242-HOTSPOTS.cor	Generic	249.6	184969.1	758071.9	1331
8k concrete	GeoXH 6000	8/8/2016	08:49:51am	Point_ge	5242-HOTSPOTS.cor	Generic	255.7	184803.8	757742.5	1376

Units: Counts per minute

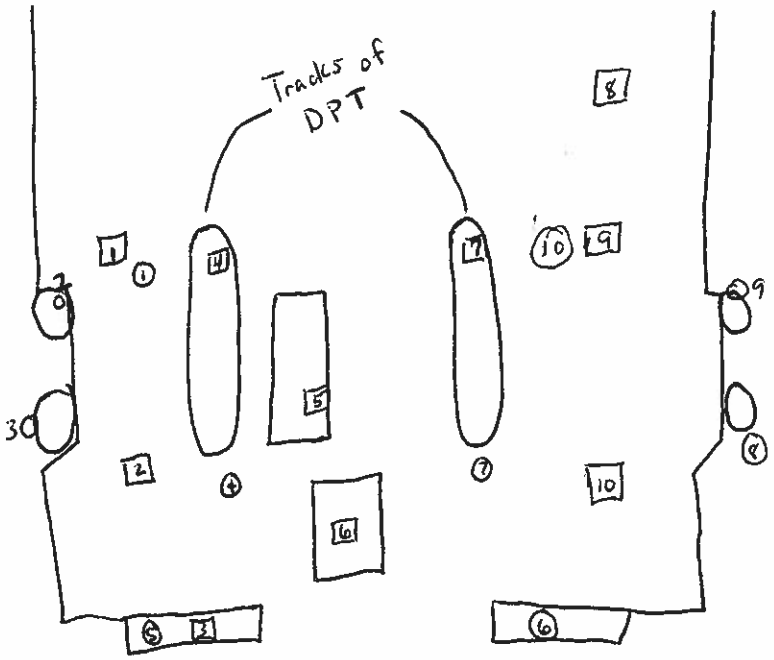
Equipment/Vehicle Receipt and Release Checklist and Survey Record

			Instrument	Probe	Background	Efficiency	MDA dpm/100cm²
License/Serial #							
Make/Model	2221/44-9	Alpha	693	946	5	BLS/17/16 ~~.11~~ .08%	
Date	8/5/16	Beta					
Surveyor(s)	J. Bailey & B. Lemons	Gamma	693 ~~395~~	992	34	BLS/17/16 ~~.08~~ .14%	

Gamma Scan Range _____ kcpm

Location		Direct Probe Measurements				Removable Contamination (Smears)	
Map ID	Description	Alpha		~~Beta~~ Gamma		Alpha	Beta
		cpm	dpm/100cm²	cpm	dpm/100cm²	dpm/100cm2	dpm/100cm²
1	Trailer & Geoprobe	2		28			
2	Trailer & Geoprobe	5		30			
3	Trailer & Geoprobe	3		42			
4	Trailer & Geoprobe	5		36			
5	Trailer & Geoprobe	5		34			
6	Trailer & Geoprobe	8		19			
7	Trailer & Geoprobe	3		25			
8	Trailer & Geoprobe	2		30			
9	Trailer & Geoprobe	5		47			
10	Trailer & Geoprobe	7		39			

For Tires:	LF/12:00	RF/3:00	RR/5:00	LR/9:00	Floor/Work Platform



Smear Direct Measurement

Comments: _____

Calculations by: Bailey Lemons Date: 9/8/16

Reviewed by: [signature] Date: 9/8/16

Sample Report

Batch ID:	Smears - 201608120927	**Count Date:**	8/12/2016 9:27:48AM
Group:	G	**Count Minutes:**	2.00
Device:	ESH Tennelec 1	**Count Mode:**	Simultaneous
Batch Key:	4850	**Operating Volts:**	1320
Selected Geometry	5/16" Stainless Steel		

Background (cpm)			Efficiency (%)			Spillover (%)	
Alpha Rate:	0.07	± 0.11	**Alpha:**	37.06	± 0.18	**Alpha to Beta:**	8.81
Beta Rate:	2.07	± 0.42	**Beta:**	27.61	± 0.19	**Beta to Alpha:**	0.06

Sample ID	Sample Type	Alpha (dpm)	Unc	Alpha MDA (dpm)	Beta (dpm)	Unc	Beta MDA (dpm)
20160812092748-G1	Unknown	1.16	1.38	5.32	5.04	5.03	17.15
20160812093038-G2	Unknown	1.16	1.38	5.31	-2.20	3.50	17.15
20160812093248-G3	Unknown	-0.19	0.29	5.31	-2.04	3.49	17.03
20160812093458-G4	Unknown	-0.19	0.29	5.31	-3.85	2.99	17.03
20160812093708-G5	Unknown	-0.19	0.29	5.31	-3.85	2.99	17.03
20160812093928-G6	Unknown	-0.19	0.29	5.32	3.39	4.70	17.03
20160812094138-G7	Unknown	-0.19	0.29	5.31	-3.85	2.99	17.03
20160812094348-G8	Unknown	1.16	1.38	5.31	-2.20	3.50	17.15
20160812094608-G9	Unknown	-0.19	0.29	5.31	-0.23	3.94	17.03
20160812094818-G10	Unknown	-0.19	0.29	5.32	5.20	5.03	17.03

Reviewed by: _____

Print Date 9/8/2016
Print Time 10:51:54AM

ORAU HEE Survey Form

	Instrument ID#	Probe ID#	Calibration Due Date	Probe Geometry	Static Count Time (minute(s)	Background	Efficiency	MDA dpm/100cm²
Alpha				N	A			
Beta	693	912	1/12/2017	0.15	1	28	33%	558

Direct & Removable (Smears) Results

Map Point	Gross Alpha c/__1 m	Net Alpha c/__1 m	Alpha DPM dpm/100cm²	Gross Beta c/__1 m	Net Beta c/__1 m	Beta DPM dpm/100cm²	Smear#
1 (Auger)				29	1	20	1
2 (Auger)				27	-1	-20	2
3 (Pump)				39	11	222	3
4 (Pump)				34	6	121	4
5 (J Meter)				35	7	141	5
6 (J Meter)				32	4	81	6
		N	A				
						N	A

Equipment	Misc. Tools
Serial #	Pump 010569 / Meter 14280
Green Tag #	303021
Date	8/16/2016
Surveyor(s)	Josh Bailey

Dose Rate Meter Id# :	N/A
Dose Rate Meter Type:	N/A
Calibration Due Date:	N/A
Dose Rate Range:	N/A mR/hr

Calculations by: Josh Bailey Date: 8/16/2016

Comments: Smear results and map attached.

Reviewed by: [signature] Date: 8/16/16

Sample Report

Batch ID:	Smears - 201608160912	Misc. Tools	**Count Date:**	8/16/2016 9:12:08AM
Group:	G		**Count Minutes:**	2.00
Device:	ESH Tennelec 1		**Count Mode:**	Simultaneous
Batch Key:	4861		**Operating Volts:**	1320
Selected Geometry	5/16" Stainless Steel			

Background (cpm)			Efficiency (%)			Spillover (%)	
Alpha Rate:	0.07	± 0.11	**Alpha:**	37.06	± 0.18	**Alpha to Beta:**	8.81
Beta Rate:	2.07	± 0.42	**Beta:**	27.61	± 0.19	**Beta to Alpha:**	0.06

Sample ID	Sample Type	Alpha (dpm)	Unc	Alpha MDA (dpm)	Beta (dpm)	Unc	Beta MDA (dpm)
20160816091208-G1	Unknown	-0.19	0.29	5.31	-2.04	3.49	17.03
20160816093049-G2	Unknown	-0.19	0.29	5.31	-7.48	1.54	17.03
20160816093309-G3	Unknown	-0.19	0.29	5.31	-3.85	2.99	17.03
20160816093519-G4	Unknown	-0.19	0.29	5.31	-5.66	2.38	17.03
20160816093729-G5	Unknown	-0.19	0.29	5.31	-3.85	2.99	17.03
20160816093939-G6	Unknown	-0.19	0.29	5.32	5.20	5.03	17.03

Reviewed by: _____

Print Date 8/16/2016
Print Time 9:42:04AM

Sample Report

Batch ID:	Smears - 201608160944	**Count Date:**	8/16/2016 9:44:32AM
Group:	G	**Count Minutes:**	2.00
Device:	ESH Tennelec 1	**Count Mode:**	Simultaneous
Batch Key:	4862	**Operating Volts:**	1320
Selected Geometry	5/16" Stainless Steel		

Background (cpm)			Efficiency (%)			Spillover (%)	
Alpha Rate:	0.07	± 0.11	**Alpha:**	37.06	± 0.18	**Alpha to Beta:**	8.81
Beta Rate:	2.07	± 0.42	**Beta:**	27.61	± 0.19	**Beta to Alpha:**	0.06

Sample ID	Sample Type	Alpha (dpm)	Unc	Alpha MDA (dpm)	Beta (dpm)	Unc	Beta MDA (dpm)
20160816094432-G1	Unknown	1.16	1.38	5.33	6.85	5.35	17.15
20160816094723-G2	Unknown	-0.19	0.29	5.31	-3.85	2.99	17.03
20160816094933-G3	Unknown	5.21	2.71	5.32	4.56	5.04	17.56
20160816095143-G4	Unknown	1.16	1.38	5.32	3.23	4.70	17.15

Reviewed by: _____

Print Date 8/16/2016
Print Time 9:53:59AM

ORAU HEE Survey Form

	Instrument ID#	Probe ID#	Calibration Due Date	Probe Geometry	Static Count Time (minute(s)	Background	Efficiency	MDA dpm/100cm^2
Alpha				N	A			
Beta	693	912	1/12/2017	0.15	1	28	33%	558

Direct & Removable (Smears) Results

Map Point	Gross Alpha c/ 1 m	Net Alpha c/ 1 m	Alpha DPM dpm/100cm^2	Gross Beta c/ 1 m	Net Beta c/ 1 m	Beta DPM dpm/100cm^2	Smear #
1				32	4	81	1
2				21	-7	-141	2
3				29	1	20	3
4				24	-4	-81	4
5				27	-1	-20	5
6				38	10	202	N/A
		N	A				
						N	A

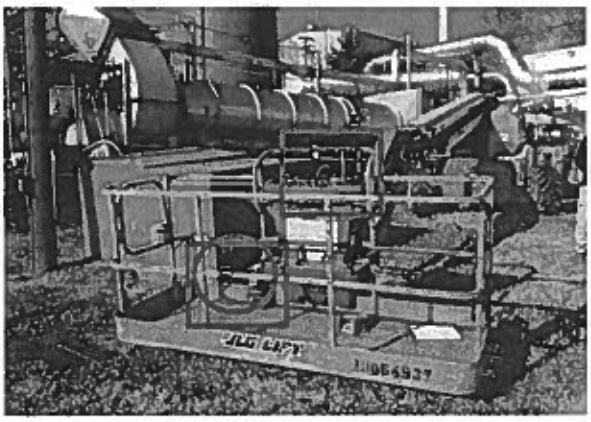
Equipment	JLG Lift
Serial #	10339636
Green Tag #	303020
Date	8/16/2016
Surveyor(s)	Josh Bailey

Dose Rate Meter Id# :	N/A
Dose Rate Meter Type:	N/A
Calibration Due Date:	N/A
Dose Rate Range:	N/A mR/hr

Calculations by: Josh Bailey Date: 8/16/2016

Comments: Smear results and map attached.

Reviewed by: [signature] Date: 8/16/16



= Direct Measurements

= Smears

Sample Report

Batch ID:	Smears - 201608150728	**Count Date:**	8/15/2016 7:28:12AM
Group:	G	**Count Minutes:**	2.00
Device:	ESH Tennelec 1	**Count Mode:**	Simultaneous
Batch Key:	4857	**Operating Volts:**	1320
Selected Geometry	5/16" Stainless Steel		

Background (cpm)		Efficiency (%)		Spillover (%)	
Alpha Rate:	0.07 ± 0.11	**Alpha:**	37.06 ± 0.18	**Alpha to Beta:**	8.81
Beta Rate:	2.07 ± 0.42	**Beta:**	27.61 ± 0.19	**Beta to Alpha:**	0.06

Sample ID	Sample Type	Alpha (dpm)	Unc	Alpha MDA (dpm)	Beta (dpm)	Unc	Beta MDA (dpm)
20160815072812-G7	Unknown	-0.19	0.29	5.31	-0.23	3.94	17.03
20160815074653-G8	Unknown	1.16	1.38	5.31	-2.20	3.50	17.15
20160815074913-G9	Unknown	-0.19	0.29	5.31	-7.48	1.54	17.03
20160815075123-G10	Unknown	1.16	1.38	5.31	-7.64	1.55	17.15
20160815075333-G11	Unknown	1.16	1.38	5.32	3.23	4.70	17.15

JLG

Reviewed by:

Print Date 8/15/2016
Print Time 7:55:49AM

ORAU HEE Survey Form

	Instrument ID#	Probe ID#	Calibration DueDate	Probe Geometry	Static Count Time (minute(s)	Background	Efficiency	MDA dpm/100cm^2
Alpha				N	A			
Beta	693	912	1/12/2017	0.15	1	26	33%	540

Direct & Removable (Smears) Results

Map Point	Gross Alpha c/__1 m	Net Alpha c/__1 m	Alpha DPM dpm/100cm^2	Gross Beta c/__1 m	Net Beta c/__1 m	Beta DPM dpm/100cm^2	Smear#
1				23	-3	-61	1
2				22	-4	-81	2
3				27	1	20	3
4				28	2	40	4
5				21	-5	-101	5
6				33	7	141	6
		N	A				
						N	A

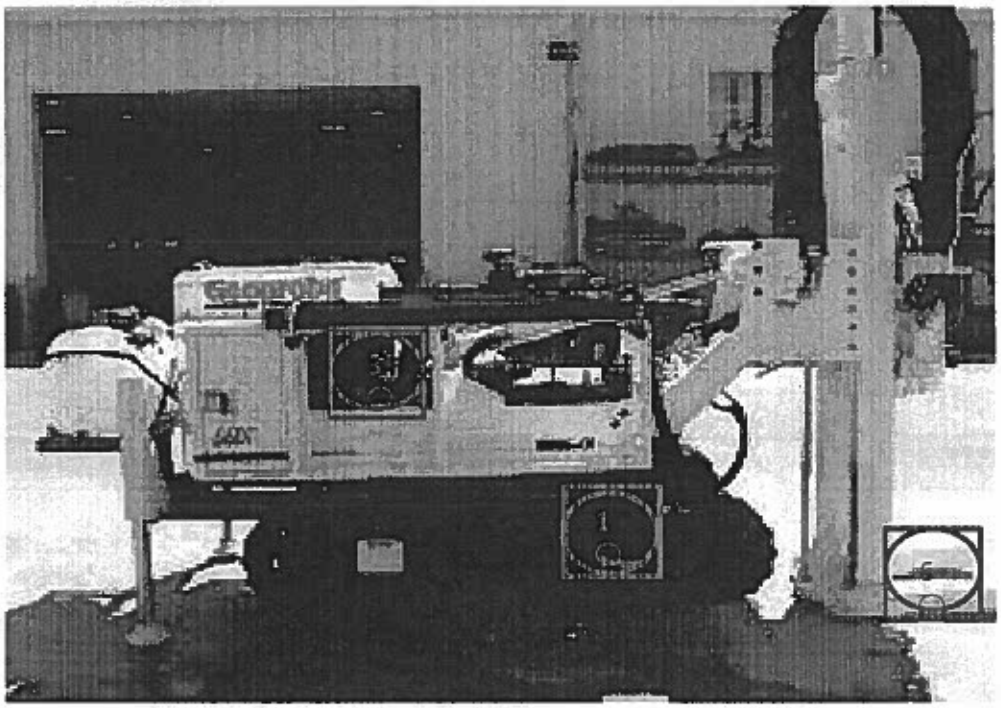
Equipment	Geoprobe Drill Rig
Serial #	6620DT
Green Tag #	303019
Date	8/15/2016
Surveyor(s)	Josh Bailey

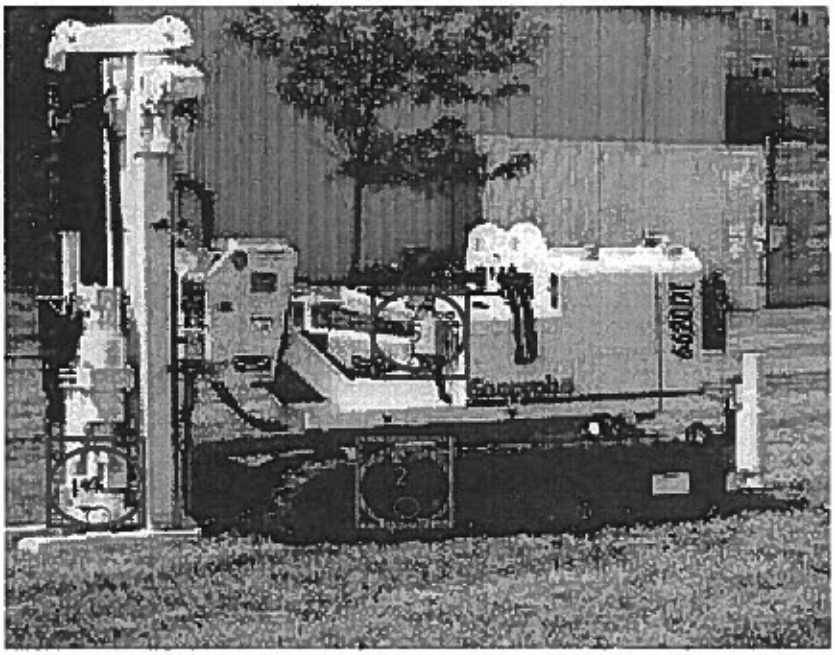
Dose Rate Meter Id# :	N/A
Dose Rate Meter Type:	N/A
Calibration Due Date:	N/A
Dose Rate Range:	N/A mR/hr

Calculations by: Josh Bailey Date: 8/15/2016

Comments: Smear results and map attached.

