## GENERAL COMMENTS:

Comment #1: The Mound Soil Screening Facility results show Pu-238 and Th-232 in surface soils, subsurface soils, and sediment samples that exceed DOE's ALARA policy limit of 25 pCi/g and 2 pCi/g, respectively. There was poor correlation between these results and analytical data from the off-site laboratory. Additional detections of interest include a TCE detection in monitoring well W411 above the MCL, and elevated levels of PAHs in sediment samples along the southern-most ephemeral stream which seems to originate near Benner Road.

Response #1: Concur, the detections of interest (VOCs and SVOCs) are discussed in Section 3.2 and 3.3 of this report. These, along with other chemical contaminants and radionuclides are discussed in the OU5 RIR.

**SPECIFIC COMMENTS:**

Comment #1: Volume I, Section 2.1.2.1, SOP 1.5:
The use of the statement "in most cases" was discussed with Mound previously as it appeared in other field reports. We realize that this particular report was likely written prior to our request for clarification of how data quality might be affected. Other more recent reports have included an explanation of how (or if) data quality might be affected. Please continue this practice. (Comment only.)

Response #1: Comment noted.

Comment #2: Volume I, Section 2.1.3.1, Page 2-11, Paragraph 2:
The well cited as W398 is most likely meant to be soil boring B398. Please make a revision to the text.

Response #2: The well cited should be soil boring B398 in the text.

Comment #3: Volume I, Section 2.1.2.4, Page 2-32, Table II.10:
An elevated pH of 8.5 was detected in monitoring well W400 (Figure 2). The elevated pH of this well screened in bedrock does not appear to be due to background conditions. The other wells screened in the BVA and the two screened in bedrock have more neutral pH readings (refer to Table II.10). Please comment.

Response #3: The elevated pH of 8.5 in monitoring well W400 appears to be a correct reading and not a result of inadequate purging. At the beginning of purging at W400, the initial pH reading was 7.36. As purging continued, the pH rose and stabilized around 8.5 with three consecutive readings prior to sampling.

After reviewing the logbook, it is apparent that all purging and sampling procedures were followed correctly. The pH meter was calibrated before and during purging and sampling. There were no conditions which may have affected pH such as organic contamination or high turbidity of the water sample.

Comment #4: Volume I, Section 1.2, Page 1-4, Paragraph 2:
The report mentions the presence of fifteen fracture seeps in the east central area of the property. These have been cited for sampling in this report, but no results are shown. In order to achieve the objectives of this report, these seeps should be included in the Extended Phase sampling if they have not been included in previous Phase I work. In addition, a map with the location of these seeps should be included in the report.

Response #4: Eight of the 15 seeps that were determined representative of the New Property were sampled in March 1994. These results were reported in the OU5 New Property Phase 1 Field Report (FINAL) along with a locator map.

Comment #5: Volume I, Section 2.1.3.2, Page 2-24, Groundwater section:
No mention is made of an upgradient well used for background comparisons. Will this be accomplished in the RI?

Response #5: Background well locations for comparisons were selected for the OU5 RIR.

Comment #6: Volume I, Section 2.1.3.2, Page 2-25, Tables II.7 through II.9:
Exceedingly high concentrations of several metals are present in groundwater samples taken from both permanent monitoring wells and boreholes. These elevated levels appear characteristic of turbid groundwater samples. Because elevated levels are found in reported ground water samples taken from both borings with temporary well screens and permanent monitoring wells, the source of the turbidity may be clay particles. These particles may be the result of improper well development or improper sampling procedures.

Comparison of elevated concentrations of metals with relatively lower concentrations of dissolved solids (Table II.7, Page 2-27) indicates that preserved samples of turbid groundwater were analyzed for metals. Analyses of unfiltered turbid water may not be representative of actual groundwater conditions. Therefore, the results submitted for metals in this report may not be characteristic of the groundwater chemistry of the New Property.

Response #6: Some results submitted for total metals may be elevated due to turbidity of the groundwater.

The two samples showing the highest concentrations of most total metals were collected from soil borings B401 and B408. After reviewing the logbooks, it is apparent that proper sampling procedures were followed when collecting these samples. However, due to the nature of sampling from a borehole, the samples are likely to have higher amounts of suspended solids, resulting in higher metals concentrations in unfiltered samples.

Samples collected from wells (W399 and W411) also showed elevated concentrations of some metals due to turbid samples. These wells were low-producing wells and very difficult to develop. After many attempts to develop each well according to the SOP, the decision was made to go ahead and sample each well even though the required volume of water was not able to be purged prior to sampling.

Wells W400 and W402 were purged and sampled according to the required procedures. The water samples at the time of collection were recorded in the field logbook as clear.

Based on this information, the data for total metals are representative, though slightly elevated, for the New Property.

Comment #7: Volume I, Section 3.2., Page 3-2, Groundwater Sampling:
The summary and other groundwater sections in this report have focused on radiological parameters. Will other parameters be discussed and compared to background values at the RI stage? In addition, we would like to see mention of the elevated levels of TCE, metals and VOC's found. There is no need to make any conclusions here; just mention of the findings is appropriate.

Response #7: For groundwater, chemical and radiological parameters are discussed and compared to background values in the OU5 RIR. The detection of VOCs (includes TCE) and metals is, however, already mentioned in Section 3.2.

Environmental Restoration Program

# OPERABLE UNIT 5
# NEW PROPERTY EXTENDED PHASE
# FIELD REPORT

**MOUND PLANT**
**MIAMISBURG, OHIO**

**VOLUME I - TEXT**

**July 1995**

**Final (Revision 0)**

**U.S. Department of Energy**
**Ohio Field Office**

EG&G Mound Applied Technologies

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# ACRONYMS

| | |
|---|---|
| BGS | below ground surface |
| BVA | Buried Valley Aquifer |
| CEC | cation exchange capacity |
| CPM | counts per minute |
| DOE | U.S. Department of Energy |
| DQA | data quality assessment |
| DQO | data quality objective |
| ER | Environmental Restoration |
| FIDLER | field instrument for the detection of low-energy radiation |
| FSP | Field Sampling Plan |
| IDM | investigative derived material |
| K-40 | potassium-40 |
| mg/kg | milligrams per kilogram |
| mg/L | milligrams per liter |
| MSL | mean sea level |
| o.d. | outer diameter |
| OEPA | Ohio Environmental Protection Agency |
| OU | operable unit |
| PAH | polycyclic aromatic hydrocarbon |
| pCi/L | picocuries per liter |
| PCB | polychlorinated biphenyl |
| PCE | tetrachloroethene |
| pCi/g | picocuries per gram |
| PPE | personal protective equipment |
| Pu-238 | plutonium-238 |
| Pu-239/240 | plutonium-239 |
| QC | quality control |
| QAPjP | Quality Assurance Project Plan |
| Ra-226 | radium-226 |
| RI/FS | Remedial Investigation/Feasibility Study |
| RSI | Regional Soil Investigation |
| SAIC | Science Applications International Corporation |
| SOP | standard operating procedure |
| Sr-90 | strontium-90 |
| SVOC | semi-volatile organic compound |
| TCE | trichloroethene |
| 1,1,1-TCE | 1,1,1-trichloroethane |
| Th-228 | thorium-228 |
| Th-230 | thorium-230 |
| Th-232 | thorium-232 |
| $\mu$g/kg | micrograms per kilogram |
| $\mu$g/L | micrograms per liter |
| U-234 | uranium-234 |
| U-235 | uranium-235 |
| U-238 | uranium-238 |
| VOC | volatile organic compound |

## ACKNOWLEDGEMENTS

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# 1. INTRODUCTION

The New Property Extended Phase Field Report supports the U.S. Department of Energy (DOE) and Mound strategy to release the majority of the New Property for non-DOE use, and/or release of DOE ownership, on an expedited basis. The purposes of this Field Report are (1) to present the results of the radiological and chemical sampling conducted as part of a larger Operable Unit (OU) 5 New Property Remedial Investigation, and (2) to further define the presence of any contaminants within the boundaries of the New Property.

The following sections briefly describe the scope of the New Property Extended Phase Field Report (denoted "Field Report"), provide a site description, and review the site land use history. The closing section presents the organization of the remainder of the report.

## 1.1. SCOPE

The Field Report presents the results of field work performed and data collected at the New Property from June through August, 1994. This work was performed in accordance with the OU5 South Property Remedial Investigation/Feasibility Study (RI/FS) Work Plan and the OU5 Work Plan Addendum (Revision 1) (DOE 1993a). The Field Report provides a presentation of findings, with available data from previous studies summarized and integrated as appropriate.

## 1.2. SITE DESCRIPTION

The New Property is located immediately south of the OU5 Operational Area (see Figure 1.1). Its borders are 1/4 mile west of Mound Road and less than 1/4 mile east of Cincinnati-Dayton Pike with Benner Road to the south. The Spoils Disposal Area, located in the northwest corner of this area, is excluded from the New Property.

The New Property is topographically characterized by relatively steep hillsides in the north and east (maximum surface elevation 880 feet mean sea level (MSL)) and flat lying lowlands in the southwest corner of the property (minimum surface elevation 710 feet MSL) (see Figure 1.2). The topographic highs are expressions of thinly interbedded Ordovician limestone and shale bedrock. A veneer of unconsolidated

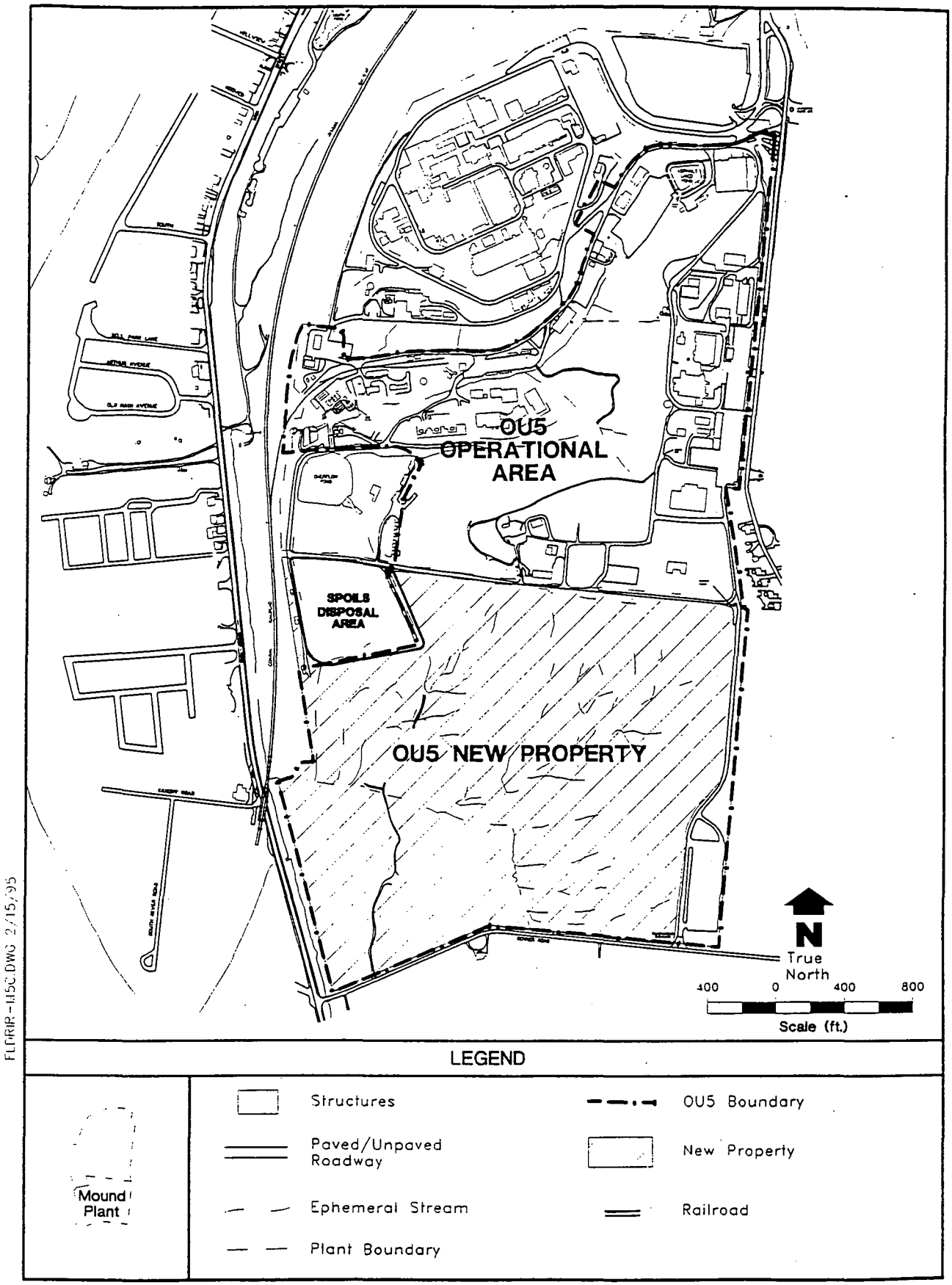


**Figure 1.1. Location of OU5 New Property**

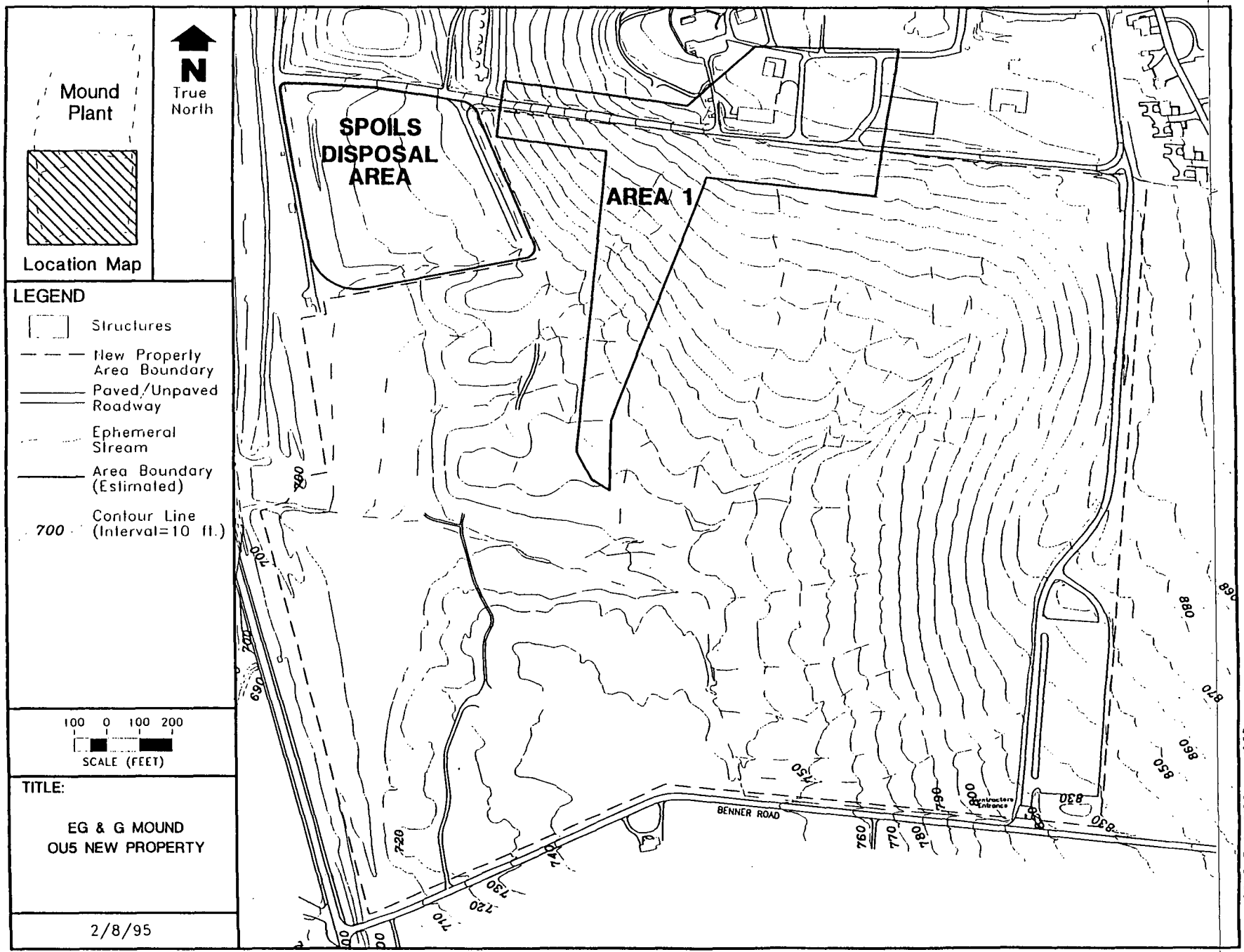


**Figure 1.2. OU5 New Property Topography**

Quaternary till and outwash deposits covers the New Property and ranges in thickness from about one foot at the northeast corner to greater than 195 feet on the western edge of the New Property.

A portion of the Buried Valley Aquifer (BVA) underlies the western edge of the New Property. The topography in this area may allow local ponding of water and sediment. Most of the runoff from the New Property collects in the ephemeral stream that discharges off-plant to the southwest. There are 15 identified seeps in the east central area of the property which serve as discharge points. The degree of interconnection between the bedrock flow system and the BVA has not been determined.

The land, which was historically used for farming, is undeveloped and lies fallow. Vegetation consists of grasses, small trees, and brush. The New Property is accessible by the Mound contractor's entrance road along the eastern boundary of the property and by an undeveloped dirt road in the southwest portion of the property. Surface features include a contractors' parking lot, paved access road to the Mound Plant, above-ground electrical transmission lines, and a small area (approximately 20' x 20') containing some tires and metal debris. This debris was found near the north end of the undeveloped dirt road on its east side, immediately southeast of an ephemeral stream.

## 1.3. SITE HISTORY

The New Property was purchased by the U.S. Government on August 26, 1981 from previous owners. A portion of the New Property, approximately 80 acres, was purchased from the Penrod estate. The estate property contained a two-story brick house, a barn, a frame tool shed, a costume shop, and an outhouse. At the time of purchase, the Penrod estate was given the option to remove any of the structures from the property; only the costume shop was removed. The other structures became the property of the U.S. Government, and were subsequently either moved or razed.

Aerial photos dated 1938, 1949, 1968, and 1980 indicate that the property was used for farming, and, except for the Spoils Disposal Area (Figure 1.1), showed no signs of construction or excavation activities. A preliminary search of Mound Environmental Restoration (ER) program documents indicated that historical and cultural studies have been completed and approved by the Ohio Historical Society, Ohio Historic Preservation Office. Other studies performed to date include assessments of wetlands, threatened and endangered species, biological resources, mineral resources, and demographics.

A Phase 1 reconnaissance investigation was conducted from February to March, 1994 to characterize areas of contamination, if any, that may require further investigation programs. That investigation in the New Property consisted of (1) a soil gas survey to screen for volatile and semi-volatile organic compounds in surface soils; (2) a multi-channel analyzer (or field instrument for the detection of low-energy radiation [FIDLER]) survey to screen for radiological contamination in surface soils; (3) radiological screening of surface soils for plutonium-238 and thorium-232; and (4) sampling of seep water to screen for organic, inorganic, and radiological contamination. The Extended Phase activity augmented the Phase 1 program with surface and subsurface soil sampling, groundwater sampling from newly installed monitoring wells, sediment sampling in seeps, and comparison of these results with Mound Soil Screening Facility and Regional Soils Investigation (RSI) data.

## 1.4. REPORT ORGANIZATION

The remainder of this report presents the results of the New Property Extended Phase investigation. Section 2 provides a discussion of the field activities, the generated data, and a comparison of this data to previous findings. Section 3 presents the summary of the results of the Extended Phase sampling program. The references are presented in Section 4. Appendices A through F provide the field logbooks, the survey maps, the boring and monitoring well logs, the radiological soil screening data, the laboratory analytical data, and the data quality assessment report.

# 2. FIELD ACTIVITIES AND DATA PRESENTATION

## 2.1. SOIL BORINGS AND MONITORING WELLS

Thirteen boreholes were drilled on the New Property in June 1994 as part of the Extended Phase investigation. Soil samples were collected for radiological, chemical and geotechnical parameter analysis, per the OU5 Quality Assurance Project Plan (QAPjP) (DOE 1993b). Monitoring wells were installed in four of the boreholes to monitor groundwater quality. Groundwater samples were collected for radiological and chemical analysis, per the OU5 QAPjP.

Borehole and monitoring well locations, presented in Figure 2.1, were located by a registered land surveyor (see Appendix B for survey maps). Three boreholes (B398, B403, B404) and one well W411 are located near the boundary between the New Property and the operational area of the Mound Plant to detect possible contaminant migration in soil and groundwater southward from the operational area. Well W399 is located along the eastern boundary of the New Property to monitor groundwater quality potentially migrating on-site from the vicinity of Mound Road. Well W402 is located south of the Spoils Disposal Area at the northwest corner of the property to detect possible contamination from that site. Well W400, located downgradient of Area 1, was installed to monitor for potential soil and groundwater contamination from Area 1. The six remaining boreholes (B401, B405, B406, B407, B408, and B409) are distributed around the site to provide radiological, chemical, and geologic/geotechnical data over the balance of the New Property.

