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Environmental Restoration Program

OPERABLE UNIT 5
NEW PROPERTY REMEDIAL INVESTIGATION REPORT

MOUND PLANT
MIAMISBURG, OHIO

February 1996

Final (Revision 0)

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

General Comments

Comment #1: The Baseline Risk Assessment (BRA) uses groundwater sampling results from seventeen residential wells and one cistern to establish background for groundwater. The report also shows groundwater background data from the April 1995 Groundwater Sweeps Report for comparison purposes. The cover letter accompanying the RI Report asks for input on which set of background groundwater data should be used.

As can be noted in Table IV.1 on pages 4-5 through 4-8 in the RI Report, the residential groundwater and seeps background criteria generally contains much higher concentrations of metals and radionuclides than the groundwater sweeps background criteria (up to 928 times as much for metals and 18 times as much for radionuclides). Figure 4.2 on page 4-3 shows the locations of the residential wells considered as background; note that a number of these wells are located downgradient of the Mound Plant. It is not appropriate to consider wells downgradient of the Mound Plant as background wells.

The five wells used in the Groundwater Sweeps Report for background could be used for background in the RI Report. Regardless of which wells are used for background, the results of the BRA would change as fewer inorganics and radionuclides would be screened out as Contaminants of Potential Concern (COPCs) based on the 95% UTL background concentration, and the RI Report would need to be reviewed again. The revised RI Report should include a figure that shows the location of the background sweeps wells.

Response #1: The RI Report will be revised to establish the regulator-approved OU9 Groundwater Sweeps data as background for groundwater and seeps at the New Property. This will entail major revisions to the Executive Summary and Sections 4, 5, 6, and 7, as well as minor revisions elsewhere. The current Figure 4.2 will be revised to show the locations of the OU9 Groundwater Sweeps monitoring wells.

Comment #2: The RI Report does not mention any of the interim remedial actions (IRAs) that are currently underway (the drainage control IRA along the northern border of the New Property in particular), or the planned OU1 groundwater pump and treat remediation. It seems that both of these remedial actions could favorably impact the decision of whether any remedial action is needed at the New Property. The drainage control IRA should help eliminate further migration of contaminants to the New Property via surface erosion. Also, groundwater modeling conducted for the OU1 Remedial Action has shown groundwater capture zones that may keep some of the groundwater under the New Property from migrating offsite.

Response #2: The nature and extent of contamination in the New Property and its associated human health and environmental risks, including the risk from any contaminants that migrated via surface erosion or groundwater from the Operational Area, do not appear to warrant a response action. Based upon the planned future commercial/industrial land use for the

Response #2 (continued):

New Property, a feasibility study to evaluate remedial alternatives is probably not warranted. However, in view of the proposed transfer of the New Property to the City of Miamisburg, a summary of current or future IRAs in the Operational Area that would reduce potential future risk from migrating contaminants reaching the New Property would be appropriate.

The Executive Summary and Sections 1 and 7 of the RI Report will be revised to include a summary of the two IRAs mentioned in the comment, as follows:

"Certain interim remedial actions (IRAs) are underway at operable units within the Mound Plant that may reduce the potential future risk from contaminants migrating to and from the New Property. At OU1, collection, treatment, and disposal of groundwater contaminated with VOCs is planned. This IRA will influence hydraulic gradients at the New Property and reduce the migration of VOCs via groundwater. Along the northern boundary of the New Property, an IRA is underway to control stormwater drainage. Surface soils contaminated with thorium and plutonium in the Operational Area will be prevented from migrating onto the New Property via stormwater runoff. Both of these IRAs may favorably impact the nature and extent of contamination at the New Property."

Comment #3: What are the long-term plans for the spoils pile on the northwest corner of the New Property? If simple institutional controls could be implemented, like some sort of erosion control to keep contaminants from migrating to the New Property, this information should be presented in the RI Report. Also, the RI Report should state what type of access exists currently, and is planned for the future, between the New Property and the Operational Area of the Mound Plant.

Response #3: As noted in Section 4.4.1.2., the materials placed in the Spoils Disposal Area are screened to ensure they do not contain radiological contamination above Mound Plant soils screening detection levels (2 pCi/g for thorium, 25 pCi/g for plutonium). In addition, it is not expected that elevated levels of other contaminants will be detected in the Spoils Disposal Area. Consequently, long-term use of the Spoils Disposal Area should be consistent with the future mission(s) at Mound. Although radiological contamination below the detection levels is likely to exist in the Spoils Disposal Area, the potential future risk from its migration onto the New Property would not significantly impact the future commercial/industrial land use. The text in Section 4.4.1.2 will be revised to include this additional information.

The text in Section 1.2.1.2 will be modified to address current and future access between the New Property and the Operational Area of the Mound Plant. Current institutional controls prohibit unrestricted access to the Operational Area from the New Property. These will be maintained if the New Property is released before the Operational Area.

Specific Comments

Comment #1: Section ES.4 Nature and Extent of Contamination
Page ES-6, Figure ES.2
Why is organic carbon considered a contaminant?

Response #1: Total organic carbon (TOC) is not a contaminant, but is a quantification of all analytes containing carbon. It was included as "organic carbon" in Figure ES.2 because it was detected at concentrations above background in the New Property soils. However, it is not a COPC, COC, or otherwise a part of the risk assessment process and will be deleted from Figure ES.2. Statements such as "TOC is not a COPC in soils" will be removed from Section 4 of the RI Report.

Comment #2: Section ES.6.1 Human Health Baseline Risk Assessment
Page ES-8, Paragraph 4
A 10^{-4} risk equals one in 10,000, not one in 1,000. Risks between 10^{-4} and 10^{-6} can not automatically be dismissed as not requiring remediation. That decision is made on a site-specific basis.

