DOE/OR/01-2483&D1

Explanation of Significant Differences for the Record of Decision for Interim Actions in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee

This document is approved for public release per review by:

G. B. Boroughs (Signature on File) 10/15/2010
BJC ETTP Classification & Information Control Office — Date

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Prepared for the
U.S. Department of Energy
Office of Environmental Management

BECHTEL JACOBS COMPANY LLC
Managing the
Environmental Management Activities at the
East Tennessee Technology Park
Y-12 National Security Complex Oak Ridge National Laboratory
Paducah Gaseous Diffusion Plant Portsmouth Gaseous Diffusion Plant
under contract DE-AC05-98OR22700
for the
U.S. DEPARTMENT OF ENERGY

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Site Name and Location

U.S. Department of Energy (DOE)
Oak Ridge Reservation (ORR)
East Tennessee Technology Park (ETTP)
Zone 1
Oak Ridge, Tennessee
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
Information System ID TN1890090003

Introduction and Statement of Purpose

Zone 1 (Fig. 1) is a 1400-acre area outside the fence of the main plant at ETTP.

The *Record of Decision for Interim Actions in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee* (Zone 1 Interim ROD) (DOE 2002) identifies the remedial actions for contaminated soil, buried waste, and subsurface infrastructure necessary to protect human health and to limit further contamination of groundwater. Since the Zone 1 Interim Record of Decision (ROD) was signed, new information has been obtained that requires the remedy to be modified as follows:

- Change the end use in Contractor's Spoil Area (CSA) from unrestricted industrial to recreational
- Remove Exposure Units (EUs) Z1-50, 51, and 52 from the scope of the Zone 1 Interim ROD
- Change the end use of the duct bank corridor from unrestricted industrial to restricted industrial
- Remove restriction for the disturbance of soils below 10 feet in Exposure Unit (EU) Z1-04

In accordance with 40 *Code of Federal Regulations* (*CFR*) 300.435, these scope modifications are a "significant" change to the Zone 1 Interim ROD. In accordance with CERCLA Sect. 117 (c) and 40 *CFR* 300.435 (c)(2)(i), such a significant change is documented with an Explanation of Significant Differences (ESD). The purpose of this ESD is to make the changes listed above.

This ESD is part of the Administrative Record file, and it, and other information supporting the selected remedy, can be found at the DOE Information Center, 475 Oak Ridge Turnpike, Oak Ridge, Tennessee 37830, from 8:00 a.m. to 5:00 p.m., Monday through Friday.

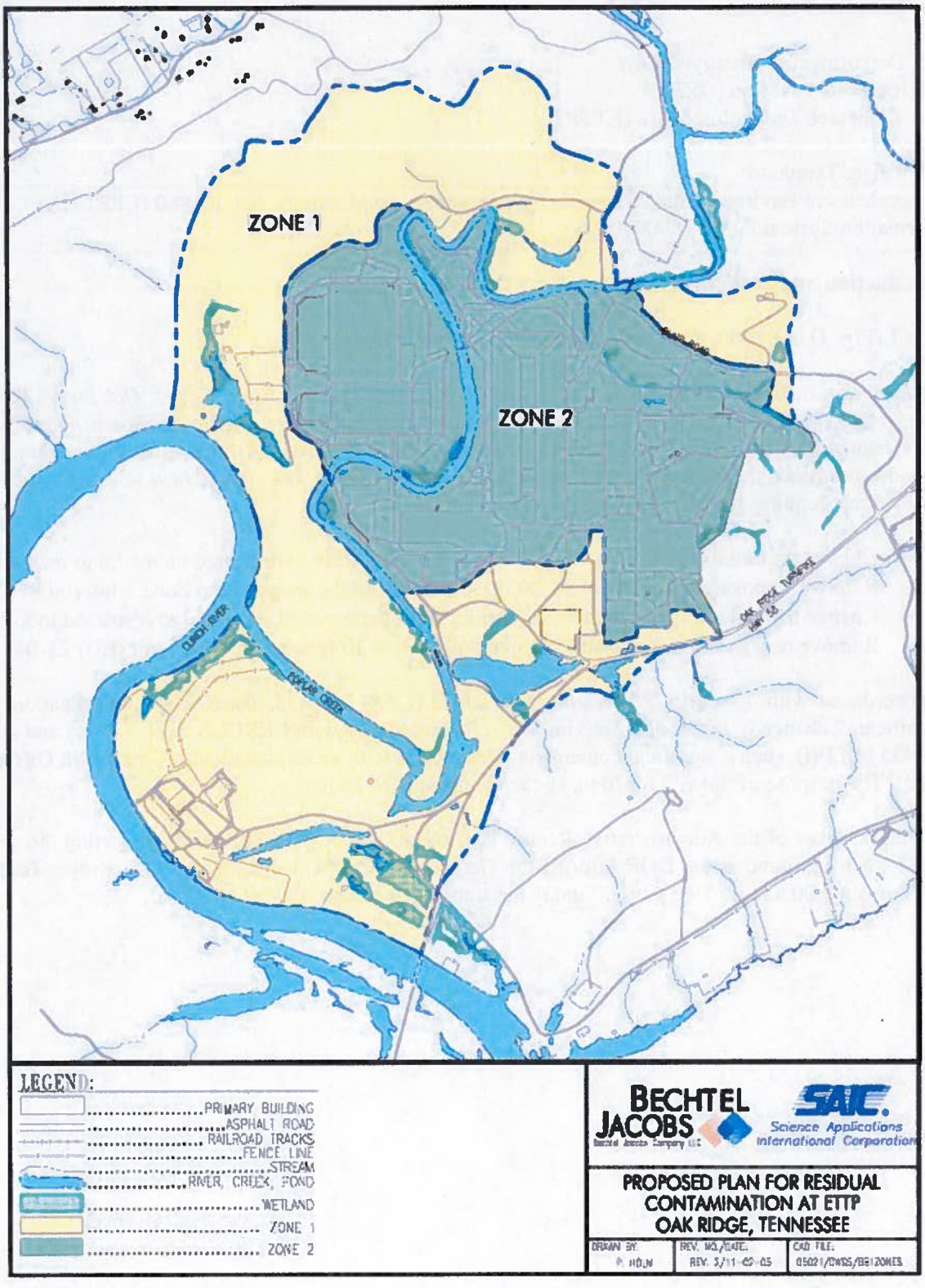

Fig. 1. Location of Zone 1 at the East Tennessee Technology Park.

Site History, Contamination, and Selected Remedy

The ORR is located in Roane and Anderson counties, within and adjacent to the corporate city limits of Oak Ridge, Tennessee. ETTP is located in Roane County near the northwest corner of the ORR. ETTP began operation during World War II as part of the Manhattan Project. The original mission of ETTP was to produce enriched uranium for use in atomic weapons. The plant produced enriched uranium from 1945 until 1985. Uranium production was terminated in 1987. ORR was placed on the National Priorities List in 1989, so remediation activities are conducted under CERCLA.

The primary contaminants of concern at ETTP follow:

- In groundwater—volatile organic compounds (VOCs) at multiple locations (trichloroethene is generally the most prevalent compound)
- In sediment—inorganic elements, radionuclides, and polychlorinated biphenyls
- In soil—inorganic elements, radionuclides, semivolatile organic compounds (particularly the polycyclic aromatic hydrocarbons), and VOCs
- In facilities—radionuclides and polychlorinated biphenyls (abandoned facilities also pose a safety and health hazard to workers.)

The purposes of the remedial actions selected in the Zone 1 Interim ROD are to allow unrestricted industrial use down to 10 feet and to remediate potential sources of groundwater contamination. Following is a summary of the major components of the Zone 1 Interim ROD remedy:

- Excavation of the Blair Quarry burial area and associated contaminated soil
- Excavation of miscellaneous contaminated soil in the K-895 Cylinder Destruct Facility area and in the Powerhouse Area
- Removal of sludge and demolition of the K-710 sludge beds and Imhoff tanks
- Implementation of land use controls (LUCs)
- Characterization of soil and remediation of areas that exceed remediation levels

Basis for the Document

The bases for the significant differences from the selected remedy are:

- The CSA was included as part of the Black Oak Ridge Conservation Easement (BORCE) that was created after the Zone 1 Interim ROD was signed.
- EUs Z1-50, -51, and -52 are the site of Resource Conservation and Recovery Act (RCRA)-permitted facilities that will not be shut down in the foreseeable future.
- The duct bank will contain fixed-in-place contaminants that were not anticipated when the Zone 1 Interim ROD was signed.
- EU Z1-04 ownership was transferred from DOE to the private sector after the Zone 1 Interim ROD was signed. The restriction on excavation below 10 feet is an impediment to development and is not necessary, based on operational history and environmental characterization data.

Description of Significant Differences

The overall impact of the post-Zone 1 Interim ROD changes to the remedy is an incremental decrease in scope and cost. Performance of the remedy remains unchanged. No major change is needed to the Zone 1 Interim ROD or its supporting analyses. A description of each change follows.

The CSA was included as part of the BORCE that was created after the Zone 1 Interim ROD was signed. The Zone 1 Interim ROD was premised on the assumption that the future end use will be industrial. However, as part of the recent Natural Resources Damage Assessment settlement on the ORR, DOE agreed to place into a conservation easement 2966 acres of DOE property on Black Oak Ridge and McKinney Ridge in the west end of Oak Ridge. This new BORCE (Fig. 2) is managed by the state of Tennessee as a Wildlife Management Area and State Natural Area. The CSA is located in the western half of the BORCE (Fig. 3). Thus, a *Supplemental Risk Assessment for the Contractor's Spoil Area Zone 1 EU-66 and EU-70, East Tennessee Technology Park, Oak Ridge, Tennessee* (DOE 2009) was prepared that presents the process and results for a revised risk assessment at the CSA that evaluates the new recreational end use of the area. This assessment of CSA (EUs Z1-66 and -70) is detailed in the *Addendum to the Phased Construction Completion Report for the Duct Island Area and K-901 Area in Zone 1 East Tennessee Technology Park, Oak Ridge, Tennessee* (DOE 2010) and determines that no remedial action is required to protect the recreational receptor. Therefore, the Zone 1 Interim ROD is being modified to change the end use of CSA (EUs Z1-66 and -70) from unrestricted industrial to recreational, due to the fact this area is in the BORCE. Because of this change in end use, the land use controls for CSA are in Table 1.

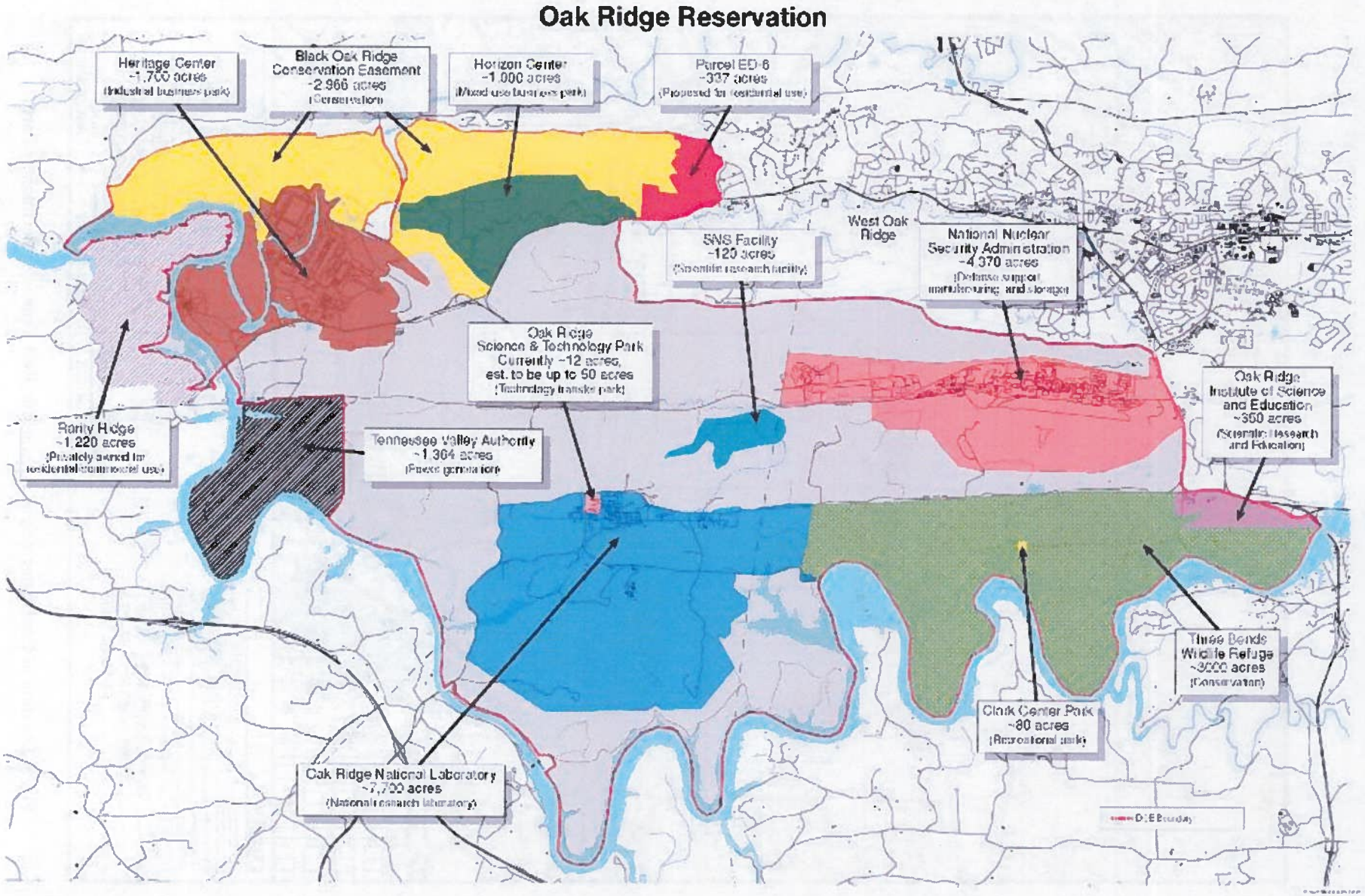

Fig. 2. Oak Ridge Reservation, including Black Oak Ridge Conservation Easement.