Reviewed by: [signature] Date: 9/8/16





= Direct Measurements

= Smears

Sample Report

Batch ID:	Smears - 201608121212	**Count Date:**	8/12/2016 12:12:01PM
Group:	G	**Count Minutes:**	2.00
Device:	ESH Tennelec 1	**Count Mode:**	Simultaneous
Batch Key:	4852	**Operating Volts:**	1320
Selected Geometry	5/16" Stainless Steel		

Background (cpm)			Efficiency (%)			Spillover (%)	
Alpha Rate:	0.07	± 0.11	**Alpha:**	37.06	± 0.18	**Alpha to Beta:**	8.81
Beta Rate:	2.07	± 0.42	**Beta:**	27.61	± 0.19	**Beta to Alpha:**	0.06

Sample ID	Sample Type	Alpha (dpm)	Unc	Alpha MDA (dpm)	Beta (dpm)	Unc	Beta MDA (dpm)
20160812121201-G1	Unknown	-0.19	0.29	5.32	1.58	4.33	17.03
20160812121622-G2	Unknown	-0.19	0.29	5.31	-5.66	2.38	17.03
20160812121832-G3	Unknown	-0.19	0.29	5.31	-2.04	3.49	17.03
20160812122042-G4	Unknown	-0.19	0.29	5.32	3.39	4.70	17.03
20160812122252-G5	Unknown	-0.19	0.29	5.31	-2.04	3.49	17.03
20160812122512-G6	Unknown	-0.19	0.29	5.33	8.82	5.65	17.03

Drill Rig

Reviewed by: _____

Print Date 8/12/2016
Print Time 12:27:28PM

HEALTH PHYSICS

MATERIAL TRANSFER CLEARANCE

TAG NUMBER
GT 303019

SURVEY INFORMATION

BUILDING	ROOM NO.
Y12	

REQUESTED BY	DIVISION
King	HEE

DESCRIPTION OF MATERIAL/REMARKS

6620 DT
Geoprobe Drill Rig

SURFACE CONTAMINATION

		CHECK IF NONE DETECTED
MAX. FIXED+REMOVABLE ALPHA	dpm/100cm^2	☒
REMOVABLE ALPHA	dpm/100cm^2	☒
MAX. FIXED+REMOVABLE BETA/GAMMA	dpm/100cm^2	☒
REMOVABLE BETA/GAMMA	dpm/100cm^2	☒

HEALTH PHYSICS INSTRUMENTS USED

Alpha Instrument I.D.	Beta/Gamma Instrument I.D.
N/A	693 / 912

SURVEY COMPLETED

DATE	BY (NAME and BADGE NUMBER)
8/15/16	Howard 140777

VOID AFTER
90 DAYS

UCN-14B (123 7-94)

ORAU HEE Survey Form

	Instrument ID#	Probe ID#	Calibration Due Date	Probe Geometry	Satic Count Time (minute(s)	Background	Efficiency	MDA dpm/100cm^2
Alpha	2221/591	43-68/595	11/18/2016	1.26	1	7	5%	243
Beta	2221/576	43-68/303	11/18/2016	1.26	1	446	12%	669

Direct & Removable (Smears) Results

Map Point	Gross Alpha c/__1_m	Net Alpha c/__1_m	Alpha DPM dpm/100cm^2	Gross Beta c/__1_m	Net Beta c/__1_m	Beta DPM dpm/100cm^2	Smear #
1	5	-2	-32	390	-56	-370	N/A
2	9	2	32	543	97	642	N/A
3	1	-6	-95	405	-41	-271	N/A
4	5	-2	-32	386	-60	-397	N/A
5	10	3	48	530	84	556	N/A
6	5	-2	-32	463	17	112	N/A
7	7	0	0	514	25	165	N/A
8	6	-1	-16	373	-73	-483	N/A
9	5	-2	-32	620	174	1151	N/A

BL
8/17/16

Equipment	NW Concrete Pad
Serial #	N/A
Green Tag #	N/A
Date	8/4/2016
Surveyor(s)	J. Bailey/B. Lemons

Dose Rate Meter Id# :	N/A
Dose Rate Meter Type:	N/A
Calibration Due Date:	N/A
Dose Rate Range:	N/A mR/hr

Calculations by: B. Lemons Date: 8/17/2016

Reviewed by: [signature] Date: 8/18/16

Comments: map attached

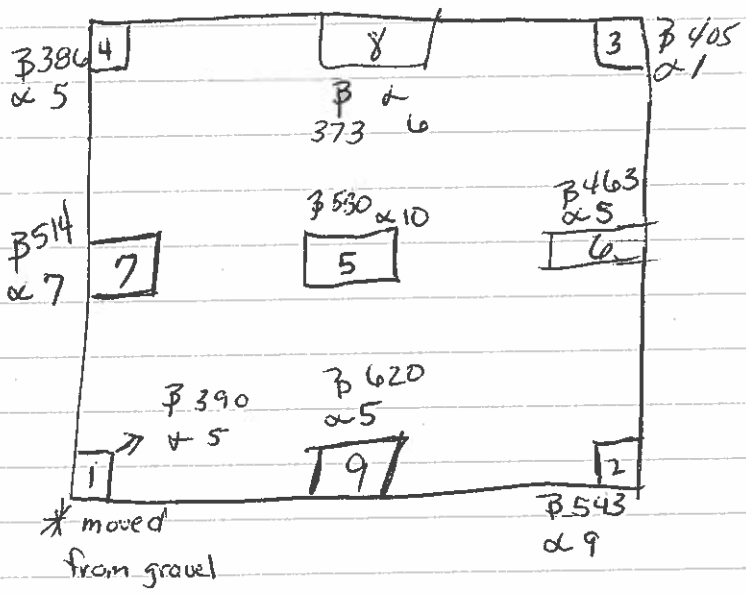
NW Concrete Pad

Furthest to the North

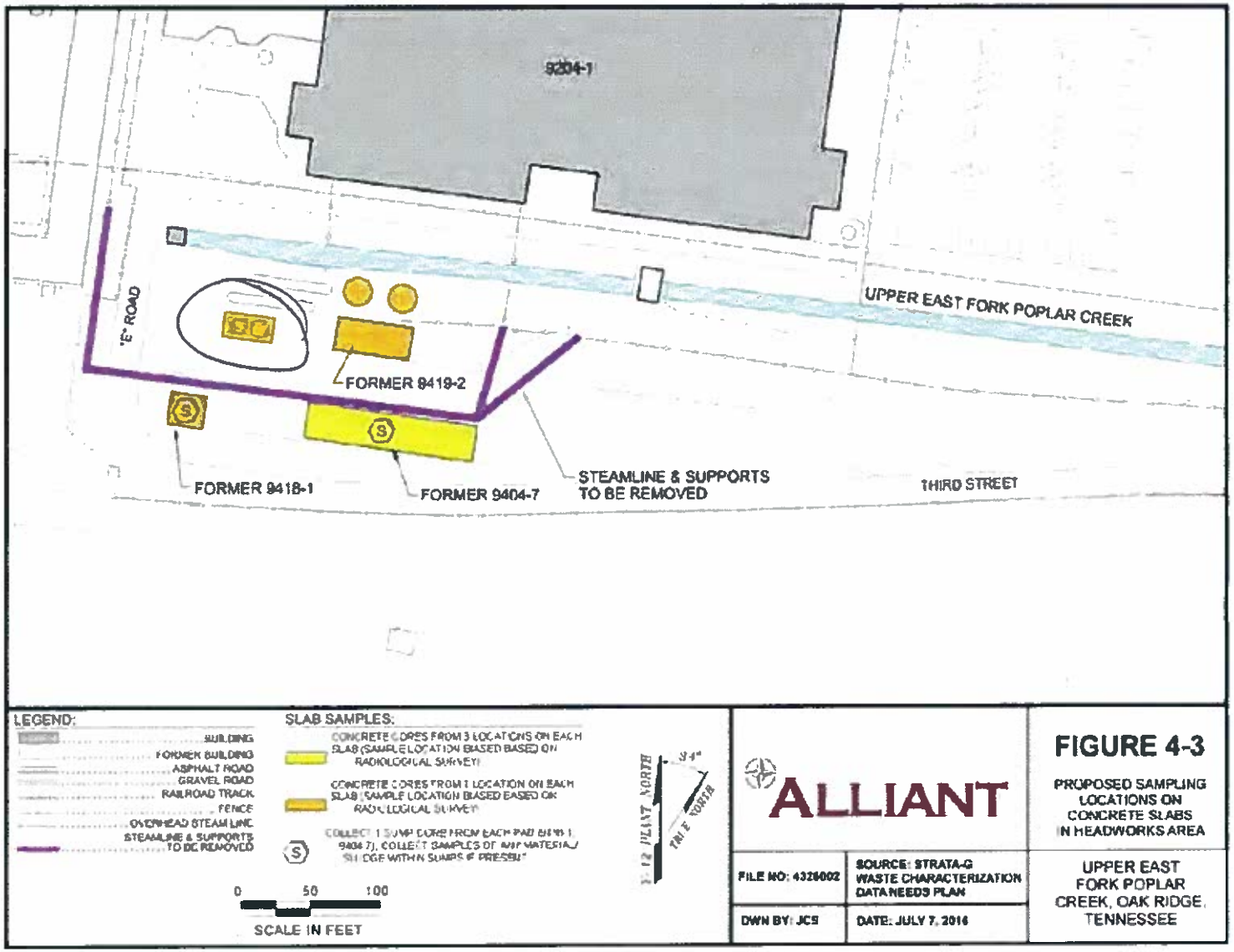
Alpha / Beta directs on
concrete pad close to creek.

5 directs &
4 corners + 1 in the middle

* 3 of 4 taken on gravel



ALLIANT



NW Concrete Pad

ORAU HEE Survey Form

	Instrument ID#	Probe ID#	Calibration Due Date	Probe Geometry	Satic Count Time (minute(s)	Background	Efficiency	MDA dpm/100cm^2
Alpha	2221/591	43-68/595	11/18/2016	1.26	1	7	5%	306
Beta	2221/576	43-68/303	11/18/2016	1.26	1	496	12%	705

Direct & Removable (Smears) Results

Map Point	Gross Alpha c/__1_m	Net Alpha c/__1_m	Alpha DPM dpm/100cm^2	Gross Beta c/__1_m	Net Beta c/__1_m	Beta DPM dpm/100cm^2	Smear #
1 Concrete pad	8	1	16	421	-75	-496	N/A
2 Concrete pad	9	2	32	433	-63	-417	N/A
3 Concrete pad	6	-1	-16	436	-60	-397	N/A
4 Concrete pad	6	-1	-16	384	-112	-741	N/A
5 Concrete pad	4	-3	-48	448	-48	-317	N/A
6 Concrete pad	5	-2	-32	453	-43	-284	N/A
7 Concrete pad	18	11	175	456	25	165	N/A
8 Concrete pad	5	-2	-32	590	94	622	N/A
9 concrete pad	5	-2	-32	398	-98	-648	N/A
10 Concrete pa	3	-4	-63	420	-76	-503	N/A
11 Concrete pa	7	0	0	424	-72	-476	N/A

BL 8/17/16

Equipment	N/A
Serial #	N/A
Green Tag #	N/A
Date	8/4/2016
Surveyor(s)	J. Bailey/ B. Lemons

Dose Rate Meter Id# :	N/A
Dose Rate Meter Type:	N/A
Calibration Due Date:	1/12/2017
Dose Rate Range:	mR/hr

EAST PAD

Calculations by: B. Lemons Date: 8/17/2016

Reviewed by: [signature] Date: 8/18/16

Comments: map attached.

Page 2 of 2

East Pad

Date

TASK	~~5283 - Willow Creek~~ 5242	AREA	~~Shed/Judgmentals~~ Y12	Surveyors/ Samplers	

	Material	Location ID #	Surface Location	Coord. X (ft)	Coord. Y (ft)	Alpha (cpm)	Beta (cpm)	Gamma (cpm)
1	Concrete	Middle of pipe Section 1	Concrete pad			8 ~~3~~ 8/4/16	421	NA
2		section 1	Concrete pad			9	433	
3		section 2	concrete pad			6	436 ~~380~~	
4		section 2	concrete pad			6	384	
5		section 2	concrete pad			4	448	
6		section 2	Concrete pad			5	453	
7		section 2	concrete pad			18	456	
8		section 2	concrete pad			5	590	
9		section 3	concrete pad			5	398	
10		section 3	concrete pad			3	420	
11	concrete	section 7	concrete pad			7	424	

Created by: Betty Lerma

Reviewed by: [signature]

Date 9-8-16

ACTIVITY SURVEY RECORD

SITE Y-12 (5242)
AREA OUTFALL 200
START TIME: 0700
END TIME: 1430
DATE: 8-4-16
SURVEYOR(S) Bailey, J.
Lemons, B.

TYPE	INSTRUMENT	DETECTOR	BKG. (cpm)	INSTRUMENT EFF. (ϵ_i)	MDC dpm/100cm²
α + β	43-68	303	7	BL 8/17/16 ~~5%~~ 12%	
α	43-68	595	496	5% ~~+2 4/8~~ BL 8/17/16	

Location #1 Large Pad. 8-4-16

LOCATION	DIRECT DETECTOR MEASUREMENTS								SMEAR #	SURFACE TYPE AND CONDITION (other remarks)
	TYPE: α + β				TYPE: α					
	c/---m	ϵ_S	ϵ_{Total}	dpm/100cm²	c/---m	ϵ_s	ϵ_{Total}	dpm/100cm²		
1	421				8				R0001	Concrete
2	433				9				R0002	
3	436				6				R0003	
4	384				6				R0004	
5	448				4				R0005	
6	453				5				R0006	
7	456				18				R0007	
8	590				5				R0008	
9	398				5				R0009	
10	420				3				R00010	
11	424				7				R00011	

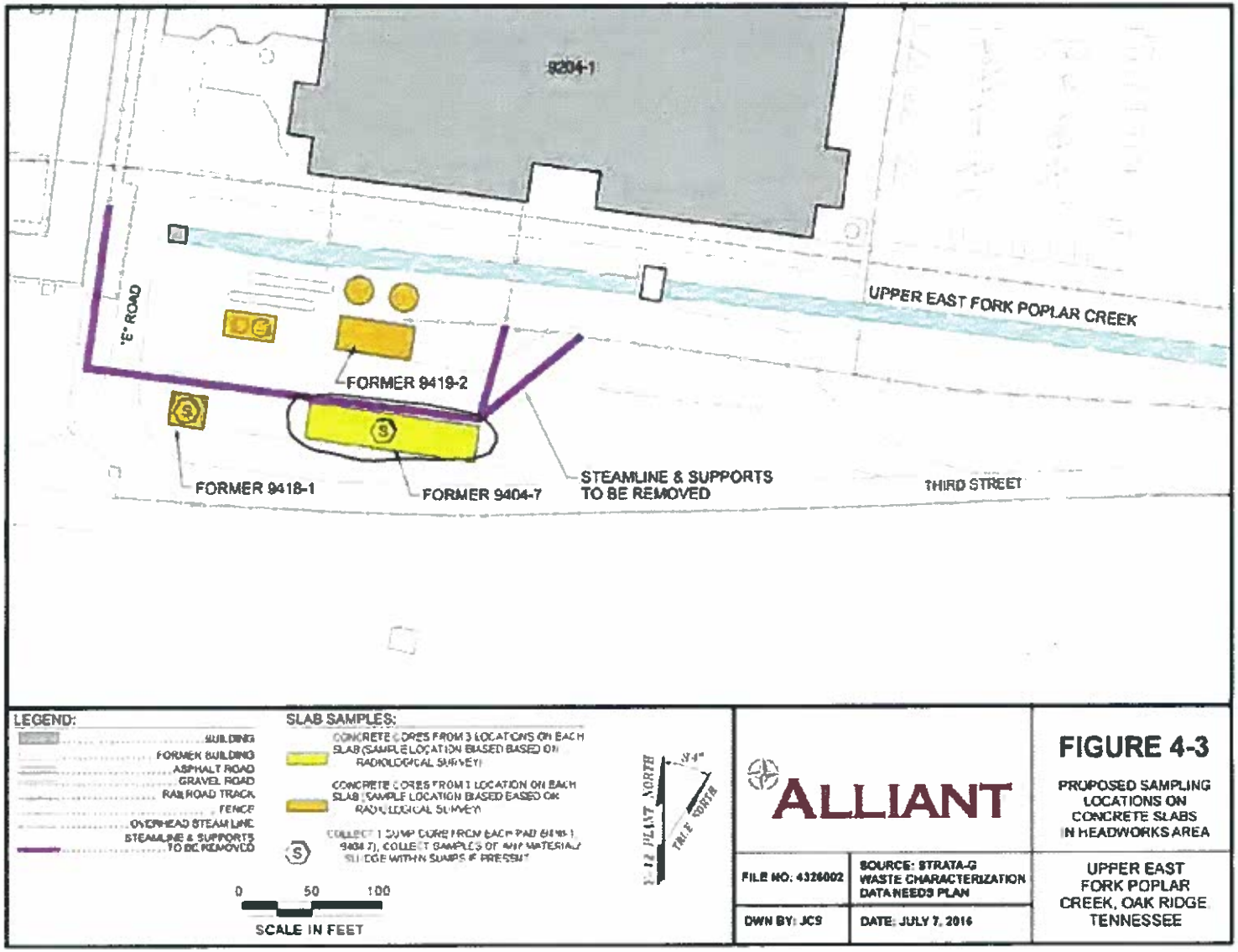
CALCULATION BY: [signature] DATE: 9-8-16