Response #2: The text will be revised as follows: "The risk assessment calculated the potential excess lifetime cancer risks for current and future land uses at the New Property for each COPC. U.S. EPA's target risk range is defined as excess lifetime cancer risk values between one in a million (10^{-6}) and one in ten thousand (10^{-4}). The decision to remediate the sites with risks within this range is made on a site-specific basis. Sites with risks greater than one in ten thousand require remediation in order to protect human health."

Comment #3: Section ES.6.1 Human Health Baseline Risk Assessment
Page ES-8, Paragraph 5
A Hazard Index (HI) greater than 1 means the potential exists for health risks regardless of whether it is one noncarcinogen or multiple noncarcinogens that caused the risk.

Response #3: The second sentence in the paragraph will be rewritten as follows: "An HI > 1 means the potential exists for health risks resulting from exposure to one or more chemicals."

Comment #4: Section 1 Introduction
Page 1-2, Paragraph 3
The text states the DOE intends to release the majority of the New Property for non-DOE use and/or release of DOE ownership. Is a portion of the New Property not being considered for release?

Response #4: The statement was not meant to imply that there are known areas within the New Property that will not be released. Rather, the statement contends that the possibility exists that there may be areas within the New Property that will not be immediately available for release.

Comment #5: Section 4.3.3.7 Volatile Organic Compounds
Page 4-66, Paragraph 2
Why is trichloroethene (TCE) not a Contaminant of Potential Concern (COPC) when it was found in two locations above the MCL?

Response #5: TCE will become a COPC in both groundwater and seeps as a result of using the OU9 Groundwater Sweeps data as the background criteria for groundwater and seeps. Section 4 will reflect this change.

Comment #6: Section 4.3.3.8 Radionuclides
Page 4-66, Paragraph 3
The text states that five radionuclides were detected above background in groundwater and seeps, but only mentions that three of them are COPCs. Ra-226 and U-235 were detected above background, and were detected in greater than 5% of the samples. Why are they not COPCs?

Response #6: As a result of the revision of the background criteria for groundwater, eleven of the thirteen radionuclides detected in groundwater will become COPCs. In addition, five of the nine radionuclides detected in seeps will become COPCs.

Comment #7: Section 6.1.2.5 Contaminants of Potential Concern
Page 6-4, Paragraph 5
The U.S. EPA's Risk Assessment Guidance for Superfund (RAGS) does not simply state that contaminants can be eliminated if they are detected infrequently. It says to "consider the chemical as a candidate for elimination if" it is (a) detected infrequently, (b) only found in one media or in low concentration, and (c) there is no reason to believe it is actually present (i.e., may be sampling artifact).

Response #7: Agree. The text will be revised to state, "Contaminants can be eliminated from consideration if (a) detected infrequently, (b) only found in one medium or in low concentration, and (c) there is no reason to believe the chemicals are actually present (i.e., may be sampling artifact)."

Comment #8: Section 6.1.3.2 Exposure Pathways under Current Land Use
Page 6-11, Paragraphs 2 and 3
Please state the rationale for assuming that construction workers are unlikely to come into contact with the seeps. Why hasn't the current land use offsite exposure to groundwater scenario been considered?

Response #8: "Based on best professional judgement, it was determined that it would be unlikely for construction workers to be exposed to seeps on a chronic (or even subchronic) basis because (1) the seeps areas have intermittent flow and are usually dry; (2) most of the seeps are located on slopes which are areas that would not be suitable for construction activities; and (3) construction workers using heavy equipment would not come into direct contact with the seeps." This rationale will be added to the text.

Response #8 (continued):

Current off-site land use is primarily residential. To develop a groundwater exposure scenario for these receptors, it would be necessary to assume that the residents are using New Property groundwater for household use. Currently, they are not. However, New Property groundwater may migrate in the future to a well where residents could use it. This is the scenario that was developed in the RI report as the future land use offsite resident. This scenario was conservative in that it used groundwater constituent concentrations from New Property wells as the exposure concentration. In other words, it assumed no dilution or attenuation of constituents as the groundwater migrated from the New Property to a residential well. Please note that it was assumed that current offsite residents were using New Property groundwater, then the calculated exposure risks would be the same as those estimated for the future off-site residents because New Property well data were used without any reduction from dilution or attenuation for the future scenario. Also note that risks to any current offsite residents using offsite groundwater (groundwater sampled at background wells) were estimated as the background risk. For these reasons, it was determined that a presentation of a current land use offsite scenario was not necessary. No changes to the text will be made in response to this comment.

Comment #9: Section 6.1.3.3 Exposure Point Concentrations
Page 6-13, Paragraph 2
The text states exposure point concentrations used in the human health risk assessment are included in Appendix D. The text should refer the reader to Appendix E for these tables.

Response #9: Agree. Text will be revised to refer to Appendix E, not D.

Comment #10: Section 6.2.5.1 Qualitative Evaluation of Exposure Pathways
Page 6-80, Paragraph 5
The text states the rationale for elimination of surface water, groundwater, and air as exposure media, but does not state why subsurface soil was eliminated as an exposure media. Please include this explanation.

Response #10: Agree. Text will be clarified. Surface soil is defined as 0 to 2 ft from surface in this BERA. This soil volume contains the majority of biological activity -- plant, animal, and microbial (Suter et al. 1993). For example, grubs and earthworms live mostly in the top few inches, and seedlings grow there, too. While there is biological activity below 2 ft, it is judged to be of much lesser exposure and was eliminated from further computation.

Reference:
Suter, G.W., II, R.J. Luxmore, and E.D. Smith. 1993. Compacted Soil Barriers at Abandoned Landfill Sites Are Likely to Fail in the Long Term, *J. Environ. Quality* 22:217-226.