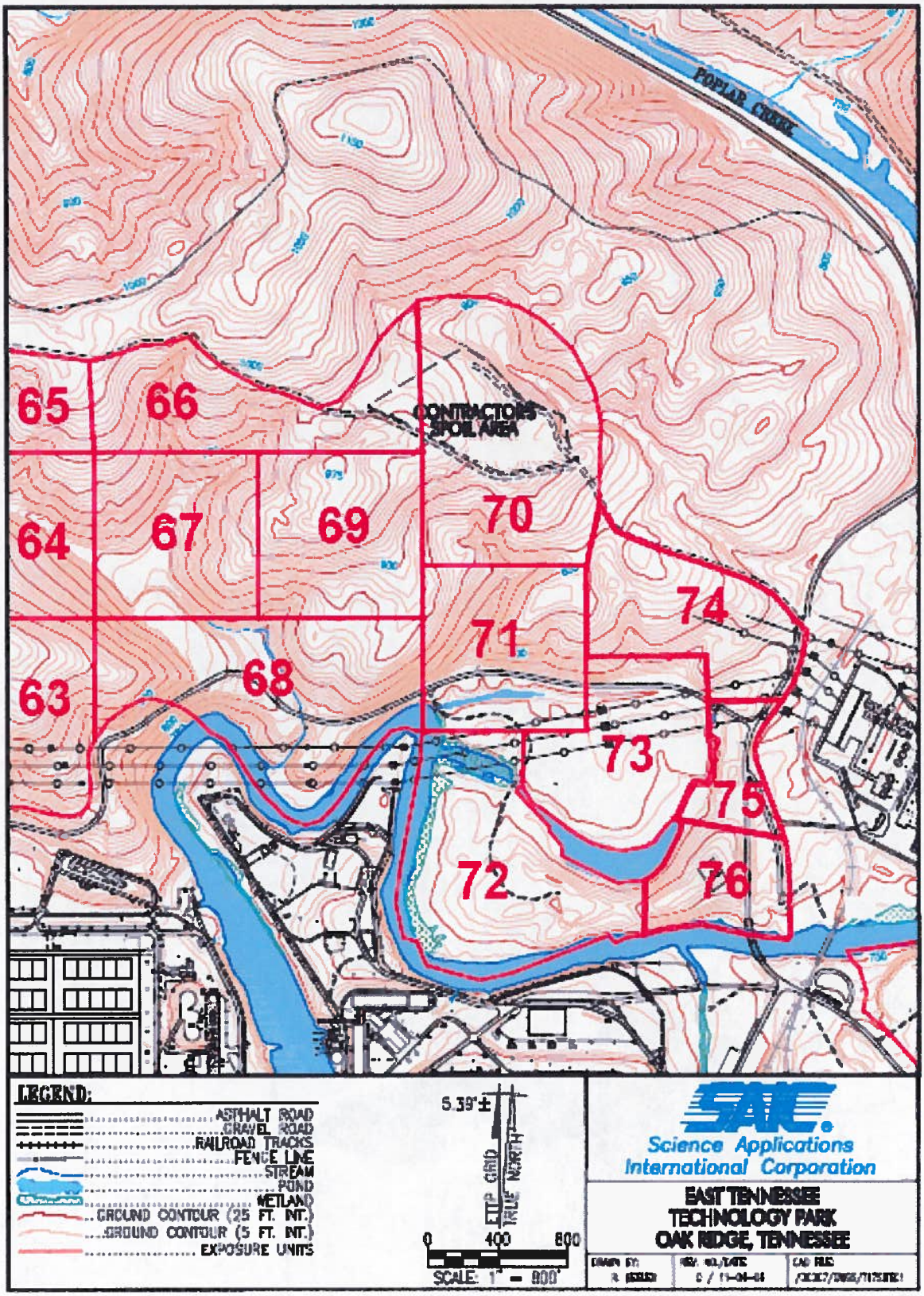

Fig. 3. Location of Contractor's Spoil Area within East Tennessee Technology Park.

Table 1. Land use controls for Contractor's Spoil Area

Type of control	Purposes of control	Duration	Implementation	Affected areas[a]
1. DOE land notation (property record restrictions)[b] A. Land use B. Groundwater	A. Restrict use of property by imposing limitations consistent with permitted use for the BORCE B. Prohibit uses of groundwater	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Drafted and implemented by DOE upon completion of all remediation activities or transfer of affected areas. Recorded by DOE in accordance with state law at County Register of Deeds office.	EUs Z1-66 and Z1-70
2. Property record notices[c]	Provide notice to anyone searching records about the existence and location of contaminated areas and limitations on their use	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Notice provided by DOE EM to the public as soon as practicable after signing the ROD, upon transfer of affected areas, and upon completion of all remediation activities. This notice will be replaced with the DOE land notation after completion of the remediation.	EUs Z1-66 and Z1-70
3. Zoning notices[d]	Provide notice to city about the existence and location of waste disposal and residual contamination areas and limitations on their use for zoning/planning purposes; uses are those permitted for the BORCE	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Initial zoning notice (same as property record notice) filed with City Planning Commission as soon as practicable after signing the ROD; final zoning notice and survey plat filed with City Planning Commission upon completion of all remedial actions.	EUs Z1-66 and Z1-70
4. EPP program[e]	Provide notice to worker/ developer (i.e., permit requester) on extent of contamination and prohibit or limit excavation/ penetration activity	As long as property remains under DOE control, including transferred property remaining subject to EPP Program	• Implemented by DOE and its contractors • Initiated by permit request • Maintain updated contamination information	EUs Z1-66 and Z1-70
6. Access controls[f] (e.g., fences, gates, portals)	Control and restrict access to workers and the public to prevent uses not consistent with permitted use for the BORCE	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Controls maintained by DOE.	EUs Z1-66 and Z1-70; specific locations, if required, will be determined by DOE

Table 1. Land use controls for Contractor's Spoil Area (cont.)

Type of control	Purposes of control	Duration	Implementation	Affected areas[a]
7. Signs[g]	Provide notice or warning to prevent unauthorized access for uses not consistent with permitted use for the BORCE	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Signage maintained by DOE.	EUs Z1-66 and Z1-70; specific locations will be determined by DOE
8. Surveillance patrols	Control and monitor access by workers/public consistent with permitted use for the BORCE	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	• Established and maintained by DOE • Necessity of patrols evaluated upon completion of remedial actions	EUs Z1-66 and Z1-70

[a] Affected Areas – EUs Z1-66 and -70 identified in the post-ROD *Addendum to the Phased Construction Completion Report for the Duct Island Area and K-901 Area in Zone 1 East Tennessee Technology Park, Oak Ridge, Tennessee* (DOE 2010).

[b] DOE land notation (property record restrictions) – Includes conditions and/or covenants that restrict or prohibit certain uses of real property and are recorded along with original property acquisition records of DOE and its predecessor agencies.

[c] Property Record Notices – Refers to any non-enforceable, purely informational document recorded along with the original property acquisition records of DOE and its predecessor agencies that alerts anyone searching property records to important information about residual contamination/waste disposal areas on the property.

[d] Zoning Notices – Includes information on the location of waste disposal areas and residual contamination depicted on a survey plat, which is provided to a zoning authority (i.e., City Planning Commission) for consideration in appropriate zoning decisions for non-DOE property.

[e] Excavation/Penetration Permit Program – Refers to the internal DOE/DOE contractor administrative program(s) that require the permit requester to obtain authorization, usually in the form of a permit, before beginning any excavation/penetration activity (e.g., well drilling) for the purpose of ensuring that the proposed activity will not affect underground utilities/structures, or, in the case of contaminated soil or groundwater, will not disturb the affected area without the appropriate precautions and safeguards.

[f] Access Controls – Physical barriers or restrictions to entry.

[g] Signs – Posted command, warning, or direction.

BORCE = Black Oak Ridge Conservation Easement
DOE = U.S. Department of Energy
EM = Environmental Management
EPP = excavation/penetration permit
EU = exposure unit
ROD = record of decision

EUs Z1-50, -51, and -52 are the site of RCRA-permitted facilities that will not be shut down in the foreseeable future. Facilities located on and covering most of EUs Z1-50, -51 and -52 are currently in use for the permitted storage of hazardous waste (Fig. 4).

- K-1066-K Yard that supports waste storage operations is on EU Z1-50.
- K-1065-D and –E; Hazardous Waste Storage Units, K-1065-F, -G, and –H; Flammable Storage Facilities, and associated support facilities and infrastructure are on EU Z1-51.
- K-1065-A, -B, and –C; Hazardous Waste Storage Units; and associated support facilities and infrastructure, are on EU Z1-52.

Because these are operating facilities storing hazardous waste, the characterization and evaluation of these EUs for possible remediation is premature. Additionally, EU Z1-50 is being used for the long-term storage of waste and other material. The use of all of these facilities is planned for the foreseeable future. Therefore, EUs Z1-50, -51, and -52 will be removed from the Zone 1 Interim ROD and will be addressed in the *Record of Decision for Soil, Buried Waste, and Subsurface Structure Actions in Zone 2, East Tennessee Technology Park, Oak Ridge, Tennessee* (DOE 2005).

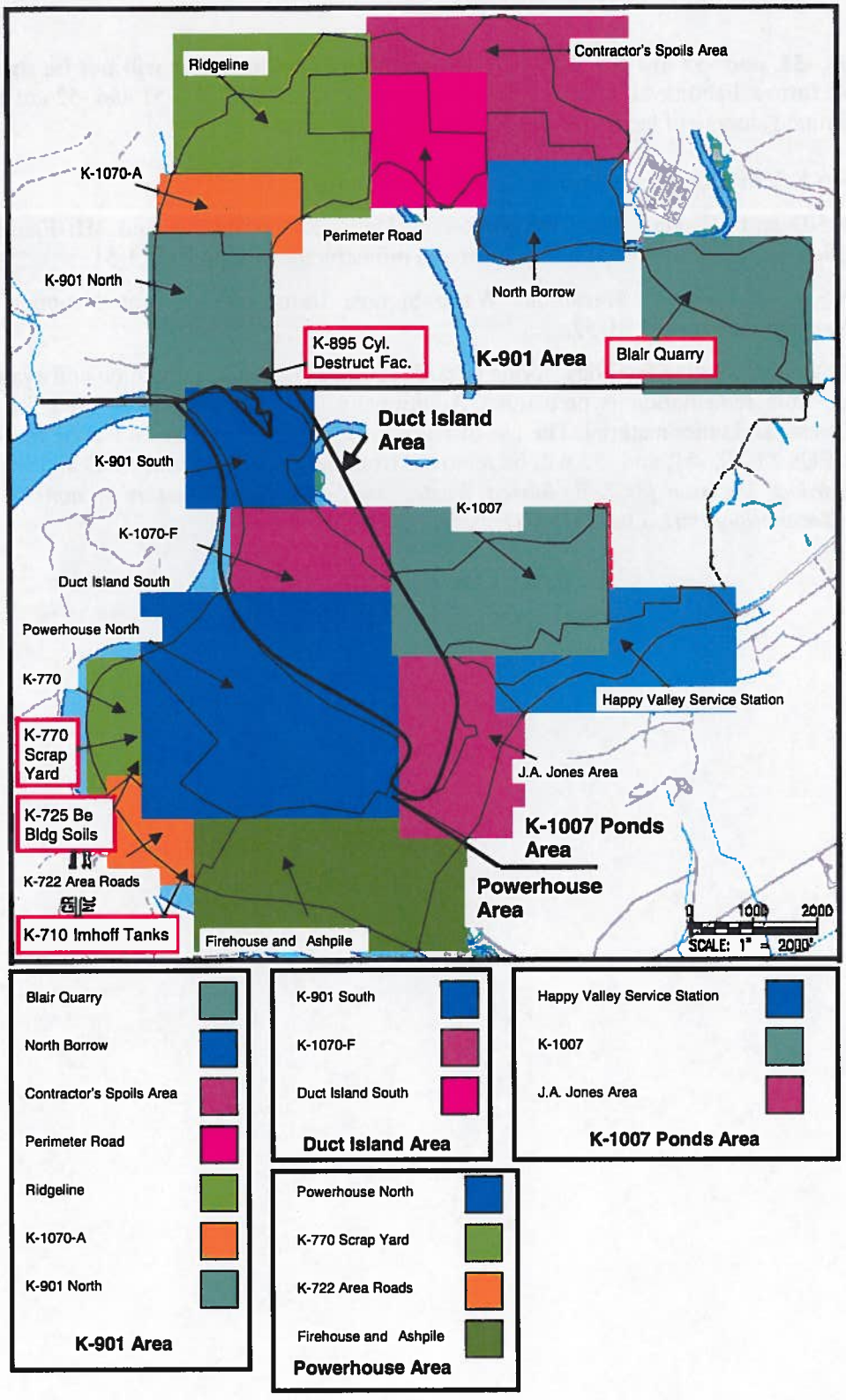

Fig. 4. Location of Exposure Units Z1-50, -51, and -52.

The duct bank will contain fixed-in-place contaminants that were not anticipated when the Zone 1 Interim ROD was signed. The underground 14 kV power transmission system that ran from the K-704 Switchhouse to the K-27 Switchyard was abandoned in the early 1970s (Fig. 5). The length of the duct bank in Zone 1 is approximately 1 mile, and the depth varies. The system consists of 13 concrete ducts, each containing a group of 6 conduits. The conduits pass through vaults that were installed at approximately every 500 feet of duct run.

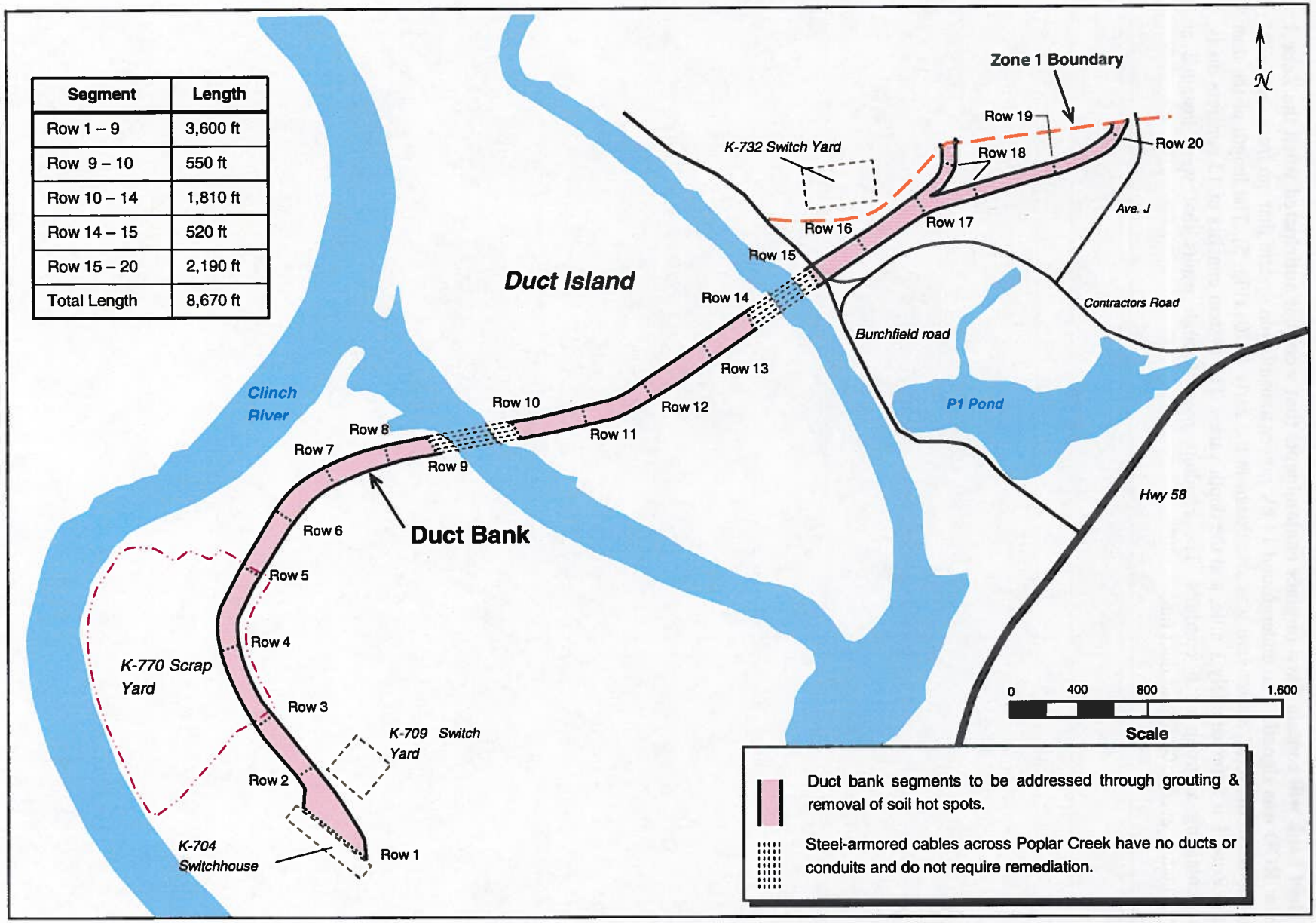

Fig. 5. Location of duct bank in Zone 1.