[signature] DATA REVIEWED / DATE

[signature] 9/8/16 CALCULATIONS REVIEWED / DATE

Figure B-12 (Front)

ALLIANT


9204-1
"E" ROAD
UPPER EAST FORK POPLAR CREEK
FORMER 9419-2
FORMER 9418-1
FORMER 9404-7
STEAMLINE & SUPPORTS
TO BE REMOVED
THIRD STREET
LEGEND:
BUILDING
FORMER BUILDING
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
FENCE
OVERHEAD STEAM LINE
STEAMLINE & SUPPORTS
TO BE REMOVED
SLAB SAMPLES:
CONCRETE CORES FROM 3 LOCATIONS ON EACH SLAB (SAMPLE LOCATION BASED BASED ON RADIOLOGICAL SURVEY)
CONCRETE CORES FROM 1 LOCATION ON EACH SLAB (SAMPLE LOCATION BASED BASED ON RADIOLOGICAL SURVEY)
COLLECT 1 SUMP CORE FROM EACH PAD (9419-1, 9404-7), COLLECT SAMPLES OF ANY MATERIALS/SLUDGE WITHIN SUMPS IF PRESENT
0
50
100
SCALE IN FEET
PLANT NORTH
TRUE NORTH
ALLIANT
FILE NO: 4326002
SOURCE: STRATA-G WASTE CHARACTERIZATION DATA NEEDS PLAN
DWN BY: JCS
DATE: JULY 7, 2016
FIGURE 4-3
PROPOSED SAMPLING LOCATIONS ON CONCRETE SLABS IN HEADWORKS AREA
UPPER EAST FORK POPLAR CREEK, OAK RIDGE TENNESSEE

ORAU HEE Survey Form

	Instrument ID#	Probe ID#	Calibration Due Date	Probe Geometry	Satic Count Time (minute(s)	Background	Efficiency	MDA dpm/100cm²
Alpha	2221/591	43-68/595	11/18/2016	1.26	1	7	5%	306
Beta	2221/576	43-68/303	11/18/2016	1.26	1	446	12%	669

Direct & Removable (Smears) Results

Map Point	Gross Alpha c/__1_m	Net Alpha c/__1_m	Alpha DPM dpm/100cm²	Gross Beta c/__1_m	Net Beta c/__1_m	Beta DPM dpm/100cm²	Smear #
1 Concrete pad	28	21	333	506	60	397	N/A
2 Concrete pad	16	9	143	511	65	430	N/A
3 Concrete pad	10	3	48	518	72	476	N/A
4 Concrete pad	7	0	0	556	110	728	N/A
5 Concrete pad	5	-2	-32	586	140	926	N/A
6 Concrete pad	13	6	95	567	121	800	N/A
7 Concrete pad	10	3	48	545	25	165	N/A
8 Concrete pad	10	3	48	485	39	258	N/A
9 concrete pad	13	6	95	559	113	747	N/A

BL
8/17/16

Equipment	N/A
Serial #	N/A
Green Tag #	N/A
Date	8/4/2016
Surveyor(s)	J. Bailey/ B. Lemons

Dose Rate Meter Id# :	N/A
Dose Rate Meter Type:	N/A
Calibration Due Date:	1/12/2017
Dose Rate Range:	mR/hr

North East Pad

Calculations by: B. Lemons Date: 8/17/2016

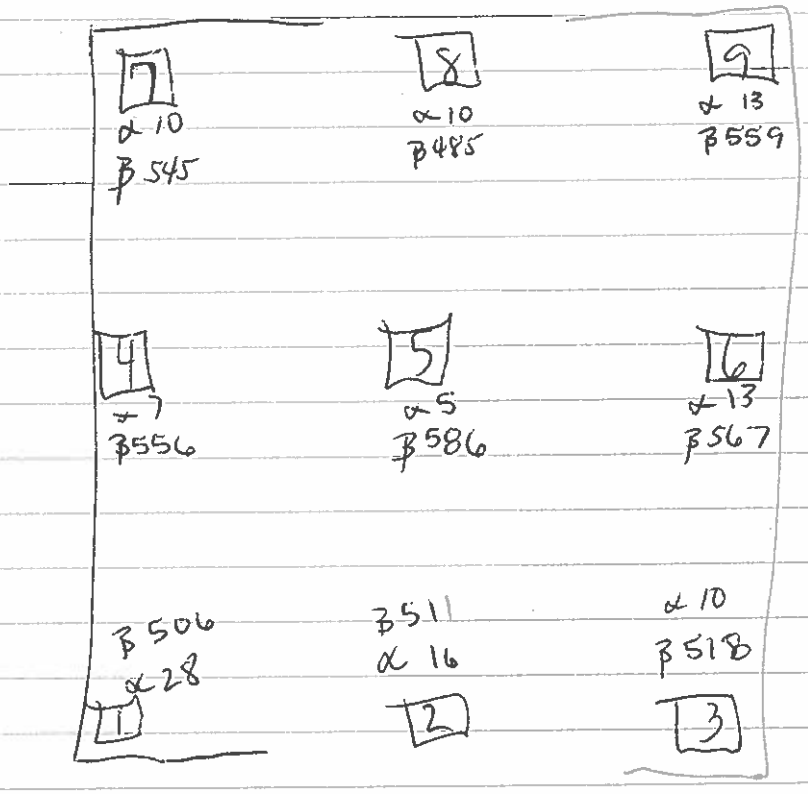
Reviewed by: [signature] Date: 8/18/16

Comments: map attached.

NORTH EAST PAD

84-16

Direct Measurements
concrete pad with plexiglass



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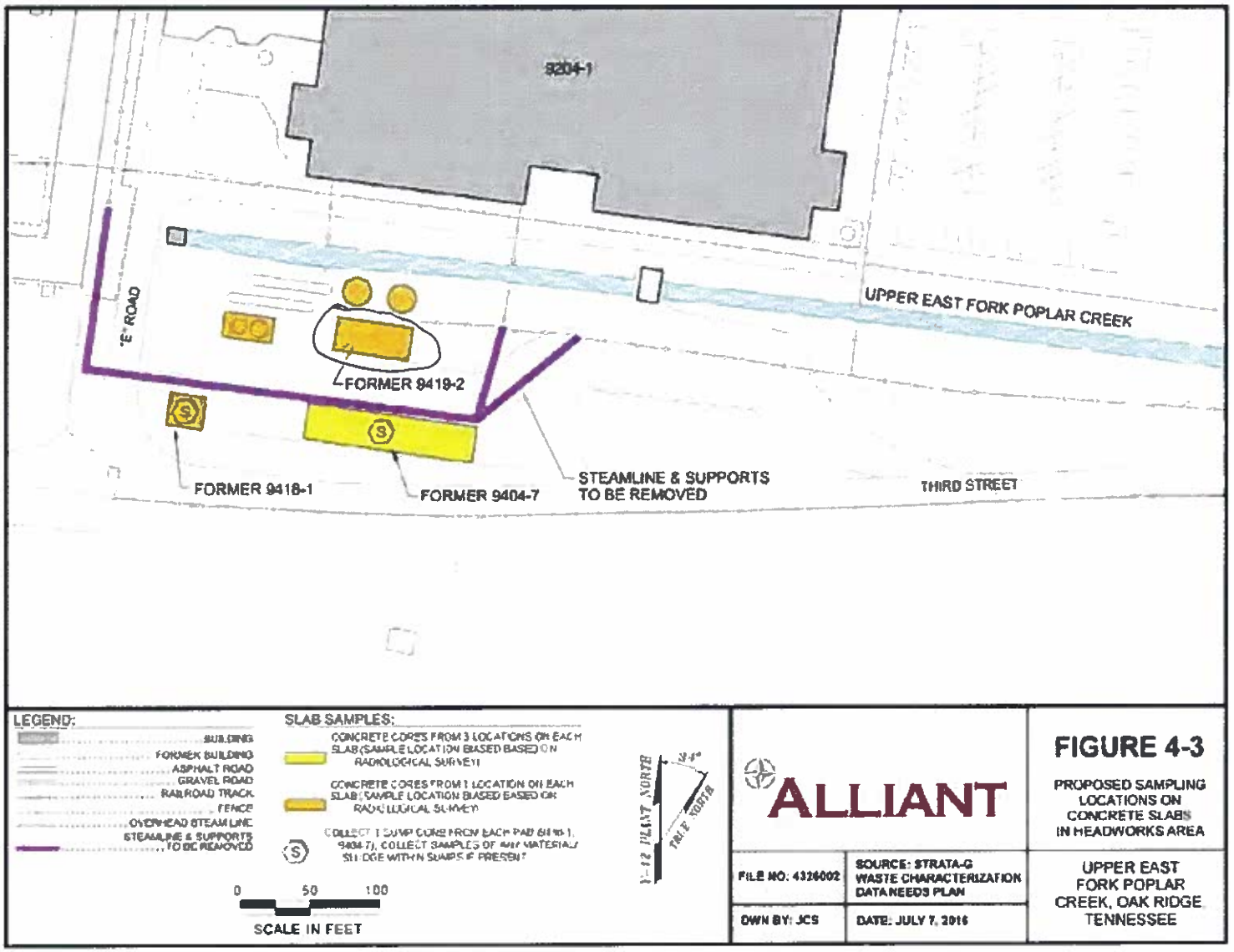

9204-1
'E' ROAD
UPPER EAST FORK POPLAR CREEK
FORMER 9419-2
FORMER 9418-1
FORMER 9404-7
STEAMLINE & SUPPORTS
TO BE REMOVED
THIRD STREET
LEGEND:
BUILDING
FORMER BUILDING
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
FENCE
OVERHEAD STEAM LINE
STEAMLINE & SUPPORTS
TO BE REMOVED
SLAB SAMPLES:
CONCRETE CORES FROM 3 LOCATIONS ON EACH SLAB (SAMPLE LOCATION BIASED BASED ON RADIOLOGICAL SURVEY)
CONCRETE CORES FROM 1 LOCATION ON EACH SLAB (SAMPLE LOCATION BIASED BASED ON RADIOLOGICAL SURVEY)
COLLECT 1 SUMP CORE FROM EACH PAD (9418-1, 9404-7), COLLECT SAMPLES OF ANY MATERIAL SLUDGE WITHIN SUMPS IF PRESENT
0 50 100
SCALE IN FEET
Y-12 PLANT NORTH
34.4°
TRUE NORTH
ALLIANT
FILE NO: 4326002
SOURCE: STRATA-G WASTE CHARACTERIZATION DATA NEEDS PLAN
DWN BY: JCS
DATE: JULY 7, 2016
FIGURE 4-3
PROPOSED SAMPLING LOCATIONS ON CONCRETE SLABS IN HEADWORKS AREA
UPPER EAST FORK POPLAR CREEK, OAK RIDGE TENNESSEE

ORAU HEE Survey Form

	Instrument ID#	Probe ID#	Calibration Due Date	Probe Geometry	Satic Count Time (minute(s)	Background	Efficiency	MDA dpm/100cm^2
Alpha	2221/591	43-68/595	11/18/2016	1.26	1	7	5%	306
Beta	2221/576	43-68/303	11/18/2016	1.26	1	446	12%	669

Direct & Removable (Smears) Results

Map Point	Gross Alpha c/__1_m	Net Alpha c/__1_m	Alpha DPM dpm/100cm^2	Gross Beta c/__1_m	Net Beta c/__1_m	Beta DPM dpm/100cm^2	Smear #
1 Concrete pad	12	5	79	435	-11	-73	N/A
2 Concrete pad	4	-3	-48	462	16	106	N/A
3 Concrete pad	5	-2	-32	443	-3	-20	N/A
4 Concrete pad	13	6	95	451	5	33	N/A
5 Concrete pad	8	1	16	449	3	20	N/A
6 Concrete pad	6	-1	-16	451	5	33	N/A
7 Concrete pad	5	-2	-32	447	25	165	N/A
8 Concrete pad	7	0	0	427	-19	-126	N/A
9 concrete pad	3	-4	-63	555	109	721	N/A

BL
8/17/16

Equipment	N/A
Serial #	N/A
Green Tag #	N/A
Date	8/15/2016
Surveyor(s)	J. Bailey

Dose Rate Meter Id# :	N/A
Dose Rate Meter Type:	N/A
Calibration Due Date:	1/12/2017
Dose Rate Range:	mR/hr

SE Concrete Pad

Calculations by: B. Lemons Date: 8/17/2016

Reviewed by: [signature] Date: 8/18/16

Comments: map attached.

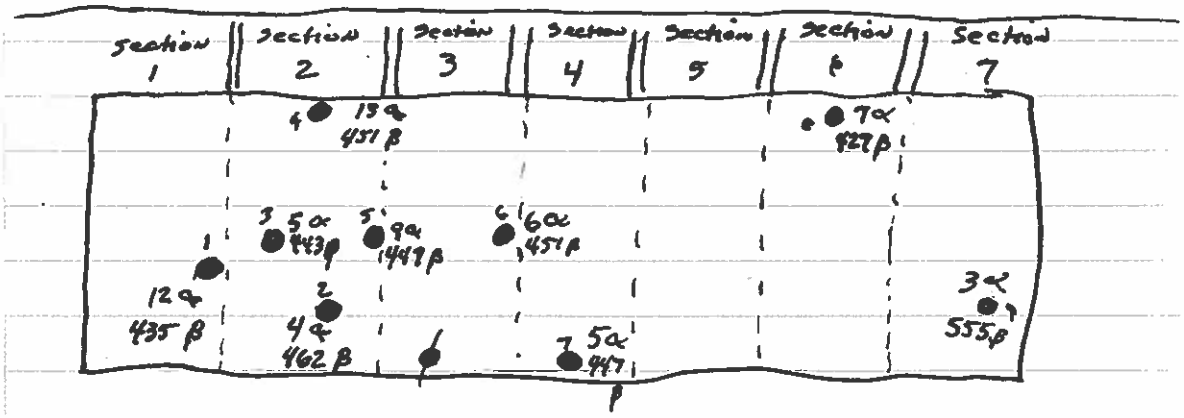
8-15-16 SE Concrete Pad

0600 : Checked out instruments.

0720 : Traveled to site At Y-12

0730 : Safety briefing

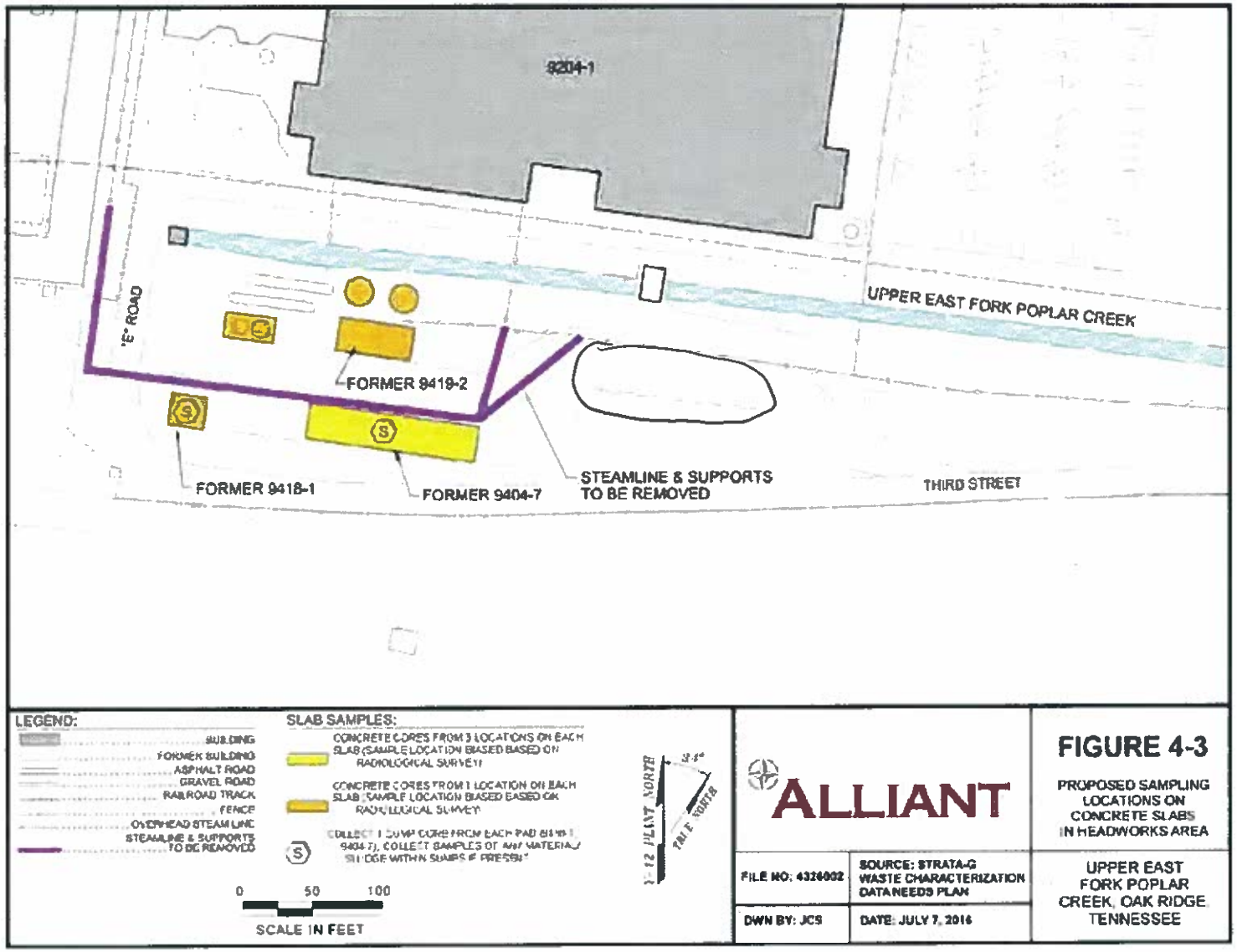
0800 : Starting to ~~takeo~~ take directs on concrete pad that was added to the scope.