Comment #11: Section 6.2.5.2 Ecological Receptors and Their Exposure
Page 6-83, Paragraph 3
What is the basis for the statement that conservative values were used for shrew exposures?

Response #11: The revised text will include a brief explanation. It was assumed that shrews ingest 30% soil and 70% earthworms (see table on exposure parameters and factors) for their total diet. This maximizes exposure of shrews to contaminated soil and contaminated earthworms that live in the soil. Both ingestion values are conservative because shrews likely eat fewer earthworms (EPA 1993) and thus less soil. Shrews would also eat other less contaminated organisms, e.g., surface invertebrates.

Reference:
EPA. 1993. *Wildlife Exposure Factors Handbook*, Vol. 1, EPA/600/R-93/1872.

Comment #12: Section 6.2.7.1 Current Baseline risk to Ecological Receptors
Page 6-96, Paragraph 2
The conclusion is made that ecoCOPCs with XQ greater than 1 are unlikely to pose risk and therefore don't qualify as ecoCOCs. However, on page 6-93 it states that an XQ greater than 1 indicates the potential for harmful ecological effects. These statements appear to be in conflict.

Response #12: Agree. The apparent contradiction will be clarified in the text. When an XQ $\geq$ 1.0, the COPC needs further evaluation because it has the potential to pose a hazard (Paragraph 2). Therefore, an evaluation follows for those ecoCOPCs with XQ $\geq$ 1; this evaluation is shown on p. 6-98. This text explains why ecoCOPCs with XQs $\geq$ 1 in Mound surface soil do not qualify as ecoCOPCs. EcoCOPCs with XQs $\geq$ 10 do not qualify because effects thresholds used to calculate XQs were based on NOAELs estimated to be 10 times lower than LOAELs. LOAELs are the appropriate endpoint for populations of non-threatened and endangered species. EcoCOPCs with XQs $\geq$ 10 at Mound did not qualify after a rather detailed evaluation of the chemical form and mode of exposure used in the published toxicity study from which the effects thresholds were derived.

Thus, a COPC where XQ is around or above 1 can become a COC if the exposure and effects data match receptors and routes of exposure and are sound. An XQ between 1 and 10 may also become a bonafide COC, if the effects data are matchable with extrapolation between receptors and routes of exposure. XQs at 10 or higher are almost automatically a COC, unless a rather rigorous evaluation of the exposure and effects data for that contaminant shows a great deal of uncertainty; then they too can remain COPCs only, as was the case at the New Property.

COMMENT RESPONSE LOCATION		
U.S. EPA		
Comment #	**RIR [Draft], October 1995**	**RIR [Draft Final], January 1996**
GC #1	Fig. 4.2 (p. 4-3), Table IV.1 (p. 4-5 through 4-8)	(same)
GC #2	no location specified	Section ES, p. ES-3; Section 1, p. 1-4
GC #3	no location specified	Section 1.2.1.2, p. 1-7
SC #1	Section ES; p. ES-6	(same)
SC #2	Section ES 6.1, p. ES-8, para. 4	Section ES 6.1, p. ES-8, para. 3
SC #3	Section ES 6.1, p. ES-8, para. 5	(same)
SC #4	Section 1, p. 1-2, para. 3	Section 1, p. 1-2, para. 2
SC #5	Section 4.3.3.7, p. 4-66, para. 2	Section 4.3.3.7, p. 4-68, para. 1
SC #6	Section 4.3.3.8, p. 4-66, para. 3	Section 4.3.3.8, p. 4-68, para. 1
SC #7	Section 6.1.2.5, p.6-4, para. 5	Section 6.1.2.5, p. 6-5, line 1
SC #8	Section 6.1.3.2, p. 6-11, para. 2 and 3	Section 6.1.3.2, p. 6-12, para. 2
SC #9	Section 6.1.3.3, p. 6-13, para. 2	changes made throughout Section 6
SC #10	Section 6.2.5.1, p. 6-80, para. 5	Section 6.2.5.1, p. 6-84, para. 2
SC #11	Section 6.2.5.2, p. 6-83, para. 3	Section 6.2.5.1, p. 6-87, lines 5-8
SC #12	Section 6.2.7.1, p. 6-96, para. 2	Section 6.2.7.1, p. 6-97, last para, and p. 6-100

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Specific Comments

Comment #1: Section ES.6.1, Page ES-8, Paragraph 4:
The risk value of 1 in 1,000 should be changed to 1 in 10,000 to reflect a 10^{-4} risk level.

Response #1: Agree. The text will be revised from "1,000" to "ten thousand."

Comment #2: Section 2, Page 2-17, Figure 2.5:
Please explain the discrepancy between plutonium and thorium levels indicated in this figure as compared to those indicated in Figure 4.18 on Pg 4-44.

Response #2: Section 2 identifies results of previous radiological surveys. Figure 2.5 indicates the results for both plutonium-238 and total thorium from the Site Survey Project (Stought et al. 1988). The values shown in the figure are readings in excess of historic Mound Plant soils screening detection levels for these radionuclides (2 pCi/g for Th-232 and 25 pCi/g for Pu-238). Section 4 reports results from the Regional Soils Investigation (March 1995), New Property Phase I Field Report (July 1995), and New Property Extended Phase Field Report (March 1995). Figure 4.18 presents all plutonium results above the background criterion of 0.13 pCi/g established for this RI. Occurrences of plutonium noted in the Site Survey Project but not corroborated by the RI results may be explained by differences in analytical methods and sampling procedures.