The remediation of the duct bank consists of excavating soil hot spots contaminated with lead outside the vaults, dewatering the vaults and conduit, grouting the vaults and partially plugging the conduits, preparing a civil survey and plat map, and implementing land use controls. Since there still will be some metal contamination and asbestos fixed in place in the vaults, and there will be buried infrastructure with void space, unrestricted industrial use to a depth of 10 feet is not practical. Therefore, the end use will be changed from unrestricted industrial to a depth of 10 feet to restricted industrial. The alternatives considered for remediation of the duct bank are:

- Remove vault sediment and backfill with inert material
- Remove entire duct bank and dispose at Environmental Management Waste Management Facility (EMWMF) or other suitable disposal facility
- Remove (excavate) vaults and dispose at EMWMF or other suitable disposal facility
- Grout vaults and conduits

The analysis of these alternatives is in Table 2.

Table 2. Remedial options for duct bank

Option	Basic Scope	Cost[1]	Advantages	Disadvantages
Clean out vaults	• Dewater vaults • Remove sediment • Backfill with inert material (gravel, soil)	$2.4 million	• Removes lead-contaminated sediment from vaults (packaged and disposed elsewhere) • Maintains structural integrity of vaults and minimizes potential for collapse or breach	• Removal of sediment accomplishes only minor reduction in mass of potential source material (lead-sheathed cables remain) • Technical difficulties in performing an effective cleanout of the vaults without impacting personnel safety • Does not address cable remnants • Does not satisfy Zone 1 Interim ROD requirement for unrestricted industrial use to a depth of 10 feet
Remove entire duct bank	• Dewater vaults • Demolish vaults • Excavate duct runs	$21.5 million	• Eliminates potential source material • Completely removes duct bank system • Satisfies Zone 1 Interim ROD for unrestricted industrial use to a depth of 10 feet	• Colossal excavation project (6000 feet x 200 feet x 8 feet deep) with significant potential for environmental impacts • Generates huge quantity of waste (at least 250,000 cubic yards) requiring transport and disposal after downsizing concrete rubble
Remove vaults	• Dewater vaults • Demolish vaults • Excavate concrete rubble	$3.7 million	• Removes vaults and any contamination contained therein • Eliminates future concerns regarding structural integrity of vaults	• Large scale excavation effort (due to large number of sites) with water management and environmental issues (several locations adjacent to Poplar Creek) • Does not address cable remnants within the duct runs • Does not satisfy Zone 1 Interim ROD requirement for unrestricted industrial use to a depth of 10 feet
Grout vaults	• Dewater vaults • Grout vault • Grout conduits to the extent practicable	$2.3 million	• Immobilizes contaminated sediment inside vaults • Isolates cable remnants within conduits • Maintains structural integrity of vaults and minimizes potential for collapse or breach	• Leaves closed-in-place source that requires future land use controls • Does not satisfy Zone 1 Interim ROD requirement for unrestricted industrial use to a depth of 10 feet.

Notes: [1] Detailed cost estimate developed only for the grouting option; all other cost estimates within +50%/-30% of actual cost.
ROD = record of decision

Options eliminated due to limited effectiveness, technical impracticability, and/or unacceptable benefit to cost ratio

Option selected based on effectiveness, technical feasibility, and acceptable benefit to cost ratio

Prior to any future excavation, appropriate protective measures will be required for the potential of encountering heavy metals and asbestos. Additionally, the duct bank is a subsurface void space. This is an important consideration in land use and will be conveyed to potential users as well. The land use controls for the duct bank corridor are in Table 3.

Table 3. Land use controls for duct bank

Type of control	Purposes of control	Duration	Implementation	Affected areas[a]
1. DOE land notation (property record restrictions)[b] A. Land use B. Groundwater	A. Restrict use of property by imposing limitations consistent with permitted use B. Prohibit uses of groundwater	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Drafted and implemented by DOE upon completion of all remediation activities or transfer of affected areas. Recorded by DOE in accordance with state law at County Register of Deeds office; civil survey and plat map.	Duct bank corridor
2. Property record notices[c]	Provide notice to anyone searching records about the existence and location of contaminated areas and void space and limitations on their use	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Notice provided by DOE EM to the public as soon as practicable after signing the ROD, upon transfer of affected areas, and upon completion of all remediation activities. This notice will be replaced with the DOE land notation after completion of the remediation.	Duct bank corridor
3. Zoning notices[d]	Provide notice to city about the existence and location of waste disposal and residual contamination areas and limitations on their use for zoning/planning purposes; no excavation without appropriate precautions	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Initial zoning notice (same as property record notice) filed with City Planning Commission as soon as practicable after signing the ROD; final zoning notice and survey plat filed with City Planning Commission upon completion of all remedial actions.	Duct bank corridor
4. EPP Program[e]	Provide notice to worker/ developer (i.e., permit requester) on extent of contamination and prohibit or limit excavation/ penetration activity	As long as property remains under DOE control, including transferred property remaining subject to EPP Program	• Implemented by DOE and its contractors • Initiated by permit request • Maintain updated contamination information	Duct bank corridor
6. Access controls[f] (e.g., fences, gates, portals)	Control and restrict access to workers and the public to prevent uses not consistent with fixed in place contamination and void space	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Controls maintained by DOE.	Duct bank corridor; specific locations will be determined by DOE

Table 3. Land use controls for duct bank (cont.)

Type of control	Purposes of control	Duration	Implementation	Affected areas[a]
7. Signs[g]	Provide notice or warning to prevent unauthorized access	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Signage maintained by DOE.	Duct bank corridor; specific locations will be determined by DOE
8. Surveillance patrols	Control and monitor access by workers/public	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	• Established and maintained by DOE • Necessity of patrols evaluated upon completion of remedial actions	Duct bank corridor

[a]Affected Areas – K-770 area (EUs 27 - 33).

[b]DOE land notation (property record restriction) – Includes conditions and/or covenants that restrict or prohibit certain uses of real property and are recorded along with original property acquisition records of DOE and its predecessor agencies.

[c]Property Record Notices – Refers to any non-enforceable, purely informational document recorded along with the original property acquisition records of DOE and its predecessor agencies that alerts anyone searching property records to important information about residual contamination/waste disposal areas on the property.

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[e]EPP Program – Refers to the internal DOE/DOE contractor administrative program(s) that require the permit requester to obtain authorization, usually in the form of a permit, before beginning any excavation/penetration activity (e.g., well drilling) for the purpose of ensuring that the proposed activity will not affect underground utilities/structures, or, in the case of contaminated soil or groundwater, will not disturb the affected area without the appropriate precautions and safeguards.

[f]Access Controls – Physical barriers or restrictions to entry.

[g]Signs – Posted command, warning, or direction.

DOE = U.S. Department of Energy
EM = Environmental Management
EPP = excavation/penetration permit
EU = exposure unit
ROD = record of decision

EU Z1-04 ownership was transferred from DOE to the private sector after the Zone 1 Interim ROD was signed. The restriction on excavation below 10 feet is an impediment to development and is not necessary, based on operational history and environmental characterization data. The Zone 1 Interim ROD states "Industrial uses will be allowed without controls to a maximum depth of 10 ft below ground surface (bgs). Use of the subsurface below 10 ft will be restricted." Accordingly, the Zone 1 Interim ROD requires land use controls to prevent disturbance of soil below 10 feet.

The restriction for disturbance of soil 10 feet or more below the ground surface will be removed from EU Z1-04 based on the following:

- Numerous soil samples collected from zero to 10 feet bgs and one soil sample collected below 10 feet indicate there is no soil contamination that precludes industrial use of the EU
- Operational history indicates there is no buried waste present within EU Z1-04 and no evidence of the presence of contamination below 10 feet
- There is no groundwater plume present within, or immediately upgradient of, EU Z1-04, and the generally stable or declining concentrations of contaminants in the groundwater plumes at the Heritage Center precludes transport of groundwater from contaminated portions of the Heritage Center to EU Z1-04
- EU Z1-04 received a No Further Action (NFA) decision (DOE 2006)

EU Z1-04 is a 21-acre grassy field bounded by roadways and the site of two new speculative buildings to be used for office space, industrial activities, or other commercial uses. The duct bank runs through EU Z1-04 and will be addressed as discussed previously. The NFA decision for EU Z1-04 was based on the data evaluation presented in the *Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1* (DOE 2006). Approximately 18 acres, designated as Parcel ED-5 East, of the 21 acres comprising EU Z1-04 have been transferred to the Heritage Center, LLC, a subsidiary of the Community Reuse Organization of East Tennessee. This property transfer was accomplished through a Covenant Deferral Request (CDR) submitted to the Environmental Protection Agency (EPA) Region 4 and the Tennessee Department of Environment and Conservation (TDEC) pursuant to 120(h)(3)(C) of CERCLA. Approval for this transfer was granted by EPA Region 4 and concurrence was received from the Governor of the state of Tennessee in 2005. The transfer of this tract of land was based on an evaluation of the environmental conditions of the property and a screening-level human health risk assessment as presented in the CDR. Consistent with the Zone 1 Interim ROD, the deed transferring the property from DOE to Heritage Center, LLC prohibits the disturbance of soil 10 feet or more below the surface without prior written approval by the parties to the *Federal Facility Agreement for the Oak Ridge Reservation* (DOE 1006), DOE, EPA and TDEC. However, based on the environmental data collected for EU Z1-04, there is no reason to suspect soil contamination at depths below 10 feet.

Soil samples were collected from EU Z1-04 in support of the Sitewide Remedial Investigation in 1998 (DOE 1998), to support transfer of the property in 2000 and 2004, and as part of the Dynamic Verification Strategy (DVS) process for Zone 1 in 2005 (DOE 2006). Soil samples were collected from 40 locations within the EU. Soil sample locations and the program collecting the sample for each location within EU Z1-04 are indicated in Fig. 6. In accordance with the approved sampling and analysis plans, the soil samples were collected from a maximum depth of 10 feet bgs with the exception of one location (EMGW05) near the southern boundary of the EU, which extended to a depth of 11.5 feet bgs. Sample collection depths for the individual sample locations are indicated in the summary of the detected constituents for all of the soil samples included as Attachment 1 and for selected locations and constituents in the cross sections in Figs. 7 through 9. These cross section locations were selected to provide a general representation of the EU conditions. Evaluation of the data obtained for EU Z1-04, as presented in the *Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1* (DOE 2006) led to the NFA decision for EU Z1-04.

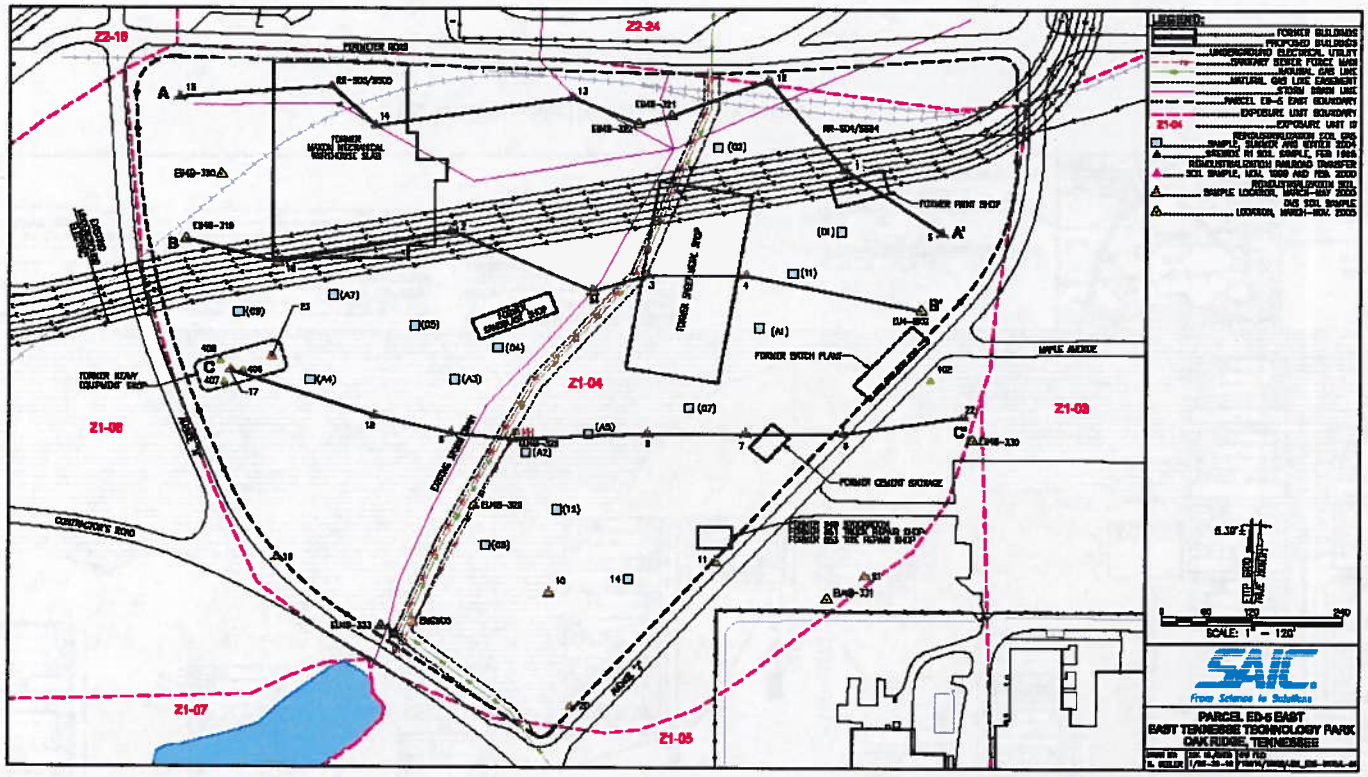

Fig. 6. Sample Locations for Exposure Unit Z1-04 Area.

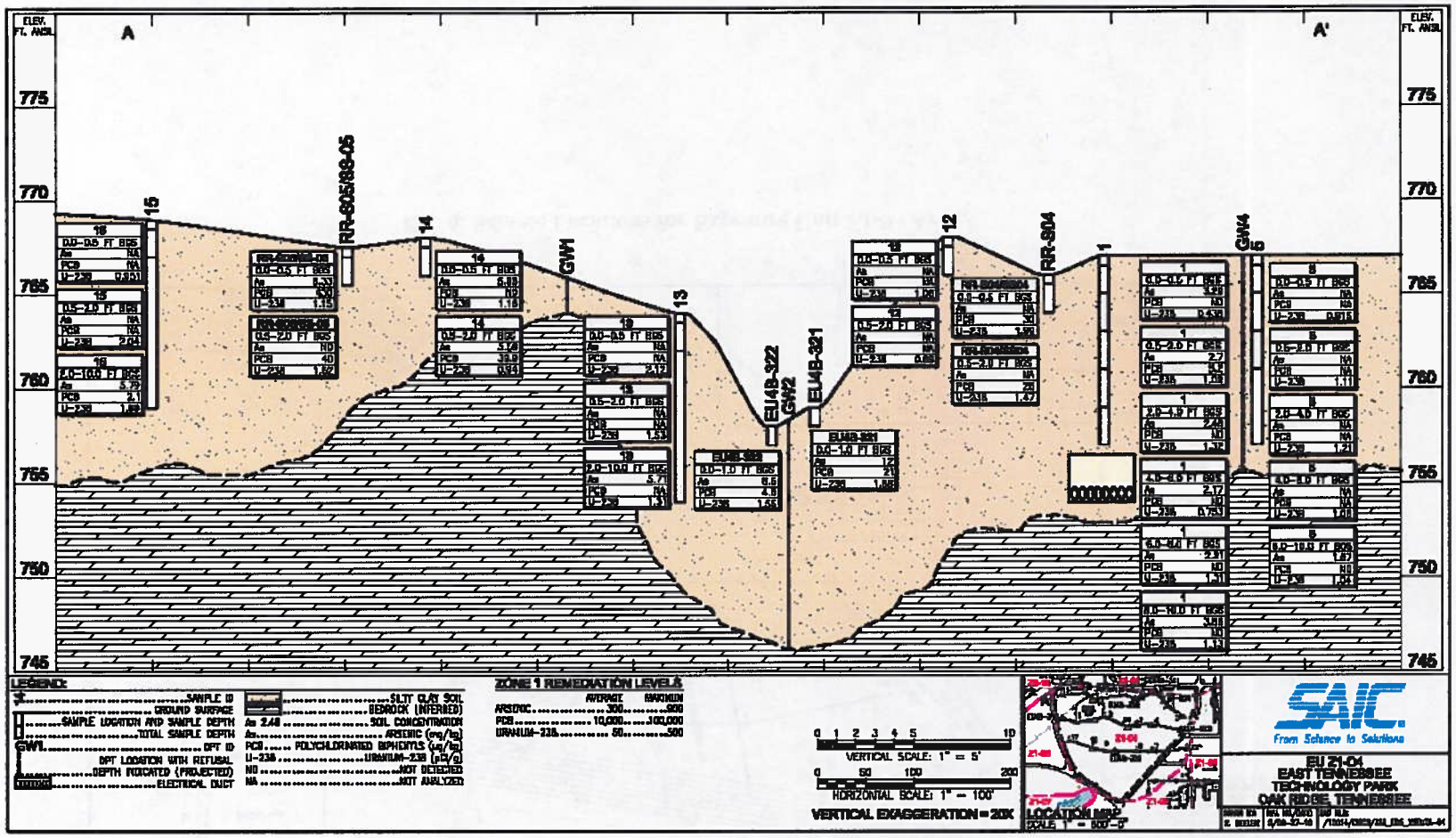

Fig. 7. Cross Section A-A for Exposure Unit Z1-04.