1 min BKgd : 446 β
7 α

Took 9 directs on the pad.

0840 : scanned sludge/soil from bottom of the pad on the west that Alliant sampled. 30-45 cpm.



ALLIANT

FIGURE 4-3

PROPOSED SAMPLING LOCATIONS ON CONCRETE SLABS IN HEADWORKS AREA

FILE NO: 4326002	SOURCE: STRATA-G WASTE CHARACTERIZATION DATA NEEDS PLAN
DWN BY: JCS	DATE: JULY 7, 2016

UPPER EAST FORK POPLAR CREEK, OAK RIDGE TENNESSEE

APPENDIX B
FIELD SCREENING RESULTS

Table B-1 Waste Characterization Sample Screening Results and Observations

LOCATION	DATE SAMPLED	MEDIA	DEPTH/ INTERVAL (ft. bgs)	PID (ppm)	JEROME METER (mg/m3 Hg)	OBSERVATIONS
A-32E	8/9/2016	Soil	0 - 5	0.0	0.007	No visible mercury.
			5 - 10	0.0	0.009	No visible mercury.
A-33E	8/10/2016	Soil	0 - 2	1.4	0.006	No visible mercury.
A-34E	8/9/2016	Soil	0 - 2	0.0	0.005	No visible mercury. Dark gray staining w/ petroleum-like odor.
A-35E	8/9/2016	Soil	0 - 2	0.0	0.006	No visible mercury.
A-36E	8/9/2016	Soil	0 - 2	0.0	0.005	No visible mercury.
A-39Ew	8/4/2016	Sediment	0 - 1	0.0	0.005	No visible mercury.
A-40E	8/4/2016	Sediment	0 - 1	0.0	0.0	No visible mercury.
A-41E	8/4/2016	Sediment	0 - 1	0.0	0.0	No visible mercury.
A-42E	8/9/2016	Soil	0 - 5	0.0	0.0	No visible mercury.
			5 - 7	0.0	0.0	No visible mercury.
			7 - 10	0.0	0.005	No visible mercury.
			10 - 13	0.0	0.007	No visible mercury.
			13 - 15	0.0	0.008	No visible mercury.
			15 - 18	0.0	0.006	No visible mercury.
			18 - 20	0.0	0.007	No visible mercury.
			20 - 25	0.0	0.005	No visible mercury.
			25 - 28	0.0	0.007	No visible mercury.
	8/11/2016	Groundwater	20 - 28	N/A	N/A	No visible mercury.
A-43E	8/9/2016	Soil	0 - 5	0.0	0.009	No visible mercury.
			5 - 10	0.0	0.009	No visible mercury.
			10 - 15	0.0	0.005	No visible mercury.
			15 - 20	0.0	0.009	No visible mercury.
			20 - 23	0.0	0.005	No visible mercury.
	8/11/2016	Groundwater	20 - 23	N/A	N/A	No visible mercury.
A-44E	8/10/2016	Soil	0 - 5	0.0	0.006	No visible mercury.
A-45E	8/10/2016	Soil	0 - 5	0.0	0.007	No visible mercury. Dark gray staining w/ petroleum-like odor last 0.8 ft.
A-46E	8/10/2016	Soil	0 - 5	0.0	0.007	No visible mercury.
A-47E	8/10/2016	Soil	0 - 5	No reading*	0.14 - 0.21	No visible mercury. Dark-gray staining w/ petroleum-like odor at 2.9 ft.

Table B-1 Waste Characterization Sample Screening Results and Observations

LOCATION	DATE SAMPLED	MEDIA	DEPTH/ INTERVAL (ft. bgs)	PID (ppm)	JEROME METER (mg/m3 Hg)	OBSERVATIONS
A-48E	8/10/2016	Soil	0 - 5	No reading*	0.01	No visible mercury.
A-49E	8/9/2016	Soil	0 - 5	0.0	0.007	No visible mercury.
A-50E	8/10/2016	Soil	0 - 5	No reading*	0.007	No visible mercury. Dark gray staining w/ slight odor at 2.8 ft.
A-51E	8/12/2016	Concrete	<1.0	0.3	0.003	None
A-52E	8/15/2016	Joint Expansion Material	<1.0	NM	NM	None
A-53E	8/15/2016	Joint Expansion Material	<1.0	NM	NM	None
A-54E	8/11/2016	Concrete	<1.0	0.5	0.003	None
	8/12/2016	Soil	0 - 2.7	N/A	N/A	Asphalt and concrete.
			2.7 - 5	0.1	0.008	No visible mercury.
			5 - 10	0.0	0.012	No visible mercury.
A-55E	8/15/2016	Concrete	<1.0	0.0	0.004	None
A-56E	8/15/2016	Concrete	<1.0	0.0	0.006	None
A-57E	8/15/2016	Concrete	<1.0	0.5	0.006	None
A-58E	8/15/2016	Concrete	<1.0	0.7	0.007	None
	8/12/2016	Soil	0 - 3.2	N/A	N/A	Asphalt and concrete.
			3.2 - 5	2.0	0.01	No visible mercury.
			5 - 10	0.0	0.014	No visible mercury.
A-59E	8/11/2016	Concrete	<1.0			None
A-60E	8/11/2016	Concrete	<1.0	0.5	0.0	None
	8/11/2016	Soil	0 - 3.5	N/A	N/A	Asphalt and concrete.
			3.5 - 5	No recovery	No recovery	Petroleum-like odor during drilling. No PID hits in ambient air at rig.
			5 - 10	0.0	0.007	No odors. No visible mercury.
A-61E	8/11/2016	Concrete	<1.0	0.5	0.0	None
	8/11/2016	Soil	0 - 2	N/A	N/A	Concrete/Asphalt.
			2 - 5	0.0	0.008	No visible mercury.
			5 - 10	0.0	0.008	No visible mercury.

Table B-1 Waste Characterization Sample Screening Results and Observations

LOCATION	DATE SAMPLED	MEDIA	DEPTH/ INTERVAL (ft. bgs)	PID (ppm)	JEROME METER (mg/m3 Hg)	OBSERVATIONS
A-62E	8/11/2016	Concrete	<1.0	0.6	0.004	None
	8/11/2016	Soil	0 - 2.2	N/A	N/A	Concrete/Asphalt.
			2.2 - 6	0.0	0.008	No visible mercury.
A-63E	8/10/2016	Concrete	<1.0	0.3	0.0	None
	8/10/2016	Soil	0 - 2	N/A	N/A	Concrete/Asphalt.
			2 - 5	0.2	0.004	No visible mercury.
			5 - 10	0.0	0.006	No visible mercury.
A-64E	8/10/2016	Concrete	<1.0	0.3	0.003	None
	8/10/2016	Soil	0 - 1.6	N/A	N/A	Concrete/Asphalt.
			2 - 5	0.2	0.006	No visible mercury.
			5 - 7	0.8	0.007	No visible mercury.
A-65E	8/15/2016	Concrete	<1.0	0.4	0.005	None
A-66E	8/11/2016	Concrete	<1.0	NM	NM	None
A-67E	8/12/2016	Concrete	<1.0	0.3	0.004	None
	8/11/2016	Soil	0 - 2.7	N/A	N/A	Concrete/Asphalt.
			2.7 - 5	0.0	0.008	No visible mercury.
			5 - 10	0.0	0.003	No visible mercury.
A-68E	8/12/2016	Concrete	<1.0	0.2	0.007	None
A-69E	8/12/2016	Concrete	<1.0	1.2	0.003	None
	8/11/2016	Soil	0 - 2.8	N/A	N/A	Concrete/Asphalt/ Gravel.
			2.8 - 5	0.2	0.005	No visible mercury.
			5 - 10	0.0	0.003	No visible mercury.
A-70E	8/12/2016	Concrete	<1.0	3.2	0.003	None
	8/11/2016	Soil	0 - 1.9	N/A	N/A	Concrete/Asphalt.
			1.9 - 5	0.2	0.0	Petroluem-like odor at 4 ft bgs. No visible mercury.
			5 - 10	0.0	0.007	No odors. No visible mercury.
A-71E	8/12/2016	Concrete	<1.0	0.3	0.003	None
A-72E	8/15/2016	Concrete	<1.0	0.6	0.007	None
A-73E	8/4/2016	Sediment	0 - 1	0.0	0.003	No visible mercury.
A-74E	8/5/2016	Sediment	0 - 1	0.0	0.058	No visible mercury.
A-75E	8/5/2016	Sediment	0 - 1	0.0	0.0	No visible mercury.
A-80E	8/9/2016	Concrete	<1.0	NM	NM	None
A-81E	8/9/2016	Concrete-1	<1.0	NM	NM	None
	8/9/2016	Concrete-2	<1.0	NM	NM	None
	8/9/2016	Concrete-3	<1.0	NM	NM	None

Table B-1 Waste Characterization Sample Screening Results and Observations

LOCATION	DATE SAMPLED	MEDIA	DEPTH/ INTERVAL (ft. bgs)	PID (ppm)	JEROME METER (mg/m3 Hg)	OBSERVATIONS
	8/15/2016	Sludge	N/A	2.8	0.008	No PID or Jerome meter hits in sump atmosphere. No visible mercury in sludge.
	8/15/2016	Liquid	N/A	N/A	N/A	No visible mercury.
A-82E	8/9/2016	Concrete	<1.0	NM	NM	None
A-83E	8/10/2016	Concrete	<1.0	0.4	0.003	None
A-84E	8/12/2016	Concrete	<1.0	0.3	0.007	None
A-85E	8/12/2016	Insulation	N/A	N/A	N/A	None
A-86E	8/12/2016	Insulation	N/A	N/A	N/A	None
A-87E	8/12/2016	Insulation	N/A	N/A	N/A	None
A-88E	8/15/2016	Roof Insulation	N/A	N/A	N/A	None
A-89E	8/12/2016	Insulation	N/A	N/A	N/A	None
A-90E	8/15/2016	Insulation	N/A	N/A	N/A	None
A-92E	8/12/2016	Insulation	N/A	N/A	N/A	None
A-93E	8/15/2016	Sludge	N/A	11.1	0.012	No PID or Jerome meter hits in sump atmosphere. No visible mercury in sludge.
	8/15/2016	Liquid	N/A	N/A	N/A	No visible mercury.

* PID malfunctioned and no reading taken.

N/A = Not applicable NM = Not measured.

APPENDIX C
FIELD LOGBOOKS

M. MRK!

OUTFALL 200

OUTFALL 200 M. MRK!

550 - Environmental - Poly - 4 3/4 in x 7 1/2 in
6 32281 55011 2
ISBN 978-1-932149-36-4

Rite in the Rain®

ALL-WEATHER

ENVIRONMENTAL FIELD BOOK

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ENVIRONMENTAL FIELD BOOK
Numbered Pages

Name Mark Maki
Alliant Corporation

Address

Phone 865-441-1190

Project DOE EM Out fall
200 Site Characterization
#4726

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Location F-12/Outfall 2000 Date 8/03/2016

Project / Client DOE

0715- Arrive on-site. Call PSS, notify working in area of Third and "E" Streets.

0745- ORAU arrives on-site. Jason Lee-Teamlead, Josh Bailey & Brittany Lemons- MACA Techs. Conduct Tailgate Safety Meeting. Brief Josh Bailey on JHA and sign-off on JHA. Temp- 74°F

0830- Walk down Headworks area of ORAU, describe walkover survey area, floor survey areas on concrete sumps & slabs, & foundations. Describe start of pipeline corridor survey area. Discuss steam/condensate line survey boundary and approach.

0930- Jason returns to site w/ Paul King and floor magnetometer cable. Walk down steam/condensate line to be surveyed along "E" Street. Agree lines can be surveyed

Location Outfall 200 Date 8/3/16

Project / Client Waste Characterization DOE EM

from ground and with a ladder. Walked down, 9418-7 building and scope for its survey of the exterior only. Will not enter due to collapsed roof and pigeon infestation.

1000- D. King & J. Lee leave site. Continue w/ walkover survey and floor survey. No activity noted w/ walkover survey detector.

1100- ORAU breaks for lunch. Floor background activity is 13 to 14K counts/min. Some areas with organic plant debris on slab are 22 to 24K CPM. Areas marked on survey slab. Josh Bailey off-site for day, ORAU may return w/ Jason & Brittany or be finish for day.

1250- ORAU back on site. Kaitlyn Engel replaced Josh Bailey as tech. Brief her on site activities, re-brief on Tailgate Safety Plan, sign off. Will take 15 min. breaks every hour on light work. Temp - 86°F humidity 54%, wind < 5 MPH.

Location Outfall 200 Date 8/3/16

Project / Client

1330- Pick up WBGT / Heat Stress Monitor from E. Clute. WBGT is 30.0°C. Stay on 15 min breaks for light activity.

1420- Floor monitor detector is reading high, possibly due to leak in mylar, causing light to get in & create high readings. From 800 CPM in AM at background location to 1,200 CPM.

1430- Head over to A-51E to perform surface survey to bias cure hole location in previous hot spot.

1500- Finish A-34E. Slight detections above background 447 CPM beta, 3,700 gamma. ORAU return to shop to repair floor monitor. Call PSS, report off for day.

[signature] 8/3/16

Location Outfall 200 Date 8/4/16

Project / Client Waste Characterization

0700 - Arrive on-site.
Temp - 73°F, humidity - 90%
winds - 0 partly cloudy.

0715 - ORAU on-site. Conduct Tailgate Safety Meeting. Work activities include ORAU survey of slabs & pipeline corridor.

0745 - Start Set-up of Sediment Sampling Activities, Calibrate Instruments.
QUESTemp 34 Calibration Module
Wet 11.6°C
Dry 45.5°C
Globe - 68.4°C
RH - 52%
All measurements within acceptable limits

0800 Readings - Heat Stress
Wet - 23.1°C
Dry - 24.6°C
Globe - 27.0°C
WBGT - 24.6°C
RH - 71%

[illegible]

Location Outfall 200 Date 8/4/16

Project / Client

0830 - Set up for Sediment Sampling Complete.

0845 - WBGT reading is ~~25.8°C~~ 25.8°C

0910 - A-39E Sediment Sample
Background - 200 → 230 CPM
Scan - 820 CPM on a 1 minute count.
Hg - 0.005
VOC/PID - 0 ppm

Call Matt Frost - discuss Scan results for Alpha/Beta on A-39E. He will process sample and wait for direction on Action Limits.

0930 - WBGT is 26.5°C.
Scan out all sample containers for A-39E. No detections over background, put samples on cooler w/ ice.

[illegible]

Location Outfall 200 Date 8/4/16

Project / Client

0945 - Take water break. Wait for call on status.

1030 - WBGT - 27.3 °C

1045 - Talk to Aquil King of ORAU about A-39E sample alpha/beta activity. Collected two background samples along UEFPC south bank. One read 720 CPM & the second read 760 CPM. It was determined activity in A-39E was not significant above background and to proceed w/ sediment sampling.

1100 - Break for lunch.

1200 - Return, meet w/ ORAU. Performing SGS survey on eastern most sump. Taken sought a alpha beta gamma Ranger detector for scanning out samples.

Location Outfall 200 Date 8/4/16

Project / Client Waste Characterization DOE/EM

1230 - Collect A-40E sediment sample.

WBGT is 30.0 °C - now on restricted work activities due to heat. - 87°F in O.R.
Dry temp - 26.8 °C
Wet temp - 32.9 °C
Globe - 38.8 °C
WBGTi - 30.3 °C
RH - 42%

1245 - A-40E collected
Scans -
Hg - 0.0 Jerome
PID - 0 ppm VOCs
Rad - 105 CPM on beta/gamma detector

1320 - Collect A-41E sediment from UEFPC
Scans - Hg - 0.0 Hg mg/m³
PID - 0.0 VOCs
Rad - 103 CPM
Sample is wet, saturated.

Location Outfall 200 Date 8/4/16

Project / Client Waste Characterization DOE EM

1400 - Collect A-73A in stream bed of UEFPC. Most of sediment media is gravel, with some fall in removed from each auger aliquot.
Scans -
Hg - 0.0 ng/m³
PID - 0.0 ppm VOCs
~~Alpha~~ Beta/Gamma - 104 CPM
WBGT - 28.5°C w/ storm coming in.
Start packing up site w/last samples.

1430 - Break down equipment for day. Storm announced over PA.

1500 - Arrive at office, pack sediment samples in cooler (4) and prepare to ship via Fed Ex to Test America lab.

1530 - Call PSS, notify off site for days.

M. Melo

Location Outfall 200 Date 8/5/16

Project / Client DOE EM / Waste Characterization Fieldwork

0700 - On-Site. Conduct Tailgate Safety Meeting. Call PSS to inform of Afient activities on-site. Cloudy, chance of rain. 73°F, humidity 94%, 0 wind.