### 2.1.1. Field Work Performed and Procedures

The field activities are described in the following subsections.

#### 2.1.1.1. Decontamination

All reusable sampling equipment was decontaminated at the beginning of the project and after each use per Standard Operating Procedure (SOP) 1.6 *General Equipment Decontamination*. Decontaminated equipment such as split-spoon samplers and stainless steel bowls and spoons were wrapped in aluminum foil and stored until use. Each drill rig, auger sections and rods, casing sections, and bailers were steam cleaned after each boring at a temporary decontamination pad located in the Spoils Disposal Area. Liquids

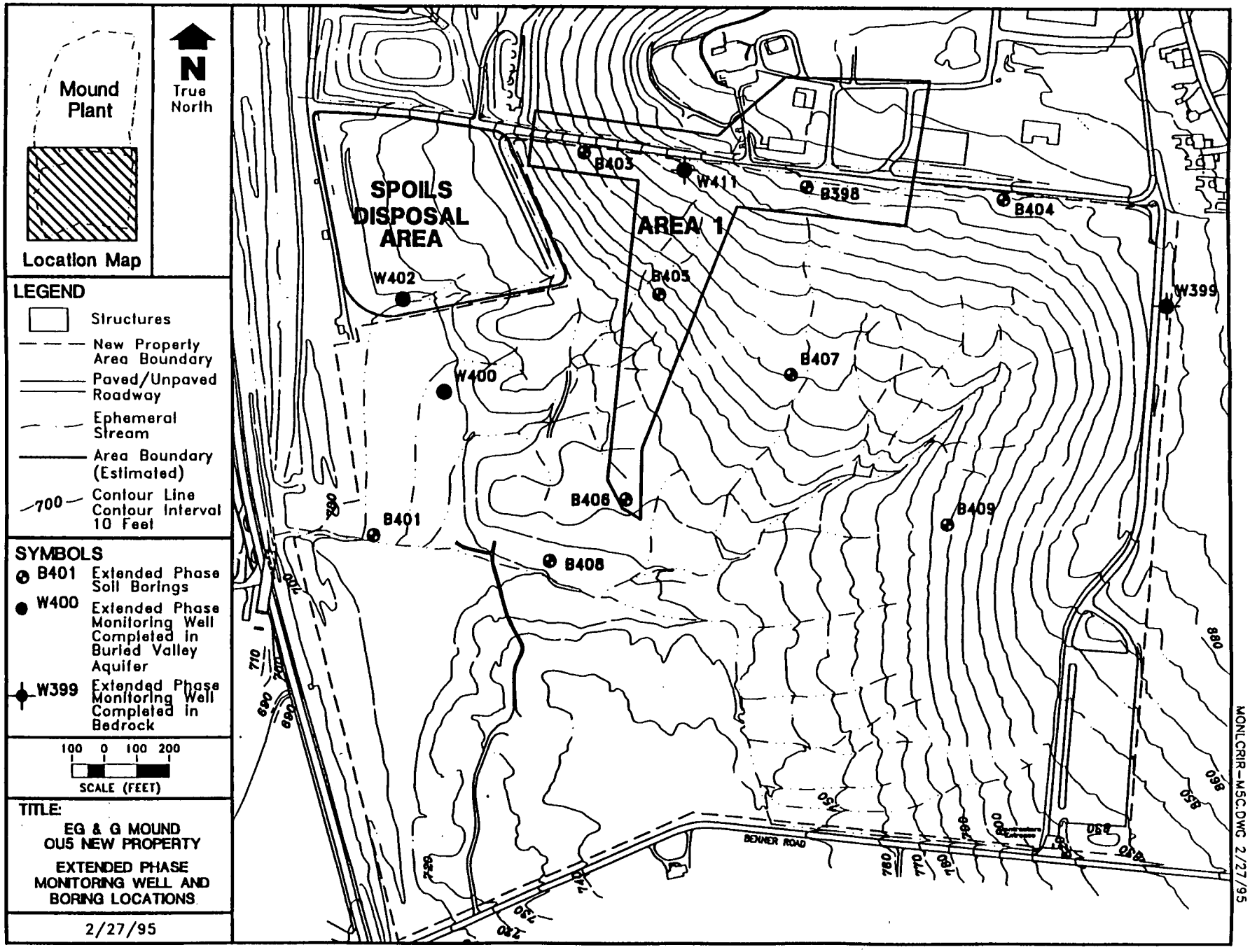


**Figure 2.1. Monitoring Well and Boring Locations in the New Property**

were contained by a plastic liner and were transferred to 55-gallon polyethylene drums using a sump pump. Solids collected from the decontamination process were transferred to 55-gallon steel drums.

#### 2.1.1.2. Site Preparation

Prior to beginning drilling activity at a borehole location, the location was cleared for underground utilities and overhead clearances. Once cleared, an excavation permit was issued. An exclusion zone was set up using construction barrels, polypropylene fencing, and caution tape, maintaining a 50-foot clearance from the borehole when possible. Clearing of small trees and shrubbery was performed using a bulldozer at several borehole locations to allow access for the drill rig. Excavation and burn permits were issued by Mound for this activity.

#### 2.1.1.3. Borehole Drilling and Abandonment

Borehole advancement and abandonment was completed in accordance with SOP 4.1 *Soil Borings*. Two types of drill rigs were used to complete the borings in the New Property, a cable-tool drill rig and a hollow-stem auger drill rig. Boreholes/wells completed using the cable-tool drill rig included W399, W400, W402, W411, and B398. B398 was intended to be a well but because no water was encountered during drilling, the borehole was abandoned. The hollow-stem auger drill rig was used to complete the remaining boreholes.

The hollow-stem drill rig used eight-inch augers to advance the boreholes to the desired depth. Using the cable-tool drill rig, the borehole was advanced by forcing drive casing through unconsolidated material with the hammering action produced by the cable-tool drill rig. Periodically, water was added to the borehole to suspend the cuttings, which were then removed using a bailer. Boreholes were eight inches in diameter with minor exceptions (see Field Variance Report, Section 2.1.2.1).

Continuous core samples were collected using split-spoon samplers from the surface to a maximum of 30 feet or until bedrock was encountered. Core samples were screened with field instrumentation to detect potential organic and radiological contamination. No contaminants were detected. Core samples were logged per SOP 5.1 *Soil and Rock Borehole Logging and Sampling,* and placed in 55-gallon steel drums. Borehole logs are presented in Appendix C.

When sampling was completed at each borehole (excluding the monitoring wells), the hole was filled with grout to the surface and allowed to dry for 24 hours. If any settling occurred, the borehole was leveled off with more grout. Borehole drilling and abandonment activities are recorded in the soil boring and monitoring well logbooks (see Appendices A.1 and A.2, respectively).

#### 2.1.1.4. Monitoring Well Installation and Development

Monitoring wells were installed according to SOP 4.3 *Monitoring Well Installation*. A stainless steel screen and riser were used in the installation. The filter pack consisted of Global #5 quartz sand. The annular space was filled with a cement-bentonite grout to the ground surface. A steel protective casing with a locking cap was placed over top of each well to a depth of approximately 2.5 feet. A square concrete pad was constructed around the protective casing to complete the installation. Well logs are presented in Appendix C.

Monitoring wells were developed using a submersible pump according to SOP 4.4 *Monitoring Well Development*. Installation and development activities are recorded in the Monitoring Well Logbooks (see Appendix A.2).

#### 2.1.1.5. Sampling

Surface and subsurface soil samples, groundwater samples (when encountered), and geotechnical samples were collected from the New Property soil borings. Pertinent sampling information was recorded in the Soil Boring Logbooks (Appendix A.1) according to SOP 4.1 *Soil Borings* and SOP 5.1 *Soil and Rock Borehole Logging and Sampling*. After collection, samples were packaged and shipped to an approved OU9 analytical laboratory per SOP 1.3 *Sample Control and Documentation*, SOP 1.4 *Sample Containers and Preservation*, and SOP 1.5 *Guide to the Handling, Packaging, and Shipping of Samples*. Sample management information was recorded in the Sample Manager Logbook (Appendix A.3).

**Soil Samples**

Two soil samples were collected from each borehole: one from the surface and one either at the depth of the water table, or at the soil/bedrock interface if groundwater was not encountered above bedrock.

Surface soil samples were collected per SOP 5.2 *Soil Sampling with a Spade and Scoop*. The top layer of sod was removed and the area was monitored for combustibles and volatile emissions per SOP 6.1 *Health and Safety Monitoring of Combustible Gas Levels*, SOP 6.2 *Health and Safety Monitoring of Organic Vapors with a Photoionization Detector*, and SOP 6.3 *Health and Safety Monitoring of Organic Vapors with a Flame Ionization Detector*. An effort was made to exclude organic matter and gravel from the sample. All samples were collected and placed in a cooler with blue ice until final labeling and shipping were completed.

Subsurface soil samples were collected using three-inch diameter split-spoon samplers either at the depth of the water table or at the soil/bedrock interface. After onsite monitoring for combustibles and volatile emissions, all samples were collected and placed in a cooler with blue ice until final labeling and shipping were completed.

At several borehole locations, the hollow-stem drill rig was relocated a few feet from the original boring location and a second boring was drilled to a specified depth (generally just above bedrock) in order to collect the subsurface sample. This was sometimes necessary when the depth of the bedrock was unknown. During drilling in the first boring, the subsurface sampling interval was exceeded preventing the collection of the sample. Drilling to just above bedrock in the second boring, based on bedrock depth in the first boring, allowed for collection of the subsurface sample at the proper depth.

Soil samples at the surface and subsurface sampling depths were collected for analysis of plutonium-238 (Pu-238) and thorium-232 (Th-232) at the Mound Soil Screening Facility. These results are presented in their entirety in Appendix D.

**Groundwater Samples**

Groundwater samples were collected per SOP 2.4 *Sampling Monitoring Wells with a Bucket-Type Bailer*, SOP 2.8 *Sampling for Volatile Organics*, and the *SOP for Groundwater Sampling Using Drill-Stem Techniques*. Groundwater was encountered in sufficient quantity to collect grab samples from borings B401 and B408.

When it was determined that a saturated zone had been encountered, borehole advancement and sampling continued until the bottom of the borehole was a minimum of three feet below the groundwater surface.

This provided a large enough sump area for the bailer. A temporary well was installed by lowering a stainless steel well screen and riser pipe into the borehole and using a hollow-stem auger string as casing. A bailer was lowered into the temporary well to purge and sample the groundwater.

Before sampling, the well was purged following SOP 2.1 *Presample Purging of Wells,* to remove suspended solids caused by the drilling process. Temperature, pH, and conductivity were monitored for stability per SOP 2.2 *Field Measurements on Ground and Surface Water Samples.* Water level was measured to determine the stable elevation to be used in the final purge volume calculation. Sampling began after three well volumes were purged and parameter stability was achieved. Groundwater samples were packaged and shipped to an OU9-QAPjP approved analytical laboratory according to SOPs 1.3, 1.4, and 1.5. Immediately after sampling, a final measurement of well water parameters was taken.

**Geotechnical Samples**

Geotechnical samples were collected from each distinct soil horizon encountered during drilling. Samples were collected using a three-inch outer diameter (o.d.), 24-inch long, stainless steel thin-walled sampler (Shelby tube) and by filling a 5-gallon plastic bucket with cuttings. Soil from the Shelby tube was used for analysis of in-situ hydraulic conductivity. Soil contained in the bucket was used for analysis of moisture content, particle size distribution, specific gravity, cation exchange capacity (CEC), and pH.

### 2.1.1.6. Investigative Derived Material

The investigative derived material (IDM) produced during this effort was handled according to SOP 1.15 *Guide to Waste Management.* The IDM consisted of soil cuttings from drilling, personal protective equipment (PPE) and other solid waste, purge water from groundwater sampling, decontamination rinse water and solids, and decontamination solutions.

Excess soil cuttings produced during drilling were temporarily placed into 55-gallon steel drums. Once soil was placed in a drum, the drum was labeled. Partially filled drums were transported to the next borehole to be filled, and the appropriate information was added to the label. Since the borings were located in an unpaved area and did not exhibit contamination as identified by field screening, the cuttings were spread on the surface around each borehole once drilling and well installation activities were

completed. This procedure was conducted per direction by EG&G Mound and approved by Ohio Environmental Protection Agency (OEPA).

All of the solid waste (non-soil) generated during the soil boring program were contained in clear plastic garbage bags, including used PPE, plastic sheeting, aluminum foil, and other refuse. The waste was then screened for radiological and organic contamination before disposal into a solid waste dumpster.

Purge water from the groundwater sampling was contained in 55-gallon polyethylene drums. Once water was placed in a drum, the drum was labeled. Partially filled drums were used for the next groundwater sampling event and the appropriate information was added to the label. Once filled, the drums were sealed and staged west of Building H.

Decontamination rinse water was transferred to 55-gallon polyethylene drums, labeled, and staged west of Building H. Solids from the decontamination pad were transferred to 55-gallon steel drums, labeled and staged at Building 19.

### 2.1.2. Quality Assurance Summary Report

The field and laboratory analysis variances are summarized in the following subsections.

#### 2.1.2.1. Field Variance Report

Except for a few minor variances, all sampling activities were conducted in accordance with the OU5 Work Plan, the OU5 Field Sampling Plan (FSP) (DOE 1993b), and the OU5 QAPjP. A few minor variances from the FSP and applicable SOPs occurred during this field effort because field conditions and unforeseen contingencies caused deviations from the established procedures. Most of them were procedural modifications that simplified certain tasks such as sample management and water sampling. An account of these variances is listed below.

OU5 FSP

Two minor variances from the OU5 FSP occurred. The first variance was that the subsurface soil samples were not collected at B398, W399, and W411 due to the presence of bedrock at shallow depths. A second

variance was that the designation for Well W397 was incorrect during the completion of field work. Because of a duplication of the well number, the designation of well W397 was changed to W411. All necessary records were corrected and there was no impact to the field investigation due to this change.

One minor variance occurred during the sampling of monitoring well W399. Due to insufficient recharge of the well and low water volume, the sample parameter list was reduced to include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), metals (including bismuth), anions, total suspended solids, and radiological constituents. The remaining parameters (total dissolved solids, explosives, cyanide, total nitrogen, total phosphorus, total organic carbon, and alkalinity) were not included in the analysis of groundwater sample W39901 collected from well W399 due to this low sample volume. The deletion of the parameters did not impact the completeness of the sampling program.

SOP 1.4

SOP 1.4 requires that:

- sample jars be wiped with methanol and sealed with Parafilm;
- sample labels be covered with clear tape;
- a 40-mL vial be used as a temperature blank; and
- water samples be tested for chlorine and cyanide.

Modifications to these requirements included wiping sample containers with de-ionized water, using adhesive labels and temperature strips, and sealing sample jars with teflon tape. In addition, chlorine and cyanide testing was not performed because this requirement applies only to residential wells. Data quality was not affected by these modification since, in most cases, they represent improvements over standard procedures.

SOP 1.5

SOP 1.5 requires that:

- samples be shipped in picnic coolers;
- certain labels be placed on the coolers; and
- sample jars be labeled with tags.

Modifications to these requirements included using state-of-the-art coolers supplied by the laboratory, using "environmental sample" labels, and labeling sample jars with adhesive labels. Data quality was not affected by these modifications since, in most cases, they represent improvements over standard procedures.

SOP 2.2

SOP 2.2 requires that the pH meter be standardized before and after each measurement, and that the probe be stored in pH 4.0 solution between measurements. During multiple and rapid measurements, such as those taken during purging and stabilization, this was not practical. For this reason, it was assumed that the SOP requirement applies to distinct sampling events. For all groundwater samples collected from the New Property, the pH meter was standardized in the field trailer before proceeding to the sampling site. The pH meter was not standardized after the sampling event because it is designed to give quality data with a pre-measurement calibration only. Between purging and stabilization, the probe was kept in sample water. Between sampling events, the probe was stored in a solution provided by the manufacturer. The use of the pH meter as described did not adversely affect the reliability and quality of the data collected.

SOP 2.2 also requires that conductivity be recorded every two gallons during purging. While all stabilization parameters were periodically recorded during purging, the frequency of these measurements varied, sometimes exceeding two gallons depending on the amount to be purged, and the proximity to purge completion. This variation did not affect the reliability of the sampling results, as is indicated by the conductivity readings.

SOP 4.1

One minor variance from SOP 4.1 occurred during drilling. SOP 4.1 requires that the cutting bit on the hollow-stem auger be equipped with a center plug device that can be removed at the desired sampling depth. This procedure prevents unwanted material from entering the casing and contaminating the soil sample, but can greatly decrease the rate of borehole advancement. A center plug was not used during hollow-stem drilling in the New Property. All of the unconsolidated materials encountered were cohesive enough to allow drilling without excessive amounts of material entering the casing. Any unwanted material that did enter a split-spoon sampler was easily recognized and discarded.

SOP 4.3

One variance from SOP 4.3 occurred during monitoring well installation activities in that six-inch diameter boreholes were drilled for all wells, except W411, rather than eight-inch boreholes. No impact to sample integrity occurred because of this variance.

One minor variance from the *SOP for Groundwater Sampling Using Drill-Stem Techniques* was that the well point used to collect groundwater grab samples was not equipped with an inflatable packer. An inflatable packer is designed to isolate a certain interval of groundwater for sampling. For the groundwater sampling, an inflatable packer was not warranted because the interval from which the sample was collected was already isolated by the casing or augers used during drilling. Therefore, the quality of the groundwater sampling results was not affected by this variance.

#### 2.1.2.2. Laboratory Data Variance Report

Soil and groundwater samples collected in the New Property were analyzed and validated in accordance with the OU5 QAPjP to assure uniform and defensible data quality. A data quality assessment (DQA) is presented in Appendix F of this report. The DQA was conducted to : (1) incorporate the analytical data validation results with the field quality control (QC) sample results, (2) evaluate the impact of all QC measures on the overall data quality, and (3) remove all unusable values from the investigation data population.

As a result of the data validation and the DQA, the data generated during this investigation has been determined to be acceptable and in compliance with the OU5 QAPjP-stated data quality objectives (DQOs).

#### 2.1.2.3. Health and Safety Report

The borehole and monitoring well installation activities were conducted according to the OU5 South Property RI/FS Health and Safety Plan (DOE 1993c). No accidents or safety violations occurred during the soil and groundwater sampling. Health and safety issues were discussed and resolved during tailgate briefings conducted by the Site Health and Safety Officer and documented in the Site Manager Logbook (Appendix A.4).

All soil samples were screened using a FIDLER to avoid exposure to radiologically contaminated soil. The borehole locations were checked for underground utilities to avoid damaging or severing utility lines while drilling. During drilling, the boreholes were monitored for combustibles and volatile emissions per SOP 6.1, SOP 6.2, and SOP 6.3.

### 2.1.3. Presentation of Data

Analytical data and physical properties data were collected from the New Property soil borings and sediment sampling locations. Analytical data included radiological and chemical analysis of soil (surface and subsurface), groundwater, and sediment samples. Validated data are presented in their entirety in Appendix E. Physical properties data included depth to bedrock, lithogy, and geotechnical analysis of soil and sediment samples. Geotechnical data are presented in Section 2.1.3.3. Table II.1 presents a summary of the samples collected in the New Property.

Analytical and physical properties data are presented in the following subsections and are summarized in Section 3.

#### 2.1.3.1. Radiological Results

Soil and groundwater samples were collected from New Property soil borings and monitoring wells and analyzed for the radionuclides specified in the OU5 QAPjP.

The radionuclides detected per media are presented in the following subsections.