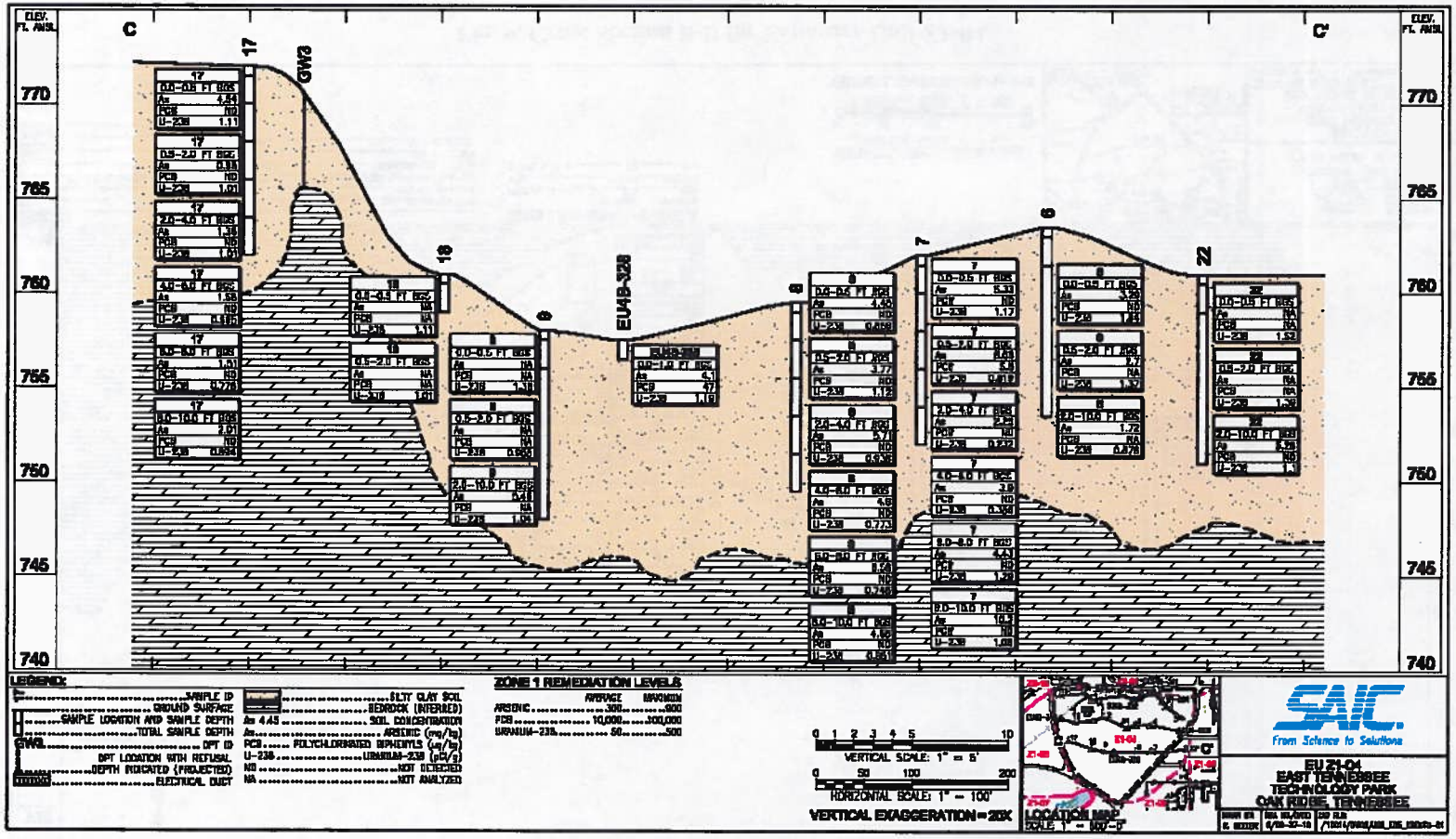

Fig. 8. Cross Section C-C for Exposure Unit Z1-04.

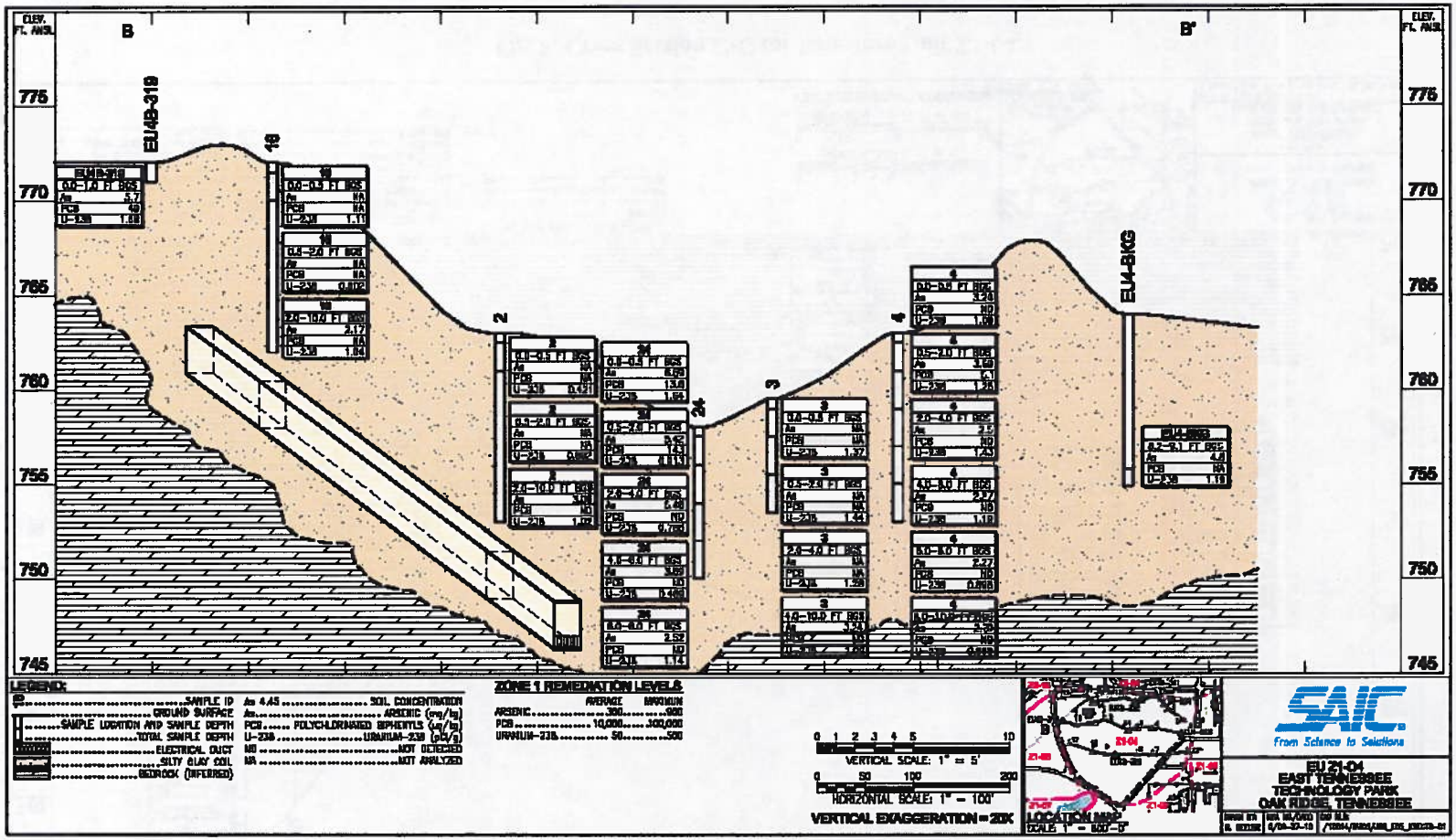

Fig. 9. Cross Section B-B for Exposure Unit Z1-04.

Field screening methods also were used as part of the sample collection activities at EU Z1-04. Field screening included radiological screening and VOC screening using hand-held meters. Field screening was performed for selection of the soil cores most likely to contain contamination for laboratory analysis and to ensure the safety of the field crews. Field screening did not reveal evidence of significant soil contamination within EU Z1-04.

In addition to soil samples from EU Z1-04, soil gas samples were also collected from sixteen locations in the winter and summer of 2004 and screened against the approved soil vapor trigger levels established for ETTP. None of the VOCs detected in either the winter or summer sampling events exceeded trigger levels, and the sum of trigger level fractions was below 1.0, indicating that cumulatively the VOCs did not exceed trigger levels. Thus, there is not a complete pathway for vapor intrusion within EU Z1-04.

An attempt was also made to collect groundwater samples within EU Z1-04 in 2005. Five temporary groundwater piezometers were to be installed to collect groundwater samples; however, none of the five were installed because of refusal of the drill rods at depths of 1 to 11.5 feet bgs. Groundwater was not encountered in the unconsolidated materials above the refusal depths, indicating that the water table lies below the top of bedrock beneath EU Z1-04. Thus, groundwater samples were not collected from the soil materials overlying bedrock within the EU.

The nearest groundwater plume to EU Z1-04 is located approximately 600 feet west of the property (Fig. 10). However, groundwater flow in the area of this plume is to the southwest towards Poplar Creek and away from EU Z1-04. It can be seen in Fig. 10 that a groundwater divide lies to the north of EU Z1-04, and the groundwater plume located to the north of EU Z1-04 lies north of this divide. Thus, groundwater flow transports this plume to the north away from EU Z1-04, and a groundwater plume is not present upgradient of this EU. In addition, contaminant concentration trend analysis of the surrounding plumes indicates that concentrations generally are decreasing or stable in these plumes. Thus, further growth of the existing plumes in the direction of EU Z1-04 is unlikely. Analytical transport modeling used to forecast plume behavior, as presented in the *Final Sitewide Remedial Investigation and Feasibility Study for the East Tennessee Technology Park* (DOE 2007), indicates that contaminant concentrations in the surrounding groundwater plumes will be further attenuated in the future. Based on the hydrogeologic conditions and the groundwater modeling results, it is highly unlikely that the groundwater plumes shown on Fig. 10 will reach EU Z1-04 in the future.

Based on the analysis of all of the available soil data and results of the DVS walkover assessment, the following summary is presented in the *Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1* (DOE 2006):

- No Zone 1 soils Contaminants of Concern (COCs) are present at concentrations in excess of maximum Remediation Levels (RLs).
- No Zone 1 soils COCs are present with a mean concentration exceeding the average RL across the EU.
- The 1×10^{-5} industrial preliminary remediation goals (PRGs) for manganese and benzo(a)pyrene were each exceeded in one sample. No other 1×10^{-5} industrial PRGs were exceeded. The two exceedances will not cause the cumulative risk across EU Z1-04 to exceed the established risk limits of 1×10^{-4} excess lifetime cancer risk and target organ hazard index of 1.
- There are no regular Maximum Contaminant Level exceedances in local groundwater wells and no groundwater screening levels are exceeded in soil samples from EU Z1-04. Based on the sample data and walkover assessment observations, there is no contaminant mass in EU Z1-04 that poses a risk to groundwater.
- NFA is appropriate under the Zone 1 Interim ROD to meet unrestricted industrial use to a depth of 10 feet for EU Z1-04.

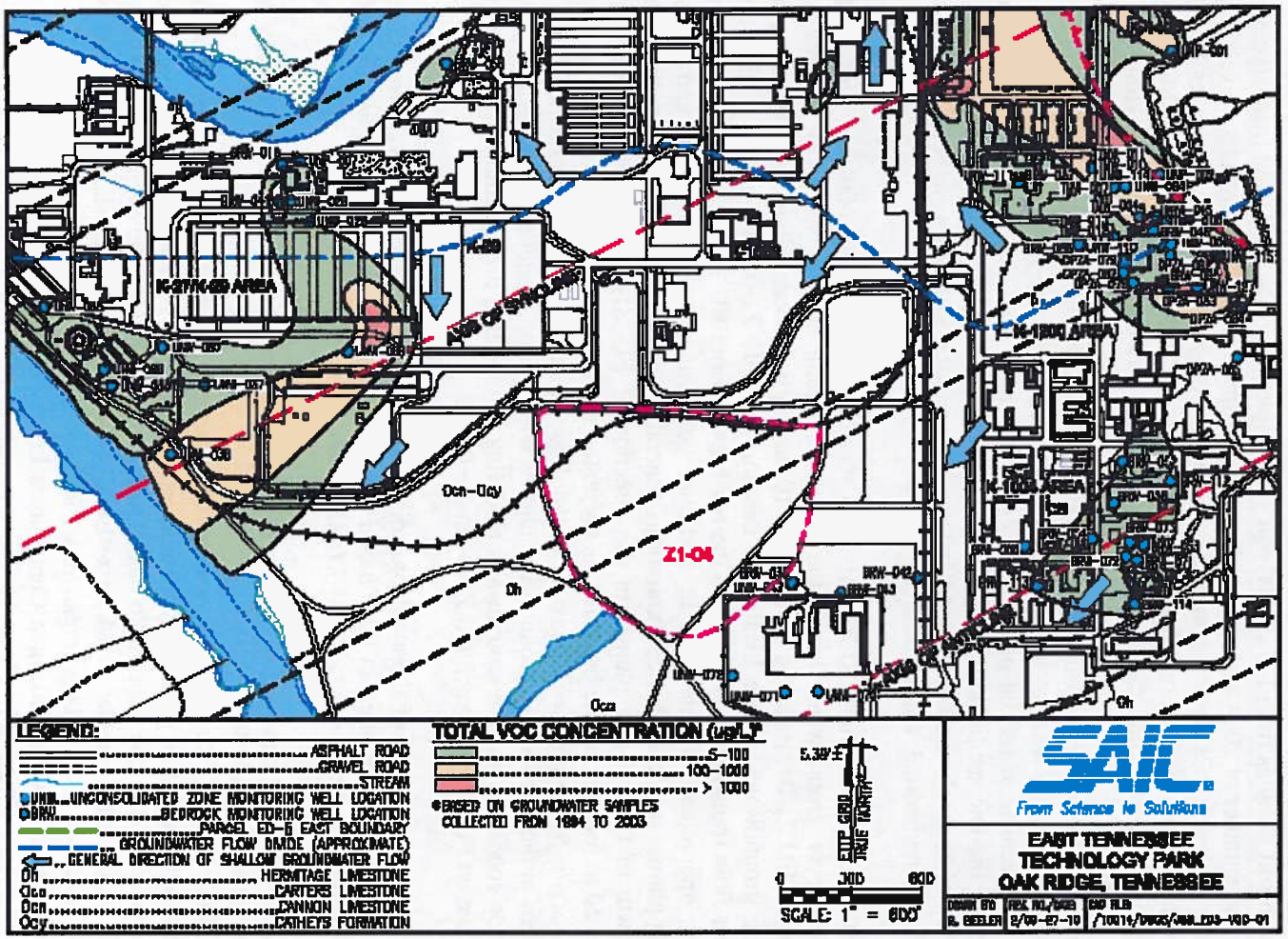

Fig. 10. Groundwater VOC plume concentrations and monitoring well locations in the vicinity of EU ZI-04.