Comment #3: Section 4.3.1, Page 4-11, first paragraph:
It is stated that a total of 59 surface soil and sediment samples were collected. In Section 7.1.1, Page 7-2, second paragraph, it is stated that 56 surface soil samples were taken. Please clarify or change text to reflect the actual number in both text locations.

Response #3: The text in Section 7 mistakenly reports the number of surface soil samples. As stated in Section 4.3.1, 59 surface soil and sediment samples were collected. The text will be revised to state the following: "A total of 32 surface soil samples (0-2 feet BGS), 11 subsurface soil samples (greater than 2 feet BGS), 27 sediment samples, eight seep samples, and six groundwater samples were collected during this RI and sent to the analytical laboratories."

Comment #4: Section 4, Page 4-33, Table IV.3:
Please specify whether the "average concentration" is truly the arithmetic mean or consists of some other statistics.

Response #4: Table IV.3 shows the arithmetic mean of all detects (not just those above background) of the specified compounds in surface soil and sediments. A footnote will be added to the table to clarify "average concentration."

Comment #5: Section 4, Page 4-57, Table IV.5:
Please confirm the Ohio MCL listed in the table for 1,2-dichloroethene. The MCL listed is likely meant for 1,2-dichloroethane (5 micrograms per liter).

Response #5: It was verified that the MCL provided in Table IV.5 should be for 1,2-dichloroethane. There is no MCL for 1,2-dichloroethene. This typographical error will be corrected.

Comment #6: Section 6, Page 6-9, Figure 6.1.1:
Please briefly explain in comment responses why the groundwater/surface water seeps exposure to the future construction worker is not a pathway of concern.

Response #6: "Based on best professional judgement, it was determined that it would be unlikely for construction workers to be exposed to seeps on a chronic (or even subchronic) basis because (1) the seeps areas have intermittent flow and are usually dry; (2) most of the seeps areas are located on slopes which are areas that would not be suitable for construction activities; and (3) construction workers using heavy equipment would not come into direct contact with the seeps." This rationale will be added to the text. Additionally, there are no plans to install groundwater wells for consumption of groundwater on the New Property, thus eliminating the likelihood of construction worker contact with groundwater.

Comment #7: Section 6.1.3.4, Page 6-13, first paragraph:
Please refer to the equations used in the U.S. EPA "Dermal Exposure Assessment: Principles and Applications", 1992, to calculate the absorbed dose from groundwater/surface water seeps exposure. Please explain in comment responses why dermal exposure calculations are performed differently than in this guidance.

Response #7: Agree; absorbed dose from groundwater/surface water seep exposure will be re-evaluated using U.S. EPA (1992); however, use of default values and professional judgement will be required. Absorbed dose from groundwater/seeps dermal exposure was initially calculated according to U.S. EPA "Risk Assessment Guidance for Superfund, Volume I, Part A," (1989) because chemical-specific parameters needed for that procedure were available while parameters needed for the procedure outlined in U.S. EPA "Dermal Exposure Assessment: Principles and Application," (1992) are unavailable for some chemicals.

Comment #8: Appendix B:
Different qualifiers were used by the laboratory and the data validator. Please define all qualifiers somewhere in the appendix.

Response #8: A glossary of both laboratory and data validation qualifiers will be added to the beginning of Appendix B.

Comment #9: Appendix C, Page C-45, Table C.4.3.1:
The "Reason for Rejected Concentration Value" column contains "NA" for pesticides/PCB's and for explosives, yet both analytes include some samples where the data was rejected. Please change the table to account for this.

Response #9: Agree. This oversight will be corrected.

COMMENT LOCATIONS		
Ohio EPA		
Comment #	**RIR [Draft], October 1995**	**RIR [Draft Final], January 1996**
SC #1	Section ES 6.1, p. ES-8, para. 4	(same)
SC #2	Section 2, p. 2-17, Section 4, p. 4-44	p. 2-17; p. 4-45
SC #3	Section 4.3.1, p. 4-11, para. 1 Section 7.1.1, p. 7-2	Section 4.3.1, p 4-16, para. 1 (same)
SC #4	Section 4, p. 4-33	(same)
SC #5	Section 4, p. 4-57	Section 4, p. 4-58
SC #6	Section 6, p. 6-9	Section 6.1.3.2, p. 6-12, para. 2, 3
SC #7	Section 6.1.3.4, p. 6-13, para. 1	Section 6.1.3.4, p. 6-14, 6-25, 6-28
SC #8	Appendix B	(same)
SC #9	Appendix C	(same)

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General Comments

Comment #1: All of the comment responses received were adequate except for one. Section 4.3.3.8 of the report, entitled Radionuclides, states that there are no radionuclide COPCs in the seeps. However, DOE's response to specific comment #6 from the U.S. EPA states that five of the nine radionuclides detected in the seeps will become COPCs. The third paragraph in this section mentions several radionuclides detected above background levels in the seeps, but no mention is made of whether any of these radionuclides will become COPCs. Please clarify whether any of these radionuclides are indeed COPCs.

Response #1: The response to comment #6 addressing radionuclide COPCs for seeps was correct. Section 4.3.3.8 of the RI Report will be corrected in accordance with the comment/response.