**Surface Soils**

Thirteen surface soil samples and two QC duplicate samples were collected and analyzed for radionuclides. Table II.2 presents the concentrations of the eleven radionuclides detected in the surface soil samples. Pu-238 was detected at the surface (0-2 ft) at borings B398, B400, B402, B403, B407, B409, and B411 at concentrations ranging from 0.09J to 1.21J picocuries per gram (pCi/g), respectively. A "J" indicates that the concentration is an estimated quantity. Thorium-228 (Th-228) was detected at the surface in twelve surface soil samples at concentrations ranging from 1.2J pCi/g to 1.77 pCi/g. Thorium-230 (Th-230) and Th-232 were detected in all surface soil samples in concentrations ranging from 1.05J to 1.91J pCi/g and

**Table II.1. Summary of Soil, Geotechnical, and Groundwater Samples Collected in the New Property**

| Soil Boring/Well ID Number | Sample ID Number, Sample Type and Depth (Below Ground Surface) | | | |
|---|---|---|---|---|
| | Surface Soil | Subsurface Soil | Geotechnical | Groundwater |
| B398 | B39801 (0-2 ft) | NC | NC | NC |
| W399 | B39901 (0-2 ft) | NC | NC | W39901 (31.7 ft) |
| W400 | B40001 (0-2 ft) | B40002 (27-31 ft) | NC | W40001 (22.8 ft) |
| B401 | B40101 (0-2 ft) | B40102 (24-30 ft) | NC | W40101 (22.9 ft) |
| W402 | B40201 (0-2 ft) | B40202 (24-26 ft) | NC | W40201 (21.7 ft)<br>W40211 (21.7 ft) |
| B403 | B40301 (0-2 ft)<br>B40311 (0-2 ft)[a] | B40302 (4.5-7 ft) | NC | NC |
| B404 | B40401 (0-2 ft) | B40402 (4-8 ft)<br>B40412 (4-8 ft)[a] | B40421 (2-8 ft)[b] | NC |
| B405 | B40501 (0-2 ft) | B40502 (5-11 ft) | B40521 (0-2 ft)[b,S] | NC |
| B406 | B40601 (0-2 ft) | B40602 (43-48.5 ft) | B40621 (6-24 ft)[b,S]<br>B40622 (30-35 ft)[b] | NC |
| B407 | B40701 (0-2 ft) | B40702 (10-15 ft) | B40721 (0-0.5 ft)[b,S]<br>B40723 (6-10 ft)[b] | NC |
| B408 | B40801 (0-2 ft)<br>B40811 (0-2 ft)[a] | B40802 (37-42 ft) | B40821 (0-2 ft)[b,S]<br>B40822 (17-34 ft)[b] | W40801 (34 ft) |
| B409 | B40901 (0-2 ft) | B40902 (9-13 ft) | NC | NC |
| W411 | B41101 (0-2 ft) | NC | NC | W41101 (24.6 ft) |

a indicates a duplicate sample
b bucket sample
S shelby tube sample
ID identification
NC no sample collected at this location

**Table II.2. Results Summary of Radionuclides Detected in New Property Surface Soil Samples (pCi/g)**

| Radionuclide | Sample Identification Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B39801 | B39901 | B40001 | B40101 | B40201 | B40301 | B40311[D] | B40401 | B40501 | B40601 | B40701 | B40801 | B40811[D] | B40901 | B41101 |
| Potassium-40 | 16.4 | 16.2 | 21.11 | 14.69 | 11.23 | 29.94 | 29.04 | 13.05 | 34.46 | 16.45 | 17.82 | 16.61 | 15.58 | 22.47 | 23.52 |
| Radium-226 | 0.92 | 0.89 | 1.17 | 0.84 | 0.57 | 1.11J | 0.36J | 0.83 | 0.95 | 1.1 | 0.89 | 0.97 | 0.82 | 1.01 | 0.86 |
| Plutonium-238 | 0.12 | --- | 0.29 | --- | 0.09J | 0.17 | --- | --- | --- | --- | 0.15J | --- | --- | 0.03J | 1.21J |
| Plutonium-239/240 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.08J |
| Thorium-228 | 1.77 | 1.49 | 1.27 | 1.21 | --- | 1.54 | 1.54 | 1.23 | 1.64J | 1.36J | 1.2J | --- | --- | 1.36 | 1.47J |
| Thorium-230 | 1.85 | 1.4 | 1.61 | 1.32 | 1.08 | 1.9J | 1.05J | 1.53 | 1.23J | 1.91J | 1.18J | 1.46J | 1.33J | 1.58 | 1.13J |
| Thorium-232 | 1.44 | 1.16 | 1.04 | 0.91 | 0.53 | 1.17 | 1.28 | 1.04 | 1.28J | 0.88J | 0.89J | 0.92J | 0.83J | 1.30 | 1.08J |
| Uranium-234 | --- | 1.03 | --- | --- | 0.58J | 0.82J | 0.74 | --- | --- | 1.17J | --- | --- | 0.96J | --- | --- |
| Uranium-235 | 0.07J | 0.21J | 0.07J | 0.16J | --- | --- | 0.07 | --- | 0.07J | 0.2J | 0.07J | 0.11J | 0.12J | 0.11J | 0.2J |
| Uranium-238 | 0.91J | 1.03 | 1.07J | 0.94J | 0.7J | 0.87J | 0.75 | 0.97J | 0.93J | 1.2J | 1.02J | 1.02J | 0.97J | 0.88J | 0.96 |
| Tritium | --- | --- | --- | --- | --- | --- | 2.7 | --- | --- | --- | --- | --- | --- | --- | --- |

--- not detected
D indicates a duplicate sample
J estimated quantity
pCi/g picocuries per gram

0.53 to 1.44 pCi/g respectively. Tritium was detected in surface sample B40311 at a concentration of 2.7 pCi/g. Radium-226 (Ra-226) and potassium-40 (K-40) were detected in all surface soil samples in concentrations ranging from 0.36J -1.17 pCi/g and 11.23 - 34.46 pCi/g, respectively. Uranium isotopes 234, 235, and 238 were detected in various surface soil samples at concentrations less than 1.2 pCi/g.

Soil screening samples were also collected at the surface (0-6 inches) at each boring location and analyzed at the Mound Soil Screening Facility for Pu-238 and Th-232. Concentrations of Pu-238 were detected above the Mound Soil Screening Facility detection limit of 25 pCi/g at five locations: W398 (40 pCi/g), B404 (36 pCi/g), B405 (28 pCi/g), B407 (38 pCi/g), and B408 (34 pCi/g). Th-232 was not detected above the Mound Soil Screening Facility detection limit of 2 pCi/g in any surface soil sample (see Appendix D).

**Subsurface Soils**

Ten subsurface soil samples and one duplicate sample were collected and analyzed for radionuclides. Table II.3 presents the concentrations of the nine radionuclides detected in the subsurface soil samples. Pu-238, plutonium-239/240 (Pu-239/240), and tritium were not detected in any of the subsurface samples. Th-228 was detected in subsurfaces samples at B405, B407, and B409 at concentrations of 1.3, 1.22J, and 1.48J pCi/g, respectively. Ra-226 and Th-230 were detected in all subsurface soil samples at concentrations ranging from 0.34 - 1.20J pCi/g and 0.23 - 1.62 pCi/g, respectively. Th-232 was detected in 10 samples in concentrations of 0.05 - 1.02J pCi/g. Uranium 234, 235, and 238 were detected in various samples at concentrations less than 1.1 pCi/g. Strontium-90 (Sr-90) was detected in subsurface sample B40502 at a concentration of 2.77J pCi/g. K-40 was detected in five subsurface samples at borings B403, B404, B405, B407, and B409 in concentrations ranging from 10.26 pCi/g to 34.22 pCi/g.

The maximum concentrations of U-235, Th-230, and Th-232 were detected in boring B409 at a depth of 9 to 13 feet below ground surface (BGS). The maximum concentration of K-40 (34 22 pCi/g) was detected in B403 at a depth of 4.5 to 7 feet BGS. The maximum concentrations of uranium-234 (U-234) and Sr-90 were detected in B405 from 5 to 11 feet BGS at 1.06J pCi/g and 2.77J pCi/g, respectively.

Soil screening samples were also collected at each subsurface sample depth and analyzed at the Mound Soil Screening Facility for Pu-238 and Th-232 (see Appendix D). Concentrations of Pu-238 were detected above the Mound Soil Screening Facility detection limit of 25 pCi/g in four subsurface samples: B39802

**Table II.3. Results Summary of Radionuclides Detected in New Property Subsurface Soil Samples (pCi/g)**

| Radionuclide | Sample Identification Number | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | B40002 | B40102 | B40202 | B40302 | B40402 | B40412[D] | B40502 | B40602 | B40702 | B40802 | B40902 |
| Potassium-40 | --- | --- | --- | 34.22 | --- | 10.26 | 26.36 | --- | 23 | --- | 22.3 |
| Radium-226 | 0.34 | 0.39 | 0.47 | 1.02J | 0.6 | 0.67 | 0.68 | 0.5 | 0.75 | 0.43 | 0.46 |
| Thorium-228 | --- | --- | --- | --- | --- | --- | 1.3 | --- | 1.22J | --- | 1.48J |
| Thorium-230 | 0.63 | 0.53J | 0.72 | 1.03J | 1.39J | 1.36 | 0.88 | 0.23 | 0.74J | 0.28 | 1.62J |
| Thorium-232 | 0.13 | --- | 0.3 | 0.66 | 0.47J | 0.35 | 0.96 | 0.05 | 0.74J | 0.08 | 1.02J |
| Uranium-234 | --- | --- | 0.52J | 0.57 | --- | 0.50J | 1.06J | --- | --- | --- | 1J |
| Uranium-235 | 0.06J | 0.08J | --- | --- | 0.09J | --- | 0.04J | 0.04J | 0.11J | 0.03 | 0.08J |
| Uranium-238 | --- | 0.82J | 0.48J | 0.65 | 0.92J | 0.53J | 0.87J | --- | 0.77J | --- | 0.91J |
| Strontium-90 | --- | --- | --- | --- | --- | --- | 2.77J | --- | --- | --- | --- |

--- not detected
D indicates a duplicate sample
J estimated quantity
pCi/g picocuries per gram

(34 pCi/g), B40502 (35 pCi/g), B40702 (31 pCi/g), and B40902 (27 pCi/g). Th-232 was detected above the Mound Soil Screening Facility detection limit of 2 pCi/g in subsurface sample B39802 at a concentration of 2.9 pCi/g.

**Groundwater**

Six groundwater samples and one duplicate sample were collected and analyzed for radionuclides. Table II.4 summarizes the concentrations of the eight radionuclides detected in the groundwater samples. The complete analytical results for groundwater are presented in Appendix E.2. Pu-238 and Th-228 were not detected in any of the samples. Th-232 was detected in samples W39901, W40101, W40801, and W41101 at concentrations from 0.15J picocuries per liter (pCi/L) to 0.39J pCi/L. Ra-226 was detected in all groundwater samples in concentrations ranging from 0.41J - 1.22J pCi/L. The highest concentrations of U-234 and U-235 were detected in W399 at 3.23J pCi/L and 0.36J pCi/L, respectively. Uranium-238 (U-238) was found in six of the groundwater samples with a maximum concentration at W408 of 1.12 pCi/L. Tritium was detected in four groundwater samples ranging from 590 to 1673 pCi/L.

### 2.1.3.2. Chemical Results

Soil and groundwater samples were collected from New Property soil borings and analyzed for the chemical parameters specified in the OU5 QAPjP.

The organic and inorganic compounds detected per media are presented in the following subsections.

**Surface Soils**

Thirteen surface soil samples and two QC duplicate samples were collected and analyzed for chemical compounds. Table II.5 presents the concentrations of the compounds detected in the surface soil samples.

No VOCs were detected in the surface soil samples. Eleven SVOCs were detected in surface soil samples. The highest concentrations of nine of the eleven SVOCs were detected at soil boring B402.

Thirteen pesticides/PCBs were detected in trace amounts (0.05 μg/kg to 6.6J μg/kg) in 11 of the 15 surface soil samples.

**Table II.4. Results Summary of Radionuclides Detected in New Property Groundwater Samples (pCi/L)**

| Radionuclides | Sample Identification Number | | | | | | |
|---|---|---|---|---|---|---|---|
| | W39901 | W40001 | W40101 | W40201 | W40211[D] | W40801 | W41101 |
| Americium-241 | --- | 0.27 | --- | 0.13 | --- | 0.47J | --- |
| Radium-226 | 1.08J | 0.51J | 1.22J | 0.41J | 0.83J | 1.22J | 0.57J |
| Thorium-230 | --- | 0.14 | 0.21J | --- | 0.69 | 0.43J | 1.17J |
| Thorium-232 | 0.22 | --- | 0.15J | --- | --- | 0.35 | 0.39J |
| Uranium-234 | 3.23J | 0.61J | 0.43J | 0.91J | 0.75J | 0.94J | 0.13J |
| Uranium-235 | 0.36J | 0.14J | --- | 0.15 | 0.15 | 0.07 | --- |
| Uranium-238 | 1.02J | 0.53J | 0.19 | 0.5 | 0.47 | 1.12 | --- |
| Tritium | --- | 590.2 | --- | 1673.3 | 1591.5 | --- | 771.6 |

--- not detected
D indicates a duplicate sample
J estimated quantity
pCi/L picocuries per liter

## Table II.5. Results Summary of Chemicals Detected in New Property Surface Soil Samples
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| | | Sample Identification Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Units | B39801 | B39901 | B40001 | B40101 | B40201 | B40301 | B40311[D] | B40401 | B40501 | B40601 | B40701 | B40801 | B40811[D] | B40901 | B41101 |
| **SVOCs** | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | ug/kg | --- | --- | --- | 63J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Benzo(a)anthracene | ug/kg | --- | 42J | --- | 58J | 90J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Benzo(a)pyrene | ug/kg | --- | 42J | --- | 51J | 98J | --- | --- | 42J | --- | --- | --- | --- | --- | --- | --- |
| Benzo(b)fluoranthene | ug/kg | --- | 95J | 64J | 98J | 160J | --- | 52J | 68J | --- | --- | 59J | 37J | --- | 49J | --- |
| Benzo(k)fluoranthene | ug/kg | --- | 160J | 130J | 170J | 320J | --- | 100J | 140J | --- | --- | 100J | 65J | --- | 100J | --- |
| Chrysene | ug/kg | --- | 54J | --- | 78J | 84J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Di-n-butylphthalate | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | 67J | 68J | --- | --- | --- | --- | --- |
| Fluoranthene | ug/kg | --- | 78J | 54J | 110J | 170J | 57J | --- | 57J | --- | --- | 65J | 41J | 39J | --- | --- |
| Indeno(1,2,3-cd)pyrene | ug/kg | --- | --- | --- | --- | 56J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Phenanthrene | ug/kg | --- | --- | --- | 78J | 100J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pyrene | ug/kg | --- | 78J | 59J | 98J | 170J | 62J | --- | 70J | --- | --- | 56J | 36J | --- | 47J | --- |
| **Pesticides/PCBs** | | | | | | | | | | | | | | | | |
| 4,4'-DDD | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 6.6J | --- |
| 4,4'-DDE | ug/kg | --- | --- | --- | --- | --- | 0.9J | 0.82J | --- | --- | --- | --- | --- | --- | --- | 1.8J |
| 4,4'-DDT | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.25J | --- | --- | --- | --- | --- |
| Aldrin | ug/kg | --- | 0.054J | --- | 0.35J | --- | --- | --- | --- | --- | --- | 0.074J | --- | --- | --- | --- |
| Endosulfan I | ug/kg | --- | --- | --- | 0.13J | --- | --- | --- | --- | --- | --- | 0.27J | 0.051J | --- | --- | --- |
| Endrin | ug/kg | --- | 0.15J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endrin Aldehyde | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.3J | --- | --- | --- | --- |
| Endrin Ketone | ug/kg | --- | 0.76J | --- | --- | --- | --- | --- | --- | --- | --- | 0.25J | --- | --- | --- | 0.52J |
| Heptachlor | ug/kg | --- | 0.13J | --- | --- | --- | --- | 0.95J | --- | --- | --- | --- | --- | --- | --- | 0.11J |
| Heptachlor Epoxide | ug/kg | --- | 0.11J | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.1J | --- | --- | --- |
| alpha-Chlordane | ug/kg | --- | --- | --- | --- | 0.25J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| delta-BHC | ug/kg | 0.17J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| gamma-Chlordane | ug/kg | --- | 0.057J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.058J | --- | --- |

## Table II.5. Results Summary of Chemicals Detected in New Property Surface Soil Samples
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| Parameter | Units | Sample Identification Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B39801 | B39901 | B40001 | B40101 | B40201 | B40301 | B40311[D] | B40401 | B40501 | B40601 | B40701 | B40801 | B40811[D] | B40901 | B41101 |
| **Explosives** | | | | | | | | | | | | | | | | |
| 1,3-Dinitrobenzene | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | 0.098J | --- | --- | --- | --- | --- | --- |
| 2,4,6-Trinitrotoluene | mg/kg | 0.11J | --- | --- | --- | --- | --- | --- | --- | 0.2J | --- | --- | --- | --- | --- | --- |
| **Anions** | | | | | | | | | | | | | | | | |
| Chloride | mg/kg | 320J | --- | 45.6J | 183J | --- | 107J | 119J | --- | 56.8J | 81.9J | 46.1J | 75.6J | --- | --- | 524J |
| Fluoride | mg/kg | 5.68J | 2.12J | 7.13J | 4.86J | 1.11J | 5.31J | 3.61J | 3.32J | 5.25J | 6.05J | 3.4J | 3.55J | 1.62J | 5.07J | 20.5J |
| Sulfate | mg/kg | 1,370 | 97.5J | 891J | 356J | 165J | 362J | 366J | 141J | 359 | 795 | 328J | 296J | 182J | 331J | 1,910J |
| Nitrate-nitrite | mg/kg | 4.12J | 2.93J | 0.908J | 7.91J | 0.557J | 10J | 11.3J | 1.67J | 11.2J | 0.673J | 5.52J | 17.9J | 12.5J | --- | 7.1J |
| **Organics** | | | | | | | | | | | | | | | | |
| Total Organic Carbon | mg/kg | 10,130J | 24,775J | 4,055J | 33,275J | 11,950 | 37,850J | 20,800J | 12,950J | 9,123J | 16,300J | 10,098J | 40,225J | 19,350J | 4,015J | 9,183J |
| **Inorganics** | | | | | | | | | | | | | | | | |
| Aluminum | mg/kg | 2,640 | 2,890 | 12,500 | 1,680 | 6,930 | 19,200 | 16,100 | 6,080 | 3,830 | 3,210 | 3,610 | 1,800 | 1,900 | 21,400 | 3,640 |
| Antimony | mg/kg | --- | --- | 2J | --- | 3.3J | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Arsenic | mg/kg | 7.3 | 7.9 | 7.4 | 6.8 | 5.1 | 5.5 | 5.3 | 6.7 | 6.3 | 11.8 | 6.7 | 7.7 | 7.4 | 7.4 | 6.4 |
| Barium | mg/kg | 18 | 18.2 | 83.7 | 12.4 | 40.4 | 123 | 117 | 42.8 | 18 | 20.4 | 22.4 | 16.1 | 16.3 | 103 | 23.7 |
| Beryllium | mg/kg | 0.12 | 0.13 | --- | 0.13 | --- | 1.1 | --- | --- | 0.23 | 0.18 | 0.21 | 0.13 | 0.12 | --- | 0.22 |
| Bismuth | mg/kg | 18.8 | 20.6 | 13.2 | 17.5 | 11.2 | 12.6 | 13.2 | --- | 28.5 | 19.6 | 19.6 | 12.3 | --- | 14.5 | 22.5 |
| Calcium | mg/kg | 2,050 | 1,420 | 7,850J | 1,670 | 88,500J | 7,360J | 7,340J | 2,200J | 2,060 | 1,680 | 1,080 | 812 | 899 | 4,980J | 1,900 |
| Chromium | mg/kg | 3.5 | 2.7 | 14.4 | 1.7 | 8.1 | 19.4 | 16.8 | 8.1 | 5 | 5.7 | 4.6 | 2.7 | 2.9 | 22.5 | 4.5 |
| Cobalt | mg/kg | 2.7 | 1.5 | 11 | 1.4 | 6.6 | 13 | 12.6 | 5.6 | 4.8 | 2.7 | 3.7 | 2.3 | 2.4 | 14.4 | 3.4 |
| Copper | mg/kg | 4.2 | 3.3 | 17 | 3.4 | 11.8 | 13.8 | 14.3 | 9.6 | 5.5 | 8.1 | 3.9 | 3.8 | 4 | 16.2 | 4.4 |
| Iron | mg/kg | 5,480 | 3,950 | 19,000 | 2,790 | 13,200 | 26,500 | 24,900 | 11,500 | 8,430 | 6,020 | 6,100 | 4,040 | 4,760 | 28,800 | 7,150 |
| Lead | mg/kg | 19J | 23.5J | 24.5 | 32J | 9 | 19.4 | 19.1 | 25.4 | 15.6J | 20.2J | 24.2J | 16.6J | 18J | 19.9 | 32.1J |
| Lithium | mg/kg | 2.3 | 4.1 | 14.5 | 2.7 | 12 | 25.4 | 22.8 | 4.8 | 6.4 | 4.4 | 4 | --- | --- | 27.3 | 4.4 |
| Magnesium | mg/kg | 1,160 | 1,070 | 4,760 | 1,180 | 22,300 | 5,600 | 5,060 | 1,410 | 1,310 | 1,310 | 915 | 583 | 656 | 4,520 | 1,030 |
| Manganese | mg/kg | 152 | 102 | 955 | 116 | 445 | 828 | 814 | 169 | 350 | 157 | 267 | 182 | 181 | 969 | 220 |
| Mercury | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.14 | --- | --- |

## Table II.5. Results Summary of Chemicals Detected in New Property Surface Soil Samples
Page 3 of 3

| | | Sample Identification Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Units | B39801 | B39901 | B40001 | B40101 | B40201 | B40301 | B40311[D] | B40401 | B40501 | B40601 | B40701 | B40801 | B40811[D] | B40901 | B41101 |
| Molybdenum | mg/kg | 4.6J | 6.2J | 5.9 | 4.1J | 4.3 | 5 | 5.8 | 2.9 | 6.2J | 5.4J | 4.2J | --- | --- | 6.2 | 5.3J |
| Inorganics (continued) | | | | | | | | | | | | | | | | |
| Nickel | mg/kg | 4.4 | 3.4 | 17.9 | --- | 12.6 | 22.1 | 20.7 | 7.3 | 8.6 | 5.7 | 4.9 | 3.6J | 3.4 | 24.1 | 5.4 |
| Potassium | mg/kg | 372 | 430 | 2,440 | 421 | 1,080 | 3,720 | 2,720 | 649 | 601 | 343 | 488 | 341 | 270 | 3,550 | 683 |
| Sodium | mg/kg | 155 | 41.7 | --- | 32.6 | --- | 544 | --- | --- | 32 | 39.3 | 37.8 | 26.7 | 27.9 | --- | 445 |
| Vanadium | mg/kg | 5.7 | 1.7 | 24.2 | 0.75 | 12.6 | 25.9 | 22 | 16.3 | 6.1 | 7.3 | 7 | 4.6 | 4.8 | 37 | 6 |
| Zinc | mg/kg | 15.1 | 7.7 | 62.5J | 6.7 | 37.1 | 82.2J | 83J | 47J | 15.8 | 23.2 | 16.5 | 13.3 | 13.4 | 62.2J | 30.5 |

--- compound not detected
D indicates a duplicate sample
J estimated quantity
ug/kg micrograms per kilogram
mg/kg milligrams per kilogram
SVOC semivolatile organic compound

Two explosives, 2,4,6-trinitrotoluene and 1,3-dinitrobenzene, were detected in the surface soil samples. 2,4,6-Trinitrotoluene was detected in surface soil samples B39801 and B40501 at concentrations of 0.11J milligrams per kilogram (mg/kg) and 0.2J mg/kg, respectively. 1,3-Dinitrobenzene was detected in B40501 at a concentration of 0.098J mg/kg.