Although manganese and benzo(a)pyrene exceeded their 1×10^{-5} industrial PRGs in one sample each, only the sample for benzo(a)pyrene exceeded the Regional Screening Level (RSL) for industrial soil at a risk of 1×10^{-5} (http://www.epa.gov/region9/superfund/prg/). The RSL exceedance of benzo(a)pyrene occurred in a sample collected from a depth of 0.5 to 2 feet bgs at a location approximately 50 feet from a paved road and within the utility corridor containing sanitary sewer lines, storm drain lines, and a natural gas line (EMGW05), any of which may be the source of this elevated occurrence. Four soil samples collected from depths below 2 feet at this location were all well below the 1×10^{-5} industrial soil RSL for benzo(a)pyrene. Thus, transport of this compound to lower soil depths is not occurring.

Although the restriction for the disturbance of soils below 10 feet bgs will be lifted, other land use controls specified in the Zone 1 Interim ROD remain in effect at EU Z1-04. These land use controls are indicated in Table 5.

Table 5. Land use controls for Exposure Unit Z1-04

Type of control	Purposes of control	Duration	Implementation	Affected area
1. DOE land notation (property record restrictions)[a] A. Land use B. Groundwater	A. Restrict use of property by imposing limitations consistent with permitted use B. Prohibit uses of groundwater	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Drafted and implemented by DOE upon completion of all remediation activities or transfer of affected areas. Recorded by DOE in accordance with state law at County Register of Deeds office; civil survey and plat map.	EU Z1-04
2. Property record notices[b]	Provide notice to anyone searching records about the existence and location of contaminated areas and subsurface void space (electrical ducts) and limitations on their use	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Notice provided by DOE EM to the public as soon as practicable after signing the ROD, upon transfer of affected areas, and upon completion of all remediation activities. This notice will be replaced with the DOE land notation after completion of the remediation.	EU Z1-04
3. Zoning notices[c]	Provide notice to city about the existence and location of waste disposal and residual contamination areas and limitations on their use for zoning/planning purposes; no excavation without appropriate precautions	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Initial zoning notice (same as property record notice) filed with City Planning Commission as soon as practicable after signing the ROD; final zoning notice and survey plat filed with City Planning Commission upon completion of all remedial actions.	EU Z1-04
4. EPP Program[d]	Provide notice to worker/ developer (i.e., permit requester) on extent of contamination and prohibit or limit excavation/ penetration activity	As long as property remains under DOE control, including transferred property remaining subject to EPP Program	• Implemented by DOE and its contractors • Initiated by permit request • Maintain updated contamination information	EU Z1-04

Table 5. Land use controls for Exposure Unit Z1-04 (cont.)

Type of control	Purposes of control	Duration	Implementation	Affected area
6. Access controls[e] (e.g., fences, gates, portals)	Control and restrict access to prevent uses not consistent with subsurface void space	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Controls maintained by DOE will be described in the deed restrictions.	EU Z1-04
7. Signs[f]	Provide notice or warning to prevent unauthorized access	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	Signage maintained by DOE.	EU Z1-04
8. Surveillance patrols	Control and monitor access by workers/public	Until the concentration of hazardous substances in the environmental media (e.g., soils and groundwater) are at such levels to allow for unrestricted use and exposure	• Established and maintained by DOE • Necessity of patrols evaluated upon completion of remedial actions	EU Z1-04

[a] DOE land notation (property record restriction) – Includes conditions and/or covenants that restrict or prohibit certain uses of real property and are recorded along with original property acquisition records of DOE and its predecessor agencies.

[b] Property Record Notices – Refers to any non-enforceable, purely informational document recorded along with the original property acquisition records of DOE and its predecessor agencies that alerts anyone searching property records to important information about residual contamination/waste disposal areas on the property.

[c] Zoning Notices – Includes information on the location of waste disposal areas and residual contamination depicted on a survey plat, which is provided to a zoning authority (i.e., City Planning Commission) for consideration in appropriate zoning decisions for non-DOE property.

[d] EPP Program – Refers to the internal DOE/DOE contractor administrative program(s) that require the permit requester to obtain authorization, usually in the form of a permit, before beginning any excavation/penetration activity (e.g., well drilling) for the purpose of ensuring that the proposed activity will not affect underground utilities/structures, or, in the case of contaminated soil or groundwater, will not disturb the affected area without the appropriate precautions and safeguards.

[e] Access Controls – Physical barriers or restrictions to entry.

[f] Signs – Posted command, warning, or direction.

DOE = U.S. Department of Energy
EM = Environmental Management
EPP = excavation/penetration permit
EU = exposure unit
ROD = record of decision

Cost

The decreased cost associated with the remedy changes is approximately $4,100,000, as shown in Table 6. This cost is approximately 15% of the estimated cost of $26 million presented in the Zone 1 Interim ROD (DOE 2002).

Table 6. Cost impact

Change	Cost Difference($)
Contractor's Spoil Area	-3,800,000
Exposure Units Z1-50, -51, and -52	-300,000
Duct Bank	0
Exposure Unit Z1-04	0
Total	**-4,100,000**

A brief explanation of the cost difference is below:

- Because CSA is in the BORCE, the end use is changed from unrestricted industrial to recreational. This change in end use avoids the remedial action required if the end use remains unrestricted industrial. The estimated cost of the remedial action is $3,800,000.
- Since EUs Z1-50, -51, and -52 will be moved from Zone 1 to Zone 2, the cost of completing the characterization of these three EUs will not be part of the Zone 1 Interim ROD. The cost still will be borne by the Zone 2 ROD, but the transfer of the scope decreases the cost of the Zone 1 Interim ROD by $300,000.
- The remediation of the duct bank is being performed, so there is no cost impact.
- Characterization of EU Z1-04 already has been completed, and no remedial action is required.

EPA and TDEC Comments

EPA and TDEC have participated with DOE in the development, early review, and subsequent revision of this ESD. Through signature of this document, EPA and TDEC indicate that they approve the ESD and endorse the changes to the scope of the Zone 1 Interim ROD.

Statutory Determinations

As required under CERCLA Sect. 121, the modified remedy protects human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate requirements (ARAR) to the remedial action, is cost-effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedy consists of interim actions and will be reevaluated in the future. No ARAR waivers are required for this remedy. This ESD does not affect the prior Zone 1 Interim ROD determination that the remedy satisfies the statutory preference for treatment. As required by CERCLA, a review will be conducted no less often than every 5 years after initiation of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Public Participation Compliance

Prior to issuance of this ESD, DOE developed a fact sheet explaining the scope of the proposed change to

the Zone 1 Interim ROD and the potential impacts to the original decision. The fact sheet was made available to the public at the DOE Information Center, 475 Oak Ridge Turnpike, Oak Ridge, Tennessee, 37830, (865) 576-0885, accompanied by public notice of its availability.

The public participation requirements set forth in *CFR* 300.435I(2)(i) will be met. After approval of the ESD, DOE will publish a public notice of availability and a brief description of the ESD in major local newspapers of general circulation. Also, the ESD will be made available to the public through placement in the Administrative Record file and the DOE Information Center.

References

DOE 1996. *Federal Facility Agreement for the Oak Ridge Reservation,* FFA-PM/96-020, U.S. Department of Energy, Office of Environmental Management, Oak Ridge, TN.

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DOE 2006. *Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1 at East Tennessee Technology Park, Oak Ridge, Tennessee,* DOE/OR/01-2294&D2, U.S. Department of Energy, Office of Environmental Management, Oak Ridge, TN.

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DOE 2009. *Supplemental Risk Assessment for the Contractor's Spoil Area Zone 1 EU-66 and EU-70, East Tennessee Technology Park, Oak Ridge, Tennessee,* DOE/OR/01-2408&D1 (now an attachment to DOE/OR/01-2261&D2/A1), U.S. Department of Energy, Office of Environmental Management, Oak Ridge, TN.

DOE 2010. *Addendum to the Phased Construction Completion Report for the Duct Island Area and K-901 Area in Zone 1 East Tennessee Technology Park, Oak Ridge, Tennessee,* DOE/OR/01-2261&D2/A1/R1, U.S. Department of Energy, Office of Environmental Management, Oak Ridge, TN.

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APPROVAL

Explanation of Significant Differences
for the Record of Decision for Interim Actions
in Zone 1, East Tennessee Technology Park
Oak Ridge, Tennessee

DOE/OR/01-2483&D1

February 2011

John R. Eschenberg, Assistant Manager for Environmental Management Oak Ridge Operations U.S. Department of Energy	Date
John Owsley, Director U.S. Department of Energy Oversight Division Tennessee Department of Environment and Conservation	Date
Franklin Hill, Acting Director Superfund Division U.S. Environmental Protection Agency – Region	Date

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ATTACHMENT 1

SUMMARY OF SOIL SAMPLE RESULTS FOR EXPOSURE UNIT Z1-04

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Summary of Soil Sample Results for Exposure Unit Z1-04

Analyte	Station ID		402	406	407	408	01						02			03				04						
	Depth		8 – 10	2 – 4	2 – 4	2 – 4	0 – 0.5	0.5 – 2	2 – 4	4 – 6	6 – 8	8 – 10	0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 4	4 – 10	0 – 0.5	0 – 8	0.5 – 2	2 – 4	4 – 6	6 – 8	8 – 10
	RL	GW SL																								
Metals (mg/kg)																										
Aluminum			9320	9820	16100	13100	6340	5650	11300	12200	12300	12600	NA	NA	12300	NA	NA	NA	11500	8130	NA	14100	16500	16400	15900	15400
Antimony		144	0.73	0.82	0.83	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	900	66.3	8.5	4.7	3.7	3.3	3.29	2.7	2.48	2.17	2.21	3.86	NA	NA	3.06	NA	NA	NA	3.24	3.24	NA	3.69	2.5	2.27	2.27	2.79
Barium		9150	53.7	35.6	45.9	68.8	33.1	50.1	52.6	24.3	33.1	54.3	NA	NA	66.5	NA	NA	NA	77.3	47.4	NA	34	27.2	54.8	33.9	52.2
Beryllium	6000		0.67	0.58	1	1.1	0.328	0.33	0.57	0.4	0.5	0.73	NA	NA	0.54	NA	NA	NA	1.51	0.38	NA	0.67	0.54	1.43	0.84	5.12
Cadmium			ND	ND	ND	ND	NA	0.35	0.45	0.33	0.52	0.46	NA	NA	0.52	NA	NA	NA	0.49	0.27	NA	0.47	0.41	0.54	0.51	0.54
Chromium		172	24.3	17	17.3	14.6	9.91	19.4	63.7	40.9	41	27.9	NA	NA	17.1	NA	NA	NA	15.3	12.3	NA	29.5	26.4	21	26.3	24.3
Cobalt			9.8	5.5	35.2	36.2	4.56	7.64	23.6	3.39	3.56	6.24	NA	NA	8.01	NA	NA	NA	11.3	4.13	NA	2.82	2.01	28.4	11.2	12
Copper			31.2	20.6	34.6	31.1	11.1	7.94	8.85	10.3	14	15.7	NA	NA	15.3	NA	NA	NA	14.6	24.1	NA	17	18.5	20.4	21.4	23.3
Iron			30100	33700	38500	40500	13300	15100	43100	32200	36500	39700	NA	NA	25500	NA	NA	NA	24500	12900	NA	44100	42300	38300	47700	38100
Lead		3370	21.7	16.5	27.8	23.1	10.4	11	19.7	4.2	4.8	5.32	NA	NA	14.6	NA	NA	NA	13.3	18.8	NA	7.21	7.43	18	11.2	11.7
Magnesium			230	3820	818	680	7080	16200	292	355	3980	445	NA	NA	25400	NA	NA	NA	6980	1370	NA	1290	450	500	455	581
Manganese			1010	346	850	793	390	553	1360	131	200	353	NA	NA	777	NA	NA	NA	561	288	NA	137	83.6	634	200	458
Mercury	1800		0.06	0.05	0.03	0.02	0.102	0.03	0.03	0.04	0.05	0.09	NA	NA	0.06	NA	NA	NA	0.05	0.06	NA	0.03	0.03	0.1	0.06	0.15
Nickel			9.4	12.2	20.1	24.2	13.1	6.18	7.7	7.92	8.94	10.1	NA	NA	9.88	NA	NA	NA	15.6	33.9	NA	7.77	10.3	17.6	11	24.4
Selenium			ND	ND	ND	2.3	ND	ND	ND	ND	ND	ND	NA	NA	ND	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver			ND	ND	ND	ND	NA	0.19	0.21	0.12	0.18	0.15	NA	NA	0.19	NA	NA	NA	0.17	0.13	NA	0.13	0.15	0.19	0.19	0.15
Thallium		10.8	0.56	0.87	1.1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium			43.8	29.2	26.9	27.9	11.6	14	34.3	31.9	30.2	33.1	NA	NA	26	NA	NA	NA	22.1	17.4	NA	38.3	31.9	30.4	31.4	25.8
Zinc			29.3	31.9	58.3	45.9	31.2	18.8	25.1	27	33.2	38.3	NA	NA	28.5	NA	NA	NA	49.4	27.9	NA	26	31.2	50.7	37.2	87.2
PCBs (µg/kg)																										
PCB-1254	100000		NA	NA	NA	NA	ND	2.1	ND	ND	ND	ND	NA	NA	ND	NA	NA	NA	ND	ND	ND	5.1	ND	ND	ND	ND
PCB-1260	100000		NA	NA	NA	NA	ND	3.1	ND	ND	ND	ND	NA	NA	ND	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs/VOCs (µg/kg)																										
2-Butanone			19	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene			ND	2	4	3	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND
M + P Xylene			2	13	23	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride		241	ND	ND	ND	ND	5	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	ND	NA	ND	ND	ND	ND	ND
Tetrachloroethene		4720	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	ND	NA	ND	ND	ND	ND	ND
Toluene		502000	97	21	72	52	ND	0.38	ND	0.42	ND	ND	NA	NA	NA	NA	NA	NA	NA	ND	NA	ND	0.36	ND	ND	0.82
Trichloroethene		1720	8	2	1	6	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	ND	NA	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane			ND	6	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		402	406	407	408	01						02			03				04						
	Depth		8–10	2–4	2–4	2–4	0–0.5	0.5–2	2–4	4–6	6–8	8–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–4	4–10	0–0.5	0–8	0.5–2	2–4	4–6	6–8	8–10
	RL	GW SL																								
Radionuclides (pCi/g)																										
Actinium-228			NA	NA	NA	NA	NA	NA	NA	1.56	1.58	1.75	NA	1.27	1.52	NA	NA	NA	1.1	1	NA	1.72	1.82	1.83	1.95	1.9
Americium-241			NA	NA	NA	NA	0.0384	ND	0.0462	0.0335	ND	0.0499	0.0568	0.0239	ND	ND	0.0568	ND	0.0593	ND	ND	ND	0.108	0.0534	ND	ND
Cesium-137	20		NA	NA	NA	NA	0.0771	0.0108	ND	ND	ND	ND	0.171	ND	ND	0.204	ND	0.0426	ND	0.506	ND	ND	ND	ND	ND	ND
Cobalt-60			NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	0.0101	ND	ND	ND	0.00792	ND	ND	ND	0.0235	ND	ND	ND
Neptunium-237	50		NA	NA	NA	NA	ND	0.0742	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0655	ND	ND
Plutonium-238			NA	NA	NA	NA	ND	0.104	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Plutonium-239/240			NA	NA	NA	NA	ND	0.28	ND	ND	ND	ND	ND	ND	ND	0.0497	NA	NA	NA	0.0442	ND	ND	ND	0.0718	ND	ND
Protactinium-234m			NA	NA	NA	NA	ND	1.26	1.37	ND	2.48	ND	0.474	ND	2.83	ND	5.05	2.37	2.2	ND	ND	ND	ND	5.27	ND	2.75
Technetium-99			NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	1.31	NA	NA
Thorium-228			NA	NA	NA	NA	0.411	1.34	1.49	1.4	1.82	1.88	0.417	1.94	1.32	1.21	1.73	1.68	1.23	1.1	1.67	1.67	1.9	1.79	1.73	1.69
Thorium-230			NA	NA	NA	NA	0.259	0.918	0.99	0.831	1.49	1.54	0.495	0.869	1.33	1.08	1.39	1.31	0.978	1.02	1.66	1.51	0.977	1.24	1.25	1.32
Thorium-232	15		NA	NA	NA	NA	0.309	1.14	1.4	1.25	1.96	1.69	0.437	1.49	1.57	1.12	1.31	1.17	1.13	0.988	1.47	1.93	1.76	1.89	1.69	1.8
Thorium-234			NA	NA	NA	NA	ND	0.802	0.93	1.15	0.968	1.53	0.291	0.82	0.948	1.66	1.82	1.31	1.08	1.21	ND	1.8	ND	1.45	1.74	1.5
Total Activity			NA	NA	NA	NA	ND	10.2	ND	6.27	12	10.3	ND	9.62	12.6	ND	12.8	10.3	10.3	8.21	4.99	7.97	18.7	14.8	ND	12.6
Uranium-233/234	7000	61.1	NA	NA	NA	NA	0.573	0.879	1.12	0.93	1.37	1.23	1.16	0.852	1.44	1.78	1.47	1.36	0.955	1.63	2.08	1.16	1.19	1.37	1.21	0.867
Uranium-235	80	61.1	NA	NA	NA	NA	ND	0.0494	0.0968	ND	ND	ND	0.0205	0.0614	ND	0.143	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.111
Uranium-235/236			NA	NA	NA	NA	ND	ND	0.0799	-0.0293	0.0939	0.0698	0.111	0.0358	0.0322	ND	0.119	0.0497	0.0308	0.102	0.0529	0.0552	0.00848	0.0363	0.15	0.101
Uranium-238	500	61.1	NA	NA	NA	NA	0.438	1.02	1.32	0.753	1.31	1.13	0.421	0.892	1.02	1.37	1.44	1.28	1.09	1.09	1.75	1.25	1.43	1.19	0.898	0.999