Environmental Restoration Program

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NEW PROPERTY REMEDIAL INVESTIGATION REPORT

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ACRONYMS

Ac-227	actinium-227
AE_s	absorption efficiency for soil
AE_t	absorption efficiency for tissue
Am-241	americium-241
ARAR	applicable or relevant and appropriate requirement
ASTM	American Society of Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	bioaccumulation factor
BAP	benzo(a)pyrene
BERA	baseline ecological risk assessment
BGS	below ground surface
BRA	Baseline Risk Assessment
BVA	Buried Valley Aquifer
CAVEAT	Computer-Aided Validation and Evaluation Analysis Tool
CCS	Contract Compliance Screening
CEC	cation exchange capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
Co-60	cobalt-60
COC	contaminant of concern
COPC	contaminant of potential concern
CRAVE	Carcinogen Risk Assessment Verification Endeavor
CRDL	contract required detection limit
Cs-137	cesium-137
DOE	U.S. Department of Energy
DQA	data quality assessment
DQO	data quality objective
ecoCOC	ecological contaminant of concern
ecoCOPC	ecological contaminant of potential concern
EF	exposure factor
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERA	ecological risk assessment
FEIS	Final Environmental Impact Statement
FFA	Federal Facilities Agreement
FIDLER	field instrument for the detection of low-energy radiation
FS	feasibility study
FSP	Field Sampling Plan
ha	hectares
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HSDB	Hazardous Substances Data Bank
HQ	hazard quotient
IRA	Interim Remedial Action
IRIS	Integrated Risk Information System
kg	kilogram

ACRONYMS (continued)

K_{oc}	organic carbon partition coefficient
LOAEL	lowest-observable-adverse-effect level
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MEIMS	Mound Environmental Information Management System
meq/100 g	milliequivalents per 100 grams
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/kg-day	milligrams per kilogram per day
mg/L	milligrams per liter
mph	miles per hour
MSL	mean sea level
NEPA	National Environmental Policy Act
NOAEL	no-observed-adverse-effect level
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OEPA	Ohio Environmental Protection Agency
ORD	Office of Research and Development
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, comparability, and completeness
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PEF	particulate emission factor
Pu-238	plutonium-238
Pu-239/240	plutonium-239/240
QA	quality assurance
QC	quality control
QAPjP	Quality Assurance Project Plan
Ra-226	radium-226
RAGS	Risk Assessment Guidance for Superfund
redox	oxidation/reduction
RfC	reference concentration
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
RSI	Regional Soil Investigation
SM/PP	Special Metallurgical/Plutonium Processing
SOP	standard operating procedure
SOW	Statement of Work
Sr-90	strontium-90
SRDS	storm water retention and discharge system
SVOC	semi-volatile organic compound
TAL	target analyte list

ACRONYMS (continued)

TCE	trichloroethene
TCL	target compound list
Th-228	thorium-228
Th-230	thorium-230
Th-232	thorium-232
TIC	tentatively identified compound
TOC	total organic carbon
U-234	uranium-234
U-235	uranium-235
U-238	uranium-238
UCL	upper confidence limit
USDA	U.S. Department of Agriculture
UTL	upper tolerance limit
VF	volatilization factor
VOC	volatile organic compound
XQ	exposure quotient

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EXECUTIVE SUMMARY

The Mound Plant was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priority List (NPL) on November 21, 1989. In accordance with its NPL status, the U.S. Department of Energy (DOE) signed a CERCLA Section 120 Federal Facility Agreement (FFA) with the U.S. Environmental Protection Agency (EPA), which became effective October 11, 1990. The Ohio Environmental Protection Agency (OEPA) became a signatory on July 15, 1993.

This report documents the remedial investigation (RI) conducted at the Mound Plant New Property under CERCLA and DOE's Environmental Restoration Program. The RI Report is presented in eight sections: Section 1 - Introduction; Section 2 - Study Area Investigation; Section 3 - Physical Characteristics of the Study Area; Section 4 - Nature and Extent of Contamination; Section 5 - Contaminant Fate and Transport; Section 6 - Baseline Risk Assessment; Section 7 - Summary and Conclusions; and Section 8 - References. A synopsis of Sections 1 through 7 is presented below.

ES.1. INTRODUCTION

The Mound Plant is a government-owned and contractor-operated facility. The plant occupies a 306-acre site in Montgomery County near Miamisburg, Ohio. The Mound Plant is located approximately ten miles south-southwest of Dayton and 45 miles north of Cincinnati. The Mound Plant consists of the Operational Area and the New Property (Figure ES.1).

The early Mound programs investigated the chemical and metallurgical properties of polonium-210. Investigations of other radioactive isotopes were also conducted. Through the present, the Mound Plant has used its radioactive research capabilities to contribute to military and non-military programs. All of these activities were conducted at the Operational Area. The New Property has never been used by DOE for plant processes, production, or operations, nor has the New Property been identified as a contaminant source. The New Property was purchased in 1981 from previous owners. Historically, the land was used for farming and is currently undeveloped.

Because the New Property has never been developed, DOE intends to release the majority of the New Property for non-DOE use and/or release of DOE ownership, on an expedited basis. An RI field program was performed to support these goals. Data collected during the New Property Phase 1 and Extended