Four anions were detected in the surface soil samples. Fluoride and sulfate were detected in all of the 15 samples, while nitrate-nitrite was detected in 14 samples, and chloride in 10 samples. The maximum chloride, fluoride, and sulfate concentrations were detected in B41101 at 524J, 20.5J, and 1,910J mg/kg, respectively. The maximum nitrate-nitrite concentration was detected in sample B40801 at 17.9J mg/kg.

Twenty-two metals were detected in the surface soil samples. Fourteen of the metals were detected in all surface soil samples. The maximum concentrations of nine metals were detected in sample B40901.

**Subsurface Soils**

Ten subsurface soil samples and one duplicate sample were collected and analyzed for chemical compounds. Table II.6 presents the concentrations of the compounds detected in the subsurface soil samples.

One VOC, acetone, was detected in the subsurface soil samples. Acetone was detected in soil borings B400, B405, B408, and B409 at concentrations ranging from 18J ug/kg to 51J ug/kg.

Three SVOCs were detected in subsurface soil samples. Di-n-butylphthalate was detected in sample B40702 at a concentration of 37J ug/kg. Di-n-octylphthalate and bis(2-ethylhexyl)phthalate were detected in borings B401, B407, and B408 at concentrations ranging from 47J - 130J ug/kg and 60J - 340J ug/kg, respectively.

One pesticide/PCB, heptachlor, was detected in sample B40102 at a concentration of 0.13J ug/kg.

One explosive, tetryl, was detected in subsurface soil sample B40702 at a concentration of 0.29J mg/kg.

## Table II.6. Results Summary of Chemicals Detected in New Property Subsurface Soil Samples
Page 1 of 2

| | | Sample Identification Number | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Units | B40002 | B40102 | B40202 | B40302 | B40402 | B40412[D] | B40502 | B40602 | B40702 | B40802 | B40902 |
| **VOCs** | | | | | | | | | | | | |
| Acetone | ug/kg | 31J | --- | --- | --- | --- | --- | 33J | --- | --- | 18J | 51J |
| **SVOCs** | | | | | | | | | | | | |
| Di-n-butylphthalate | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | 37J | --- | --- |
| Di-n-octylphthalate | ug/kg | --- | 130J | --- | --- | --- | --- | --- | --- | 68J | 47J | --- |
| bis(2-Ethylhexyl) phthalate | ug/kg | --- | 340J | --- | --- | --- | --- | --- | --- | 60J | 170J | --- |
| **Pesticides/PCBs** | | | | | | | | | | | | |
| Heptachlor | ug/kg | --- | 0.13J | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Explosives** | | | | | | | | | | | | |
| Tetryl | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | 0.29J | --- | --- |
| **Anions** | | | | | | | | | | | | |
| Chloride | mg/kg | --- | 46.5J | 33.6J | 176J | 44.7J | 54J | 53.5J | 40.8J | 54.1J | 47.1J | --- |
| Fluoride | mg/kg | --- | 1.42J | 1.18J | 3.68J | 4.39J | 4.36J | 5.54J | 2.45 | 5.73J | 1.3J | 3.49J |
| Sulfate | mg/kg | 25.4J | 83.3J | 480J | 248J | 921J | 531J | 330 | 63.1 | 208J | 40.4J | 187J |
| Nitrate-nitrite | mg/kg | --- | 1.19J | --- | 0.834J | 0.684J | 0.861J | --- | --- | 2.36J | 0.589J | --- |
| **Organics** | | | | | | | | | | | | |
| Total Organic Carbon | mg/kg | 33,150J | 6,533J | 13,325J | 6,170J | 26,550J | 18,000J | 4,398J | 3815J | 8,423J | 19,650J | 2,820J |
| **Inorganics** | | | | | | | | | | | | |
| Aluminum | mg/kg | 1,870 | 437 | 2,710 | 14,800 | 5,220 | 5,630 | 3,360 | 668 | 4,070 | 363 | 15,900 |
| Antimony | mg/kg | 2.9J | --- | 2.3J | 2.9J | 2.9J | 2.2J | --- | 1.8J | 1.8J | --- | --- |
| Arsenic | mg/kg | 4.5 | 6.8 | 3.3 | 4.4 | 7.5 | 6.3 | 3.7 | 4.4 | 5.7 | 5.1 | 3.4 |
| Barium | mg/kg | 9.2 | 2.7 | 14.2 | 40.1 | 26.9 | 27.1 | 8.1 | 8.4 | 10.5 | 2 | 19.1 |
| Beryllium | mg/kg | --- | --- | --- | --- | --- | --- | 0.18 | --- | 0.19 | --- | --- |
| Bismuth | mg/kg | --- | 66.9 | --- | 15.6 | --- | --- | 23.6 | 69.1 | 27.2 | 57.2 | 18 |
| Calcium | mg/kg | 190,000J | 26,800 | 127,000J | 76,900J | 106,000J | 103,000J | 28,300 | 38,600 | 15,300 | 38,000 | 62,800J |
| Chromium | mg/kg | 4 | 1 | 4.4 | 14.6 | 6.7 | 7 | 4.1 | 7.7 | 5.1 | 1.2 | 17.4 |
| Cobalt | mg/kg | 1.7 | 0.37 | 3.7 | 10.4 | 4.8 | 4.8 | 4.4 | 0.68 | 3.4 | 0.52 | 12.7 |

## Table II.6. Results Summary of Chemicals Detected in New Property Subsurface Soil Samples
Page 2 of 2

| Parameter | Units | Sample Identification Number | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B40002 | B40102 | B40202 | B40302 | B40402 | B40412[D] | B40502 | B40602 | B40702 | B40802 | B40902 |
| **Inorganics (Continued)** | | | | | | | | | | | | |
| Copper | mg/kg | 5 | 1.9 | 7.8 | 15.8 | 11.8 | 10.9 | 4.9 | 15.7 | 4.6 | 1.4 | 23.3 |
| Iron | mg/kg | 4,820 | 1,480 | 7,240 | 20,100 | 15,200 | 10,600 | 6,960 | 1,670 | 6,450 | 1,300 | 24,600 |
| Lead | mg/kg | 3.8 | 6.3J | 6 | 4.7 | 7.9 | 7.3 | 13.5J | 5.6J | 18.4J | 5.2J | 2 |
| Lithium | mg/kg | 4.6 | --- | 6.6 | 33 | 8.9 | 9.3 | --- | --- | --- | --- | 41.4 |
| Magnesium | mg/kg | 40,900 | 15,600 | 40,300 | 10,500 | 56,500 | 36,800 | 1,720 | 118,500 | 2,530 | 13,500 | 14,600 |
| Manganese | mg/kg | 195 | 43.4 | 261 | 405 | 354 | 253 | 294 | 51.1 | 213 | 42.3 | 743 |
| Molybdenum | mg/kg | --- | --- | --- | 5.3 | --- | --- | --- | --- | --- | --- | 6.2 |
| Nickel | mg/kg | 2.9 | --- | 6.5 | 19.1 | 10.8 | 10.1 | 6 | 5.5 | 6.1 | --- | 22.1 |
| Potassium | mg/kg | 658 | 176 | 725 | 3,140 | 992 | 961 | 795 | 158 | 1,080 | 157 | 4,320 |
| Sodium | mg/kg | --- | 72.2 | --- | --- | --- | --- | 79.1 | 85.2 | 80.9 | 66.8 | --- |
| Vanadium | mg/kg | 5.7 | 0.45 | 6.3 | 16.6 | 11.2 | 10.9 | 4.8 | 1.7 | 6.2 | 1.3 | 19.4 |
| Zinc | mg/kg | 14.1J | 4.1 | 18.7J | 45.4J | 30.5J | 38.6J | 15.9 | 34.1 | 25.6 | 4.8 | 48.2J |

--- compound not detected
D indicates a duplicate sample
J estimated quantity
ug/kg micrograms per kilogram
mg/kg milligrams per kilogram
SVOC semivolatile organic compound
VOC volatile organic compound

Four anions were detected in the subsurface soil samples. Sulfate was detected in all of the 11 samples, while fluoride was detected in 10 samples, chloride in nine samples, and nitrate-nitrite in six samples. The maximum chloride and sulfate concentrations were detected in boring B404 (sample B40412) at 54J mg/kg and 531J mg/kg, respectively. The maximum fluoride and nitrate-nitrite concentrations were detected in sample B40702 at 5.73J mg/kg and 2.36J mg/kg, respectively.

Twenty-one metals were detected in the subsurface soil samples. Fourteen of the metals were detected in all subsurface soil samples. The maximum concentrations of eleven metals were detected in sample B40902.

**Groundwater**

Six groundwater samples and one QC duplicate sample were collected and analyzed for chemical compounds. Table II.7 presents the concentrations of the compounds detected in the groundwater samples.

Five VOCs were detected in the groundwater samples. Trichloroethene (TCE) was detected in sample W40211 and W41101 at concentrations of 2J micrograms per liter (ug/L) and 8 ug/L, respectively. 1,2-Dichloroethene was detected at concentrations of 2J ug/L and 4J ug/L in samples W40211 and W41101, respectively. Three VOCs were detected in sample W40101: acrylonitrile (25J ug/L), hexane (1J ug/L), and toluene (1J ug/L). No VOCs were detected in samples W39901, W40001, W40201, or W40801.

Two SVOCs were detected in five groundwater samples. Phenol was detected in samples W40211 and W41101 at a concentration of 1J ug/L. In five samples (W39901, W40001, W40201,W40801, and W41101), bis(2-ethylhexyl)phthalate was detected in concentrations ranging from 1J to 6J ug/L.

No pesticides/PCBs were detected in the groundwater samples collected from the New Property. One explosive, 2,4,6-trinitrotoluene, was detected in groundwater samples W40001 and W41101 at concentrations of 0.76J ug/L and 0.26J ug/L, respectively.

Four anions were detected in the groundwater samples. Chloride, fluoride, and sulfate were detected in all samples, while nitrate-nitrite was detected in all samples except W39901. The maximum chloride, fluoride, and sulfate concentrations of 488, 1.04, and 399 milligrams per liter (mg/L), respectively, were detected in W39901. The maximum nitrate-nitrite concentration of 0.658 mg/L was detected in W40201.

**Table II.7. Results Summary of Chemicals Detected in New Property Groundwater Samples**
**Page 1 of 3**

| Parameter | Units | Sample Identification Number | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | W39901 | W40001 | W40101 | W40201 | W40211[D] | W40801 | W41101 |
| **VOCs** | | | | | | | | |
| 1,2-Dichloroethene | ug/L | --- | --- | --- | --- | 2J | --- | 4J |
| Acrylonitrile | ug/L | --- | --- | 25J | --- | --- | --- | --- |
| Hexane | ug/L | --- | --- | 1J | --- | --- | --- | --- |
| Toluene | ug/L | --- | --- | 1J | --- | --- | --- | --- |
| TCE | ug/L | --- | --- | --- | --- | 2J | --- | 8 |
| **SVOCs** | | | | | | | | |
| Phenol | ug/L | --- | --- | --- | --- | 1J | --- | 1J |
| bis(2-Ethylhexyl) phthalate | ug/L | 5J | 6J | --- | --- | 1J | 3J | 2J |
| **Explosives** | | | | | | | | |
| 2,4,6-Trinitrotoluene | ug/L | --- | 0.76J | --- | --- | --- | --- | 0.26J |
| **Anions** | | | | | | | | |
| Chloride | mg/L | 488 | 65.3 | 113 | 156 | 157 | 42.7 | 232 |
| Fluoride | mg/L | 1.04 | 0.193J | 0.31 | 0.16J | 0.201 | 0.201J | 0.393 |
| Sulfate | mg/L | 399 | 29.8 | 43.7 | 70 | 71.5 | 42.6 | 62.2 |
| Nitrate-nitrite | mg/L | --- | 0.552 | 0.56J | 0.648 | 0.536 | 0.53J | 0.339 |
| **Inorganics** | | | | | | | | |
| Aluminum | ug/L | 1,130J | 4,810 | 40,200 | 9,950 | 2,160 | 58,800 | 31,500 |
| Antimony | ug/L | 2.3 | --- | --- | --- | --- | --- | --- |
| Arsenic | ug/L | --- | --- | 9.9J | --- | --- | 472J | --- |

**Table II.7. Results Summary of Chemicals Detected in New Property Groundwater Samples**
**Page 2 of 3**

| Parameter | Units | Sample Identification Number | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | W39901 | W40001 | W40101 | W40201 | W40211[D] | W40801 | W41101 |
| **Inorganics (continued)** | | | | | | | | |
| Barium | ug/L | 46.9J | 133J | 240J | 102J | 76.1J | 552J | 95J |
| Bismuth | ug/L | --- | 193 | 688J | 147 | 111 | 1,460J | 264 |
| Calcium | ug/L | 111,000 | 420,000 | 703,000 | 179,000 | 149,000 | 1,760,000 | 255,000J |
| Chromium | ug/L | 309 | --- | 111J | --- | --- | 164J | --- |
| Cobalt | ug/L | 8.3 | 6.9 | --- | 7 | --- | 126J | 18.2 |
| Copper | ug/L | 8.3 | 26.9J | 160 | --- | --- | 485 | --- |
| Iron | ug/L | 2,840 | 4,950 | 136,000J | 10,300 | 2,530 | 470,000J | 31,500 |
| Lead | ug/L | --- | 8.5J | 80.7 | 6J | --- | 148 | 6.7J |
| Lithium | ug/L | --- | 8.4 | 70.1 | 12.6 | 3.9 | --- | 132 |
| Magnesium | ug/L | 63,200 | 86,100J | 242,000J | 55,600J | 45,400J | 462,000J | 81,900J |
| Manganese | ug/L | 220 | 1,010J | 2,190J | 317J | 111J | 7,000J | 1,120J |
| Mercury | ug/L | --- | --- | --- | --- | --- | 0.4 | --- |
| Molybdenum | ug/L | --- | --- | 168 | --- | --- | --- | --- |
| Nickel | ug/L | 394 | 18.4J | 122J | 7.4J | --- | 322J | 32.9J |
| Potassium | ug/L | 65,000 | 7,550J | 10,800 | 7,410J | 4,030J | 13,300 | 28,400J |
| Sodium | ug/L | 423,000 | 24,800 | 42,400 | 42,200 | 42,900 | 18,900 | 59,200 |
| Thallium | ug/L | 3.6 | --- | --- | --- | --- | --- | --- |
| Vanadium | ug/L | 2.5 | 4.7 | 84.4J | 15 | 4.1 | 138J | 29.1 |
| Zinc | ug/L | 109J | 261 | 413J | 67.9 | 30.3 | 1,140J | 83 |

**Table II.7. Results Summary of Chemicals Detected in New Property Groundwater Samples**
**Page 3 of 3**

| Parameter | Units | Sample Identification Number | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | W39901 | W40001 | W40101 | W40201 | W40211[D] | W40801 | W41101 |
| **Inorganics (continued)** | | | | | | | | |
| Alkalinity | mg/L | --- | 247 | --- | 312 | 320 | --- | 335 |
| Total Organic Carbon | mg/L | --- | 3.14 | 2.75 | 1.83 | 2.11 | 2.9 | 2.28 |
| Kjeldahl Nitrogen | mg/L | --- | 0.153J | 0.368J | 0.244J | 0.264J | 0.369J | 0.797J |
| Total Phosphorus | mg/L | --- | 0.331 | 0.666J | 0.136 | 0.213 | --- | 0.236 |
| Dissolved Solids | mg/L | --- | 499 | 516 | 908 | 946 | 431 | 1,100 |
| Suspended Solids | mg/L | 138 | 4,680 | 6,170 | 47 | 430 | 19,400 | 97 |

--- compound not detected
D indicates a duplicate sample
J estimated quantity
ug/L microgram per liter
mg/L milligram per liter
VOC volatile organic compound
SVOC semi-volatile organic compound

Twenty-two metals were detected in the groundwater samples. Ten of the metals were detected in all groundwater samples. The maximum concentrations of 13 metals were detected in sample W40801. Several analytes were detected in only one or two samples. Antimony was detected in sample W39901 at a concentration of 2.3 ug/L. Arsenic was detected in W40101 and W40801 at concentrations of 9.9J ug/L and 472J ug/L, respectively. Mercury was detected in sample W40801 at a concentration of 0.4 ug/L and molybdenum was detected in sample W40101 at a concentration of 168 ug/L. Thallium was detected in sample W39901 at a concentration of 3.6 ug/L.

#### 2.1.3.3. Geotechnical Results

Geotechnical data include depth to bedrock, lithology, and geotechnical analysis of subsurface soil samples.

Depth to Bedrock

In the New Property, depth to bedrock increases from the northeast and east to the southwest and west reaching a depth of over 200 feet BGS in the southwest corner of the property (DOE 1994a). Depth to bedrock in the New Property soil borings ranged from 1.5 feet BGS at W398 to 55.4 feet BGS in B406. Bedrock was not penetrated in W400, W402, B401, and B408. Table II.8 shows depths to bedrock for all borings where bedrock was encountered. Bedrock was characterized as interbedded weathered shale and weathered limestone, though sometimes when drilling with the hollow-stem auger rig, bedrock was defined at the point of auger refusal.

Lithology and Geotechnical Analyses

Based on the field investigation, the geology of the New Property can be summarized as Quaternary glacial deposits overlying bedrock which in turn is overlain by a silty/clayey soil horizon. The glacial deposits consist of interbedded outwash and till which are thickest throughout the western half of the property where they comprise the BVA. Conversely, these deposits form only a thin bedrock veneer over the eastern, elevated portion of the property.

**Table II.8. Total Depth and Depth to Bedrock in New Property Soil Borings**

| Boring/Well ID | Total Depth of Boring (ft BGS) | Depth to Bedrock (ft BGS) | Elevation (ft MSL) |
|---|---|---|---|
| W399 | 34.0 | 3.8 | 887.54 |
| W400 | 34.0 | NE | 705.27 |
| W402 | 32.6 | NE | 704.56 |
| W411 | 40.05 | 14.0 | 836.65 |
| B398 | 33.02 | 1.5 | 864.02 |
| B401 | 30.0 | NE | 703.68 |
| B403 | 7.5 | 7.5 | 798.75 |
| B404 | 8.8 | 8.8 | 877.99 |
| B405 | 11.3 | 11.3 | 771.50 |
| B406 | 63.0 | 55.4 | 733.36 |
| B407 | 15.7 | 12.8 | 790.36 |
| B408 | 42.0 | NE | 714.67 |
| B409 | 14.0 | 12.0 | 797.14 |

BGS below ground surface
ID identification
MSL mean sea level
NE bedrock not encountered

Bedrock in the New Property consists of interbedded marine limestones and shales of the Richmond Group (DOE 1994a). Bedrock does not outcrop in the New Property but is very near the surface in the northeast corner. This is seen in borehole B398 where bedrock was encountered at 1.5 feet BGS. Depth to bedrock is found at increasingly deeper depths toward the southwest corner of the property. Quaternary glacial deposits at the New Property consist of Pleistocene outwash and till. These deposits are thickest to the west and southwest and thin dramatically to the east and northeast. The bulk of these glacial deposits are outwash which is a mix of sand and gravel (i.e. coarser grained sediments) of varying proportions, with minor amounts of clay and silt. Till deposits consist of varying proportions of clay and silt (i.e. finer grained sediments) and may be pictured as interbedded lenses and fingers within the outwash.