Calibrate PID & Jerome meter.

0750 - Collect A-74E sediment sample. Waterlevel in UEFPC is higher today due to overnight rain, and has a cloudy color, not as clear as yesterday.
Scans -
Jerome meter - 0.058 ng/m³
PID - 0.0 ppm VOCs
Rad - 55 CPM
Thunder in storm due to north, wait until it passes before collecting sediment A-75E.

0930 - Wait for storm to pass to north. ORAU completes scan of M&C equipment in their yard.

M. Melo

Location Outfall 200 Date 8/5/16

Project / Client Waste Characterization DOE EM

37

0945 - Collect A-75E. Located in rip-rap on bank of north side of UEFPC. In native soil under rip rap.

Scans -

Jerome meter - 0.0 ltg ms/m³

PID - 0.0 VOCs

NaI - beta/gamma -> 7 CPM

Collect samples, leave to meet ORAU @ Headquarters.

Scanned out sample containers.

0955 - Meet w/ ORAU @ head works, conduct Tailgate Safety Mtg & discuss schedule.

Scan in soil/sediment sample area

Scan cut hole in 9404-7 slab, count is 120 CPM w/ beta/gamma.

1015 - Discuss next week's activities w/ ORAU. ORAU off-site for day.

1100 - Pack sediment samples A-74E & A-75E, prepare COC, leave site for day. Call PSS, inform of exit.

Location Outfall 200 Date 8/5/16

Project / Client Waste Characterization DOE EM

0700 - On-Site, conduct TGSM. ORAU on-site w/ new RCT Adam. Set up for day's activities. Orient Alliant staff on Questemp heat stress monitor calibration & monitoring.

0800 - ORAU crew starts completion of pipeline Corridor Survey. Some showers in area. WBGT @ 26.4°C.

0930 - ORAU returned, notified Alliant of "hot spot" near 3rd Street bridge between large transformer & UEFPC. Activity of 7000 CPM and slightly higher m/s small area (2).

ORAU also finishes pipeline corridor survey east of Third Street, to location A-50E.

1000 - MGE arrives on-site. Pack equipment, conduct briefing of project, review JHA, discuss work activities, review SHSP requirements, describe heat stress program, orient to job site. Conduct TGSM.

Location Outfall 200 Date 8/8/16

Project / Client Waste Characterization DOE EM

1200 - Leave for lunch. Locate water source for M&W. Look out water dechlorination procedures.

1300 - Return to site, discuss starting DPT operations. At this time no written grounding with Y-12 facilities is in place and JHA revision for the grounding is in process.

1315 - Inspect DPT rig & equipment, Unload from trailer and operation, 6620 DPT / Geoprobe. Line rope - tagged & in good condition.
Hydraulic leaks.
Drill Smith operation.
Hydraulic hoses in good condition with breakaway straps in-place.

1330 - WBGT - 30.1 °C, 50% work restriction in place. Start DPT soil sampling at A-42E, sample to 30 ft. Hit refusal at 7' bgs. Move my 3 ft. to the South, drill down

Location Outfall 200 Date 8/8/16

Project / Client

1330 - and hit refusal at 7 ft bgs. Move my 3 ft to east, 4 ft SE from original location. Drill past obstacle, sample from 7 ft to 13 ft bgs.

1430 - ORAU beta/gamma pancake detector indicates activity at 209 CPM at 7 ft. bgs. Background at 30-40 CPM in 0-5 ft soils.

1500 - Take call with ORAU's David Long and ORAU R.O. They say we should have some controls in place due to two instances of activity significantly above background at surface soil in pipeline corridor & at 7 ft bgs in location A-42E. Notify Matt Frost that ORAU will contact him. Suspend work at site until we receive direction on how to proceed.
B. Gillan off-site to pick up dechlorination tablets.

Location Outfall 200 Date 8/8/16

Project / Client Waste Characterization

1545 - M&W & ORAU off-site for day. Leave DPT rig on A-42 E. Secure samples on table, cover with plastic sheeting and tie down. ORAU will return in morning and scan samples in to re-check & see if any radon may have biased the scan high from the soil cores. ORAU will start a Radiation Work Plan and implement on Tuesday. No increase in PPE expected, additional monitoring of conditions expected.

WBGT Readings -
Wet - 26.4°C
Dry - 32.9°C
Globe - 40.1°C
WGBT$_0$ - 28.6°C
Relative humidity - 45%

- Reciprocate water in MW tank.
- Will store soils in a 55-gal drum. B.G. & R.S. go to pick up drum labels for drum for steel storage.

Location Outfall 200 Date 8/8/16

Project / Client Waste Characterization
DOE EM.

1630 - Cover up samples on table w/ plastic sheeting & duct tape. Close up gate, call PSS, off-site for day.

M. Whi

Location Outfall 200 Date 8/9/16

Project / Client Waste Characterization
DOE EM

0700 - Arrive on-site. Mostly cloudy, showers, 75°F, 93% humidity. Call PSS, open up gate.

0730 Conduct Tailgate Safety Meeting w/ MW. Cover POD ORAU MWP & coring activities
WBGT Reading - 24.8°C
RH 75%
- Unit will not calibrate for humidity, change battery, sensor block seems to be loose.

0800 - ORAU re-scans soil core. Activity on beta/gamma probe detector @ 50 CPM with occasional spikes of 130 CPM in small areas.

0900 - United Rental delivers man-lift to site after calling PSS & returning to job site @ headquarters. ORAU scans in man-lift passes scan, unload & park it. M&U delivers insulated

Location Outfall 200 Date 8/9/16

Project / Client

6 guage ground wire to site. Rig up to ground on pipe rack, prepare to core.
Pack sample for A-42E & ice down
1000 - Start boring at A-42E, TD anticipated to 30' BGS
WBGT - 29.5°C with unit in sun.
1010 WBGT - 27°C
Humidity 54%
Lower after cooling unit in shade.
1045 - Completed boring A-42E TD @ 23' BGS. No VOCs at borehole, some water in bottom of boring, inserted pol. tubing inside outer casing to TD. Lost shoe on bottom of boring.
- Completed first concrete core on Slab 9407-07.
WBGT - 27.5°C, RH 63%
Core scanned out w/ no activity above BG.
1130 - Break for lunch.

Location Outfall 200 Date 8/9/16
Project / Client Waste Characterization

1200 - Return from lunch
WBGT - 28.5°C
Walk down location A-49E, located on 2nd Street between 0204 - & UEFPC.
5-ft composite boring. Drill to 4.5 ft, hit grp rap or limestone bedrock.
No rad detected above background
no VOCs Hg is 0.007 ug/m³
1245 Collect A-36E, located adjacent to Third St. Collected sample from 0-2 ft. Sample is road base w/ gravel & some asphalt coated grains. Layer of geotextile recovered.
Scans -
Rad - no activity above BG.
VOCs - No VOCs 0.0 ppm
Hg - 0.0005 ug/m³
1315 - Break - WGBT - 29.8°C
1330 - Drill A-35E to depth of 2 ft bgs. Slight fuel-like odor & staining in upper 5 ft of sample.

Location Outfall 200 Date 8/9/16
Project / Client Waste Characterization
DOE EM

Scans - 0.0 ppm VOCs
No Radioactivity above background.
1400 - John Ruggy on-site for safety audit. Inspects setup, PPE, DPT rig & man-lift.
1430 - Collect A-32E, 0-10 ft BGS. Slight fuel-like odor & staining in upper 5-ft. of sample.
Scans - 0.0 ppm VOC
Hg - ug/m³
Rad - No activity above background
WBGT - 29.0°C. Breeze increasing 5-10 mph, partly cloudy 89.0°F on weather app. Taking 15 min break.
1530 - Collect core from 9419-2 slab. Get PPE for splitting core. Call lab and get aliquot size for cores. 200g for metals, 100g for PCB & Rad. Most core aliquots are 7600g in size.
1630 - MU off-site for day. Break cores

Location Outfall 200 Date 8/9/16

Project / Client DOE EM

and bag, label, weigh & package in cooler, fill out COC. Pack Soil samples & fill out COC. All sample containers scan out no activity. Plan for Wed. 8/10/16

1700 - Pack up equipment, load coolers, Call PSS offsite Fordyce.

1730 - Drop off Coolers at FedEx for Priority Overnight to TestAmerica in Missouri.

Location Outfall 200 Date 8/10/16

Project / Client Mate Characterization

0700 - On-site Fordyce, open gate, call PSS. Start set-up for soil sampling. Recon stainless steel bowls.

0730 - M&W & ORAU on-site. Conduct Tailgate Safety Meeting. Discuss Plan of Day.

0800 - M&W cover second location at 9419-2. M&W collects sample A-44E. No activity above background. 0-5 ft in depth

0830 - Collect soil sample A-33E with hand auger at edge of tank concrete ring foundation. Soil in A-33E is sandy loam and ~~a~~ clayey sand fill. No ~~scans~~ activity above background of 20-50 CPM.

0900 - M&W collects A-45E, east of headwalls in pipeline corridor.

0930 - M&W collects A-46E, in pipeline corridor. 0-5 ft. BGS, Rad scan - no activity above background for A-45E & A-46E.

1000 - M&W drills hole in 9720-8

Location Outfall 200 Date 8/10/16

Project / Client Waste Characterization DOE EM

pavement for grounding rod. Place 7' rod 4.5 ft into soil, 1 ft. left above ground. Central location allows core truck to reach all locations on 5720-8. Start carry on drilling DPT location on slab.

1015 - M&W collects A-47E, 0-5 ft.

1030 - M&W collects A-50E, on south side of UEFPC, 0-5 ft in depth.

1100 - M&W collects A-48E, 0-5 ft. on north side of UEFPC, last sample for pipeline corridor.

Collects sample/concrete core A-64E. Cannot drill past concrete, which is 7 1/2 in. thick under 8" asphalt.

1145 - Break for lunch after packing last samples.

1300 - Doug Mullaney delivers sample bottles & 10 ft. ladder to New Hope.

Location Outfall 200 Date 8/10/16

Project / Client

Continue drilling at A-64E. Temp - 87°, cloudy, light shower in area. Stop drilling due to rebar in hole. Meet at Crane Hess to discuss figures with building foundation plans on 5720-8 slab.

1430 - Collected & logged soil sample A-63E. 0-10 ft, planed, refusal @ 6 ft. in gravel fill. No scan above background, 0.00 H_2S mg/m³ 0.0 ppm VOCs.
WBGT - 28.0°C RH - 65%
light shower passed, no lightning.

1430 - Move A-64E 3 ft to NW from original location. Start drill through asphalt & concrete, collect soils. Avoid footers. First sample in gravel fill 0-5 ft. Second sample - refusal at 7 ft. No rad scan activity above BG.
WBGT - 28.5°C RH ↓ to 45%

1500 - Check all borings for groundwater. All shallow borings are dry after

Location Outfall 200 Date 8/10/16

Project / Client Waste Characterization

8 to 36 hours of setting open. Start packing soil & concrete samples, prepare COC.
WBGT 28.3°C
RH - 38%
M&W & ORAU off-site for day. M&W to get new anchors to work in asphalt.
1615 - Finish packing & cooler COCs. Breakdown equipment, load out. Store tables & canopy on-site due to water coolers. Off-site for day, leave for FedEx.

M. Wali

Location Outfall 200 Date 8/11/16

Project / Client Waste Characterization
DOE Eun

0700 - On-site, start set-up for day. Dean Treadway on-site for orientation on man-lift. Call PSS.
0730 - M&W & ORAU on-site. Discuss Plan of Day & conduct Tailgate Safety Meeting. One crew is working at Headwaters to survey steam lines, second crew @ G720-8 slab sampling soil & concrete. Brandy & Dean leave for orientation on site and use of man-lift.
0800 - Set up on core hole w/ new asphalt anchor bolts. Walk down locations DPT rig will perform soil sampling. Receive instruction on use of heat stress monitor.
0830 - Start steam line radiological survey w/ ORAU. Make transder ground observation for Gilliam & Bailey.
1000 - Complete Steam Line Rad survey to ‡ Street.

Location Outfall 200 Date 8/11/16

Project / Client Waste Characterization / DOE EM

1015 - Set up on A-43E borehole, water in borehole and tubing in-place, use peristaltic pump to fill sample containers, fill full suite.

VOA-2

1L-Amber - 1 w/HCL

1L Amber - 3 unpreserved

1L Poly - 6 preserved w/HNO3

1100 - Boring pumps dry. Break for lunch.

1200 - Return from lunch. WBGT - 31.5 C RH - 32%. Finish collection of water samples from A-43E

1300 - Deliver samples to Brandy for packaging.

1500 - Finish collecting water sample from bailing A-42E. Could not collect all 6 recommended sampled, only 5 L out of 6.

1600 - Finish soil sampling for day. M&U & OR Au off-site.

Location Outfall 200 Date 8/11/16

Project / Client Waste Characterization DOE EM

Start labeling, packing coolers and filling out COCs. Brian Pescamps reviews asbestos sampling approach for steam lines. Retrieve more ice for coolers, 3 bags/cooler min.

1800 - Off-site for day. Drive to Fed Ex to Ship Coolers.

- 5 - coolers
- 3 - waters (A-42E, A-43E, & Material Blank)
- 1 cooler - soil
- 1 cooler - concrete samples.

M. Mali

Location Outfall 200 Date 8/12/16

Project / Client Waste Characterization DOE EM

0700 - On-site, set up equipment for day. Calibrate instruments. Partly cloudy, 74°F 90% humidity

0730 - M&W & OR/FU on site. Conduct Tailgate Safety Mtg. and Plan of the Day.
- Complete radiological survey of steam & CR line & collect swipes.
- Call PSS & Beta-3 operations to inform them of activities on "E" Road near PIDAS fence.

0800 - Continue concrete coring - 12 locations remaining on 9720-8.
- Finish 2 soil borings @ 9720-8
- NAK on surveys of MPT rig soils, concrete & equipment.

0900 - Prepare for steam line survey along "E" Road. Set out traffic control cones, escort in near-lift. Finish radiological swipes on scarred segments of steam line. Notify John Nugent of activity.

1000 - Jorge Gonzalez, DOE EM MTF Facility Representative

Location Outfall 200 Date 8/12/16

Project / Client Waste Characterization DOE EM

visite 9720-8 & Headwaters Area work sites. Discuss site activities, H&S program (heat stress, etc) & findings, (no free liquids observed, no radiological activity above background). Moldy scraps were considered to be related to radon on plastic soil liner.

1030 - ~~The Nuengent~~ Mr. Gonzalez left site

Mr. Gonzalez leaves site, exchange contact information.

Start asbestos sampling of steam & condensate return line. Sample insulation, wrap, mud & valve mud on steam line. Wrap & insulation on condensate return line.

1100 - Collect concrete sample from ring foundation at 9419-2 slab.

1145 - Finish sampling at Headwaters, head to 9720-8, break for lunch @ 1200.

1250 - Return to site: Continue concrete coring. M&W starts plugging soil borings w/ bentonite. Cap borings w/ concrete on hard surfaces. Break up concrete cores into aliquots.

Location Outfall 200 Date 8/12/16
Project / Client Waste Characterization
DOE EM

1400 - Collect asbestos sample from Bldg. 9417-8 shed after NOE letter. Collect equipment rinsate water sample from soil sampling bowls. Scan cut concrete, start packing samples
WBGT - 30.1°C, RH - 40% for workers under canopy
WBGT - 32.1°C, RH - 40% for workers in sun.
Partly cloudy 93°F, wind 5-10 MPH
1600 - Packing coolers. Get call from Doug Mullaney with directions to pack concrete samples on ice to 4°C. Repack coolers.
1700 - Deliver 5 geotechnical soil conductivity samples to GEO Services LLC.
Deliver 2 coolers & 1 FedEx box (asbestos samples) to FedEx.

Location Outfall 200 Date 8/15/2016
Project / Client Waste Characterization
DOE EM

0645 - On-site for day. Call PSS, working @ 9720-8 & Headwaters areas.
0730 - Conduct Tailgate Safety Meeting & R.O.P.
1) Finish 6 concrete core
2) Rad scan of new sump, materials sample & equipment
3) Collect sump samples
4) Collect asbestos samples @ 9417-8 shed & tank.
Temp - 75°F, Partly Cloudy
~~Rel Humidity~~ - 90%
WBGT - 23.8°C, RH - 81%
0900 - Collect tank & 9417-8 shed roof samples for asbestos.
- Collect 9408-8 sump sludge & water samples.
1030 - Collect 9408-8 sump water sample after removing steel plate. No sludge in bottom of 400 gal sump, ~1/2 full of water. Some concrete rubble on bottom, oily sheen on water and slight odor

Location Outfall 200 Date 8/15/16
Project / Client Waste Characterization
DOE EM.

during collection. No solid collected over 200 mL. Will try a different plate for a sludge sample.
1130 - Pack samples on ice. M&W back after getting a new core saw to replace broken saw.
WBGT - 26.6°C 41% RH
1145 - Break for lunch.
1230 - Return. Take trip to pull up more presence LL poly bottles.
1300 - Collect sludge sample from 9408-08 sump bottom in two valve pits at east end of sump. Collect final concrete cores.
1500 - Collect A - E on cracks in asphalt, recover concrete joint material.
1530 - Secure sump lids with bolts at 9408-8. Pack up sample IDW. Meet w/ Jorge Gonzalez, FR. Report we are 90% finished w/ field work as of COB Tuesday. Still have to manage IDW & scan out & demobilize equipment.