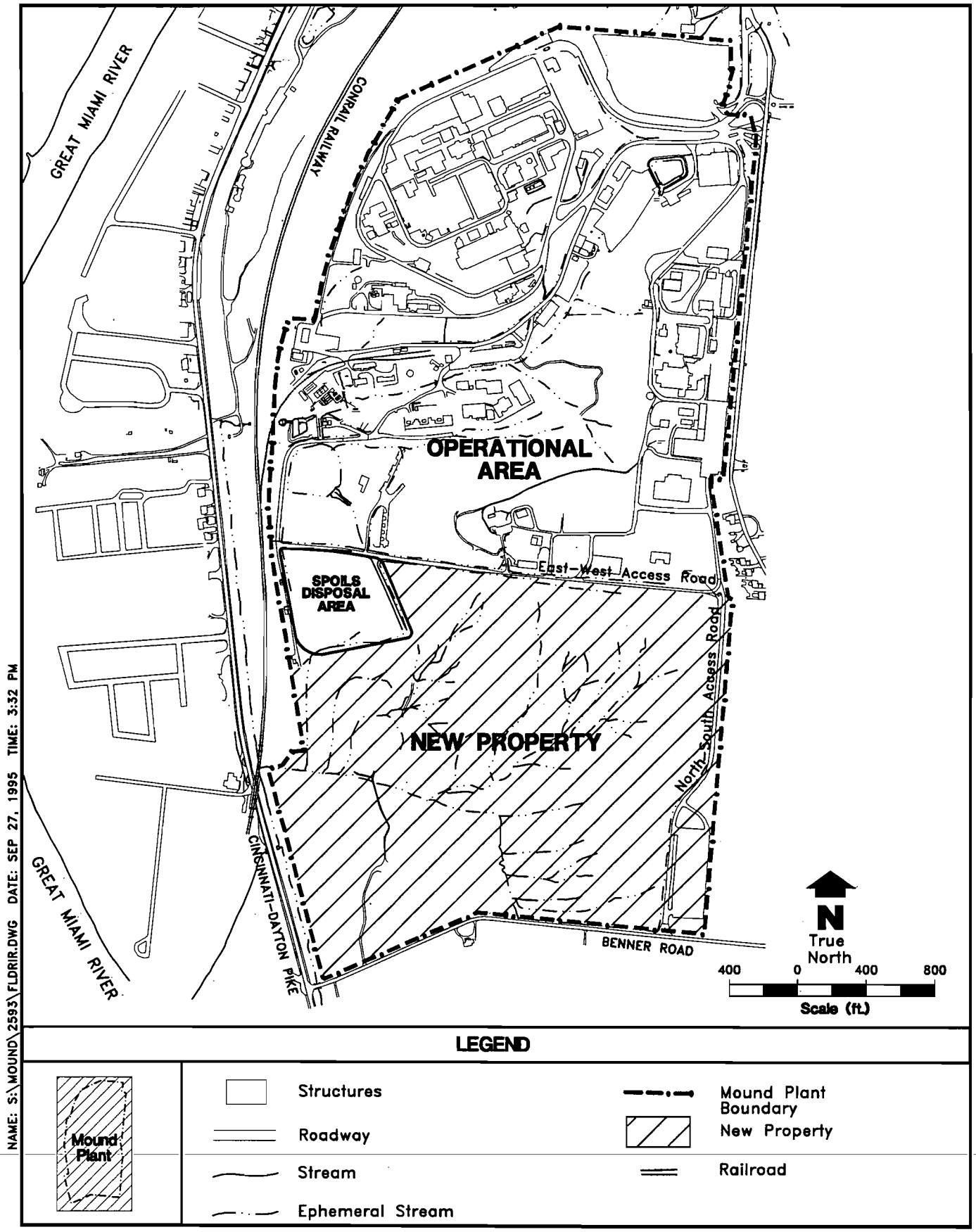

Figure ES.1. Map of the Mound Plant

Phase investigations and supplemental data collected during the Operable Unit (OU) 9 Groundwater Sweeps Program, the OU9 Regional Soils Investigation (RSI), and the OU9 Site-Wide Ecological Characterization Study were used to perform the baseline risk assessment (BRA) and to prepare this report.

Certain interim remedial actions (IRAs) are underway at operable units within the Mound Plant. The IRAs may favorably influence the nature and extent of contamination at the New Property. These IRAs will reduce the migration of some contaminants from the Operational Area to the New Property through groundwater movement and surface soil erosion.

ES.2. STUDY AREA INVESTIGATIONS

The RI field activities conducted at the New Property augmented work performed under previous investigations. The objectives of the RI investigation were to identify and characterize the nature and extent of contamination, develop a conceptual model for potential contaminant release and migration, and perform a baseline risk assessment of the New Property.

The RI Phase 1 and Extended Phase field activities included the following: 1) a soil gas survey to screen for volatile and semi-volatile organic compounds in surface soils; 2) a multi-channel analyzer [field indicator for the detection of low-energy emitting radiation (FIDLER)] survey to screen for radiological contamination in surface soils; 3) radiological screening of surface soils for plutonium-238 and thorium-232; 4) seep sampling; 5) groundwater sampling from newly installed monitoring wells; 6) surface and subsurface soil sampling from borings; and 7) sediment sampling in the ephemeral streams. These activities were supplemented with data collected during previous field investigations under other Mound Plant programs: 1) groundwater sampling during the OU9 Groundwater Sweeps Program at the New Property (DOE 1995b); 2) surface and subsurface soil sampling during the OU9 Regional Soils Investigation (RSI) (DOE 1995c); and 3) an ecological assessment performed as part of the OU9 Site-Wide Ecological Characterization Study (DOE 1994c).

The field programs were conducted according to the OU5 Remedial Investigation/Feasibility Study (RI/FS) Work Plan (DOE 1993a), the OU5 RI/FS Quality Assurance Project Plan (QAPjP) (DOE 1993d), the OU9 Site-Wide RI/FS Work Plan (DOE 1992d), and the OU9 Site-Wide Remedial Site Investigation (RI/FS) QAPjP (DOE 1993e). The data provided by these investigations was used to characterize the nature and extent of possible contamination at the New Property and to perform a baseline human health and

ecological risk assessment. The BRA assessed the risks associated with current and future land use scenarios to determine the need for remedial actions that may be required at the New Property.

ES.3. PHYSICAL CHARACTERISTICS OF THE STUDY AREA

The dominant surface features within and around the study area are a prominent bluff on which the Mound Plant is located, and the Great Miami River, which occupies a wide valley. Relief in the New Property is characterized by moderately southwestward to westward sloping terrain. The steepest slopes are found in the extreme northeast corner of the New Property; nearly flat lowlands lie in the southwestern portion. Elevations range from 700 feet above mean sea level (MSL) in the southwestern quadrant, to approximately 880 feet above MSL in the northeast corner. The western most edge of the New Property lies within the 100-year floodplain of the Great Miami River, circumscribed by the 710-ft topographic contour.