Most of the surface soil in the New Property was logged as variations of silty clay with root structures and organic material.

The lithologic description is based on field interpretation of cores and cuttings and is supplemented with laboratory analyses of geotechnical samples. Some discrepancies between the visual description and laboratory data can be expected, and are due in part to the qualitative nature of field logging versus the quantitative results achieved by the laboratory. Borehole profiles are presented in Appendix C and the results of laboratory analyses for the geotechnical samples are presented in Table II.9.

Three lithologic layers were described during the field investigation of the New Property. The uppermost lithology is a surface layer of very dark gray to brown silty-clay with varying proportions of silt. The material may also contain traces of gravel and organic material. This lithology was encountered at the surface in all borings in the New Property, and reached its maximum thickness of 22 ft in B406. Geotechnical samples B40521, B40721, and B40821 were collected from this interval.

Below the surface layer is a sand and gravel interval. This interval is composed of silty clays, commonly with fairly abundant limestone fragments. In areas of higher elevations, clay grades downward to weathered bedrock (either shale or fossiliferous limestone). The horizon ranges in thickness from 0 to 27 ft (at B406). Geotechnical samples B40421, B40621, and B40723 were collected from this interval. This lithologic zone was not present in W398, B409, W399, and W411, where the clay-silt surface layer directly overlies bedrock.

**Table II.9. Geotechnical Analyses of Soil Samples**

| Sample Number | Soil Symbol | Natural Moisture (%) | Specific Gravity | Grain Size Analysis | | | | | Atterburg Limits | | Coefficient of Permeability (cm/sec) | CEC (MeqNa/100g) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | $D^{10}$ (mm) | Liquid Limit (%) | Plastic Index (%) | | | |
| B40421[B] | CL | 8.8 | 2.73 | 14 | 33 | 29 | 24 | NA | 26 | 10 | NA | 11.12 | 7.3 |
| B40521[B] | MH | 31.8 | 2.77 | 1 | 8 | 31 | 60 | NA | 52 | 21 | NA | 41.5 | 7 |
| B40521[T] | NR | 36.8 | NA | NA | NA | NA | NA | NA | NA | NA | $2.9 \times 10^{-8}$ | NA | NA |
| B40621[B] | CL/ML | 7.4 | 2.65 | 10 | 37 | 32 | 21 | NA | 18 | 5 | NA | 4.24 | 7.4 |
| B40621[T] | NR | 9.9 | NA | NA | NA | NA | NA | NA | NA | NA | $9.1 \times 10^{-9}$ | NA | NA |
| B40622[B] | SP-SM | 4 | 2.75 | 36 | 53 | 6 | 5 | 0.032 | NP | NP | NA | 3.43 | 7.5 |
| B40721[B] | ML | 26.2 | 2.65 | 1 | 17 | 42 | 40 | NA | 42 | 15 | NA | 30.32 | 7 |
| B40721[T] | NR | 17.3 | NA | NA | NA | NA | NA | NA | NA | NA | $1.7 \times 10^{-9}$ | NA | NA |
| B40723[B] | CL | 17.1 | 2.73 | 2 | 14 | 26 | 58 | NA | 35 | 16 | NA | 14.1 | 7.4 |
| B40821[B] | CL | 13.5 | 2.62 | 1 | 29 | 41 | 29 | NA | 32 | 11 | NA | 23.58 | 7.2 |
| B40821[T] | NR | 17.4 | NA | NA | NA | NA | NA | NA | NA | NA | $1.1 \times 10^{-6}$ | NA | NA |
| B40822[B] | SM | 3.5 | 2.75 | 28 | 57 | 9 | 6 | 0.017 | NP | NP | NA | 2.44 | 7.2 |
| B40822[T] | NR | 11.7 | NA | NA | NA | NA | NA | NA | NA | NA | $9.3 \times 10^{-7}$ | NA | NA |

| | |
|---|---|
| T | geotechnical shelby tube sample |
| B | geotechnical bucket sample |
| NA | not analyzed |
| NR | not recorded |
| NP | non-plastic |
| CEC | cation exchange capacity |
| cm/sec | centimeters per second |
| MeqNa/100g | milliequivalent of sodium per 100 grams |
| CL | clay |
| MH | inorganic silts with medium plasticity |
| ML | inorganic silts with slight plasticity |
| SM | silty sand |
| SP | well-sorted sand |
| $D^{10}$ | 10% of sample had smaller grain size diameter than this number |

The third lithologic zone is a well-graded sand and gravel interval, possibly BVA material. Geotechnical samples B40622 and B40822 were collected from this interval.

### 2.1.3.4. Field Measurements for Groundwater

Table II.10 summarizes the field measurement results taken for groundwater sampling in the New Property.

**Table II.10. Field Measurements for New Property Groundwater Samples**

| Parameter | Units | Sample Identification Number | | | | | |
|---|---|---|---|---|---|---|---|
| | | W39901 | W40001 | W40101 | W40201 | W40801 | W41101 |
| pH | s.u. | 7.38 | 8.50 | 7.50 | 7.82 | 7.77 | 7.53 |
| Redox potential | mvolts | -3.6 | 122.8 | NR | 213.6 | 200 | 153.6 |
| Conductivity | umhos/cm | 2.7 | 0.723 | 0.910 | 1.244 | 0.72 | 1.393 |
| Water temperature | °C | 13.2 | 15 | 12.3 | 15.3 | 12.8 | 15.8 |
| Dissolved Oxygen | mg/L | 6 | 88%[a] | NR | 71%[a] | 6.72 | 54%[a] |
| Alkalinity ($CaCO_3$) | mg/L | 390 | 305 | 232 | 285 | 268.5 | 312 |

| | |
|---|---|
| a | dissolved oxygen readings were recorded as a percentage instead of mg/L. |
| $CaCO_3$ | calcium carbonate |
| °C | degrees Celsius |
| redox | oxidation-reduction |
| uhos/cm | micromhos per centimeter |
| mg/L | milligrams per liter |
| mvolts | millivolts |
| NR | not recorded |
| s.u. | standard units |

### 2.1.4. Comparison with Historical Data

The following subsections summarize and compare Extended Phase data with historical data (if available).

### 2.1.4.1. Radiological Results

Surface Soils

In May 1994, six surface soil samples (NPS001 - NPS006) were collected in the southernmost part of the New Property (see Figure 2.2) as part of the RSI verification soil sampling. These samples were analyzed for radionuclides, the results of which are presented in the OU5 New Property Phase I Field Report (DOE 1994b). Because these sample were collected in the southern portion of the New Property, the results are most useful for general rather than specific comparisons to the Phase I and Extended Phase results.

Overall, the Extended Phase radiological data for soils correlate with the results of the RSI verification soil sampling. Analytes detected in both the RSI and Extended Phase samples were Ra-226, K-40, isotopic thorium, isotopic uranium, and tritium. Ra-226 was detected in RSI samples NPS001 and NPS006 at concentrations of 0.83 pCi/g and 2.42 pCi/g, respectively. Ra-226 was present at concentrations within this range in all Extended Phase surface soil samples. K-40, isotopic thorium, and isotopic uranium was detected in all six RSI soil samples in concentrations that are within the range of values detected in Extended Phase samples. Tritium was found in RSI samples NPS002 (0.185 pCi/g), NPS004 (0.309 pCi/g), and NPS005 (0.066 pCi/g), and was detected in B403 (in Area 1) at 2.7 pCi/g.

The RSI sampling program conducted from April to June, 1994 evaluated additional soil samples to a maximum depth of two feet. Twelve of the RSI sampling locations are within the New Property boundary (see Figure 2.2). The results of this investigation are presented in the OU9 Regional Soils Investigation Report (DOE 1995). Of the radiological constituents detected, the RSI, Phase 1, and Extended Phase investigations had five in common (Pu-238, Ra-226, Th-228, Th-230, and Th-232). Ra-226 concentrations in Extended Phase soil samples were generally lower than in the nearest RSI samples. Pu-238 and Th-228 were both detected in the 0.5 to 3.0 pCi/g range in the RSI samples, and Pu-238 and thorium were detected in the Mound Soil Screening Facility analyses from the New Property Phase 1 investigation. Extended Phase laboratory results for points in close proximity to the RSI locations (W398, B400, and B403) revealed concentrations of these radionuclides, including Th-230 and Th-232, within the range observed in RSI sampling.

The Phase 1 FIDLER survey measured surface radiological activity that exceeded background within and proximate to Area 1. Points of elevated radiological activity were also measured over the remainder of

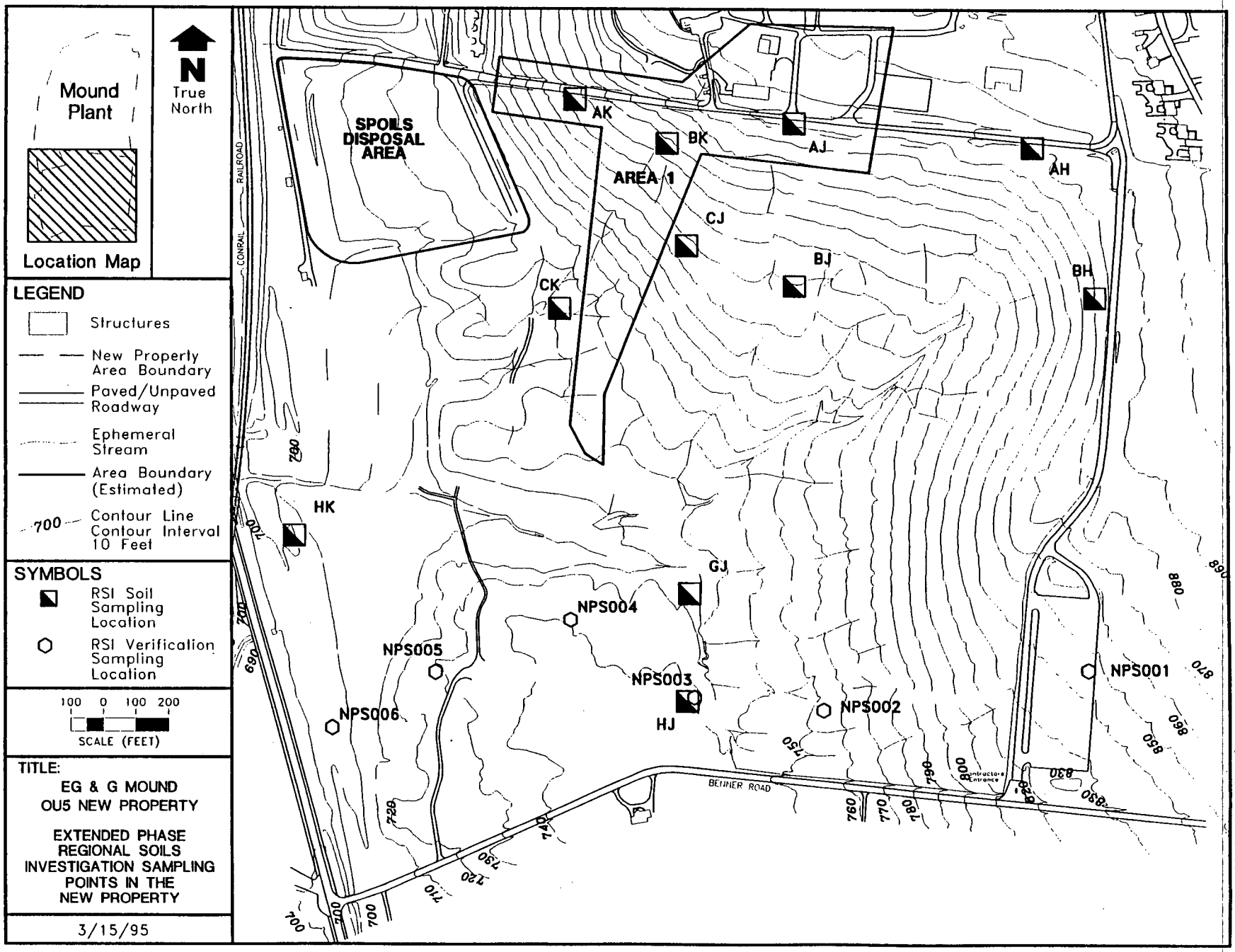


**Figure 2.2. Regional Soils Investigation Sampling Points in the New Property**

the New Property (see Figure 2.3). Subsequent Mound Soil Screening Facility analyses during Phase 1 did not confirm the presence of Pu-238 or Th-232 in surface soils from any of these locations except one. Soil Screening Facility detections of radionuclides occurred at one additional location where FIDLER readings were at or below background levels. Pu-238 was measured at 25 pCi/g at a location within Area 1, and Th-232 was encountered at 2 pCi/g in a sample immediately southeast of Area 1 (DOE 1994). These measurements are consistent with Extended Phase findings of Pu-238 at borings located within or adjacent to Area 1. Soils analyzed by the off-site laboratory confirm this pattern of Pu-238 distribution in area 1, with the exception of B402, in which Pu-238 was detected although it is well outside of Area 1. Those points of elevated surface radiological activity not confirmed by the Soil Screening Facility indicate the possible presence of radionuclides other than Pu-238 and Th-232. Results from the Extended Phase Investigation and the RSI soil sampling and verification soil sampling support this conclusion, as described above.

Subsurface Soils

No historical subsurface radiological data are available for depths greater than two feet for comparison with the results of the Extended Phase investigation.

Groundwater

As part of Mound's ER monitoring program, groundwater from eight wells in the New Property (see Figure 2.4) was sampled and analyzed. Wells 0354, 0351, and 0353 are bedrock wells, and the remaining wells, deep and shallow, are completed in the BVA. For comparison with the Extended Phase data, historical water quality data are available from three wells completed at different depths in the BVA: well 0158 (30 feet), 0319 (95 feet), and 0320 (117 feet). Data from wells 0344, 0351, 0353, 0354, and 0356 has been collected as part of the OU9 groundwater monitoring program, but has not yet been released.

Radiological data for tritium is available for existing monitoring wells 0158, 0319, and 0320 (DOE 1992). Thorium isotopes are reported for well 0158 only. This well is not located near any of the Extended Phase monitoring wells, and so cannot be used for any specific comparisons. However, its completion depth is much closer to that of Extended Phase wells. Results recorded in the course of several sampling rounds at well 0158 indicate the presence of tritium from 557 to 1140 pCi/L. Tritium values in Extended

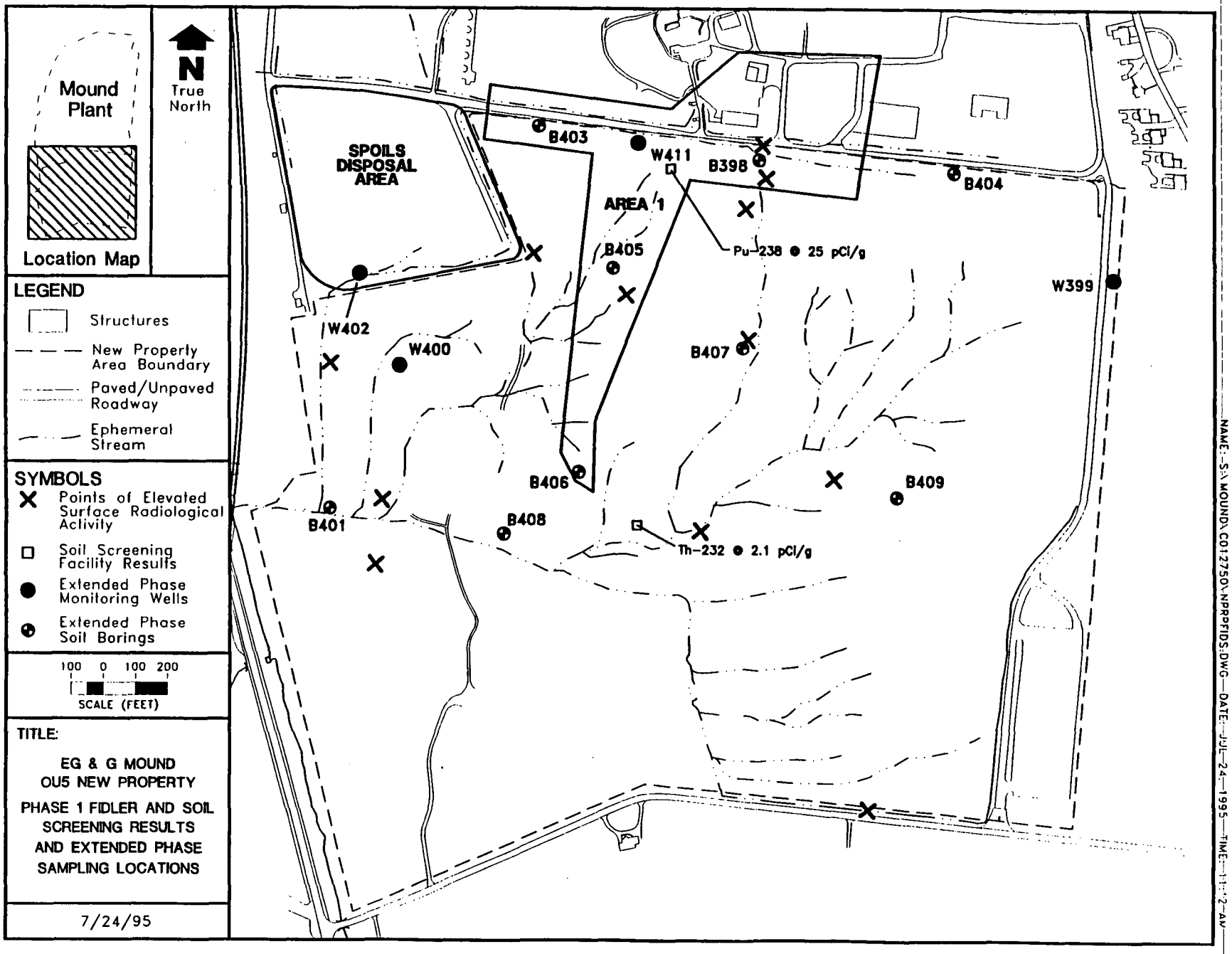


**Figure 2.3. Phase 1 FIDLER and Soil Screening Results and Extended Phase Sampling Locations**



NAME:--S:\MOUND\C012750\NPRPFIDS.DWG--DATE:--JUL--24,--1995--TIME:--11:12-AM

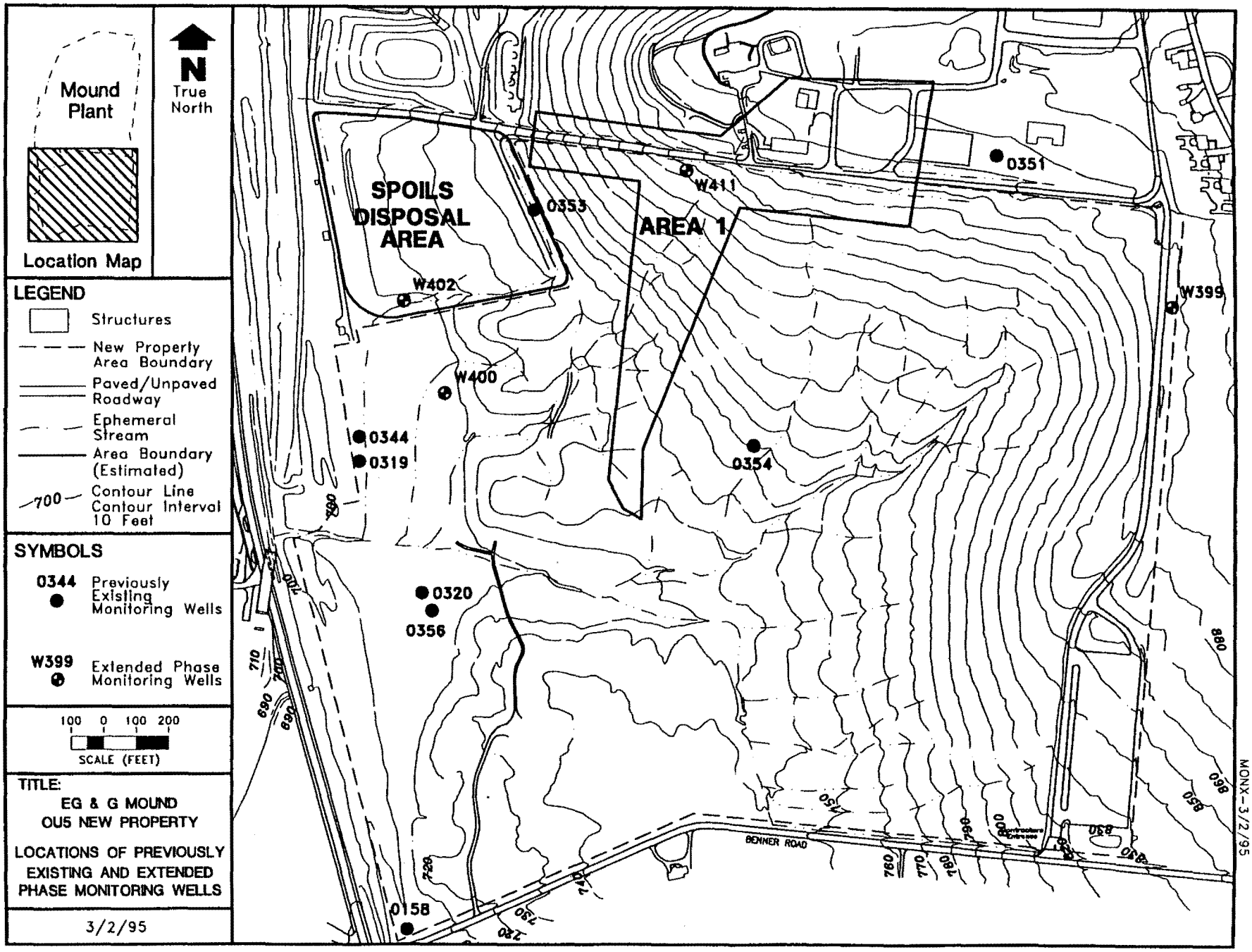


**Figure 2.4. Locations of Previously Existing and Extended Phase Monitoring Wells in the New Property**

.0Phase monitoring wells W400, W402, and W411 are comparable, ranging from 590 to 1673 pCi/L. Isotopic thorium results recorded in well 0158 are as follows: Th-228: 0.314 pCi/L; Th-230: 0.0171 pCi/L; and Th-232: 0.0021 pCi/L. Thorium isotopes 230 and 232 were analyzed and detected in all Extended Phase monitoring wells. Th-230 results are consistent with results from well 0158, but Th-232 results in W399 and W411 exceed those in well 0158 by two orders of magnitude.