Location Outfall 200 Date 8/15/16
Project / Client Waste Characterization

1630 - M&W moves to Headwalls to re-drill sump concrete at northernmost sump, 9418-1.
Pack samples, collect Nitrate Blank sample, prepare COC's.
1 Pack up site equipment & secure IDW.
1730 - Ship 4 coolers & 1 Box via FedEx to Test America
1) - 2) sludge sampled from sumps
2) - 2 - sump water sampled from 9404-7 & 9404-8 sumps.
Receive call from M&W, curing concrete cover on sump 9418-1 cored to 24-inches, cannot find grease in top of sump. Call Matt Frost, will discuss at-shift of sump with Gene Hess

M. Wade

Location Outfall 200 Date 8/16/16

Project / Client Waste Characterization

NUE EAI

0700 - On-site. Conduct Tailgate Safety Meeting and Plan of Day.

0730 - Contact Gene Hess about furnace sump 9418, cored 2 ft into sump, no bottom reached.

0800 - Jason Derby on-site. Discuss project activities. Discuss sump 9418 depth cored. Wall down patched cored hole on slab 9720-8. Agreed that recovery of cuttings was not needed, only document footage moved from original location.

0830 - Meet Gene Hess at headwaters. Gene Identifies 9418 sump is filled with flowable fill. Discuss other sumps. 9408-07 is open and 9408-08 is open and contains water. M&W plugs conduit of 9418. ORAU scans out equipment.

1030 - ORAU delivers green tags for equipment. Man-lift off-site. M&W off-site to get CDL driver for 1 ton truck & trailer

Location Outfall 200 Date 8/16/16

Project / Client Waste Characterization

Pick up stakes and flags at soil borings and take to 9720-8 lot. ORAU puts flags in radiological hot spots by paint shed, as requested by Derby & Hess. Day at equipment.

1115 - Break for lunch.

1200 - Back on-site. Pack & prepare final Material Blank water sample. Pick up paint & store. Paint out two areas in pipeline corridor with radioactivity (75k) & one background (8k cpm). Put contact IDW in clear trash bags, add waste tags, tie up & store along wall. Pack equipment, deliver samples to Fed Ex. M&W retrieves DET rig.

1400 - off-site for day. Call PSS, Alliant & Subcontractor off from job-site for these activities.

Location _____ Date _____

Project / Client _____

End of Log book

Location _____ Date _____

Project / Client _____

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B. Gillen

Beandy

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Location Y-12 Date 08-09-16

Project / Client Outfall 200

1000 Began coring at the first concrete location on the former 9404-7 pad.

BG 08-09-16
~~1200~~ 1220 Began coring at the second concrete location on the former 9404-7 pad.

1240 Began coring at the third concrete location on the former 9404-7 pad.

1530 Sampled concrete core YMTFA80 9418 C1.

1536 Sampled concrete core YMTFA80 9418 C2.

1540 Sampled concrete core YMTFA80 9418 C3.

Rite in the Rain

Location 412 Date 08-09-16

Project / Client Outfall 200

1550 Sampled concrete core for YMTTFA80 9418C.

1800 Sampled concrete core for YMTTFA80, 9418 EG 08-09-16

82 WKI C.

630 Finished packing samples for shipment and left site.

Location 412 Date 08-10-16

Project / Client Outfall 200

0700 Arrived onsite on had tailgate safety meeting. Discussed the plan of the day and calibrated instruments.

0830 Concrete core AB2E was extracted and began drying so RADON could survey. Sample # YMTTFA82 WKI2 C.

0900 Relocated to the 9720-08 pad for sampling and installation of ground wire.

1000 Began coring at the first location on the 9720-08 pad.

Rite in the Rain

Location Y12 Date 08-10-16

Project / Client Outfall 200

1045 Concrete core was extracted from A64E.

1220 Concrete core was extracted from A62E.

1400 Began size reduction of concrete cores for sample segregation.

1425 Sample number YMTFA63C was weighed and measurements were taken with the PID and Jerome meter.

63C PCBs >610g, 0.3ppm, 0.000
Rad >610g, 0.1ppm, 0.000
TCLP metals
595g, 0.3ppm, 0.000

1435 Sample number YMTFA64C (cont.)

Location Y12 Date 08-10-16

Project / Client Outfall 200

1435 (cont.) was weighed and measurements were taken with the PID and Jerome meter.

64C PCBs >610g, 0.2ppm, 0.003
Rad >610g, 0.2ppm, 0.000
TCLP metals
>610g, 0.3ppm, 0.000

1530 Sample YMTFA83 unk2C was weighed and measurements were taken with the PID and Jerome meter.

83 unk2C
PCBs >610g, 0.4ppm, 0.000
Rad 363g, 0.4ppm, 0.000
TCLP Metals
460g, 0.1ppm, 0.003

1600 Packaged samples and prepped for shipment. After samples were packaged we left site.

Rite in the Rain

Location 412 Date 08-11-16

Project / Client Outfall 200

0700 Arrived onsite had tailgate safety meeting, discussed the plan of the day, and calibrated instruments.

0730 Met with Dean Treadway in the headworks area to inspect the Genie Lift and practice driving before Radion surveys.

0800 Ran the Genie Lift so Radion could perform surveys of the pipeline corridor.

1015 Finished running the genie lift and returned to 9720-B pad to resume concrete coring.

Location 412 Date 08-11-16

Project / Client Outfall 200

1300 Sample YMTFA43 GW was taken.

1325 Sample YMTFA62 C was taken. The sample was weighed and measurements were taken with the PID and Jerome meter.
62C PCBs >610g, 0.2ppm, 0.004
RAD >610g, 0.4ppm, 0.004
TCLP >610g, 0.1ppm, 0.000

1328 Sample was taken from YMTFA61C. The sample was weighed and measurements were taken with the PID and Jerome meter.
61C PCBs >610g, 0.3ppm, 0.000
Rad >610g, 0.2ppm, 0.000
TCLP >610g, 0.4ppm, 0.000

Rite in the Rain

Location Y12 Date 08-11-16

Project / Client Outfall 200

1330 Sample was taken from YMTFA60C. Samples were weighed and measurements were taken with PID and Jerome meter.

60C PCBs >610g, 0.3ppm, 0.000
Rad 548g, 0.1ppm, 0.000
TCLP 585g, 0.3ppm, 0.000

1335 Sample was taken from YMTFA34C. Samples were weighed and measurements were taken with the PID and Jerome meter.

34C PCBs 510g, 0.5ppm, 0.000
Rad >610g, 0.5ppm, 0.003
TCLP >610g, 0.2ppm, 0.003

1530 Sample number YMTFA39C was taken.

1630 Sample number YMTFA60C was taken.

Location Y12 Date 08-11-16

Project / Client Outfall 200

1640 Begun packing samples and prepping for shipment.

1800 Finished packing samples and left site.

Rite in the Rain

Location 412 Date 08-12-16

Project / Client Outfall 200

0700 Met onsite and had tailgate safety meeting, discussed the plan of the day, and calibrated instruments. Walked down coring locations with Bob.

0800 Operated aerial boomlift for Radcon to complete survey/smears of steam and condensate lines.

1040 Took first asbestos sample from condensate insulation. Sample number is YMTFA851D.

1045 Took first sample from insulation wrap from steam line. Sample number is YMTFA861D.

Location 412 Date 08-12-16

Project / Client Outfall 200

1100 Took second asbestos sample from mudding around steam line valve. Sample number is YMTFA871D.

1105 Took third asbestos sample from steam pipe insulation. Sample number is YMTFA721D.

1330 Took first asbestos sample from the dechlorination shed walls. Sample number is YMTFA391D.

1412 Samples were taken and measured with the PID and Jerome meter. Sample number YMTFA09C had readings of 1.2 ppm VOCs, 0.003 mg/m³ Hg.

Rite in the Rain

Location 412 Date 08-12-16

Project / Client Outfall 200

1415 Samples were taken from YMTFA67C and measurements were taken with the PID and Jerome meter. measurements were 0.3 ppm VOCs and 0.004 mg/m3 Hg.

1420 Samples were taken from YMTFA68C and measurements were taken with the PID and Jerome meter. VOCs 0.2 ppm, 0.007 mg/m3 Hg

1425 Samples were taken from YMTFA51C and measurements were taken with the PID and Jerome meter. 0.3 ppm VOCs and 0.003 mg/m3 Hg

Location 412 Date 08-12-16

Project / Client Outfall 200

1445 Samples were taken from YMTFA70C and measurements were taken with the PID and Jerome meter. 3.2 ppm VOCs, 0.003 mg/m3 Hg

1450 Samples were taken from YMTFA71C and measurements were taken with the PID and Jerome meter. 0.3 ppm VOCs and 0.003 mg/m3 Hg

1516 Samples were taken at YMTFA84 unk 3C and measurements were taken with the PID and Jerome meter. 0.3 ppm VOCs and 0.007 mg/m3 Hg.

1530 Began packing samples and prepping for shipment.

Rite in the Rain

Location 412 Date 8-15-16

Project / Client Outfall 200

0700 Arrived onsite and attended tailgate safety meeting, discussed the plan of the day, and began cleanup of the site.

0800 Collected the first asbestos sample from the roof of the dechlorination shed. Sample number #4MTFA88RF.

0900 Collected the first asbestos sample from the dechlorination tank insulation. Sample number #4MTFA90LD

1423 Collected concrete core from A-58E and measurements were taken from PID and (cont.)

Location 412 Date 8-15-16

Project / Client Outfall 200

1423 Jerome meter. VOCs were 0.7 ppm and 0.007 mg/m³ Hg. Weights of samples were also recorded.

Rad-610g
PCBs 392g
TCLP metals 760g

Sample number is 4MTFA58C.

1428 Collected concrete core from A57E and measurements were taken with the PID and Jerome meter. VOCs were 0.5 ppm and 0.006 mg/m³ Hg. Weights of samples were also recorded.

Rad 607g
PCBs 760g
TCLP metals 760g

Sample number is #4MTFA57C.

Rite in the Rain.

Location Y12 Date 8-15-16

Project / Client Outfall 200

1438 Collected concrete core from A56E and measurements were taken with the PID and Jerome meter. VOCs were 0.4 ppm and 0.004 mg/m3 Hg. Weights of samples were also recorded

Rad 498g
PCBs 7610g
TCLP metals 460g

Sample number is YMTFA56C.

1445 Collected concrete core from A55E and measurements were taken with PID and Jerome meter. VOCs 0.0 ppm and 0.004 mg/m3 Hg. Weights of samples were also recorded

Rad 528g
PCBs 7610g
TCLP metals 7610g

Sample number is YMTFA55C.

Location Y12 Date 08-13-16

Project / Client Outfall 200

1455 Concrete core was collected from A105E and measurements were taken with the PID and Jerome meter. VOCs 0.4 ppm and 0.005 mg/m3 Hg.

Rad 360g
PCBs 310g
TCLP metals 7610g

Sample number is YMTFA105C.

1505 Concrete core was collected from A72E and measurements were taken with the PID and Jerome meter. VOCs 0.0 ppm and 0.007 mg/m3 Hg.

Rad 360g
PCBs 7610g
TCLP metals 390g

Sample number is YMTFA72C.

Rite in the Rain

Location Y12 Date 08-15-16

Project / Client Outfall 200

1513 Collected expansion joint material from concrete core. Sample number is YMTFA53E5.

1537 Collected expansion joint material from concrete core. Sample number is YMTFA52E5.

End of logbook

Brandy Gilliam

Location Date

Project / Client

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Project OUT FALL 200 Site Characterization

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Location Y-12 Headworks Date 8-4-2016

Project / Client

0710 Arrive on site. weather is warm and humid. Matt and Mark on site. Jerome meter LAST Cal 5-27-16.

0730 Tailgate H&S w/ ORAU (Josh and Brittany. Matt has left.

0745 calibrate PID & Jerome meter (Zero & Nogen). Today we will collect sediment samples. ORAU is conducting walkover survey at Headworks area.

0900 Collect sample # A-39E
Jerome meter reading (JMR) = 0.005 Hg mg/m3
PID = 0.0 ppm. JM #14280

1240 Collect sample # A-40E
JMR = 0.0 Hg mg/m3
PID = 0.0
NOTE: ORAU conducts a Rad Scan on each sample before we place them in the cooler

1310 Temperature is ~~85~~ 90 F and humid, partly cloudy. (90°F) RS 8-4-16
check Jerome meter zero & is OK. Will check daily.

Rite in the Rain

Location Y-12 Headworks Date 8-4-16

Project / Client

1325 collect sample A 41 E
JMR = 0.0 Hg mg/m3
PID = 0.0 ppm

1400 collect sample A 73 E
JMR = 0.003 Hg mg/m3
PID = 0.0 ppm

No visible mercury observed in any of the sediment samples collected today.

1435 Head out to pack & ship samples

1600 samples shipped to lab and end day.

Location Y-12 Headworks Date 8-5-16

Project / Client

0705 Arrive onsite. Weather is cloudy w/ light rain. Mark and I onsite. OnAu to come later. Today we will finish sediment sampling

0720 TAILGATE H&S. Cal PID & Jerome

0750 Collect sediment sample A-74 E
JMR = 0.058 Hg mg/m3
PID = 0.0 ppm

0925 collect sediment sample A-75 E
JMR = 0.0 Hg mg/m3
PID = 0.0 ppm

No visible mercury observed in today's sediment samples.

1030 Head out to pack & ship samples and to prepare for Monday.

Rite in the Rain

Location Y-12 Headworks Date 8-8-14

Project / Client

0710 Arrive on site. Weather is warm and sunny. Matt Here.

0720 Have Tailgate H&S meeting. Also, brief Adam (ORAU) on JHA. ORAU (Adam & Josh) Also, Mark, me and Brandy (Alliant) on site. Cal PID & Jerome.

1035 MARK heads out to meet drillers.

1040 Drillers Arrive. RSS 8-8-14

1335 Setting up on A-42E (0-30 FT)

1340 Begin A-42E (0-30 FT bgs) ~~Pla~~ Planned

1350 We have gotten a "high" count reading @ ~7 FT bgs of 152 cpm. Background has been around 30 cpm. We will call Matt and pause work until they can discuss w/ ORAU & DOE.

1545 Head out & END DAY.

Location Y-12 Headworks Date 8-9-14

Project / Client

0706 Arrive on site. Weather is warm and muggy

0708 TAIGate H&S meeting

0730 Today we will complete boring A-42E. No more high radiological readings. ORAU says likely radon.

1000 We have finish A-42E and getting ready to begin A-43E

1226 Begin A-49E ~~(50 FT bgs)~~ RSS 8-9-14 (Planned depth = 5 FT bgs)

1342 Begin A-35E. 0-2 FT bgs

1420 Begin A-32E. 0-10 FT bgs.

1445 Begin A-34E. 0-2 FT bgs

1630 Head out for the day

Rite in the Rain

Location Y-12 Headworks Date 8-10-16

Project / Client

0700 Arrive on site. Weather is Hot and muggy. Calibrate PID & Check JM.
0730 Tailgate H&S Meeting.
0817 Begin A-44E (0-5 FT bgs).
0840 Begin A-33E (0-2 FT) w/ Hand Auger.
1010 Borings A45E & A46E are completed.
1315 Begin A-63E at 9720-8 slab.
1415 Begin A-64E (0-10 FT bgs = Planned depth).
1600 Today we drilled & sampled the following borings:

A-33E	A-63
A-44E	A-64
A-45E	A-46
A-47E	
A-48E	
A-50E	

END DAY.

Location Y-12 9720-8 Date 8-11-16

Project / Client

0700 Arrive on site. Weather is sunny w/ wind. Tailgate H&S. RS 8-11-16 ~~Weather~~
0824 Begin A-70E. So far we have only encountered water in two borings (A-42E & 44A-43E at the Headworks Area). RS 8-11-16
0850 Begin A-69E (0-10FT bgs)
0959 Begin A-67E (0-10Ft bgs
1213 Begin A-62. Call Erika Gish at Lab. & Told her that sample for radionuclides may have been labeled as 62 rather than 64 (YMTFA 64 S0 010) yesterdays shippment.
1400 Begin A-60E. D-10 FT bgs. Had to ~~step over~~ OFF SET (twice) RS 8-11-16 3 times due to re-bar. Petroleum-like odor. RS 8-11-16
1550 Pack samples for Shipment.
1800 END DAY.

Rite in the Rain

Location 9720-8 Slab Date 8-12-16

Project / Client

0700 Arrive on site. Cal PID & Check JM.
0730 TAILGATE H&S Meeting. Weather is warm and muggy. Cal PID.
0814 Begin A-54E. Offset boring 2FT NE due to rebar.
0915 Jorge Gonzales on site
0925 Jorge Heads out
0926 Begin A-58E.
1015 We have off set A-58E three ~~two~~ times. RS 8-12-16 CAN't get past 3-5 to 4 FT
1025 OFF set 12 FT west for A-58E. We believe we are near the old loading dock in an area backfilled w/crusher run & cement. Therefore, we off set the boring 12 FT west.
1110 Finally finished A-58E. made 7 ~~6~~ RS 8-12-16 attemps. Last attempt was Successful. ~~5FT NW~~ RS 8-12-16 10 FT NW.
1500 We have (5) five soil samples to submit for analysis of soil corrosivity: 32, 42, 61 69 & 70.
1600 Head out for the day.