Topographic highs are discontinuous bedrock exposures of thinly bedded shales and limestones. Thin veneers of unconsolidated Quaternary tills and outwash deposits range in thickness from zero feet at the bedrock exposures to more than 195 feet on the western edge of the New Property. These deposits are the materials that make up the Buried Valley Aquifer (BVA) that underlies the western portion of the New Property.

The degree of hydraulic interconnection between the bedrock and the BVA varies at the Mound Plant. At the New Property, the groundwater flow is predominantly southward along the trend of the BVA. Hydrogeologic data suggests that the Great Miami River acts as a recharge source to the BVA over most of the year creating a local groundwater ridge near the river that acts as a barrier to groundwater flow from the Mound Plant (DOE 1994f).

A natural topographic divide immediately north of the New Property boundary creates a watershed system within the New Property. Runoff from the New Property and part of the Operational Area of the Mound Plant passes through this drainage network. All of the streams on the New Property are intermittent and some are fed by seeps during periods of precipitation, primarily during spring and early summer. The extent of connection between the surface water and groundwater systems is not known. Most of the runoff water and eroded sediment collect in the ephemeral stream and discharge off-plant to the southwest where

it combines with drainage from the southern portion of the Miami-Erie Canal to ultimately discharge into the Great Miami River.

Land use in the immediate area surrounding the New Property is industrial (Mound Plant), recreational (Miamisburg city parks), residential, and commercial. Much of this development is located in the Great Miami River floodplain, while uplands closer to the New Property are used for open space, agriculture, and residences. Adjacent to the western boundary of the New Property is a CONRAIL rail line. Current land use within a five-mile radius of the Mound Plant is summarized in the OU9 Site-Wide RI/FS Work Plan (DOE 1992d).

ES.4. NATURE AND EXTENT OF CONTAMINATION

The New Property contains low levels of contaminants that are mostly found in the surface soils of the area. Metals, semi-volatile organic compounds (SVOCs), and radionuclides were the primary contaminants detected above background concentrations. A list of contaminants detected above background criteria and identified contaminants of concern (COCs) in the surface soils, subsurface soils, groundwater, and seeps is shown in Figure ES.2.

Some radiological constituents were detected at the New Property. Plutonium-238 (Pu-238) was detected in surface soil samples collected along the northern perimeter road just south of Building 21, and in a small area located south of the Spoils Disposal Area. Thorium-228 (Th-228), thorium-230 (Th-230), and thorium-232 (Th-232) were also detected in surface soils in these same locations, but to a lesser extent. The average concentrations of radionuclides detected in the New Property soil samples were generally at or below background levels. Radiological constituents were infrequently detected at low concentrations in groundwater and seep samples. The average concentrations of radionuclides detected in the groundwater were at or below background levels.

Fewer types of contaminants were detected in subsurface soils than in surface soils. Average concentrations of metals and radionuclides generally increased with depth in the first two feet of soil. Average concentrations of SVOCs generally decreased with depth.

SURFACE SOILS
Chloride
Fluoride
Nitrate-Nitirite-N
Sulfate
Aluminum
Antimony
Arsenic
Bismuth
Cadmium
Cerium
Chromium
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Neodymium
Nickel
Potassium
Selenium
Sodium
Thallium
Tin
Vanadium
Zinc
1,3-Dinitrobenzene
2,4,6-Trinitrotoluene
4,4'-DDD
alpha-Chlordane
beta-BHC
2-Methylnaphthalene
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
***Benzo(a)pyrene**
***Benzo(b)fluoranthene**
Benzo(g,h,i)perylene
Benzo(k)flluoranthene
Benzoic Acid
Carbazole
Chrysene
Di-n-butylphthalate
***Dibenzo(a,h)anthracene**
Dibenzofuran
Fluoranthene
Fluorene
***Indeno(1,2,3-c,d)pyrene**

***Contaminant of Concern**

SURFACE SOILS (cont.)
Naphthalene
Phenanthrene
Pyrene
bis(2-Ethylhexyl)phthalate
2-Butanone
Acetone
Carbon tetrachloride
Ethylbenzene
Hexane
Methylene Chloride
Toluene
Xylene, Total
Plutonium-238
Plutonium-239/240
Radium-226
Strontium-90
Thorium-228
Thorium-230
Thorium-232
Tritium
Uranium-234
Uranium-235

SUBSURFACE SOILS
Chloride
Sulfate
Antimony
Bismuth
Lithium
Magnesium
Potassium
Tetryl
Di-n-butylphthalate
Di-n-octylphthalate
bis(2-Ethylhexyl)phthalate
Acetone
Strontium-90
Uranium-235

GROUNDWATER
Ammonia
Chloride
Nitrate as Nitrogen
Sulfate
Aluminum
Antimony
***Arsenic**
Barium
***Beryllium**
Bismuth

GROUNDWATER (cont.)
Calcium
***Chromium**
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
***Manganese**
Mercury
Molybdenum
***Nickel**
Potassium
Selenium
Sodium
Thallium
Vanadium
Zinc
2,4,6-Trinitrotoluene
1,2-Dichloroethene
Acrylonitrile
Hexane
Trichloroethene
***Americium-241**
Plutonium-239/240
Radium-226
Thorium-228
Thorium-230
Thorium-232
Tritium
Uranium-234
Uranium-235
Uranium-238

SEEPS
Chloride
Sulfate
Calcium
Iron
Magnesium
Silver
Sodium
Vanadium
1,3,5-Trinitrobenzene
1,3-Dinitrobenzene
PETN
Trichloroethene
Actinium-227
Americium-241
Strontium-90
Thorium-230
Uranium-234

Figure ES.2. Contaminants Detected Above Background Criteria

The groundwater within the New Property contains only few contaminants at low concentrations. No discernible plumes of groundwater contamination and no trends in seep contamination were detected during this or previous investigations.