#### 2.1.4.2. Chemical Results

Surface Soils

RSI and Phase 1 investigations conducted in the New Property in 1994 provide a basis for comparison of Extended Phase field data. Previous investigations conducted included a Phase 1 soil gas survey and the collection of six soil verification samples during the RSI field activities. Results of these studies are presented in the OU5 New Property Phase 1 Field Report (DOE 1994b). Additionally, RSI samples were collected at locations within and adjacent to the New Property, as shown in Figure 2.2. All of these samples provide some chemical information for comparison with Extended Phase results.

The six RSI verification samples were analyzed for VOCs, SVOCs, pesticides, PCBs, common anions, inorganics, and radiological constituents. Validated RSI data indicated di-n-butylphthalate present in estimated quantities at NPS003 (240J ug/kg), NPS004 (180J ug/kg), and NPS005 (420 ug/kg). NPS003 also contained estimated quantities of toluene (4.7J ug/kg), xylene (21J ug/kg), 2-butanone (8.5J ug/kg), carbon tetrachloride (9.6J ug/kg), and ethylbenzene (2.1J ug/kg). Occurrence of organic compounds in the RSI samples was limited to methylene chloride at AH, AJ, and AK at 66, 26, and 68 ug/kg, respectively (see Figure 2.2). With the exception of some polycyclic aromatic hydrocarbon compounds, no organic compounds were detected at the Extended Phase borings located nearest these sampling points.

Metals were detected in all RSI verification samples in concentrations that are within the ranges found in the Extended Phase samples. Five RSI sampling locations within the New Property were found to have inorganic analytes above "baseline," according to the OU9 Regional Soils Investigation Report (DOE 1995). Results reported represent the maximum value among the surface and subsurface samples collected (maximum depth sampled was two feet). Sample points AK, AJ, AH, CK, and CJ (see Figure 2.2) were found to have above-baseline values for arsenic, aluminum, beryllium, bismuth, iron, potassium,

magnesium, selenium, sodium, and thallium. Extended Phase results for these metals at sampling points near the RSI sampling locations are generally at lower concentrations.

Subsurface Soils

During the Phase I investigation, soil gas sampling of soils greater than two feet BGS revealed concentrations of aromatic hydrocarbons in the southwest and southeast corners of the New Property. Cycloalkanes/alkenes were detected along the eastern site boundary and the eastern boundary of Area 1, with localized occurrences scattered within the southern portion of the site. TCE and tetrachloroethene (PCE) were detected in three soil gas samplers. Since the Extended Phase did not include borings in these areas, no additional information on these findings is available. Subsurface soil SVOCs were detected at high concentrations in boring B402 and in estimated quantities in well W399 during the Extended Phase investigation. In contrast, no soil gas response was found at the Phase 1 sampling point nearest boring B402 and only a small relative response to cycloalkanes/alkenes around well W399. Other SVOC results from the Extended Phase study do not correlate to soil gas responses from the Phase 1 study.

Groundwater

Common anion concentrations detected in the three previously existing wells (0158, 0319, 0320) are consistent with the results from Extended Phase sampling in newly-installed wells in the New Property. Metals results reported for the Extended Phase study are consistent with the data collected from the previously existing wells.

VOCs were detected in all three sample locations (0158, 0319, and 0320) in the course of several sampling rounds in 1987 to 1992. In well 0158, trichloroethane (0.4 ug/L), 2-butanone (up to 16 ug/L), acetone (up to 20 ug/L), methylene chloride (up to 110 ug/L), and toluene (up to 8 ug/L) were present. TCE (0.9 ug/L) and PCE (0.4 ug/L) were detected in well 0319. Well 0319 is also near a Phase 1 soil gas sampling location that showed a response to these compounds. At well 0320, 1,1,1-TCE (0.3 ug/L), methylene chloride (1 ug/L), and total xylenes (2.0 ug/L) were detected. The nearest Extended Phase monitoring well to 0319 and 0320 is W401. Three VOCs (acrylonitrile at 25J ug/L, hexane at 1J ug/L, and toluene at 1J ug/L) were detected in the groundwater at W401.

## 2.2. SURFACE WATER AND SEDIMENT SAMPLING

Twenty-seven sediment samples were collected in the New Property ephemeral stream to identify the presence of any potential radiological or chemical contaminants. No surface water sample was collected because the ephemeral stream was dry. Geotechnical samples were collected at some of the locations and analyzed for certain parameters. A summary of the sediment and geotechnical samples collected is presented in Table II.11. The field activities are summarized in the following subsections.

### 2.2.1. Field Work Performed and Procedures

Sediment samples were collected at twenty-seven locations in the New Property from July 5 to July 12, 1994, per SOP 5.2. The sediment sampling locations are displayed in Figure 2.5. Sediment samples were collected at all locations for chemical and radiological analysis, and at nine locations for geotechnical parameter analysis (see Table II.11), per the OU5 QAPjP.

#### 2.2.1.1. Decontamination

All reusable sampling equipment was decontaminated at the beginning of the project and after each use per SOP 1.6. Decontaminated equipment such as stainless steel bowls and spoons were wrapped in aluminum foil and stored until use.

#### 2.2.1.2. Site Preparation

Minimal clearing of shrubbery and undergrowth was required to allow access to the sampling locations. This work was conducted in accordance with the OU5 Health and Safety Plan (DOE 1993c).

#### 2.2.1.3. Sampling

One sediment sample was collected from each sampling location per SOP 5.2. In order to collect the sample, grass and any debris were cleared from the location. Samples were collected, packaged, and shipped to an OU9 QAPjP-approved laboratory according to Mound SOPs 1.3, 1.4, and 1.5 (see Sample Manager Logbook in Appendix A.3). Sediment samples were analyzed for VOCs, SVOCs, metals, cyanide, pesticides/PCBs, lanthanides, explosives, anions, and radiological constituents. .

**Table II.11. Summary of Sediment and Geotechnical Samples Collected in the New Property**
**Page 1 of 2**

| Sediment Sample Location | Sediment Sample ID Number and Depth (BGS) | Geotechnical Sample ID Number and Depth (BGS) |
|---|---|---|
| SD01 | SD0101 (0-2 ft) | NC |
| SD02 | SD0201 (0-2 ft) | NC |
| SD03 | SD0301 (0-2 ft) | SD0321 (0-2 ft)[B] |
| SD04 | SD0401 (0-2 ft) | NC |
| SD05 | SD0501 (0-2 ft) | NC |
| SD06 | SD0601 (0-2 ft) | NC |
| SD07 | SD0701 (0-2 ft) | SD0721 (0-2 ft)[B] |
| SD08 | SD0801 (0-2 ft) | SD0821 (0-2 ft)[B] |
| SD09 | SD0901 (0-2 ft)<br>SD0911 (0-2 ft) | SD0921 (0-2 ft)[B] |
| SD10 | SD1001 (0-2 ft) | NC |
| SD11 | SD1101 (0-2 ft) | NC |
| SD12 | SD1201 (0-2 ft) | NC |
| SD13 | SD1301 (0-2 ft)<br>SD1311 (0-2 ft) | NC |
| SD14 | SD1401 (0-2 ft) | SD1421 (0-2 ft)[B] |
| SD15 | SD1501 (0-2 ft) | SD1521 (0-2 ft)[B] |
| SD16 | SD1601 (0-2 ft) | SD1621 (0-2 ft)[B] |
| SD17 | SD1701 (0-2 ft) | NC |
| SD18 | SD1801 (0-2 ft) | NC |
| SD19 | SD1901 (0-2 ft) | NC |
| SD20 | SD2001 (0-2 ft) | SD2021 (0-2 ft)[B] |
| SD21 | SD2101 (0-2 ft)<br>SD2111 (0-2 ft) | NC |
| SD22 | SD2201 (0-2 ft) | NC |
| SD23 | SD2301 (0-2 ft) | SD2321 (0-2 ft)[B] |

**Table II.11. Summary of Sediment and Geotechnical Samples Collected in the New Property**
**Page 2 of 2**

| Sediment Sample Location | Sediment Sample ID Number and Depth (BGS) | Geotechnical Sample ID Number and Depth (BGS) |
|---|---|---|
| SD24 | SD2401 (0-2 ft) | NC |
| SD25 | SD2501 (0-2 ft) | NC |
| SD26 | SD2601 (0-2 ft) | NC |
| SD27 | SD2701 (0-2 ft) | NC |

B bucket sample
BGS below ground surface
ID identification
NC no sample collected at this location

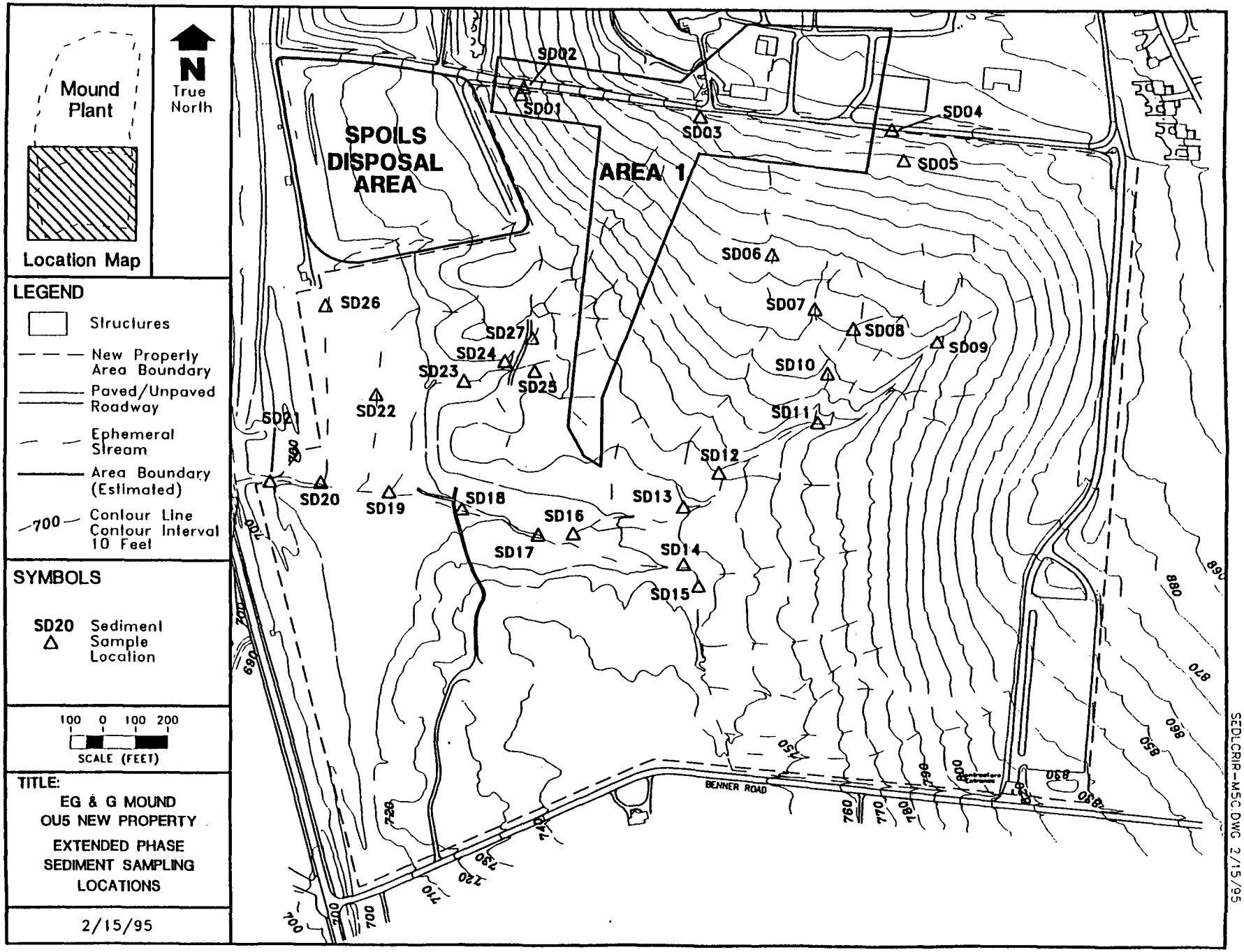


**Figure 2.5. Sediment Sampling Locations in The New Property**

Geotechnical samples were collected at nine locations. Immediately following the collection of the chemical and radiological samples, geotechnical samples were collected by filling a 5-gallon plastic bucket approximately half full with sediment using a spade. These samples were shipped to an OU9 QAPjP-approved laboratory per SOPs 1.3, 1.4, and 1.5 and analyzed for moisture content, particle size distribution, specific gravity, CEC, and pH.

### 2.2.2. Quality Assurance Summary Report

The field and laboratory analysis variances are summarized in the following subsections.

#### 2.2.2.1. Field Variance Report

All sampling was conducted in accordance with the OU5 Work Plan, the OU5 FSP, and the OU5 QAPjP. No variances occurred.

#### 2.2.2.2. Laboratory Data Variance Report

Sediment samples collected in the New Property were analyzed and validated in accordance with the OU5 QAPjP to assure uniform and defensible data quality. The DQA is presented in Appendix F of this report. The DQA was conducted to: (1) incorporate the analytical data validation results with the field QC sample results, (2) evaluate the impact of all QC measures on the overall data quality, and (3) remove all unusable values from the investigation data population.

As a result of the data validation and the DQA, the data generated during this investigation has been determined to be acceptable and in compliance with the OU5 QAPjP-stated DQOs.

#### 2.2.2.3. Health and Safety Report

The sediment sampling was conducted according to the OU5 South Property RI/FS Health and Safety Plan (DOE 1993c). No accidents or safety violations occurred during the sampling.

All sediment samples were screened using a FIDLER to avoid exposure to radiologically contaminated soil. Health and safety issues were discussed and resolved during daily tailgate briefings conducted by the Site Health and Safety Officer and documented in the Site Manager Logbook (Appendix A.4).

### 2.2.3. Presentation of Data

The following subsections summarize the radiological and chemical sediment data from these sampling efforts. Validated data are presented in their entirety in Appendix E.3.

#### 2.2.3.1. Radiological Results

Twenty-seven sediment samples and three QC duplicate samples were collected and analyzed for radionuclides. Table II.12 presents the concentrations of the ten radionuclides detected in the sediment samples. Pu-238 was detected in 12 samples at concentrations ranging from 0.03J pCi/g to 21.87 pCi/g. Th-228 was detected in 21 samples at concentrations ranging from 0.48J pCi/g to 3.78 pCi/g. Concentrations of Th-228/230/232 greater than 2.0 pCi/g were detected a sample location SD03. Uranium-234/235/238 was detected in various samples at concentrations ranging from 0.03 pCi/g to 1.06 pCi/g. Ra-226 and K-40 concentrations ranged from 0.41 - 1.19 pCi/g and 12.16 - 29.52 respectively. Tritium was detected at three locations: SD13 (2 pCi/g), SD17 (3 pCi/g), and SD20 (2.6 pCi/g).

Soil screening samples were also collected at each sediment sampling location and analyzed at the Mound Soil Screening Facility for Pu-238 and Th-232 (see Appendix D). Concentrations of Pu-238 were detected above the Mound Soil Screening Facility detection limit of 25 pCi/g in two sediment samples: SD0301 (47 pCi/g) and SD2401 (31 pCi/g). Th-232 was detected above the Mound Soil Screening Facility detection limit of 2 pCi/g in three sediment samples: SD0301 (5.3 pCi/g), SD0701 (2.2 pCi/g), and SD2001 (2.1 pCi/g).

#### 2.2.3.2. Chemical Results

Twenty-seven sediment samples and three QC duplicate samples were collected and analyzed for chemical compounds. Table II.12 presents the concentrations of the compounds detected in the sediment samples.