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		05					06			07						08							09		
	Depth		0–0.5	0.5–2	2–4	4–6	6–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–4	4–6	6–8	8–10	0–0.5	0–8	0.5–2	2–4	4–6	6–8	8–10	0–0.5	0.5–2	2–10
	RL	GW SL																								
Metals (mg/kg)																										
Aluminum			NA	NA	NA	NA	13800	NA	NA	15400	19200	10900	1720	2780	19500	27200	6870	17200	22800	22800	16400	16200	20400	NA	NA	18400
Antimony		144	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.233	2.65	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	900	66.3	NA	NA	NA	NA	1.67	NA	NA	ND	5.33	8.06	2.25	3.9	4.43	10.2	2.82	6.26	3.77	5.71	4.6	6.56	4.68	NA	NA	5.46
Barium		9150	NA	NA	NA	NA	57.4	NA	NA	39.2	59.3	133	10.1	8.48	53.2	5150	42.3	112	61.1	175	129	109	145	NA	NA	94.2
Beryllium	6000		NA	NA	NA	NA	1.06	NA	NA	0.54	1.46	0.91	0.16	0.33	1.04	2.82	0.45	2.36	1.71	8.32	2.07	1.72	9.8	NA	NA	3.9
Cadmium			NA	NA	NA	NA	0.59	NA	NA	ND	ND	ND	ND	ND	ND	4.65	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
Chromium		172	NA	NA	NA	NA	28.5	NA	NA	29.8	21.3	17.4	15.7	25.2	21	15.4	10.7	19.8	22.2	24.1	36.4	18.8	23.6	NA	NA	19.5
Cobalt			NA	NA	NA	NA	9.79	NA	NA	16.7	19.1	7.14	2.69	2.48	8.21	150	8.47	12.8	99.9	32.4	29.7	15.6	27.2	NA	NA	30.7
Copper			NA	NA	NA	NA	16.9	NA	NA	12	27.5	21.3	1.72	2.62	23.5	66.2	12.8	21	26.6	28.4	21.8	22.4	26	NA	NA	37.7
Iron			NA	NA	NA	NA	36700	NA	NA	42700	40700	30400	5280	12800	42400	52300	13100	35700	46200	49400	40100	40400	44800	NA	NA	46900
Lead		3370	NA	NA	NA	NA	13.3	NA	NA	16	23.9	36.5	2.9	NA	13	23.3	14.9	15.3	33.1	19.7	26.8	17.8	22	NA	NA	23.7
Magnesium			NA	NA	NA	NA	993	NA	NA	899	3910	13000	593	6040	2850	1360	12400	10700	2220	3660	1670	4540	3170	NA	NA	6790
Manganese			NA	NA	NA	NA	677	NA	NA	566	488	298	155	135	328	45000	275	492	972	437	556	629	770	NA	NA	1570
Mercury	1800		NA	NA	NA	NA	0.07	NA	NA	0.04	0.04	1.13	NA	NA	NA	NA	0.04	0.11	0.15	NA	0.01	0.01	0.03	NA	NA	0.07
Nickel			NA	NA	NA	NA	16.4	NA	NA	9.55	43.8	15.6	2.65	4.83	21.2	69.6	17.7	30.8	27.8	54	29.8	29	53	NA	NA	39.9
Selenium			NA	NA	NA	NA	ND	NA	NA	2.01	1.52	ND	ND	ND	0.67	ND	ND	0.61	ND	1.5	0.85	ND	ND	NA	NA	1.41
Silver			NA	NA	NA	NA	0.13	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
Thallium		10.8	NA	NA	NA	NA	NA	NA	NA	ND	3	1.21	ND	0.66	ND	10.1	2.87	ND	ND	0.86	ND	3.31	2.64	NA	NA	0.82
Vanadium			NA	NA	NA	NA	28.5	NA	NA	34.9	26.3	25.5	7.91	18	29.7	34.7	13.1	22.5	30	24.1	28.6	21.3	27.4	NA	NA	27.9
Zinc			NA	NA	NA	NA	51.7	NA	NA	33.8	76.4	51.2	11.4	16.7	77.2	111	33.7	89.8	76.3	138	120	65.6	112	NA	NA	106
PCBs (µg/kg)																										
PCB-1254	100000		NA	NA	NA	NA	ND	NA	NA	NA	ND	5.8	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
PCB-1260	100000		NA	NA	NA	NA	ND	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
SVOCs/VOCs (µg/kg)																										
Acetone			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.3	7.2	ND	NA	26.1	5.1	5.3	12.1	ND	NA	NA	NA
2-Methylnaphthalene			NA	NA	NA	NA	ND	NA	NA	NA	ND	ND	24.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
Benzo(*a*)pyrene			NA	NA	NA	NA	ND	NA	NA	NA	212	239	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
Benzo(*b*)fluoranthene			NA	NA	NA	NA	ND	NA	NA.	NA	284	303	ND	194	ND	ND	228	ND	ND	ND	ND	ND	ND	NA	NA	NA
Chloroform			NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	0.27	0.31	ND	ND	ND	NA	NA	NA
Methylene chloride		241	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23.2	32.8	NA	NA	NA	25.5	33.7	37	ND	NA	NA	NA
Toluene		502000	NA	NA	NA	NA	NA	NA	NA	NA	0.38	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	NA	NA	NA

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		05					06			07						08							09		
	Depth		0 – 0.5	0.5 – 2	2 – 4	4 – 6	6 – 10	0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 4	4 – 6	6 – 8	8 – 10	0 – 0.5	0 – 8	0.5 – 2	2 – 4	4 – 6	6 – 8	8 – 10	0 – 0.5	0.5 – 2	2 – 10
	RL	GW SL																								
Radionuclides (pCi/g)																										
Actinium-228			NA	NA	NA	NA	1.72	NA	0.649	1.38	1.13	0.65	0.315	0.586	0.898	1.48	0.796	NA	1.64	1.64	1.44	1.28	1.44	NA	0.981	1.26
Americium-241			ND	0.021	ND	ND	0.211	0.0371	NA	NA	NA	NA	NA	NA	ND	NA	0.0388	ND	0.0357	ND	ND	0.0362	ND	0.0792	NA	NA
Cesium-137	20		0.0828	ND	ND	ND	ND	0.229	0.0538	ND	0.0571	ND	ND	ND	0.0341	ND	0.252	ND	ND	ND	ND	ND	ND	0.167	ND	ND
Cobalt-60			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00625	NA
Neptunium-237	50		ND	ND	0.025	ND	ND	ND	NA	NA	NA	NA	NA	NA	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Plutonium-238			ND	ND	ND	0.58	ND	ND	NA	NA	NA	NA	NA	NA	ND	NA	ND	ND	0.0775	ND	ND	ND	ND	ND	NA	NA
Plutonium-239/240			ND	ND	0.0222	ND	ND	ND	NA	NA	NA	NA	NA	NA	ND	NA	0.0838	ND	ND	ND	ND	ND	ND	ND	NA	NA
Protactinium-234m			ND	ND	2.21	ND	ND	1.97	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.31	ND	ND
Strontium-90			ND	ND	0.355	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.281	ND	ND	ND	ND	ND	0.217
Thorium-228			1.06	1.39	1.23	1.35	1.65	1.09	1.47	1.45	1.1	0.703	0.267	0.375	0.981	1.76	0.905	1.61	1.71	1.51	1.43	1.19	1.72	1.23	0.948	1.19
Thorium-230			1.1	0.893	1.16	1.02	1.02	1.3	1.81	0.875	0.996	1.1	0.341	0.3	0.944	0.989	0.848	1.34	1.17	1.05	0.796	0.817	1.09	1.35	1.2	1.14
Thorium-232	15		0.865	0.902	0.954	1.31	1.42	1.18	1.16	1.22	1.07	0.604	0.187	0.315	0.723	1.47	0.71	1.42	1.63	1.67	1.45	1.17	1.44	1.05	1.11	1.14
Thorium-234			ND	1.7	ND	0.964	ND	1.15	1.04	1.24	0.842	1.35	0.761	0.715	1.55	ND	0.952	ND	1.1	ND	0.7	0.848	0.928	0.869	0.817	1.21
Total Activity			ND	12.4	12.9	ND	13.9	NA	NA	7.28	ND	ND	ND	ND	4.25	8.54	ND	10.2	ND	ND	5.65	6.78	4.38	4.42	7.02	ND
Uranium-233/234	7000	61.1	1.02	1.59	1.19	1.04	1.14	3.08	1.34	0.934	1.36	0.878	0.388	0.438	0.696	0.975	0.846	1.07	0.754	0.91	0.901	0.709	0.712	2.15	1.02	1.17
Uranium-235	80	61.1	ND	ND	ND	0.171	ND	ND	ND	ND	ND	ND	ND	0.0337	ND	ND	0.117	ND	ND	0.0934	0.0939	ND	ND	0.0812	ND	ND
Uranium-235/236			ND	0.074	0.0918	NA	0.0588	0.145	ND	0.034	0.0823	0.0916	ND	ND	ND	0.0744	0.0421	0.214	0.0459	0.0466	ND	0.046	0.0471	0.231	0.057	0.0744
Uranium-238	500	61.1	0.915	1.11	1.21	1.06	1.04	1.84	1.37	0.876	1.17	0.819	0.232	0.356	0.586	1.08	0.856	0.885	1.12	0.938	0.773	0.746	0.851	1.36	0.955	1.04

ID = identification
NA = not analyzed
ND = not detected
RL = maximum remediation level
GW SL = groundwater screening level
PCB = polychlorinated biphenyl
SVOC = semivolatile organic compound
VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		10			11			12			13			14			15			16		
	Depth		0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10
	RL																					
Metals (mg/kg)																						
Aluminum			7170	7520	15400	NA	NA	25000	NA	NA	NA	NA	NA	22000	17000	18500	NA	NA	NA	25000	NA	NA	21200
Antimony		144	NA	0.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.48	NA	NA	NA	NA	NA	NA	NA
Arsenic	900	66.3	4.05	4.64	6.71	NA	NA	6.44	NA	NA	NA	NA	NA	5.71	5.98	5.59	NA	NA	NA	5.79	NA	NA	2.17
Barium		9150	48.2	57.3	65.7	NA	NA	56.8	NA	NA	NA	NA	NA	107	99.5	93.6	NA	NA	NA	55.2	NA	NA	116
Beryllium	6000		0.585	0.43	0.51	NA	NA	2.35	NA	NA	NA	NA	NA	2.03	1.06	0.6	NA	NA	NA	1.28	NA	NA	1.95
Cadmium			ND	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA	ND	ND	ND	NA	NA	NA	ND	NA	NA	0.7
Chromium		172	12.1	12.5	24.5	NA	NA	22.6	NA	NA	NA	NA	NA	26.1	0.52	19.2	NA	NA	NA	19.3	NA	NA	25.8
Cobalt			4.66	5.27	14.9	NA	NA	24.1	NA	NA	NA	NA	NA	19.1	12.9	22.8	NA	NA	NA	12	NA	NA	13.9
Copper			14.7	20.3	12.7	NA	NA	29.5	NA	NA	NA	NA	NA	25.5	40.1	15	NA	NA	NA	28.1	NA	NA	25.4
Iron			12200	11600	30700	NA	NA	43400	NA	NA	NA	NA	NA	44600	28300	29900	NA	NA	NA	38300	NA	NA	40600
Lead		3370	12.1	19.7	23.1	NA	NA	19.2	NA	NA	NA	NA	NA	24.6	30.2	24.7	NA	NA	NA	27.2	NA	NA	21
Magnesium			7950	34400	3250	NA	NA	3020	NA	NA	NA	NA	NA	3710	1820	5220	NA	NA	NA	7600	NA	NA	4780
Manganese			335	363	1160	NA	NA	703	NA	NA	NA	NA	NA	660	969	2070	NA	NA	NA	671	NA	NA	653
Mercury	1800		0.08	0.02	0.02	NA	NA	0.05	NA	NA	NA	NA	NA	0.03	0.105	0.07	NA	NA	NA	0.03	NA	NA	0.03
Nickel			14.8	21.4	10.1	NA	NA	36.8	NA	NA	NA	NA	NA	28.5	24.8	12.9	NA	NA	NA	19.1	NA	NA	37.4
Selenium			ND	ND	1.14	NA	NA	ND	NA	NA	NA	NA	NA	0.9	ND	ND	NA	NA	NA	ND	NA	NA	ND
Thallium		10.8	0.597	3.8	ND	NA	NA	ND	NA	NA	NA	NA	NA	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND
Vanadium			13.8	15.4	33.5	NA	NA	28.2	NA	NA	NA	NA	NA	37.3	31.2	38.8	NA	NA	NA	42.2	NA	NA	24.4
Zinc			32.8	32.2	33.3	NA	NA	87.2	NA	NA	NA	NA	NA	83.4	55.3	39.2	NA	NA	NA	74.3	NA	NA	95.1
PCBs (µg/kg)																							
PCB-1254	100000		ND	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA	ND	39.9	NA	ND	ND	2.1	NA	NA	NA
PCB-1260	100000		11.7	9.3	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA	ND	ND	NA	ND	ND	ND	NA	NA	NA
SVOCs/VOCs (µg/kg)																							
Acetone			ND	4.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA	NA	ND	NA	NA	NA
Benzo(*a*)pyrene			ND	ND	526	NA	NA	ND	NA	NA	NA	NA	NA	311	ND	226	NA	NA	NA	ND	NA	NA	NA
Benzo(*b*)fluoranthene			ND	ND	592	NA	NA	ND	NA	NA	NA	NA	NA	349	ND	266	NA	NA	NA	ND	NA	NA	NA
Benzo(*ghi*)perylene			ND	ND	255	NA	NA	ND	NA	NA	NA	NA	NA	ND	ND	ND	NA	NA	NA	ND	NA	NA	NA
Benzo(*k*)fluoranthene			ND	ND	549	NA	NA	ND	NA	NA	NA	NA	NA	308	ND	ND	NA	NA	NA	ND	NA	NA	NA
Bis(2-ethylhexyl)phthalate		2350000	ND	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA	ND	372	ND	NA	NA	NA	ND	NA	NA	NA
Chrysene			ND	ND	661	NA	NA	ND	NA	NA	NA	NA	NA	454	ND	ND	NA	NA	NA	ND	NA	NA	NA
Dibenz(*a,h*)anthracene			ND	ND	236	NA	NA	ND	NA	NA	NA	NA	NA	ND	ND	ND	NA	NA	NA	ND	NA	NA	NA
Fluoranthene			ND	ND	674	NA	NA	ND	NA	NA	NA	NA	NA	1120	ND	267	NA	NA	NA	ND	NA	NA	NA
Indeno(1,2,3-*cd*)pyrene			ND	ND	296	NA	NA	ND	NA	NA	NA	NA	NA	ND	ND	ND	NA	NA	NA	ND	NA	NA	NA