Richard Stu

Location 9720-8 SLAB & Date 8-15-16

Project / Client Headworks area

0700 Arrive on site weather is warm, sunny and partly cloudy.
0730 Tailgate H&S meeting Calibrate PID & Check Jerome zero. All o.k.
0815 Arrive at Headworks area to collect sludge samples
0830 Collect sluge sample from sump 9404. PID = 28ppm VOCs, JMR = 0.008 Hg mg/m³
0900 collect sump liquid sample from 9404-7, very little water
1020 Collect sump liquid sample from new 9404-8. This is a new sample (Just added) ~~A-92~~ (Liquid) A-93. RS 8-15-16 Approximately 4FT of water in sump 9404-8 & we collect water sample ~2 FT below water surface. Oil sheen noted on water.
1056 Obtained small quantity of gravel & sludge from 9404-8

Richard Stu

Rite in the Rain

Location Headworks Area Date 8-15-16

Project / Client

(New sump sample Added). Obtain JMR of 0.012 Hg mg/m3. PID = 11.1 ppm VOCs. Petroleum-like odor and oily sheen on water as we attempt to collect and sludge sample. Made several attemps so far, but only getting gravel and trash (paper product) from the bottom of the sump.

1300 Brandy G and Mark M collected 9404-8 sludge sample

1420 (?) Collect Equipment Blank sample YMTFA 9404-EB by flowing ASTM Type II water over the decontaminated stainless-steel bowl used for compositing sludge samples. NOTE: It was poured thru a decontaminated bucket Auger (used to collect the sample) and into a bowl used to composite the sludge samples. ASTM TYPE II lots #s 0512 16D; 66D212 Exp (11/17) (4/18)

RS 8-15-16

RS 8-15-16

Location Headworks Area Date 8-15-16

Project / Client

1700 End Day and Head to office for supplies.

Rite in the Rain

Location 9720-8/ Headworks Date 8-16-16

Project / Client

0700 Arrive on site. Weather is sunny and warm.

0730 Tailgate H&S meeting. We walk down area of A-5BE where we made several attemps to drill. The final soil boring location was offset 10 FT north of the survey pin.

0745 Jason Darby on site. RS 8-16-16

0910 Collect Equipment Blank ~~qpo~~ by pouring ASTM TYPE II over Auger bucket & into a bowl. Both have been deconned. (YMTFA 9720 EB).

1015 Collect Final Field Blank of ASTM Type II (YMTFA 9404 FB)

1230 We begin cleaning up the site and prepare to head out to the office

1330 Head to office & to ship samples.

END of logbook

Location Date

Project / Client

Rite in the Rain

APPENDIX D
BORING LOGS

Hole No. A 32 E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core Barrel
2. LOCATION (Coordinates or Station) Headworks Area	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M&W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 Dr
4. HOLE NO. (As shown on drawing title and file number) A-32E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER DAVID GRIFFIS	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER not Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-9-16 STARTED 1420 COMPLETED 1440
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 10 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			0.9 FT Gravel sub base (GM-ML) 0.9'			0-5 FT 3.8 FT Recovery (3.8') 0.0 ppm VOCs 0.007 Hg mg/m³
	1		Sandy SILT Dark gray, Damp, loose to medium dense, mostly SILT, little fine sand, trace medium sand, trace clay (SM) same as above except orange-brown and little clay (1.8 FT), soft to med. dense, damp (ML) at 2.4 FT same as above except little fine to medium gravel			
	2					
	3					
	4					
	5					5-10 FT 4 FT Recovery 0.0 ppm VOCs 0.009 Hg mg/m³
	6		Same as above except dark gray staining thru-out. Also, accessional light gray clay lenses thru-out Petroleum-like odor			
	7					
	8					
	9					NOTE: No visible mercury observed.
	10		END BORING @ 10 FT bgs			

A-32E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A 32E

Hole No. 33E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT	OU Fall 200
2. LOCATION (Coordinates or Station)	Headworks Area
3. DRILLING AGENCY	Alliant (HAND AUGER)
4. HOLE NO. (As shown on drawing title and file number)	A 33E
5. NAME OF DRILLER	Mark Maki
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	unknown
8. DEPTH DRILLED INTO ROCK	N/A
9. TOTAL DEPTH OF HOLE	2 FT bgs
10. SIZE AND TYPE OF BIT	5 ft 3" O.D. Core Barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	N/A
12. MANUFACTURER'S DESIGNATION OF DRILL	6620 DT
13. TOTAL NO. OF OVERBURDEN SAMPLES	DISTURBED 1/1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES	N/A
15. ELEVATION GROUND WATER	not Encountered
16. DATE HOLE 8-10-16	STARTED 0840 COMPLETED 0850
17. ELEVATION TOP OF HOLE	N/A
18. TOTAL CORE RECOVERY FOR BORING	N/A %
19. SIGNATURE OF INSPECTOR	[signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0–1		Sandy SILT, Dark brown, loose, dry, Mostly SILT Some fine to coarse sand,			0-2 FT ~2 FT 0.006 Hg mg/m3 Ø 1.4 ppm VOCs
	2		END Boring @ 2.0 FT BGS			Conducted w/ a HAND AUGER
						NOTE: No visible Hg observed

A-33E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A-33E

Hole No: 34E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT Outfall 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core Barrel
2. LOCATION (Coordinates or Station) Headworks Area	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620DT
4. HOLE NO. (As shown on drawing title and file number) A-34E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED ~~2~~ 1 UNDISTURBED 1
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES 8-9-16 N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Not Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-9-16 STARTED 1445 COMPLETED 1448
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 2 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Gravel Subbase (GM-ML) 0.3'			0-2 FT 1.3 FT Recovery 0.0 ppm VOCs 0.005 Hg mg/m³
	1		Gravelly SILT, Orange brown Damp, loose to medium dense Mostly Silt, little fine to medium gravel, trace to little clay, Dark gray staining and Petroleum-like odor throughout. checked w/ PID twice & no hits.			
	2		END Boring at 2.0 FT bgs			
						NOTE: no visible Hg Observed.

A-34E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A-34E

Hole No. 35E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" Core Barrel
2. LOCATION (Coordinates or Station) Headworks Area	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-35 E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 1/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE STARTED 8-9-16 1342 COMPLETED 1350
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 2 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Gravel Sub base (GM-ML)			0-2 FT 2 FT Recovery 0.0 ppm 0.006 Hg mg/m3
	1		1.2 FT Clayey SILT. orange-brown, Damp, medium dense to dense mostly Silt, little clay, trace to little medium gravel, Trace med gravel (ML)			
	2		END BORING at 2.0 FT bgs			
	3					
	4					
	5					NOTE: No visible Hg Observed

A-35E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO A-35E

Hole No. 36E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT	Outfall 200
2. LOCATION (Coordinates or Station)	Headworks Area
3. DRILLING AGENCY	M&W Drilling
4. HOLE NO. (As shown on drawing title and file number)	A-36E
5. NAME OF DRILLER	David Griffis
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	unknown
8. DEPTH DRILLED INTO ROCK	N/A
9. TOTAL DEPTH OF HOLE	2 FT bgs
10. SIZE AND TYPE OF BIT	5 FT 3" Core Barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	N/A
12. MANUFACTURER'S DESIGNATION OF DRILL	6620 DT
13. TOTAL NO. OF OVERBURDEN SAMPLES	DISTURBED 1/1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES	N/A
15. ELEVATION GROUND WATER	NOT Encountered
16. DATE HOLE 8-9-16	STARTED 1245 COMPLETED 1250
17. ELEVATION TOP OF HOLE	N/A
18. TOTAL CORE RECOVERY FOR BORING	N/A %
19. SIGNATURE OF INSPECTOR	[signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	1		Gravel sub base, Gravelly SILT, mostly SILT, some gravel, light grey, damp, loose to medium dense trace medium to fine sand, Geotextile present (GM-ML)			0-2 FT 1.3 FT Recovery 0.0ppm VOC, 0.005 ~~ppm~~ Hg mg/m3 RS 8-9-16
	2		END Boring @ 2.0 FT			
	3					NOTE: No visible Hg observed

A-36E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT OF 200

HOLE NO. A-36E

Hole No. 42E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-13	SHEET 1 OF 3 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D Core barrel
2. LOCATION (Coordinates or Station) Headworks Area (A-42E)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-42E	13. TOTAL NO. OF OVERBURDEN SAMPLES: DISTURBED 5/1 UNDISTURBED N/A
5. NAME OF DRILLER DAVID Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER N/A (~20 FT bgs)
7. THICKNESS OF OVERBURDEN unknown	16. DATE HOLE 8-8-16 STARTED 1340 COMPLETED 8-9-16 0930
8. DEPTH DRILLED INTO ROCK N/A RS 8-9-16	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 28.30 FT bgs (Refusal)	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	1		FILL: Fine gravelly sand and SILT Gray-brown, loose, slightly damp, fine to medium sand, trace SILT, Brick present @ 1.6 FT bgs (SP)			2.9 FT Recovery 45 cpm 0.0 ppm VOCs Jerome Meter Reading = (JMR) 0.0 Hg mg/m3 0-5 FT
	2		Sandy SILT, orange-brown, loose, slightly damp, fine to coarse sand, trace clay, weathered shale (Saprolite) Fine to medium gravel Present last 0.9 FT Electrical wiring @ ~2 FT bgs (US") Fill (SM)			NOTE: Boring relocated offset 4 FT SE due to refusal @ 7 FT bgs at original location. We hit refusal @ 2 locations (original & 3 FT SOUTH) before ending up 4 FT SE.
	3					
	4					
	5					5-7 FT 2 FT Recovery
	6		Same as above Silty CLAY, light-brown, soft, damp, trace to 20% SILT, low plasticity			0.0 ppm VOCs JMR = 0.0 Hg mg/m3
	7		Refusal @ 7 FT. STEP OVER 3 FT SOUTH, 2nd Refusal 7 FT move 4 FT SE			
	8		~~NO DATA 7-10 FT bgs~~ RS 8-08-16 Same as above			152 cpm High Cont 0.0 ppm (After setting overnight) 0.005 Hg mg/m3 7-10 FT 3 FT Recovery, sample covered overnight
	9					NOTE: We paused drilling till high cont reading was rechecked and determined to be Radon. Drilling stopped at ~1350 8-8 & completed on 8-9-16.
	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT OF 200 HOLE NO. A 42E

A-42E

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE: N/A

Hole No. A-42E

PROJECT: OUTFALL 200

INSTALLATION: 1-12

SHEET 3 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Same as above			0.0 ppmv (after setting out overnight) 0.007 Hg mg/m3 10-13 FT 3 FT Recovery
	11					
	12					
	13		Same as above except medium stiff			13-15 FT / 2 FT recovery new core 8-9-2014 @ 0830 0.0 ppm VOC 0.008 Hg mg/m3
	14					
	15		Same as above except wet @ 16.1 FT			15-18 FT 3 FT Recovery 0.0 ppm VOC 0.006 Hg mg/m3
	16					
	17					
	18		Same as above and wet w/ trace fine gravel			18-20 FT (18-20 FT) 3 FT Recovery 0.0 ppm VOC 0.007 Hg mg/m3
	19					
	20	▽	Silty CLAY. Orange-brown, soft, wet, trace silt, high plasticity, trace fine gravel			20-25 FT 5 FT Recovery 0.005 Hg mg/m3 0.0 ppm VOC
	21					
	22					

A-42E

ENG FORM 1836-A JUN 67

PROJECT OF 200

HOLE NO A-42E

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE: N/A

Hole No. A-42E

PROJECT: OUTFALL 200

INSTALLATION: Y-12

SHEET 2 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	23					
	24					
	25		Same as above			25-28 FT 3 FT Recovery PID = 0.0 ppm VOC 0.007 Hg mg/m3 (Jerome meter Reading)
	26					
	27					
	28		Refusal @ 28 FT bgs (Bedrock?) NOTE: Hole caved in before we could insert sample tube for water to the bottom. will let set with tube in & check later.			SAMPLED composite at 0920
	29					NOTE: Groundwater encountered at ~ 20 FT bgs. No visible Hg observed through out the boring.
	30					

A-42E

Hole No. 43E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 3 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5FT 3" O.D. Core barrel
2. LOCATION (Coordinates or Station) Headworks Area	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-43E	13. TOTAL NO. OF OVERBURDEN SAMPLES: DISTURBED 51 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER N/A (~20 FT bgs)
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE STARTED 8-9-16 1005 COMPLETED 1048
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 23 FT bgs (Refusal)	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Gravel Subbase (GM-ML)			0-5 FT 4.1 FT recovery 0.009 Hg mg/m³ 0.0 ppm VOCs
	1		1.3'			
			Gravelly SILT, Orange to light brown, Slightly damp, fine to coarse sand (little), trace clay, Mostly SILT, little gravel (fine) ML.			
	2		Same as above except little medium gravel (2.2-2.8')			
			Same as above except trace medium gravel, ML-GM			
	3					
	4					
	5		Same as above except little medium to fine gravel and brick fragments, little clay and trace charcol			5-10 FT 5.0 FT recovery 0.009 Hg mg/m3 0.0 ppm VOCs
	6					
	7					
	8					
	9					
	10					

A-43E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A-43E

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE: N/A

Hole No. 43E

PROJECT: OUTFALL 200

INSTALLATION: Y-12

SHEET 2 OF 3 SHEETS

ELEVATION a	DEPTH b (10)	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Same as above except no brick fragments			10-15 5 FT Recovery 0.0ppm VOCs 0.005 Hg mg/m3
	11					
	12					
	13					
	14					
	15		Same as above except damp			15-20 FT 5 FT Recovery 0.0ppm VOCs 0.009 Hg mg/m3
	16					
	17					
	18		Grades to: Gravelly clay, olive-brown, damp Mostly clay w/ few to little fine to medium gravel and trace silt, soft, (CL)			
	19					
	20	▽	Same as above except wet ~~and~~ RS 8-9-16			20-23 FT 3 FT Recovery 0.0 ppm VOCs 0.005 Hg mg/m3
	21					
	22					

A-43E

ENG FORM 1836-A JUN 67

PROJECT: OF 200

HOLE NO: A-43E

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE N/A	Hole No. A-43E
PROJECT OUTFALL 200	INSTALLATION Y-12	SHEET 3 OF 3 SHEETS

ELEVATION a	DEPTH b 22	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	23		Refusal at 23 FT (Bedrock?)			Sampled composite at 1050
			NOTE: Tubing for GW sampling inserted to TD in boring.			
	24					
	25					NOTE: Groundwater encountered at ~ 20 FT bgs. No visible Mercury observed in soils throughout the boring.

A-43E

Hole No. 44E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" OD Core barrel
2. LOCATION (Coordinates or Station) Pipeline Corridor (A-44E)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-44E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 1/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN unknown	16. DATE HOLE 8-10-16 STARTED (RS) COMPLETED (RS)
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 5 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Gravelly SILT, Dark gray, loose, Damp, mostly Silt, little fine to medium gravel Trace to little fine and medium sand (GM-ML) 0.9'			0-5 FT 2.8 FT Recovery 0.0 ppm VOCs 0.006 Hg mg/m3
	1		SILTY GRAVEL light gray, loose, Slightly Damp, mostly fine to medium gravel, little Silt, little fine to coarse sand (GM) Brick Fragments & Asphalt 1.5'			NOTE: Boring offset 4 FT South due to slope to UEFDC.
	2		Gravelly SILT, Orang-brown Slightly damp, mostly Silt, little ~~to f~~ fine gravel, little fine and medium Sand (ML) Brick Fragments & Asphalt			
	3					
	4					
	5		END BORING @ 5 FT bgs			NOTE: No visible Hg Observed.

A-44E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A-44E

Hole No. 45E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT Outfall 200	10. SIZE AND TYPE OF BIT 5FT 3" O.D. Core Barrel
2. LOCATION (Coordinates or Station) Pipeline Corridor	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-45 E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 1/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-10-16 STARTED (RS) COMPLETED (RS)
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 5 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0–5		Clayey SILT, orange brown slightly dense to medium dense, Mostly SILT, little clay, trace to few fine and medium gravel, damp (ML) Dark grey staining through out test 0.8 FT Petroleum-like odor			0-5 FT 3.6 FT Recovery 0.0 ppm VOCs 0.007 Hg mg/m3 NOTE: Boring offset 4 FT SOUTH DUE TO slope toward creek.
	5		End Boring @ 5 FT bgs			NOTE: No visible Hg Observed.

A-45E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A-45E

Hole No. 46E

DRILLING LOG

DIVISION N/A

INSTALLATION Y-12

SHEET 1 OF 1 SHEETS

1. PROJECT OUTFall 200
2. LOCATION (Coordinates or Station) Pipeline Corridor
3. DRILLING AGENCY M & W Drilling
4. HOLE NO. (As shown on drawing title and file number) A-46E
5. NAME OF DRILLER David Griffis
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN unknown
8. DEPTH DRILLED INTO ROCK N/A
9. TOTAL DEPTH OF HOLE 4 FT bgs (Refusal)
10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core Barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 1 UNDISTURBED
14. TOTAL NUMBER CORE BOXES N/A
15. ELEVATION GROUND WATER NOT Encountered
16. DATE HOLE STARTED 8-10-16 COMPLETED 8-10-16
17. ELEVATION TOP OF HOLE N/A
18. TOTAL CORE RECOVERY FOR BORING N/A %
19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0–4		Gravelly SILT light-gray to orange brown, loose to medium dense, Damp, mostly silt, little fine to medium gravel, trace to little clay. 0.6 to 1.2 FT broken up Rip rap (cobbles) Asphalt chunks present			0-5 FT 3.9 FT Recovery 0.0 ppm VOCs 0.007 Hg mg/m3 Refusal at ~ 2 FT Bgs. Move boring ~1 foot South and Refuse again ~ 4.0 FT Bgs. NOTE: Offset Boring 4 FT South due to Slope toward UEFPC.
	4		Refusal @ 4.0 FT bgs			NOTE: No visible Hg Observed.