**Table II.12. Results Summary of Radionuclides Detected in New Property Sediment Samples (pCi/g)**
**Page 1 of 3**

| Radionuclides | Sample Identification Number | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SD0101 | SD0201 | SD0301 | SD0401 | SD0501 | SD0601 | SD0701 | SD0801 | SD0901 | SD0911[D] | SD1001 | SD1101 | SD1201 |
| Potassium-40 | 29.52 | 26.46 | 14.9 | 16.63 | 17.36 | 15.45 | 15.56 | 31.71 | --- | --- | 22.67 | 12.16 | --- |
| Radium-226 | 1.03 | 0.89 | 0.8 | --- | 0.88 | 0.63J | 0.68 | 0.85 | 0.41 | 0.45 | 1.02 | --- | 0.42J |
| Plutonium-238 | 0.25 | 0.25 | 11.23J | 0.79 | --- | 0.46 | --- | --- | --- | --- | --- | --- | --- |
| Thorium-228 | 1.63 | 1.6 | 3.78 | 1.38J | 1.2J | 1.69 | --- | 1.52 | --- | 0.5J | 1.45J | 0.48J | --- |
| Thorium-230 | 1.42J | 1.53J | 2.21J | 1.59J | 1.18 | 1.55 | 0.69 | 1.35 | 0.58 | 0.39 | 1.66J | 0.15J | 1.41 |
| Thorium-232 | 1.16J | 1.31J | 2.12J | 0.89J | 0.92 | 1.11 | 0.51 | 0.84 | 0.36 | --- | 0.95J | --- | 0.4 |
| Uranium-234 | 0.65 | 0.79 | 0.94 | 0.91J | 0.83 | 0.69J | 0.52J | 0.77J | 0.55J | 0.47 | 0.78J | 0.53 | 0.35 |
| Uranium-235 | --- | --- | 0.03 | 0.05J | 0.06 | --- | --- | 0.17J | 0.12J | --- | 0.04J | --- | --- |
| Uranium-238 | 0.97 | 0.93 | 0.84 | 0.95J | 0.84 | 0.79J | 0.53J | 0.93J | 0.68J | 0.47 | 1J | 0.45 | 0.55 |
| Tritium | --- | --- | --- | --- | --- | --- | --- | --- | 2.6 | --- | --- | --- | --- |

**Table II.12. Results Summary of Radionuclides Detected in New Property Sediment Samples (pCi/g)**
**Page 2 of 3**

| Radionuclides | Sample Identification Number | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SD1301 | SD1311[D] | SD1401 | SD1501 | SD1601 | SD1701 | SD1801 | SD1901 | SD2001 | SD2101 | SD2111[D] | SD2201 | SD2301 |
| Potassium-40 | 15.2 | 14.13 | 12.48 | --- | 11.5 | --- | --- | --- | 16.39 | 19.5 | 16.48 | 25.63 | 23.25 |
| Radium-226 | 0.73J | --- | 0.56 | 0.49 | 0.52J | 0.54J | 0.55J | 0.48J | 0.71J | 0.82 | 0.84 | 1.09 | 0.92 |
| Plutonium-238 | --- | --- | --- | --- | --- | 0.03J | 0.03J | --- | --- | --- | --- | 0.9 | 21.87 |
| Thorium-228 | 1.24 | --- | --- | --- | 1.31 | --- | --- | --- | 1.45 | 1.29J | 0.88J | 1.4J | 1.71J |
| Thorium-230 | 1.83 | 2.24 | 0.98 | 0.87J | 1.48 | 1.78 | 1.03J | 0.82J | 1.61 | --- | 0.2J | 1.66J | 1.94 |
| Thorium-232 | 0.93 | 0.79 | 0.57 | 0.29J | 0.83 | 0.41 | 0.29J | 0.53J | 1.01 | 0.76J | 0.35J | 0.89J | 1.8 |
| Uranium-234 | 0.54J | 0.5J | 0.4J | 0.45J | 0.58J | 0.5J | 0.33J | 0.57J | 0.58J | 0.67 | 0.61 | 0.99 | 0.71 |
| Uranium-235 | --- | --- | --- | --- | 0.06J | --- | --- | --- | --- | --- | --- | --- | --- |
| Uranium-238 | 0.65J | 0.58J | 0.56J | 0.36J | 0.97J | 0.61J | 0.4J | 0.59J | 0.77J | 0.78 | 0.62 | 1.06 | 0.78 |
| Tritium | --- | 2 | --- | --- | --- | 3 | --- | --- | --- | --- | --- | --- | --- |

**Table II.12. Results Summary of Radionuclides Detected in New Property Sediment Samples (pCi/g)**
**Page 3 of 3**

| Radionuclides | Sample Identification Number | | | |
|---|---|---|---|---|
| | SD2401 | SD2501 | SD2601 | SD2701 |
| Potassium-40 | 20.15 | 21.62 | 25.45 | 21.88 |
| Radium-226 | 1.19 | 1.08 | 1 | 1.02 |
| Plutonium-238 | 4.99 | --- | 0.43J | 1.73J |
| Thorium-228 | 1.79J | 1.44J | 1.07J | 1.5J |
| Thorium-230 | 1.36 | 2.26 | 1.32J | 1.53 |
| Thorium-232 | 1.04 | 1 | 0.53J | 0.55 |
| Uranium-234 | 0.77 | 0.93 | 0.86 | 0.68 |
| Uranium-235 | 0.14 | 0.04 | 0.04 | --- |
| Uranium-238 | 0.79 | 0.88 | 0.89 | 0.69 |
| Tritium | --- | --- | --- | --- |

--- compound not detected
D indicates a duplicate sample
J estimated quantity
pCi/g picocuries per gram

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
**Page 1 of 12**

| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD0101 | SD0201 | SD0301 | SD0401 | SD0501 | SD0601 | SD0701 | SD0801 | SD0901 | SD0911[D] |
| **VOCs** | | | | | | | | | | | |
| Acetone | ug/kg | --- | --- | --- | --- | --- | --- | 55J | 19J | --- | --- |
| Hexane | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SVOCs** | | | | | | | | | | | |
| 2-Methylnaphthalene | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Acenaphthene | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Acenaphthylene | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Anthracene | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Benzo(a)anthracene | ug/kg | 44J | 48J | --- | 130J | --- | --- | --- | --- | 98J | 130J |
| Benzo(a)pyrene | ug/kg | --- | --- | --- | 130J | --- | --- | --- | --- | 100J | 150J |
| Benzo(b)fluoranthene | ug/kg | 130J | 120J | 34J | 230J | 69J | 63J | --- | --- | 220J | 250J |
| Benzo(k)fluoranthene | ug/kg | 210J | 200J | 63J | 440 | 130J | 130J | --- | --- | 380J | 470 |
| Benzo(g,h,i)perylene | ug/kg | --- | --- | --- | 41J | --- | --- | --- | --- | --- | 55J |
| Benzoic Acid | ug/kg | --- | --- | --- | --- | --- | 86J | --- | --- | --- | 71J |
| Carbazole | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Chrysene | ug/kg | 51J | 51J | --- | 110J | --- | 43J | --- | --- | 92J | 140J |
| Di-n-butylphthalate | ug/kg | --- | --- | --- | --- | 47J | --- | --- | --- | --- | --- |
| Dibenzofuran | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dibenzo(a,h)anthracene | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fluoranthene | ug/kg | 97J | 98J | --- | 260J | 64J | 59J | --- | --- | 150J | 280J |
| Fluorene | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
**Page 2 of 12**

| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD1001 | SD1101 | SD1201 | SD1301 | SD1311[D] | SD1401 | SD1501 | SD1601 | SD1701 | SD1801 |
| **VOCs** | | | | | | | | | | | |
| Acetone | ug/kg | --- | --- | --- | --- | --- | 12J | --- | --- | --- | --- |
| Hexane | ug/kg | 10J | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SVOCs** | | | | | | | | | | | |
| 2-Methylnaphthalene | ug/kg | --- | --- | --- | --- | --- | --- | 110J | --- | --- | --- |
| Acenaphthene | ug/kg | --- | --- | --- | --- | --- | --- | 120J | --- | --- | --- |
| Acenaphthylene | ug/kg | --- | --- | --- | --- | --- | --- | 290J | --- | 69J | 73J |
| Anthracene | ug/kg | --- | --- | --- | --- | --- | 150J | 690 | --- | 120J | 200J |
| Benzo(a)anthracene | ug/kg | --- | --- | --- | --- | --- | 900 | 2,800 | --- | 770 | 770 |
| Benzo(a)pyrene | ug/kg | --- | --- | --- | --- | --- | 860 | 2,500 | --- | 740 | 770 |
| Benzo(b)fluoranthene | ug/kg | --- | 62J | --- | 48J | 58J | 1,300 | 4,800 | --- | 1,500 | 1,600 |
| Benzo(k)fluoranthene | ug/kg | --- | 100J | --- | 98J | 86J | 690J | 8,600J | --- | 2,700 | 2,900 |
| Benzo(g,h,i)perylene | ug/kg | --- | --- | --- | --- | --- | --- | 220J | --- | 190J | 250J |
| Benzoic Acid | ug/kg | --- | --- | --- | 43J | --- | --- | --- | --- | 49J | --- |
| Carbazole | ug/kg | --- | --- | --- | --- | --- | --- | 420 | --- | --- | 78J |
| Chrysene | ug/kg | --- | --- | --- | --- | --- | 940 | 2,400 | --- | 710 | 640 |
| Di-n-butylphthalate | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dibenzofuran | ug/kg | --- | --- | --- | --- | --- | --- | 250J | --- | --- | 42J |
| Dibenzo(a,h)anthracene | ug/kg | --- | --- | --- | --- | --- | --- | 130J | --- | 60J | 95J |
| Fluoranthene | ug/kg | --- | 69J | --- | 42J | 48J | 1,500 | 5,000 | --- | 1,200 | 1,300 |
| Fluorene | ug/kg | --- | --- | --- | --- | --- | --- | 460 | --- | 53J | 100J |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
**Page 3 of 12**

| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD1901 | SD2001 | SD2101 | SD2111[D] | SD2201 | SD2301 | SD2401 | SD2501 | SD2601 | SD2701 |
| **VOCs** | | | | | | | | | | | |
| Acetone | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Hexane | ug/kg | --- | 4J | --- | --- | --- | --- | --- | --- | --- | --- |
| **SVOCs** | | | | | | | | | | | |
| 2-Methylnaphthalene | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Acenaphthene | ug/kg | --- | --- | 42J | --- | --- | --- | --- | --- | --- | --- |
| Acenaphthylene | ug/kg | 44J | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Anthracene | ug/kg | 94J | --- | 150J | 50J | --- | --- | --- | --- | --- | --- |
| Benzo(a)anthracene | ug/kg | 460 | --- | 540 | 230J | --- | --- | --- | --- | 48J | --- |
| Benzo(a)pyrene | ug/kg | 440 | --- | 570 | 280J | --- | --- | --- | --- | 56J | --- |
| Benzo(b)fluoranthene | ug/kg | 900 | --- | 1100 | 510 | 70J | 35J | --- | --- | 120J | --- |
| Benzo(k)fluoranthene | ug/kg | 1600 | --- | 2200 | 930 | 110J | 58J | --- | --- | 220J | --- |
| Benzo(g,h,i)perylene | ug/kg | 180J | --- | 160J | 150J | --- | --- | --- | --- | --- | --- |
| Benzoic Acid | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Carbazole | ug/kg | 41J | --- | 85J | --- | --- | --- | --- | --- | --- | --- |
| Chrysene | ug/kg | 390 | --- | 500 | 220J | --- | --- | --- | --- | 58J | --- |
| Di-n-butylphthalate | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dibenzofuran | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dibenzo(a,h)anthracene | ug/kg | 46J | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fluoranthene | ug/kg | 740 | --- | 1300 | 430 | 56J | --- | --- | --- | 81J | --- |
| Fluorene | ug/kg | 50J | --- | 99J | --- | --- | --- | --- | --- | --- | --- |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**

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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD0101 | SD0201 | SD0301 | SD0401 | SD0501 | SD0601 | SD0701 | SD0801 | SD0901 | SD0911[D] |
| **SVOCs (continued)** | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | ug/kg | --- | --- | --- | 49J | --- | --- | --- | --- | --- | 67J |
| Naphthalane | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Phenanthrene | ug/kg | 47J | 48J | --- | 170J | --- | --- | --- | --- | 88J | 260J |
| Pyrene | ug/kg | 60J | 62J | --- | 190J | 50J | 51J | --- | --- | 130J | 230J |
| bis(2-Ethylhexyl) phthalate | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | 81J | --- |
| **Pesticides/PCBs** | | | | | | | | | | | |
| 4,4'-DDE | ug/kg | --- | --- | 1.1J | --- | 0.77J | --- | --- | --- | 0.79J | --- |
| 4,4'-DDT | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dieldrin | ug/kg | --- | --- | --- | 0.65J | --- | 0.31J | --- | --- | --- | --- |
| Endosulfan II | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endrin Aldehyde | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endrin Ketone | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Heptachlor | ug/kg | --- | --- | --- | --- | --- | --- | 0.79J | 0.86J | --- | --- |
| Heptachlor Epoxide | ug/kg | --- | --- | --- | 0.35J | --- | --- | --- | --- | --- | 0.52J |
| alpha-Chlordane | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Anions** | | | | | | | | | | | |
| Chloride | mg/kg | 37.5J | 237J | 183J | 350J | 32.2J | 35J | 59.4J | 46J | 95J | 96.2J |
| Fluoride | mg/kg | 2.16J | 5.68J | 1.6J | 13.1J | 2.41J | 1.85J | 3.44J | 5.86J | 6.31J | 5.76J |
| Sulfate | mg/kg | 120J | 734J | 25.9J | 540J | 215J | 403J | 553J | 637J | 92.8J | 393J |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**

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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD1001 | SD1101 | SD1201 | SD1301 | SD1311[D] | SD1401 | SD1501 | SD1601 | SD1701 | SD1801 |
| **SVOCs (continued)** | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | ug/kg | --- | --- | --- | --- | --- | 390J | 850 | --- | 230J | 330J |
| Naphthalene | ug/kg | --- | --- | --- | --- | --- | --- | 200J | --- | --- | --- |
| Phenanthrene | ug/kg | --- | --- | --- | --- | --- | 900 | 3,700 | --- | 520 | 870 |
| Pyrene | ug/kg | --- | 45J | --- | --- | 48J | 1,800 | 3,300 | --- | 920 | 970 |
| bis(2-Ethylhexyl) phthalate | ug/kg | --- | --- | --- | --- | --- | --- | --- | 58J | 67J | --- |
| **Pesticides/PCBs** | | | | | | | | | | | |
| 4,4'-DDE | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4,4'-DDT | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dieldrin | ug/kg | --- | --- | --- | --- | --- | --- | 1.2J | --- | --- | --- |
| Endosulfan II | ug/kg | --- | --- | --- | --- | --- | 0.74J | --- | --- | --- | --- |
| Endrin Aldehyde | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endrin Ketone | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | 0.67J | --- |
| Heptachlor | ug/kg | --- | --- | --- | --- | --- | 1.2J | --- | --- | --- | --- |
| Heptachlor Epoxide | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| alpha-Chlordane | ug/L | --- | --- | --- | --- | --- | --- | 0.24J | --- | --- | --- |
| **Anions** | | | | | | | | | | | |
| Chloride | mg/kg | --- | 62.9J | 45.8J | 56.5J | 66.9 | 119 | 50J | 82.3J | 74.8J | 32J |
| Fluoride | mg/kg | 3.62J | 3.11J | 1.06J | --- | 4.52J | 4.97J | 0.899J | 2.91J | 5.63J | 3.4J |
| Sulfate | mg/kg | 345J | 264J | 418J | 277J | 514J | 1,150J | 215J | 125J | 86.4J | 100J |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD1901 | SD2001 | SD2101 | SD2111[D] | SD2201 | SD2301 | SD2401 | SD2501 | SD2601 | SD2701 |
| **SVOCs (continued)** | | | | | | | | | | | |
| Indeno(1,2,3-cd)pyrene | ug/kg | 190J | --- | 160J | 110J | --- | --- | --- | --- | --- | --- |
| Naphthalene | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Phenanthrene | ug/kg | 460 | --- | 910 | 220J | --- | --- | --- | --- | 58J | --- |
| Pyrene | ug/kg | 560 | --- | 830 | 310J | 39J | --- | --- | --- | 78J | --- |
| bis(2-Ethylhexyl) phthalate | ug/kg | --- | --- | --- | 45J | 68J | 120J | --- | --- | --- | --- |
| **Pesticides/PCBs** | | | | | | | | | | | |
| 4,4'-DDE | ug/kg | --- | --- | --- | 0.78J | --- | --- | --- | --- | --- | --- |
| 4,4'-DDT | ug/kg | --- | --- | --- | --- | --- | 0.48J | --- | --- | --- | --- |
| Dieldrin | ug/kg | --- | --- | --- | 0.44J | --- | --- | --- | --- | 0.52J | --- |
| Endosulfan II | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Endrin Aldehyde | ug/kg | --- | --- | --- | --- | --- | --- | 0.81J | --- | --- | --- |
| Endrin Ketone | ug/kg | 0.86J | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Heptachlor | ug/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Heptachlor Epoxide | ug/kg | --- | --- | 0.3J | --- | --- | --- | --- | --- | --- | --- |
| alpha-Chlordane | ug/L | 3.5J | --- | --- | 1.5J | --- | --- | --- | --- | --- | --- |
| **Anions** | | | | | | | | | | | |
| Chloride | mg/kg | 34.1J | 49.6J | 46.3J | 50.6J | 44.8J | --- | 47.8J | 37.1J | 58.3J | 50.2J |
| Fluoride | mg/kg | 1.76J | 4.21J | --- | 1.82J | 2.77J | 2.63J | 1.43J | 2.38J | 4.09J | 2.63J |
| Sulfate | mg/kg | 84.5J | 52.5J | --- | --- | 140J | 331J | 167J | 293J | 26.9J | 225J |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD0101 | SD0201 | SD0301 | SD0401 | SD0501 | SD0601 | SD0701 | SD0801 | SD0901 | SD0911[D] |
| **Anions (continued)** | | | | | | | | | | | |
| Nitrate-nitrite | mg/kg | 65.7J | 13.2J | 9,170J | 4.62J | 3.81J | --- | --- | --- | 0.673J | --- |
| **Inorganics** | | | | | | | | | | | |
| Aluminum | mg/kg | 23,000J | 12,800J | 16,200J | 19,800J | 14,400J | 13,100 | 14,000 | 14,500 | 10,600J | 9,990J |
| Antimony | mg/kg | --- | --- | --- | --- | --- | 3J | 1.9J | --- | 1.3J | --- |
| Arsenic | mg/kg | 6.6J | 5.1J | 10.5 | 9.6 | 7.4 | 8 | 6.5 | 5.6 | 17.1J | 9.6J |
| Barium | mg/kg | 123 | 78.6 | 77.1 | 97.4 | 77.4 | 95.2 | 58.6 | 66.3 | 101 | 84.7 |
| Beryllium | mg/kg | 1.1 | 0.67 | 0.67 | 0.77 | 0.62 | --- | --- | --- | 0.47 | 0.45 |
| Bismuth | mg/kg | 38.2 | 24.8 | 20 | 34.5 | 18.9 | 18 | 13.1 | 12.6 | 61.5 | 39.4 |
| Cadmium | mg/kg | 0.25J | --- | --- | --- | --- | --- | --- | --- | 5J | 0.59J |
| Calcium | mg/kg | 7,700 | 12,200 | 14,300 | 9,410 | 14,400 | 21,100J | 46,600J | 12,800J | 63,200 | 87,500 |
| Chromium | mg/kg | 23.5 | 14.2 | 18.8J | 21.5J | 17.5J | 14.3 | 15.7 | 16.2 | 17.7 | 15 |
| Cobalt | mg/kg | 11.6 | 9 | 9.4 | 10.9 | 13.4 | 13 | 13.1 | 12.9 | 10.1 | 9.8 |
| Copper | mg/kg | 17.3J | 13.1J | 14.8J | 16.3J | 12.9J | 14.8 | 15.3 | 15 | 27.5J | 26.7J |
| Cyanide | mg/kg | --- | --- | 1.1 | --- | --- | --- | --- | --- | --- | --- |
| Iron | mg/kg | 26,400 | 20,200 | 22,100 | 23,400 | 21,400 | 19,300 | 21,500 | 21,700 | 40,500 | 31,200 |
| Lead | mg/kg | 29.3J | 20.2J | 16.7 | 22.3 | 17.5 | 19.9 | 13.2 | 11.4 | 255J | 128J |
| Lithium | mg/kg | 26.9 | 17.5 | 15.1 | 16.5 | 14.2 | 13.8 | 24.2 | 21.4 | 13.3 | 12.7 |
| Magnesium | mg/kg | 5,380 | 5,010 | 5,790 | 5,930 | 4,130 | 5,960 | 6,230 | 4,730 | 6,630 | 8,510 |
| Manganese | mg/kg | 800J | 646J | 551J | 702J | 733J | 1,050 | 810 | 785 | 5,240J | 823J |
| Mercury | mg/kg | 0.13 | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD1001 | SD1101 | SD1201 | SD1301 | SD1311[D] | SD1401 | SD1501 | SD1601 | SD1701 | SD1801 |
| **Anions (continued)** | | | | | | | | | | | |
| Nitrate-nitrite | mg/kg | 1.31J | --- | 0.921 | --- | 1.89 | 0.765 | --- | 2.03J | 1.44J | 1.19J |
| **Inorganics** | | | | | | | | | | | |
| Aluminum | mg/kg | 10,900J | 7,740J | 7,660 | 10,400 | 8,410 | 11,800 | 6,320 | 15,600J | 8,370J | 6,290J |
| Antimony | mg/kg | --- | --- | 2.5J | 2.9J | 3.3J | 2.5J | 2.6J | --- | --- | --- |
| Arsenic | mg/kg | 5J | 6.3J | 4.2 | 6.2 | 6.2 | 7.5 | 5.4 | 7.3J | 6J | 6.8J |
| Barium | mg/kg | 53.8 | 58.9 | 51.9 | 80.7 | 55.4 | 77.7 | 61.2 | 89 | 49.7 | 47.7 |
| Beryllium | mg/kg | 0.49 | 0.37 | --- | --- | --- | --- | --- | 0.65 | 0.37 | 0.28 |
| Bismuth | mg/kg | 17.1 | 23.6 | 12.6 | 15.2 | 15 | 19.4 | 16 | 43.9 | 46.6 | 43.5 |
| Cadmium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Calcium | mg/kg | 25,800 | 99,800 | 70,700J | 53,000J | 63,100J | 26,700J | 60,800J | 33,500 | 54,400 | 81,500 |
| Chromium | mg/kg | 12.1 | 10 | 9.9 | 11.8 | 10 | 13.5 | 7.7 | 16.7 | 10.5 | 9.7 |
| Cobalt | mg/kg | 10.4 | 10.4 | 9.7 | 10.8 | 10.3 | 10.5 | 9 | 9.5 | 7.6 | 7.1 |
| Copper | mg/kg | 11.1J | 10J | 10.5 | 11.6 | 12.7 | 13.9 | 8.4 | 14.5J | 9.9J | 7.2J |
| Cyanide | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Iron | mg/kg | 17,800 | 17,200 | 18,100 | 17,100 | 17,100 | 18,900 | 13,200 | 21,400 | 14,100 | 17,600 |
| Lead | mg/kg | 11.1J | 14.1J | 14.4 | 15.5 | 18.7 | 16.5 | 12.2J | 12.2J | 12.6J | 10.2J |
| Lithium | mg/kg | 15.4 | 12.5 | 12.9 | 12.5 | 12.5 | 15.4 | 9.1 | 18.1 | 10.2 | 7.9 |
| Magnesium | mg/kg | 4,170 | 6,500 | 4,240 | 6,310 | 6,030 | 11,500 | 19,900 | 13,500 | 17,300 | 18,200 |
| Manganese | mg/kg | 840J | 1,070J | 789 | 959 | 716 | 953 | 975 | 963J | 707J | 800J |
| Mercury | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD1901 | SD2001 | SD2101 | SD2111[D] | SD2201 | SD2301 | SD2401 | SD2501 | SD2601 | SD2701 |
| **Anions (continued)** | | | | | | | | | | | |
| Nitrate-nitrite | mg/kg | --- | --- | 10,500J | 522J | 1.03J | 1.79J | 48.7J | 1.68J | 4,900J | 1.93J |
| **Inorganics** | | | | | | | | | | | |
| Aluminum | mg/kg | 7,580J | 13,400J | 10,800J | 12,800J | 16,000J | 15,300J | 12,100J | 17,100J | 19,100J | 15,100J |
| Antimony | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Arsenic | mg/kg | 5.8J | 5.9J | 6.1J | 6.3J | 6.7J | 7J | 7.2J | 7.9J | 8.2J | 7J |
| Barium | mg/kg | 53.1 | 107 | 71 | 77.8 | 96.3 | 82.2 | 77.5 | 79.4 | 92.6 | 84.7 |
| Beryllium | mg/kg | 0.39 | 0.71 | 0.53 | 0.57 | 0.77 | 0.7 | 0.63 | 0.73 | 0.83 | 0.68 |
| Bismuth | mg/kg | 31.4 | 30.7 | 26.2 | 39.5 | 27.5 | 29 | 29.4 | 34.4 | 33.2 | 35.1 |
| Cadmium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Calcium | mg/kg | 49,700 | 3,370 | 26,500 | 30,400 | 3,140 | 4,920 | 10,500 | 7,260 | 14,200 | 11,500 |
| Chromium | mg/kg | 10.1 | 15.2 | 12.8 | 15.4 | 18.3 | 18.2 | 14.2 | 19.1 | 21.3 | 17 |
| Cobalt | mg/kg | 8.1 | 11.2 | 10.4 | 10.3 | 11.9 | 10.7 | 10.8 | 11.3 | 11 | 12.2 |
| Copper | mg/kg | 9.5J | 17.1J | 14.3J | 14.3J | 17.3J | 14.4J | 15.7J | 16.4J | 20.8J | 15J |
| Cyanide | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Iron | mg/kg | 15,300 | 21,400 | 17,600 | 18,500 | 21,100 | 22,700 | 21,200 | 22,200 | 25,400 | 21,700 |
| Lead | mg/kg | 13J | 12.2J | 19.4J | 19J | 19J | 14.2J | 15.8J | 14.3J | 18.5J | 15.4J |
| Lithium | mg/kg | 9.8 | 14.9 | 13.5 | 14.5 | 19 | 19.4 | 16.6 | 20.2 | 23.9 | 19.2 |
| Magnesium | mg/kg | 9,800 | 2,950 | 8,030 | 10,300 | 3,190 | 3,760 | 5,560 | 4,800 | 6,440 | 6,210 |
| Manganese | mg/kg | 749J | 1,300J | 902J | 939J | 1,200J | 1,040J | 995J | 911J | 794J | 1,180J |
| Mercury | mg/kg | --- | --- | 0.14 | 0.16 | --- | --- | --- | --- | 0.15 | --- |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD0101 | SD0201 | SD0301 | SD0401 | SD0501 | SD0601 | SD0701 | SD0801 | SD0901 | SD0911[D] |
| **Inorganics (continued)** | | | | | | | | | | | |
| Molybdenum | mg/kg | 7.8 | 8.4 | 10.5 | 9.6 | 8 | 5.4 | 5.4 | 4.2 | 15.7 | 14 |
| Nickel | mg/kg | 22.4 | 17.6 | 18.3 | 19.8 | 17.5 | 16.1 | 19 | 19.1 | 16.9 | 17.7 |
| Potassium | mg/kg | 5,230J | 2,680J | 2,370J | 2,360J | 2,000J | 2,020 | 2,620 | 2,200 | 2,040J | 1,880J |
| Selenium | mg/kg | 1.2 | 0.77 | --- | --- | --- | --- | --- | --- | 1 | --- |
| Silver | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | 0.35 | --- |
| Sodium | mg/kg | 750 | 1,890 | 1,510 | 3,450 | 658 | --- | --- | --- | 865 | 742 |
| Thallium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | 2.1J | --- |
| Tin | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | 41.1 | 20.1 |
| Vanadium | mg/kg | 31.9 | 17.8 | 29.9 | 38.1 | 26.2 | 24.7 | 21.8 | 23.8 | 20.4 | 21.5 |
| Zinc | mg/kg | 82.4J | 63.1J | 117 | 73.7 | 60.1 | 59.4J | 42.3J | 45.5J | 1,310J | 144J |
| **Lanthanides** | | | | | | | | | | | |
| Cerium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | 23.6 | 27.6 |
| Neodymium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | 20.3 | 25.5 |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD1001 | SD1101 | SD1201 | SD1301 | SD1311[D] | SD1401 | SD1501 | SD1601 | SD1701 | SD1801 |
| **Inorganics (continued)** | | | | | | | | | | | |
| Molybdenum | mg/kg | 6.3 | 9.8 | 5 | 4.7 | 5.1 | 6.9 | 5.6 | 13.1 | 13.2 | 14.8 |
| Nickel | mg/kg | 17.3 | 14.4 | 12 | 14.6 | 12.3 | 17.3 | 12.3 | 18.8 | 12.5 | 11.5 |
| Potassium | mg/kg | 1,620J | 1,440J | 1,170 | 1,860 | 1,290 | 2,040 | 892 | 2,950J | 1,690J | 1,290J |
| Selenium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Silver | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sodium | mg/kg | 492 | 607 | --- | --- | --- | --- | --- | 721 | 562 | 592 |
| Thallium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Tin | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Vanadium | mg/kg | 17.5 | 14.7 | 14.4 | 20 | 16.4 | 24 | 13.9 | 28 | 17.8 | 15.7 |
| Zinc | mg/kg | 36.2J | 42.9J | 33J | 42.1J | 40.3J | 48.8J | 28.7J | 45.3J | 33.9J | 29.8J |
| **Lanthanides** | | | | | | | | | | | |
| Cerium | mg/kg | 44.2 | 32.7 | --- | --- | --- | --- | --- | --- | --- | --- |
| Neodymium | mg/kg | 23.1 | 23.4 | --- | --- | --- | --- | --- | --- | --- | --- |