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		10			11			12			13			14			15			16		
	Depth		0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–10
	RL	GW SL																					
Methylene chloride		241	8.2	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6	ND	NA	NA	NA	NA	NA	NA	NA
Phenanthrene			ND	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA	382	ND	205	NA	NA	NA	ND	NA	NA	NA
Pyrene			ND	ND	905	NA	NA	NA	NA	NA	NA	NA	NA	1010	ND	218	NA	NA	NA	ND	NA	NA	NA
Toluene		502000	ND	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
Radionuclides (pCi/g)																							
Actinium-228			NA	0.467	1.44	NA	1.37	1.03	NA	0.779	NA	NA	1.41	1.3	NA	1.23	NA	NA	1.38	1.45	NA	1.31	1.46
Americium-241			0.0993	NA	NA	ND	NA	NA	ND	0.0386	NA	ND	ND	0.107	ND	0.0939	NA	ND	0.0518	ND	0.0617	NA	NA
Cesium-137	20		0.215	ND	ND	0.221	ND	ND	0.0879	0.107	NA	0.519	ND	ND	0.0295	0.0643	NA	0.037	ND	ND	0.119	ND	ND
Cobalt-60			ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND
Neptunium-237	50		ND	NA	NA	ND	NA	NA	ND	ND	NA	0.0163	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	NA
Plutonium-238			ND	NA	NA	ND	NA	NA	ND	ND	NA	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	NA
Plutonium-239/240			ND	NA	NA	ND	NA	NA	ND	ND	NA	ND	ND	ND	ND	ND	NA	0	ND	ND	ND	NA	NA
Protactinium-234m			1.88	ND	ND	2.78	ND	ND	ND	1.84	NA	ND	4.49	ND	3.96	ND	NA	ND	3.12	ND	2.42	ND	1.97
Strontium-90			ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND
Technetium-99			0.013	1.07	1.53	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND
Thorium-228			0.763	0.581	1.27	1.24	1.58	1.81	1.22	1.11	NA	1.56	1.67	1.39	1.22	1.24	NA	1.02	1.46	1.39	1.24	1.44	1.59
Thorium-230			0.74	0.737	1.28	1.16	1.35	1.07	1.18	1.09	NA	1.56	1.67	1.45	1.07	1.1	NA	1.03	2.01	1.6	1.11	0.865	0.856
Thorium-232	15		0.628	0.383	1.33	1.09	1.63	1.74	1.24	1.02	NA	1.3	1.4	1.32	1.22	1.55	NA	1.04	1.42	1.33	1.12	1.33	1.48
Thorium-234			0.79	0.961	1.86	1.85	1.83	ND	0.984	0.684	NA	1.02	1.99	1.67	1.3	ND	NA	0.86	2.33	1.4	1.25	0.962	1.1
Total Activity			ND	ND	6.11	ND	9.7	10.9	ND	ND	NA	ND	5.19	5.7	ND	ND	NA	ND	9.17	8.11	ND	7.09	ND
Uranium-233/234	7000	61.1	0.853	0.714	1.02	1.3	1.16	1	1.29	1.28	NA	3.04	1.62	0.743	1.17	1.07	NA	1.42	1.94	1.74	1.48	0.944	0.718
Uranium-235	80	61.1	ND	0.0805	ND	ND	0.172	0.215	0.17	0.0943	NA	0.123	0.144	ND	0.113	0.139	NA	0.137	0.112	0.109	ND	0.116	ND
Uranium-235/236			0.0552	ND	0.0634	ND	0.0568	0.0613	ND	0.0746	NA	0.192	0.0722	0.0656	0.161	0.0202	NA	ND	0.0869	0.134	0.0908	0.0395	0.0233
Uranium-238	500	61.1	0.728	0.603	1.22	1.16	1.24	0.938	1.06	0.89	NA	2.12	1.53	1.31	1.16	0.94	NA	0.951	2.04	1.69	1.11	0.802	1.04

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		17						18		19			20			23						24				
	Depth		0–0.5	0.5–2	2–4	4–6	6–8	8–10	0–0.5	0.5–2	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–4	4–6	6–8	8–10	0–0.5	0.5–2	2–4	4–6	6–8
	RL	GW SL																									
Metals (mg/kg)																											
Aluminum			7210	10900	11700	13600	12700	18500	NA	NA	NA	NA	20100	NA	NA	14300	10900	17700	17600	18000	13500	17400	15000	14000	14000	11500	12100
Antimony		144	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.59	NA	NA	NA	NA	0.258	NA	NA	NA	NA
Arsenic	900	66.3	4.54	0.98	1.36	1.58	1.51	2.01	NA	NA	NA	NA	3.13	NA	NA	4.94	5.15	4.8	3.76	4.55	2.34	0.91	6.59	5.42	5.46	3.89	2.52
Barium		9150	55.1	23.5	25.7	28	29.1	53.2	NA	NA	NA	NA	61.6	NA	NA	45.8	61.3	63.7	34.7	32.1	47.6	34	59.5	59.2	65.4	62.6	70.2
Beryllium	6000		0.396	0.36	0.42	0.45	0.75	1.03	NA	NA	NA	NA	1.27	NA	NA	ND	0.53	0.51	0.39	0.69	0.48	1	0.885	1.08	1.3	0.57	0.7
Cadmium			NA	0.23	0.31	0.33	0.67	0.75	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	0.64	0.76	NA	1.03	1.22	0.38	0.3
Chromium		172	10.1	16.4	17.5	25.7	18	19.5	NA	NA	NA	NA	19.8	NA	NA	21.5	14.8	33.4	28.4	27.8	21.4	22.1	20.8	15.5	17.6	15	14.1
Cobalt			4.69	1.55	3.23	1.83	12.5	23	NA	NA	NA	NA	10.6	NA	NA	24.1	5.31	29	8.08	13.1	26.8	16	10.5	17.9	17.3	7.03	16.9
Copper			18.5	10.6	13.8	15.1	23	28.3	NA	NA	NA	NA	19.4	NA	NA	9.64	21	14.7	12.9	21.7	15.5	23.6	35.8	30.8	27.4	14	12.6
Iron			11900	22000	29500	37400	38800	42300	NA	NA	NA	NA	30800	NA	NA	27600	13600	38400	29300	48000	33500	47000	23800	24300	30900	17000	17900
Lead		3370	28	4.81	6.85	5.91	19.2	24.7	NA	NA	NA	NA	7.39	NA	NA	27.2	21.9	52.7	16.2	19.6	31.8	19.6	24.5	29.4	38.6	18.3	25.7
Magnesium			36300	388	372	491	1010	3220	NA	NA	NA	NA	1380	NA	NA	821	22100	6010	2640	2030	7260	967	4200	15400	18600	13300	1010
Manganese			349	38.7	103	88.3	415	753	NA	NA	NA	NA	393	NA	NA	1650	311	1620	297	433	1220	451	729	790	784	555	534
Mercury	1800		0.065	0.03	0.04	0.07	0.01	ND	NA	NA	NA	NA	0.085	NA	NA	0.039	0.084	ND	ND	ND	0.02	NA	0.111	0.04	0.15	0.03	0.02
Nickel			20.3	5.99	7.98	7.43	15.5	21.1	NA	NA	NA	NA	13.3	NA	NA	7.63	48.8	11	9.69	15.2	9.59	13.8	45	26.5	26	10.2	9.11
Selenium			ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	NA	NA	ND	NA	1.54	0.97	1.6	NA	0.3	ND	ND	ND	ND	ND
Thallium		10.8	1.3	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	NA	NA	ND	1.73	3.34	4.09	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium			15	21.9	25.9	30.9	28.3	27.8	NA	NA	NA	NA	32.8	NA	NA	33.6	16.7	40.9	36.7	33	38.2	28.5	28.9	27.3	29.2	19.9	27.2
Zinc			71.4	18.8	25.9	25.7	47.5	56	NA	NA	NA	NA	55.4	NA	NA	31	47.6	31	25.5	41.7	29.9	43.7	64.8	174	95.4	41.4	29.8
PCBs (µg/kg)																											
PCB-1254	100000		ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	4.2	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	100000		ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	13.6	143	ND	ND	ND
SVOCs/VOCs (µg/kg)																											
Acetone			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.1
Benzene			ND	0.45	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(*a*)pyrene			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	262	314	ND	ND	ND
Benzo(*b*)fluoranthene			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	250	474	ND	ND	ND
Benzo(*k*)fluoranthene			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	238	260	ND	ND	ND
Chrysene			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	295	261	ND	ND	ND
Fluoranthene			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	654	346	ND	ND	ND
Methylene chloride		241	1.2	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	3.9	ND	ND	ND	ND	ND	ND	2.6	13.8	10.1	9.9
Pentachlorophenol			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	349	334	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	441	ND	ND	ND	ND
Pyrene			ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	468	295	ND	ND	ND
Toluene		502000	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	0.9	ND	ND	ND	ND	0.68

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		17						18		19			20			23						24				
	Depth		0–0.5	0.5–2	2–4	4–6	6–8	8–10	0–0.5	0.5–2	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–10	0–0.5	0.5–2	2–4	4–6	6–8	8–10	0–0.5	0.5–2	2–4	4–6	6–8
	RL	GW SL																									
Radionuclides (pCi/g)																											
Actinium-228			NA	NA	NA	NA	1.11	1.46	NA	1.23	NA	1.5	1.73	NA	1.53	1.26	NA	NA	NA	NA	1.3	1.38	NA	0.903	0.748	0.725	1.01
Americium-241			ND	ND	0.035	0.121	ND	0.0631	0.0612	NA	NA	0.0692	0.162	0.0373	0.15	0.11	ND	ND	ND	0.0613	NA	NA	ND	NA	NA	NA	NA
Cesium-137	20		0.28	0.138	0.18	ND	ND	ND	0.29	ND	0.262	ND	ND	0.321	0.0368	ND	0.3	ND	ND	ND	0.0342	ND	0.289	0.0535	0.0154	0.0209	ND
Plutonium-238			ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	0	ND	ND	0.049	0.031	NA	NA	ND	NA	NA	NA	NA
Plutonium-239/240			ND	ND	ND	ND	ND	ND	0.0679	NA	ND	ND	0.107	ND	ND	ND	ND	ND	ND	0.031	NA	NA	0.163	NA	NA	NA	NA
Protactinium-234m			ND	ND	2.54	6.62	1.3	3.5	1.32	ND	1.74	ND	ND	ND	3.05	ND	ND	ND	ND	4.65	3.08	ND	ND	2.46	1.51	1.88	ND
Strontium-90			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	47.9	ND
Thorium-228			0.794	1.77	1.73	2.02	1.22	1.34	0.535	1.18	0.995	1.59	1.77	1.13	1.33	1.33	1.05	1.58	1.64	1.75	1.35	1.68	1.12	1	1.08	0.856	1.14
Thorium-230			0.903	1.19	0.941	1.05	0.809	0.768	0.602	1.22	1.11	1.26	1.43	1.02	1.25	0.987	1.04	1.64	1.5	1.26	1.26	1.06	1.31	1.11	0.897	0.765	1.04
Thorium-232	15		0.769	1.32	1.22	1.66	1.24	1.35	0.54	0.89	1.01	1.46	1.5	1.2	1.23	1.35	0.925	1.34	1.57	1.43	1.34	1.23	1.02	1.08	0.808	0.699	1.14
Thorium-234			ND	1.58	0.997	0.923	1.28	1.06	0.462	1.33	1.48	1.16	1.35	ND	1.09	1.11	1.2	2.43	ND	1.67	1.24	1.13	1.23	1.61	0.953	1.36	1.57
Total Activity			ND	14.9	ND	ND	4.56	4.68	ND	7.9	ND	8.28	4.81	ND	ND	4.26	NA	9.98	ND	NA	9.13	10.5	ND	9.08	6.49	ND	6.82
Uranium-233/234	7000	61.1	2.45	0.9	0.994	0.935	0.745	0.638	2.03	1.09	1.99	1.54	0.872	1.08	1.56	0.978	2.26	1.87	1.24	1.5	1.19	1.09	1.99	1.04	0.875	0.682	0.909
Uranium-235	80	61.1	0.0737	ND	0.102	ND	0.152	0.0966	ND	0.0894	0.128	0.122	ND	ND	0.165	0.113	ND	ND	ND	ND	ND	ND	ND	0.105	ND	ND	0.148
Uranium-235/236			0.143	0.125	0.111	ND	0.00996	0.00965	0.102	0.0371	0.228	0.101	0.00107	ND	0.0511	0.025	0.105	-0.0768	0.0286	0.0869	0.0667	0.0462	0.141	0.00977	0.0507	0.0625	0.0363
Uranium-238	500	61.1	1.11	0.972	0.97	0.665	0.778	0.694	1.11	1.01	1.21	1.29	1.04	1.02	1.09	1.02	1.59	1.46	1.22	1.23	1.47	0.935	1.64	0.913	0.765	0.469	1.14