A-46E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT OF200

HOLE NO. A-46E

Hole No. 47E

DRILLING LOG

DIVISION	N/A
INSTALLATION	Y-12
SHEET OF SHEETS	
1. PROJECT	OUTFALL 200
2. LOCATION (Coordinates or Station)	Pipeline Corridor
3. DRILLING AGENCY	M&W Drilling
4. HOLE NO. (As shown on drawing title and file number)	A-47E
5. NAME OF DRILLER	David Griffis
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	UNKNOWN
8. DEPTH DRILLED INTO ROCK	N/A
9. TOTAL DEPTH OF HOLE	5 FT bgs
10. SIZE AND TYPE OF BIT	5 FT 3" O.D. Core Barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	N/A
12. MANUFACTURER'S DESIGNATION OF DRILL	6620 DT
13. TOTAL NO. OF OVERBURDEN SAMPLES	DISTURBED 1 / UNDISTURBED
14. TOTAL NUMBER CORE BOXES	N/A
15. ELEVATION GROUND WATER	NOT Encountered
16. DATE HOLE	STARTED 8-10-16 (RS) COMPLETED (RS)
17. ELEVATION TOP OF HOLE	N/A
18. TOTAL CORE RECOVERY FOR BORING	N/A %
19. SIGNATURE OF INSPECTOR	[signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Top Soil 0.6'			0-5 FT 3.3 FT Recovery — ppmv 0.14 Hg mg/M3 0.21 Hg mg/m3 at bottom of core PID not functioning for this reading. Recalibrate PID.
	1		Clayey silt, orange-brown Damp, loose to medium dense. Mostly silt, little to some clay, little coarse sand and fine gravel.			
	2		Dark gray staining and slight odor at 2.9 FT damp to wet, Petroleum-like odor			
	3					
	4					
	5		END Boring @ 5 FT bgs			NOTE: No visible Hg Observed.
	6					
	7					
	8					
	9					
	10					

A-47E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A-47E

Hole No. 48E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core Barrel
2. LOCATION (Coordinates or Station) Pipeline Corridor	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W DRILLING	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-48E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 8 1/1 UNDISTURBED RS 8-0-16
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-10-16 STARTED 0845 COMPLETED 0855
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 5 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR Rachel Stout

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0–5		Gravelly SILT, Light-gray to orange Brown, loose to medium dense, dry to damp, mostly Silt, little fine to medium gravel, trace to little clay. ~~Wood~~ RS 8-0-16 wood fragments at 1.8 FT to end of sample.			0.5 FT 2.2 FT Recover 0.01 Hg mg/m3 PID not Functioning
	5		END BORING @ 5 FT bgs			NOTE: No visible Hg observed.

A-48

Hole No. 49E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core Barrell
2. LOCATION (Coordinates or Station) Pipeline Corridor	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620DT
4. HOLE NO. (As shown on drawing title and file number) A-49E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 1 / UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-9-16 STARTED 1220 COMPLETED 1230
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 4.5 FT	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Gravel sub base (GM-ML) 1.9'			0-5 FT 3.6' Recovery 0.0ppm VOCs 0.007 ~~Hg~~ Mg/m3 NOTE: Boring offset 4 FT North of orig location due to slope toward UEFPC.
	1					
	2		Gravelly SILT, orange-brown to light grey, damp, loose to medium dense, mostly SILT, little fine to medium gravel, trace clay, trace coarse gravel (GM-ML)			
	3					
	4					
			Refusal at 4.5 FT bgs (Rip Rap likely)			NOTE: No visible Hg observed.
	5					
	6					
	7					
	8					
	9					
	10					

A-49E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A-49E

Hole No. 50E

DRILLING LOG	DIVISION N/A	INSTALLATION 7-12	SHEET 1 OF 1 SHEETS

1. PROJECT Outfall 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core barrel
2. LOCATION (Coordinates or Station) Pipeline Corridor	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M&W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-50E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 1/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Not Encountered
7. THICKNESS OF OVERBURDEN unknown	16. DATE HOLE 8-10-16 STARTED COMPLETED
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 5 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0–5		Clayey SILT, orange-brown loose to medium dense, damp mostly silt, little fine to medium gravel trace fine to medium sand, (ML). at 2.8 FT wood fragments and cobble fragments, Dark gray staining, slight odor, Damp to wet @ 2.8 FT			0.5 FT 3.65 FT Recovery ___ ppm VOCs 0.007 Hg mg/m3 PID NOT FUNCTIONING properly.
	5		END BORING @ 5.0 FT			NOTE: No visible Mercury observed.

A-50E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT OF 200 HOLE NO. A-50E

Hole No. S4E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5FT 3" Core Barrell
2. LOCATION (Coordinates or Station) 9720-8 SLAB	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-54E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER DAVID GRIFFIS	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-12-16 STARTED 0814 COMPLETED 0822
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9 TOTAL DEPTH OF HOLE 10 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR Rahul Sh

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt 0.2'			OFF set boring 2' NE due to rebar
			Concrete			2.3 FT Recovery of 0-5 FT bgs
	1					0.1 ppm VOCs
						0.008 Hg mg/m3
	2		2.7'			
			Gravel Subbase			
	3					
			Silty CLAY, orange-brown Medium stiff, damp. Mostly CLAY, little Silt, Trace coarse gravel (CL)			
	4					
	5		same as above			5-10 FT 3.4 FT Recovery
						0.0 ppm
	6					0.012 Hg mg/m3
			cobbles present 6.7-6.9'			
	7					
	8					
	9					NOTE: No visible Mercury Observed.
	10		END BORING at 10 FT bgs			

A-54E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT OF 200 HOLE NO. A-54E

Hole No. 58E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" Core barrel
2. LOCATION (Coordinates or Station) 9720-8 SLAB	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W DRILLING	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-58E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN unknown	16. DATE HOLE 8-12-16 STARTED 0926 COMPLETED RS
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 9 FT bgs (Refusal)	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt			0-5 FT 1.6 FT Recovery 2.0 ppm VOCs 0.01 Hg mg/m³ (3.2 FT Asphalt concrete)
	1		Concrete			
	2					
	3		Gravel sub base			
	4		Gravelly SILT, light gray, damp, loose, mostly SILT some gravel, little fine to coarse sand, (Gm-ML) Black to dark gray staining @ 1.1 to 1.3 FT bgs			
	5		Same as above			5-10 FT 2.9 FT Recovery 0.014 Hg mg/m³ 0.0 ppm VOCs
	6		SILTY CLAY, soft, damp, mostly clay, little to some silt (CL), trace fine gravel			
	7					
	8					
	9		Refusal @ 9 FT			NOTE: No visible Mercury observed.
	10					

A-58E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A58E

Hole No. 60E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" Core barrel (3" O.D)
2. LOCATION (Coordinates or Station) 9720-8 SLAB	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-60E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER RS 8-11-16 ~~N/A~~ NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-11-16 STARTED 1400 COMPLETED 1408
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt 0.8'			0-5 FT (3.5' Asphalt/concrete) No recovery Petroleum-like odor During 1st Five feet (5 FT) but ~~got~~ not RSB 8-11-16 readings w/ PID. Boring off set 3 ft NE (Rebar)
	1		Concrete 2.7'			
	2					
	3		No DATA (No recovery)			
	4					
	5		Silty CLAY, orange-brown, Damp soft to medium stiff, mostly CLAY, Little Silt, trace to little gravel (fine) trace coarse gravel (CL)			5-10 FT 4.6 FT Recovery 0.0 ppmv 0.007 Hg mg/m3 No odors during 5-10 FT drilling
	6					
	7					
	8					NOTE: Boring location off-set 2x due to rebar. No visible Mercury observed.
	9					
	10		END Boring @ 10 FT bgs			

A-60E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. 60E

Hole No. 61E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" Core Barrel
2. LOCATION (Coordinates or Station) 9720-8 SLAB	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-61E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-1-14 STARTED 1300 COMPLETED 1315
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 10 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt 0.7'			0-2 FT Concrete/Asphalt
	1		Concrete 2.0 FT			
	2		Gravel Sub base 3.5 FT			2-5 FT 2.6 FT Recovery 0.0 ppm VOCs 0.008 Hg mg/m3
	3					
	4		Silty CLAY, orange-brown to olive gray, damp, loose to stiff, mostly clay, little ~~clay~~ silt, trace to little fine to coarse gravel (CL)			
	5		Same as above except orange brown and mottled w/ black (dark grey) lenses			5-10 FT 3.9 FT Recovery 0.0 ppm VOCs 0.008 Hg mg/m3
	6					
	7					
	8		Same as above except soft			
	9		Same as above except olive brown and medium stiff			NOTE: No visible Hg observed.
	10		END BORING			

A-61E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT OF200 HOLE NO. A-61E

Hole No. 62E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core barrel
2. LOCATION (Coordinates or Station) 9720-8 SLAB	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY MEW DRILLING	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-62E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-11-16 STARTED 1213 COMPLETED 1219
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 6 FT bgs (Refusal)	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt 0.5			0-5 FT 2.2 FT Recovery 0.0 ppm VOC 0.008 Hg mg/m3
	1		concrete 2.2'			
	2		Gravel Sub base 3.8'			
	3		Silty clay, Olive-grey, damp, soft to stiff, mostly clay little silt, trace fine gravel, gray clay lenses thru-out (CL) medium plasticity RS 8-11-16			
	4		Same as above except orange-brown and dry,			
	5		Refusal @ 6.0 FT bgs			NOTE: No visible Hg Observed.
	6					
	7					
	8					
	9					
	10					

A-62E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT OF 200 HOLE NO. A-62E

Hole No. 63 E

DRILLING LOG	DIVISION N/A	INSTALLATION 7-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core Barrel
2. LOCATION (Coordinates or Station) 9720-8 S/AB	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M & W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-63 E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN unknown	16. DATE HOLE 8-10 STARTED 1315 COMPLETED 1326
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 6 FT bgs (Refusal)	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt			
	1		Concrete			
	2		Gravel sub'base, Gravelly SILT, Light gray, damp loose, mostly SILT, some fine to coarse gravel (GM-ML)			2-5 FT 1.6 FT Recovery 0.2 ppm VOC 0.004 Hg mg/m3
	3					
	4					
	5		Same as above			5-10 FT 2.1 FT Recovery 0.0 ppm VOCs 0.006 Hg mg/m3
			Clayey SILT, Olive-brown damp mostly SILT, some clay, damp, medium plasticity (ML)			
	6		Refusal at 6.0 FT bgs (Gravel, Rip Rap present)			NOTE: Rip Rap in drive shoe. Also, No visible Hg Observed
	7					
	8					
	9					
	10					

A-63

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO. A-63E

Hole No. 64E

DRILLING LOG

DIVISION	N/A
INSTALLATION	Y-12
SHEET	1 OF 1 SHEETS
1. PROJECT	OUTFALL 200
2. LOCATION (Coordinates or Station)	9720-8, A-64E
3. DRILLING AGENCY	M&W Drilling
4. HOLE NO. (As shown on drawing title and file number)	A-64E
5. NAME OF DRILLER	David Griffis
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	UNKNOWN
8. DEPTH DRILLED INTO ROCK	N/A
9. TOTAL DEPTH OF HOLE	RS 8-10-16 ~~N/A~~ 7 FT (Refusal)
10. SIZE AND TYPE OF BIT	5 FT 3" O.D. Core Barrel
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	N/A
12. MANUFACTURER'S DESIGNATION OF DRILL	6620 DT
13. TOTAL NO. OF OVERBURDEN SAMPLES	DISTURBED 2 / UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES	N/A RS 8-10-16
15. ELEVATION GROUND WATER	~~N/A~~ NOT Encountered
16. DATE HOLE	8-10-16 STARTED 1415 COMPLETED 1422
17. ELEVATION TOP OF HOLE	N/A
18. TOTAL CORE RECOVERY FOR BORING	N/A %
19. SIGNATURE OF INSPECTOR	[signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
		RS 8-10-16	0.9 ~~0.8~~ FT Asphalt ~~0.8~~ FT Concrete 0.7 RS 8-10-16			1.6 FT Asphalt & concrete. NOTE: offset boring 3FT NW to avoid likely footer.
	1		1.6 FT			
			disregard line RS 8-10-16			
	2		Gravel subbase. Gravelly SILT, light gray, damp loose to medium dense, mostly SILT, some fine to coarse gravel (GM-ML)			2-5 FT 1.9 FT Recovery 0.2 ppm VOCs 0.006 Hg mg/M3
	3					
	4					
	5		same as above w/ brick fragments 5.3			5-7 FT 2 FT Recovery 0.8 ppm VOCS 0.007 Hg mg/M3
	6		SILTY CLAY, orange-brown, damp, medium dense, mostly clay, little silt, trace fine gravel, low plasticity (CL), trace coarse gravel, mottled			
	7		Refusal @ 7.0 FT bgs			NOTE: No visible Mercury observed.
	8					
	9					
	10					

A-64E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT OF 200 HOLE NO A-64E

Hole No. 67E

DRILLING LOG	DIVISION N/A	INSTALLATION 4-12	SHEET OF SHEETS

1. PROJECT Outfall 200	10. SIZE AND TYPE OF BIT Star bit & 5' Core barrel (3")
2. LOCATION (Coordinates or Station) 970-8 SLAB	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M&W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-67E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN UNKNOWN	16. DATE HOLE 8-1-16 STARTED 0959 COMPLETED 1007
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 10 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt 0.5'			0-5 FT 2.3 FT Recovery (100%) 0.0 ppm VOCs 0.008 Hg Mg/m3
	1		Concrete			
	2		2.7'			
	3		Clayey SILT, Olive-gray, Damp loose to medium stiff, mostly silt, little clay, trace medium gravel (SC), trace cobble			
	4					
	5		Same as above except orange-brown and stiff and no cobbles, dry			5-10 FT 5.0 FT Recovery 0.0 ppm VOCs 0.003 Hg Mg/m3
	6					
	7					
	8					
	9					NOTE: No visible Hg observed.
	10		End Boring 10 FT bgs			

A-67E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO. A-67E

Hole No. 69E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 FT 3" O.D. Core Barrel
2. LOCATION (Coordinates or Station) RS 8-11-16 ~~OUTFALL 200~~ 9720-8	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M&W DRILLING ~~9720-8 SLAB~~ RS 8-11-16	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-69E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER DAVID GRIFFIS	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NOT Encountered
7. THICKNESS OF OVERBURDEN Unknown	16. DATE HOLE 8-11-16 STARTED 0850 COMPLETED 0900
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 10 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR Rahul Shah

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt 0.5'			0-5 2.2 FT ~~2.2 FT~~ Recovery (~~44%~~ 100%) RS 8-11-16 RS 8-11-16 0.2 ppmv 0.005 Hg mg/m3 (2.8 FT Asphalt & concrete)
	1		concrete			
	2		RS 8-11-16 ~~COA 23~~			
			Gravel subbase			
	3		Clayey SILT, olive-gray, medium stiff, damp, mostly silt, little clay, trace fine gravel (SC)			
	4					
	5		Same as above except soft and wet (Drilled poured water downhole to keep dust down)			5-10 FT 2.9 FT Recover 0.0 ppm VOCs 0.003 Hg mg/m3
	6					
	7					
	8					
	9					NOTE: No visible Hg Observed.
	10		End boring at 10 FT bgs			

A-69E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO. A-69E

Hole No. 70E

DRILLING LOG	DIVISION N/A	INSTALLATION Y-12	SHEET 1 OF 1 SHEETS

1. PROJECT OUTFALL 200	10. SIZE AND TYPE OF BIT 5 F 3" O.D. Core Barrel
2. LOCATION (Coordinates or Station) 9720-8 SLAB	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) N/A
3. DRILLING AGENCY M&W Drilling	12. MANUFACTURER'S DESIGNATION OF DRILL 6620 DT
4. HOLE NO. (As shown on drawing title and file number) A-70E	13. TOTAL NO. OF OVERBURDEN SAMPLES DISTURBED 2/1 UNDISTURBED
5. NAME OF DRILLER David Griffis	14. TOTAL NUMBER CORE BOXES N/A
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Not encountered
7. THICKNESS OF OVERBURDEN Unknown	16. DATE HOLE 8-1-16 STARTED 0824 COMPLETED 0846
8. DEPTH DRILLED INTO ROCK N/A	17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 10 FT bgs	18. TOTAL CORE RECOVERY FOR BORING N/A %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
			Asphalt 0.5			0-5 FT RS 8-10-15 2.13 FT Recovery 0.2 ppm VOCs 0.0 Hg mg/m3
	1		Concrete 1.4			(1.9 FT Asphalt & Concrete)
			Gravel subbase			
	2		RS 8-11-16 ~~Core~~ 2.9			
	3	RS 8-11-16	Silty CLAY. Orange-brown, Damp, medium ~~dense~~ stiff to ~~dense~~ stiff, mostly clay, little silt, trace fine gravel trace cobble (CL) RS 8-11-16			
	4		same as above except olive-brown w/ petroleum-type odor			Petroleum-like odor RS 8-11-16 No PID Hits
	5		same as above except no odor & orange-brown w/ no cobbles			5-10 FT 4.2 FT Recovery 0.0 ppm VOCs 0.007 Hg mg/m3
	6					
	7					
	8					
	9					NOTE: No visible Hg Observed.
	10		END Boring at 10 FT bgs			

A-70E

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO. A 70 E

APPENDIX E
DATA VALIDATION REPORTS

APPENDIX F
LEVEL II ANALYTICAL LABORATORY DATA REPORTS

APPENDIX G
LEVEL IV ANALYTICAL LABORATORY DATA REPORTS