**Table II.13. Results Summary of Chemicals Detected in New Property Sediment Samples**
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| Parameter | Units | Sample Identification Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SD1901 | SD2001 | SD2101 | SD2111[D] | SD2201 | SD2301 | SD2401 | SD2501 | SD2601 | SD2701 |
| **Inorganics (continued)** | | | | | | | | | | | |
| Molybdenum | mg/kg | 11.8 | 8.2 | 10.2 | 12 | 7.8 | 7.5 | 10 | 9.3 | 9.7 | 10.9 |
| Nickel | mg/kg | 13.3 | 21.2 | 16.5 | 17.1 | 20.7 | 20.2 | 20 | 21.2 | 23.7 | 19.1 |
| Potassium | mg/kg | 1,310J | 1,930J | 1,710J | 2,280J | 3,030J | 2,590J | 1,930J | 2,730J | 3,380J | 2,880J |
| Selenium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | 0.94 | 0.8 |
| Silver | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sodium | mg/kg | 581 | 728 | 620 | 779 | 700 | 628 | 691 | 763 | 761 | 591 |
| Thallium | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Tin | mg/kg | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Vanadium | mg/kg | 15.8 | 23.2 | 20.5 | 24.7 | 28.6 | 28.4 | 21.9 | 31 | 31.7 | 26.4 |
| Zinc | mg/kg | 40.1J | 48.9J | 50.3J | 53.3J | 56.1J | 48.4J | 54.1J | 49.1J | 68.2J | 51.7J |
| **Lanthanides** | | | | | | | | | | | |
| Cerium | mg/kg | --- | --- | --- | --- | --- | 50.9 | 40.9 | 40.4 | --- | 48.4 |
| Neodymium | mg/kg | --- | --- | --- | --- | --- | 33.4 | 16.5 | --- | --- | 28.7 |

--- compound not detected
D indicates a duplicate sample
J estimated quantity
ug/L microgram per liter
mg/L milligram per liter
VOC volatile organic carbon
SVOC semi-volatile organic carbon

Two VOCs, acetone and hexane, were detected in the sediment samples. Acetone was detected in three samples, SD0701, SD0801, and SD1401, at concentrations of 55J ug/kg, 19J ug/kg, and 12J ug/kg, respectively. Hexane was detected in SD1001 at 10J ug/kg and in SD2001 at 4J ug/kg.

Twenty-two SVOCs were detected in the sediment samples. The greatest number of SVOCS (19) at the highest concentrations were detected in sample SD1501. Samples SD1701, SD1801, SD1901, and SD2101 showed varying concentrations of 14 to 16 SVOCS. No SVOCS were detected in SD0701, SD0801, SD1001, SD1201, SD2001, SD2401, SD2501, and SD2701.

Nine pesticides/PCBs were detected in trace amounts (0.24J ug/kg to 3.5J ug/kg) in 18 of the 30 sediment samples. No pesticides/PCBs were detected in samples SD0101, SD0201, SD1001, SD1101, SD1201, SD1301, SD1601, SD1801, SD2001, SD2201, SD2501, and SD2701. No explosives were detected in any of the sediment samples.

Four anions were detected in the sediment samples. Chloride, fluoride, and sulfate were detected in 28 of the 30 samples, while nitrate-nitrite was detected in 21 of the samples. The maximum chloride and fluoride concentrations were detected in SD0401 at 350J mg/kg and 13.1J mg/kg, respectively. The maximum sulfate concentration was detected in sample SD1401 at 1,150J mg/kg, and the maximum nitrate-nitrite concentration was detected in sample SD2101 at 10,500J mg/kg.

Twenty-eight metals were detected in the sediment samples. Eighteen of the metals were detected in all sediment samples. Cyanide was detected in sample SD0301 at a concentration of 1.1 mg/kg. Mercury was detected at three locations, SD01, SD21, and SD26, at concentrations ranging from 0.13 mg/kg to 0.16 mg/kg. Silver and thallium were detected in sample SD0901 at concentrations of 0.35 mg/kg and 2.1J mg/kg, respectively. Tin was detected in one location SD09 (samples SD0901 and SD0911) at concentrations of 41.1 mg/kg and 20.1 mg/kg.

Two lanthanides were detected in the sediment samples collected at the New Property. Cerium was detected in eight samples and neodymium was detected in seven samples. The maximum cerium and neodymium concentrations were detected in sample SD2301 at concentrations of 50.9 mg/kg and 33.4 mg/kg, respectively.

#### 2.2.3.3 Geotechnical Results

The geotechnical results for the sediment samples are summarized in Table II.14.

### 2.2.4. Comparison with Historical Data

No historical sediment data are available for comparison. However, because the erosion of surface soils in the New Property may result in their deposition as sediments in the ephemeral stream system, it is necessary to compare the Extended Phase sediment results with the surface soils chemical data as evaluated during the Phase 1 and Extended Phase investigations. No sediment samples were taken in the vicinity of the six RSI verification surface soil samples, so these data cannot be used for comparison.

The most logical approach is to compare the sediment samples to the nearest Extended Phase soil boring(s) in a common drainage basin. Soil gas and FIDLER survey results from the Phase 1 investigation may also be compared with the sediment data.

#### 2.2.4.1. Radiological Results

The highest measurements of the ten radionuclides detected in New Property sediments occur at sampling points that have no soil borings in the same drainage basin, with one exception. At SD13, the maximum concentration of Th-230 (2.24 pCi/g) was measured several hundred feet downslope from B407 and B409, where no Th-230 was detected in surface soils. The Extended Phase surface soils and their corresponding sediment samples largely contained Ra-226, K-40, Th-228/230/232, U-234/235/238, and Pu-238. Though K-40 and Ra-226 concentrations were slightly higher in some sediment samples than in the surface soils at the nearest boring, there was generally a favorable correlation between the results. In SD05, six radionuclides are present in higher concentrations than in the nearest soil boring. In SD01, results correlate with results for the same eight radionuclides found in the nearest soil boring (B403). In SD03, SD23, and SD26, K-40 and Ra-226 are present at concentrations comparable to those in the nearest soil samples (B400 and B402), but these sediments also contain Pu-238 and thorium isotopes that were not detected in the surface soils.

**Table II.14. Summary of Geotechnical Analyses of New Property Sediment Samples**

| Sample Number | Soil Symbol | Natural Moisture (%) | Specific Gravity | Grain Size Analysis | | | | | Atterburg Limits | | Coefficient of Permeability (cm/sec) | CEC (MeqNa/100g) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | $D^{10}$ (mm) | Liquid Limit (%) | Plastic Index (%) | | | |
| SD0321[B] | GM | 20.3 | 2.69 | 39 | 16 | 18 | 27 | 0.0005 | 38 | 12 | NA | NA | 6 |
| SD0721[B] | CL | 21.1 | 2.72 | 10 | 22 | 25 | 43 | NA | 37 | 17 | NA | NA | 7.2 |
| SD0821[B] | CL | 20.6 | 2.68 | 23 | 24 | 18 | 35 | NA | 36 | 16 | NA | NA | 7.2 |
| SD0921[B] | SC | 33.5 | 2.75 | 31 | 41 | 17 | 11 | 0.0033 | 33 | 11 | NA | NA | 7 |
| SD1221[B] | SC | 14.1 | 2.72 | 22 | 45 | 13 | 20 | 0.0006 | 35 | 13 | NA | NA | 7.1 |
| SD1321[B] | CL | 21.4 | 2.7 | 23 | 24 | 41 | 12 | NA | 35 | 14 | NA | NA | 7 |
| SD1521[B] | GC | 14.9 | 2.74 | 42 | 31 | 12 | 15 | 0.0007 | 32 | 11 | NA | NA | 7 |
| SD1621[B] | GC | 14.7 | 2.71 | 43 | 24 | 13 | 20 | 0.001 | 37 | 14 | NA | NA | 7.3 |
| SD2021[B] | CL | 21.4 | 2.68 | 14 | 16 | 37 | 33 | NA | 39 | 17 | NA | NA | 7 |
| SD2321[B] | ML/CL | 23.3 | 2.69 | 15 | 33 | 29 | 23 | NA | 39 | 14 | NA | NA | 6.8 |

| | |
|---|---|
| B | geotechnical bucket sample |
| NA | not analyzed |
| CL | clay |
| GC | clayey gravel |
| GM | silty gravel |
| ML | inorganic silts with slight plasticity |
| SC | clayey sand |
| SM | silty sand |
| CEC | cation exchange capacity |
| cm/sec | centimeters per second |
| MeqNa/100g | milliequivalent of sodium per 100 grams |
| $D^{10}$ | 10% of sample had smaller grain size diameter than this number |

SD03 is located near several of the locations where FIDLER results were measured above background in the Phase 1 investigation. SD03 had the highest concentrations of Th-228 (3.78 pCi/g) and Th-232 (2.12J pCi/g) recorded in the sediment sampling during the Extended Phase investigation.

#### 2.2.4.2. Chemical

Results of the Phase 1 soil gas survey indicate that cycloalkanes/alkenes may be present in the sediments at SD12, SD13, SD14, SD15, SD18, SD19, and SD20. The Extended Phase analytical data show no organics in SD12, and low levels of four polycyclic aromatic hydrocarbons (PAHs) in SD13. SD14 had acetone and PAHs in concentrations ranging from 150J to 1500 ug/kg. SD15 had the highest concentrations of SVOCs measured in the sediment, ranging from 110 to 5000 ug/kg. SD18 and SD19 also had concentrations of PAHs in the range of 40 to 3000 ug/kg. SD20 contained 4J ug/kg of one VOC, hexane, and no SVOCs.

# 3. SUMMARY

## 3.1. SOIL SAMPLING

Extended Phase sampling included analyses of 15 surface and 12 subsurface sampling locations. Laboratory analyses of inorganic, organic, and radiological constituents, as well as geotechnical evaluations, were performed to characterize potential contamination of New Property soils.

All surface soil samples contain radionuclides Ra-226 and K-40 at concentrations from 0.36 to 1.17 pCi/g and 11.23 to 34.46 pCi/g, respectively. Pu-238 and Th-228 were found in several borings at concentrations less than 2 pCi/g. Tritium was detected only in the surface soil form boring B403 at 2.7 pCi/g. Mound Soil Screening Facility results for Pu-238 are inconsistent from the off-site lab results. Pu-238 was detected above the Mound Soil Screening detection limit of 25 pCi/g in surface soil samples B39801, B40401, B40501, B40701, and B40801. Mound Soil Screening results for Th-232 were consistent with the Extended Phase results as all values were less than the detection limit of 2 pCi/g. Surface soils contain no VOCs and eleven SVOCs scattered among eleven of the borings. Trace or estimated amounts of pesticides/PCBs and 2,4,6-trinitrotoluene were found. Anions and metals were present in all surface soils in amounts that are consistent with previous findings.

All eleven subsurface soil samples contain Ra-226 at concentrations ranging from 0.34 to 1.02 pCi/g, with the highest concentration from B403 in Area 1. Th-232 was detected in ten of the eleven samples at concentrations ranging from 0.05 to 1.02 pCi/g. K-40 was detected in five borings, with the maximum concentration at B405, at 4.5 to 7 feet BGS. Pu-238, Pu-239/240, and tritium were not present in any of the subsurface samples. Th-228 and U-235 were present in three and eight subsurface samples, respectively. The highest concentrations of Ra-226 was found in B403 in Area 1. B404 had the highest concentrations of Th-230 and U-238. B405 has the highest concentration of Sr-90 and U-234. Soil Screening Facility Pu-238 results are inconsistent with the Extended Phase laboratory results. Pu-238 was detected above the Mound Soil Screening detection limit of 25 pCi/g in borings B398, B405, B407, and B409. Th-232 was detected above the Mound Soil Screening detection limit of 2 pCi/g in sample B39892 at a concentration of 2.9 pCi/g. Acetone was detected in four of 11 subsurface samples, with a maximum concentration of 51J ug/kg from B409. B401, B407, and B408 were found to contain three phthalate esters in concentrations from 37J to 170J ug/kg. Heptachlor and tetryl were each found in one boring at low concentrations. Anions and metals were present in all subsurface samples.

## 3.2. GROUNDWATER SAMPLING

Groundwater samples were collected at six locations and evaluated for inorganic, organic, and radiological constituents. Eight radionuclides were detected in groundwater. Seven radionuclides were detected in samples W40001 and W40801, while six were detected in well W402. These wells are located either downgradient of Area 1 or the Spoils Disposal Area. Pu-238 was not detected in the groundwater. Th-232 was detected in samples W39901, W40101, W40801, and W41101 at concentrations ranging from 0.15 and 0.39J pCi/L. Ra-226 was detected in all groundwater samples at concentrations from 0.51J to 1.22J pCi/L.

Five VOCs were detected in three monitoring wells, and two SVOCs were detected in five wells. Pesticides/PCBs were not detected in the groundwater. 2,4,6-Trinitrotoluene was found in estimated concentrations less than 1 ug/L in wells W400 and W411. Three anions and ten metals were detected in all groundwater samples.

## 3.3. SEDIMENT SAMPLING

Twenty-seven sediment samples were collected and analyzed for inorganic, organic, radiological, and geotechnical parameters.

Pu-238 was encountered at 11 sample locations, with a maximum concentration of 21.87 pCi/g at SD23. Th-228 occurred in 21 sample locations, with the maximum concentration at 3.78 pCi/g at SD03. Tritium was found in concentrations between 2 and 3 pCi/g at three sample locations. Uranium isotopes (234/235/238) and thorium isotopes 230 and 232 were detected in almost every sediment sampling location.

Acetone was detected in three of the 27 sample locations (SD07, SD08, and SD14). Twenty-one SVOCs, nearly all of them PAHs, were detected in 19 locations. No SVOCs were detected at SD07, SD08, SD10, SD12, SD16, SD20, SD24, SD25, and SD27. SD15 had the highest concentrations and the greatest number of SVOCs in the Extended Phase sediment sampling. Nine pesticides/PCBs were present in 18 of the samples, in trace amounts (0.24J to 3.5J ug/kg). Two lanthanides, cerium and neodymium, were detected in the sediments. Cerium was present in eight samples, at a maximum concentration of 50.9 ug/kg in SD23. Neodymium was detected in seven samples in concentrations as high as 33.4 ug/kg, also in SD23.

# 4. REFERENCES

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