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		EMGW05					EU4B-319	EU4B-320	EU4B-321	RR-S04	RR-S05	RR-SS04	EU4B-322	RR-SS05	EU4B-328	EU4B-329	EU4-BKG
	Depth		0.5 – 2	2 – 4	4 – 8	8 – 10	10 – 11.5	0 – 1	0 – 1	0 – 1	0 – 0.5	0 – 0.5	0.5 – 2	0 – 10	0.5 – 2	0 – 1	0 – 1	8.2 – 9.1
	RL	GW SL																
Metals (mg/kg)																		
Aluminum			12600	15000	17100	17200	16400	11000	15000	9700	NA	36600	NA	15000	15600	11000	8200	17000
Antimony		144	NA	NA	NA	NA	NA	0.13	0.2	0.33	NA	ND	NA	0.35	ND	0.13	0.053	0.044
Arsenic	900	66.3	3.23	4.72	4.16	4	6.45	5.7	9.5	12	NA	6.33	NA	8.6	ND	4.1	3.7	4.8
Barium		9150	58	44.8	56.6	86.9	74.5	65	65	57	NA	119	NA	62	64.3	75	74	36
Beryllium	6000		0.737	NA	0.674	1.04	0.938	0.6	0.57	0.75	NA	0.913	NA	1.1	1.45	0.62	0.83	0.95
Boron			NA	NA	NA	NA	NA	2.6	2.7	5.7	NA	NA	NA	3.6	NA	3.5	3.5	2.8
Cadmium			NA	NA	0.154	NA	NA	0.96	1.6	1.2	NA	1.47	NA	1.6	1.56	0.88	0.49	1.1
Chromium		172	0.154	34.7	23.7	22.5	22.8	25	31	88	NA	33.4	NA	28	15.2	12	18	30
Cobalt			9.79	8.71	10.4	12.3	13.3	12	11	9.5	NA	9.28	NA	11	16	8.3	12	6.2
Copper			15.8	14.8	15.9	23.2	21.2	13	19	50	NA	22.7	NA	32	35.1	12	9.2	22
Iron			19400	28600	31100	30600	33300	31000	40000	35000	NA	23800	NA	60000	35800	22000	23000	54000
Lead		3370	19.3	19.5	18.4	27	28.6	20	26	59	NA	25.8	NA	34	43.2	32	11	14
Lithium			NA	NA	NA	NA	NA	5.3	6.7	10	NA	NA	NA	11	NA	10	9.1	10
Magnesium			6560	3250	2470	3930	4800	1400	1600	5300	NA	7850	NA	7100	7060	17000	22000	850
Manganese			403	326	619	655	572	890	1100	520	NA	657	NA	730	1340	740	480	130
Mercury	1800		0.064	0.046	0.064	0.088	0.079	0.12	0.12	0.13	NA	0.108	NA	0.057	0.065	0.034	0.035	0.049
Molybdenum			NA	NA	NA	NA	NA	0.59	0.97	1.2	NA	NA	NA	1.4	NA	0.33	0.38	0.37
Nickel			13.2	16.4	17.7	20.4	22.7	12	24	93	NA	40	NA	30	37.3	9	11	20
Phosphorous			NA	NA	NA	NA	NA	NA	381	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium			NA	NA	NA	NA	NA	1.2	0.61	0.94	NA	ND	NA	ND	11	ND	ND	ND
Silicon			NA	NA	NA	NA	NA	NA	1240	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver			ND	0.12	0.177	0.163	ND	0.13	0.28	0.17	NA	ND	NA	0.14	ND	0.1	ND	ND
Strontium			NA	NA	NA	NA	NA	NA	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium		10.8	2.4	0.909	ND	ND	ND	0.23	0.27	0.25	NA	ND	NA	0.25	ND	0.2	0.14	0.25
Tin			NA	NA	NA	NA	NA	NA	0.84	NA	NA	NA	NA	NA	NA	NA	NA	NA
Titanium			NA	NA	NA	NA	NA	NA	166	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium			NA	NA	NA	NA	NA	1.2	1.7	2.4	NA	NA	NA	2.2	NA	1.1	0.62	0.74
Vanadium			21.5	28.1	29.7	29.2	29.4	29	45	29	NA	44	NA	39	38	24	17	39
Zinc			38.6	43.4	65.6	54.5	62.6	28	45	97	NA	70.7	NA	56	104	26	27	55
PCBs (µg/kg)																		
PCB-1254	100000		15.7	6.3	11.3	14.4	7.8	ND	ND	ND	ND	0.43	ND	ND	0.04	ND	ND	NA
PCB-1260	100000		10.7	8.8	ND	16.2	16.7	49	100	21	0.03	ND	0.025	4.6	ND	47	58	NA

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		EMGW05					EU4B-319	EU4B-320	EU4B-321	RR-S04	RR-S05	RR-SS04	EU4B-322	RR-SS05	EU4B-328	EU4B-329	EU4-BKG
	Depth		0.5 – 2	2 – 4	4 – 8	8 – 10	10 – 11.5	0 – 1	0 – 1	0 – 1	0 – 0.5	0 – 0.5	0.5 – 2	0 – 10	0.5 – 2	0 – 1	0 – 1	8.2 – 9.1
	RL	GW SL																
SVOCs/VOCs (µg/kg)																		
Acenaphthene			ND	ND	ND	ND	ND	NA	23	ND	NA	ND	NA	ND	ND	ND	ND	NA
Acenaphthylene			ND	ND	ND	ND	ND	NA	ND	ND	NA	0.063	NA	21	ND	ND	ND	NA
Anthracene			ND	ND	ND	ND	ND	NA	56	ND	NA	0.066	NA	41	ND	ND	ND	NA
2-Methylnaphthalene			ND	ND	ND	ND	ND	NA	44	ND	NA	48	NA	47	ND	ND	ND	NA
Benz(*a*)anthracene			1330	738	ND	ND	ND	NA	210	120	NA	0.53	NA	210	ND	68	21	NA
Benzo(*a*)pyrene			2890	1480	ND	258	230	NA	200	110	NA	0.65	NA	210	ND	71	21	NA
Benzo(*b*)fluoranthene			1570	1050	356	282	391	NA	330	200	NA	0.81	NA	300	ND	86	28	NA
Benzo(*ghi*)perylene			956	594	ND	ND	ND	NA	140	84	NA	ND	NA	180	ND	80	ND	NA
Benzo(*k*)fluoranthene			1730	758	ND	ND	ND	NA	96	52	NA	0.67	NA	120	ND	38	ND	NA
Carbazole			ND	ND	ND	ND	ND	NA	43	ND	NA	0.052	NA	28	ND	ND	ND	NA
Chrysene			1420	794	ND	ND	ND	NA	210	1.15	NA	0.65	NA	210	ND	ND	ND	NA
Dibenzofuran			ND	ND	ND	ND	ND	NA	20	ND	NA	ND	NA	24	ND	ND	ND	NA
Fluoranthene			1600	1710	ND	ND	343	NA	500	180	NA	0.86	NA	350	0.16	ND	19	NA
Fluorene			ND	ND	ND	ND	ND	NA	22	ND	NA	ND	NA	ND	ND	ND	ND	NA
Indeno(1,2,3-*cd*)pyrene			972	586	ND	ND	ND	NA	110	63	NA	0.42	NA	130	0.078	61	ND	NA
Methylene chloride		241	9.8	13.7	21.3	2.9	2.2	NA	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA
Naphthalene			ND	ND	ND	ND	ND	NA	23	30	NA	ND	NA	23	ND	ND	ND	NA
Phenanthrene			398	729	ND	ND	ND	NA	280	100	NA	0.26	NA	220	ND	ND	ND	NA
Pyrene			1890	1600	ND	ND	279	NA	430	190	NA	0.9	NA	360	0.13	ND	ND	NA
Toluene		502000	0.36	0.49	1 4	0.38	ND	NA	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		EMGW05					EU4B-319	EU4B-320	EU4B-321	RR-S04	RR-S05	RR-SS04	EU4B-322	RR-SS05	EU4B-328	EU4B-329	EU4-BKG
	Depth		0.5 – 2	2 – 4	4 – 8	8 – 10	10 – 11.5	0 – 1	0 – 1	0 – 1	0 – 0.5	0 – 0.5	0.5 – 2	0 – 10	0.5 – 2	0 – 1	0 – 1	8.2 – 9.1
	RL	GW SL																
Radionuclides (pCi/g)																		
Actinium-228			1.18	1.24	1.48	1.44	1.51	1.11	1.38	NA	NA	NA	NA	NA	NA	1.38	1.2	1.85
Bismuth-212			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.65	NA
Bismuth-214			NA	NA	NA	NA	NA	0.87	0.743	1.28	NA	NA	NA	0.911	NA	ND	0.673	0.538
Cesium-137	20		0.0419	0.123	0.0437	0.0593	0.117	ND	ND	0.419	0.68	0.26	0.0558	ND	NA	ND	ND	NA
Cobalt-60			0.0112	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	0.0791	ND	ND	NA
Europium-152			NA	NA	NA	NA	NA	NA	NA	0.614	NA	NA	NA	NA	NA	NA	NA	NA
Lead-212			NA	NA	NA	NA	NA	0.93	1.24	1.24	NA	NA	NA	0.949	NA	1.32	1.01	1.6
Lead-214			NA	NA	NA	NA	NA	1.11	1.17	0.808	NA	NA	NA	1.03	NA	0.851	0.473	1.01
Neptunium-237	50		NA	NA	NA	NA	NA	ND	ND	ND	0.0198	NA	NA	ND	NA	ND	ND	NA
Plutonium-239/240			NA	NA	NA	NA	NA	NA	NA	NA	0.0396	NA	NA	NA	NA	NA	NA	NA
Potassium-40			NA	NA	NA	NA	NA	11.5	15.7	12.9	NA	NA	NA	13.8	NA	15.3	15.1	23.2
Protactinium-234m			ND	ND	2.22	ND	2.23	NA	NA	NA	NA	NA	3.21	NA	4.3	NA	NA	NA
Radium-226	15		NA	NA	NA	NA	NA	0.931	1.32	1.11	NA	NA	NA	1.06	NA	1.09	1.07	0.871
Strontium-90			ND	ND	ND	0.304	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Technetium-99			NA	NA	NA	NA	NA	ND	ND	ND	0.52	0.29	2.56	ND	4.07	ND	ND	NA
Thallium-208			NA	NA	NA	NA	NA	NA	0.575	0.343	NA	NA	NA	0.403	NA	0.435	0.382	0.512
Thorium-228			1.52	1.22	1.38	1.15	1.19	1.13	1.55	1.42	NA	0.09	NA	1.7	0.0877	1.15	1.54	1.74
Thorium-230			1.21	0.861	1.02	0.842	0.977	1.04	1.36	1.76	0.38	0.22	0.14	1.2	NA	1.46	0.959	1.19
Thorium-232	15		1.43	0.982	1.41	1.24	1.19	1.22	1.54	1.03	0.16	0.14	0.0222	1.38	0.0103	1.04	1.34	1.84
Thorium-234			1.25	1.35	1.13	0.995	1.06	ND	ND	ND	NA	NA	2.03	ND	3.02	ND	ND	NA
Total Activity			ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	39.6	NA	NA	NA
Uranium-234	7000	61.1	NA	NA	NA	NA	NA	2	1.75	2.38	NA	1.74	NA	2.03	NA	1.17	1.11	1.03
Uranium-233/234	7000	61.1	1.67	1.57	1.32	2.37	7.43	NA	1.67	NA	3.07	NA	1.66	NA	1.68	NA	NA	NA
Uranium-235	80	61.1	0.0954	0.123	0.029	ND	0.349	0.439	ND	ND	0.12	0.08	0.0898	0.0956	0.264	ND	ND	0.0717
Uranium-235/236			0.0618	0.0637	-0.0163	0.0429	0.299	NA	0.118	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-238	500	61.1	1.08	1.11	1.08	1.39	1.27	1.32	1.36	1.68	1 99	1.15	1.47	1.55	1.62	1.19	0.969	1.19

ID = identification NA = not analyzed ND = not detected RL = maximum remediation level
GW SL = groundwater screening level PCB = polychlorinated biphenyl SVOC = semivolatile organic compound VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		21			22			EU4B-330	EU4B-331
	Depth		0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10	8 – 10	8 – 10
	RL	GW SL								
Metals (mg/kg)										
Aluminum			N/A	N/A	11,700	N/A	N/A	20600	17000	8500
Antimony		144	N/A	N/A		N/A	N/A		0.25	0.026
Arsenic	900	66.3	N/A	N/A	2.49	N/A	N/A	6.28	3.8	2.7
Barium		9150	N/A	N/A	73.2	N/A	N/A	75.5	69	69
Beryllium	6000		N/A	N/A	0.757	N/A	N/A	N/D	1.6	0.55
Boron			N/A	N/A	N/A	N/A	N/A	N/A	5.1	1
Cadmium			N/A	N/A	N/D	N/A	N/A	N/D	2.4	1.2
Chromium		172	N/A	N/A	13.9	N/A	N/A	35.4	18	13
Cobalt			N/A	N/A	14.7	N/A	N/A	14.3	24	12
Copper			N/A	N/A	10.9	N/A	N/A	14.4	25	7.2
Iron			N/A	N/A	19500	N/A	N/A	48600	33000	16000
Lead		3370	N/A	N/A	16.2	N/A	N/A	7.06	8.9	12
Lithium			N/A	N/A	N/A	N/A	N/A	N/A	17	5.9
Magnesium			N/A	N/A	2770	N/A	N/A	1250	2000	670
Manganese			N/A	N/A	1130	N/A	N/A	1040	390	700
Mercury	1800		N/A	N/A	0.05	N/A	N/A	0.025	0.033	0.011
Molybdenum			N/A	N/A	N/A	N/A	N/A	N/A	0.67	0.25
Nickel			N/A	N/A	9.58	N/A	N/A	10.1	25	7.4
Phosphorous			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium			N/A	N/A	N/D	N/A	N/A	2.12	N/D	N/D
Silicon			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver			N/A	N/A	N/D	N/A	N/A	N/D	N/A	N/D
Strontium			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium		10.8	N/A	N/A	N/D	N/A	N/A	N/D	0.34	0.14
Tin			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Titanium			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		21			22			EU4B-330	EU4B-331
	Depth		0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10	8 – 10	8 – 10
	RL	GW SL								
Metals (mg/kg)										
Uranium			N/A	N/A	N/A	N/A	N/A	N/A	2.1	0.63
Vanadium			N/A	N/A	21.9	N/A	N/A	52.7	34	18
Zinc			N/A	N/A	25.3	N/A	N/A	41.6	57	17
SVOCs/VOCs (µg/kg)										
Toluene		502000	N/D	0.48	N/A	N/A	N/A	0.65	N/A	N/A
Trichloroethene		1720	N/D	N/D	N/A	N/A	N/A	N/D	N/A	N/A
1,1,2-Trichloro-1,2,2-trifluoroethane			N/D	N/A	N/A	N/A	N/A	N/A	N/A	N/A

ID = identification
NA = not analyzed
ND = not detected
RL = maximum remediation level
GW SL = groundwater screening level
PCB = polychlorinated biphenyl
SVOC = semivolatile organic compound
VOC = volatile organic compound

Summary of soil sample results for Exposure Unit Z1-04 (continued)

Analyte	Station ID		21			22			EU4B-330	EU4B-331
		Depth	0 – 0.5	0.5 – 2	2 – 10	0 – 0.5	0.5 – 2	2 – 10	8 – 10	8 – 10
	RL	GW SL								
Radionuclides (pCi/g)										
Actinium-228			N/A	0.689	1.28	N/A	1.4	1.09	NA	NA
Alpha Activity			N/A	N/A	N/A	N/A	N/A	N/A	NA	NA
Americium-241			0.0558	N/A	N/A	0.0407	N/A	N/A	NA	NA
Beta Activity			N/A	N/A	N/A	N/A	N/A	N/A	NA	NA
Cesium-137	20		0.216	0.064	N/D	N/D	N/D	N/D	NA	NA
Cobalt-60			N/D	N/D	N/D	N/D	0.0208	N/D	NA	NA
Neptunium-237	50		N/D	N/A	N/A	0.0158	N/A	N/A	NA	NA
Plutonium-238			N/D	N/A	N/A	N/D	N/A	N/A	NA	NA
Plutonium-239/240			N/D	N/A	N/A	N/D	N/A	N/A	NA	NA
Protactinium-234m			N/D	1.72	2.65	1.82	2.93	N/D	NA	NA
Thorium-228			0.848	0.776	1.1	1.27	1.89	1.7	NA	NA
Thorium-230			0.995	0.964	1.4	1.18	1.72	1.65	NA	NA
Thorium-232	15		0.809	0.652	1.14	1.17	1.39	1.7	NA	NA
Thorium-234			0.818	0.909	0.813	1.16	1.59	N/D	NA	NA
Total Activity			N/D	N/D	N/D	N/D	10	9.19	NA	NA
Uranium-234	7000	61.1	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA
Uranium-233/234	7000	61.1	1.17	0.948	1.3	1.71	1.44	1.15	NA	NA
Uranium-235	80	61.1	N/D	0.0774	N/D	0.126	0.134	0.174	NA	NA
Uranium-235/236			N/D	0.0206	0.0906	0.113	0.0468	0.0572	NA	NA
Uranium-238	500	61.1	0.833	0.716	1.21	1.52	1.39	1.1	NA	NA

ID = identification
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