Radionuclide and chemical contaminants were detected in the soil at the New Property. Possible sources of radionuclide contamination may include Area 1, the Spoils Disposal Area, and Mound Plant air emissions. Possible sources of chemical contamination may include the roads surrounding the New Property, historical farming activity, the Spoils Disposal Area, and offsite industrial air emissions associated with Mound Plant activities.

Historical Mound records show that the New Property has never been used by the Mound Plant for waste disposal or for plant processes. There are no identified landfills or disposal areas within the New Property associated with Mound Plant activities.

ES.5. CONTAMINANT FATE AND TRANSPORT

The factors that affect the environmental fate of COCs at the New Property include mobility in groundwater, degradation potential, persistence in soils and water, and potential for biological uptake. The most likely contaminant transport mechanisms occurring at the New Property include surface water runoff and soil erosion, infiltration, and groundwater flow.

Soil erosion is likely the predominant transport mechanism at the New Property, most notable in the ephemeral stream drainage. This mechanism may be responsible for the redeposition of the polycyclic aromatic hydrocarbons (PAHs), pesticides, and radionuclides that were detected in the surface soils. Infiltration and dissolution are minor transport mechanisms and may be responsible for the distribution of volatile organic compounds (VOCs), radionuclides, and water soluble metals in surface and subsurface soil.

Movement of contaminated sediment to the ephemeral streams via surface water runoff and erosion appears to be an important transport mechanism at the New Property. This mechanism contributes to the distribution of PAHs and radionuclides "downstream" from the Spoils Disposal Area and the Area 1 "arm." Surface runoff also effectively transports water soluble metals. Migration of dissolved and suspended

contaminants via groundwater flow is another significant transport mechanism. It is likely that VOCs, SVOCs, metals, and radionuclides will eventually migrate offsite with the groundwater.

ES.6. BASELINE RISK ASSESSMENT

The purpose of the Baseline Risk Assessment (BRA) was to evaluate current and future risks to human health and the environment from exposure to contaminants at the New Property. The human health and the ecological BRAs are summarized in the following subsections.

ES.6.1. Human Health Baseline Risk Assessment

The human health BRA evaluated current and future risks to human health from exposures to contaminants present at, or released from, the New Property. The focus of the risk assessment was to provide information to justify action (including "no action") at the New Property by identifying the contaminants of concern (COCs), potential exposures, and the potentially exposed population to evaluate risks that may need to be mitigated.

The human health risk assessment identified a number of COCs. This list is a subset of the analytes detected above background that are COPCs. The selection of COCs is based on quantitative assessments of toxicity, exposure, and cancer and noncancer risks for each COPC.

The risk assessment calculated the potential excess lifetime cancer risks for current and future land uses at the New Property for each COPC. U.S. EPA's target risk range is defined as excess lifetime cancer risk values between one in a million (10^{-6}) and one in ten thousand (10^{-4}). The decision to remediate sites with risks within this range is made on a site-specific basis. Sites with risks greater than one in ten thousand require remediation in order to protect human health.

Noncancer health risks were evaluated using a Hazard Index (HI) calculation for each environmental medium and exposure scenario. An HI > 1 means the potential exists for health risks resulting from exposure to one or more chemicals.

Table ES.1 summarizes the COCs and their associated numerical risk values.

Table ES.1. Summary of Human Health Risks

CONTAMINANTS	COC?	PATHWAY	SCENARIO	SITE RISK		BACKGROUND RISK	
				Noncancer[1]	Cancer[2]	Noncancer	Cancer
SOIL/SEDIMENT							
Benzo(a)pyrene	Yes	dermal	current trespasser	NA	1.22E-6	NA	NA
			future industrial	NA	1.65E-5	NA	NA
Benzo(b)fluoranthene	Yes	dermal	future industrial	NA	2.37E-6	NA	NA
Dibenzo(a,h)anthracene	Yes	dermal	future industrial	NA	1.92E-6	NA	NA
Indeno(1,2,3-cd)pyrene	Yes	dermal	future industrial	NA	1.13E-6	NA	NA
Arsenic	No[3]	dermal	future industrial	NA	6.81E-6	NA	7.44E-6
		ingestion		NA	2.41E-6	NA	2.63E-6
Mercury	No[3]	dermal	future industrial	1.54	NA	2.84	NA
			future excavation	1.51	NA	2.83	NA
Manganese	No[3]	inhalation	future excavation	1.58	NA	2.54	NA
GROUNDWATER							
Beryllium	Yes	ingestion	future adult	NA	2.73E-5	NA	1.21E-5
			future child	NA	1.27E-5	NA	5.65E-6
Chromium	Yes	ingestion	future adult	1.69	NA	NA	NA
			future child	3.95	NA	1.74	NA
Manganese	Yes	ingestion	future adult	38.4	NA	1.17	NA
			future child	89.5	NA	2.74	NA
		dermal	future adult	2.76	NA	NA	NA
			future child	4.25	NA	NA	NA
Nickel	Yes	ingestion	future child	1.26	NA	NA	NA
Arsenic	Yes	ingestion	future adult	6.05	1.17E-3	2.57	4.96E-4
			future child	14.1	5.45E-4	6.00	2.32E-4
		dermal	future adult	NA	9.55E-6	NA	4.06E-6
			future child	NA	2.95E-6	NA	1.25E-6
Americium-241	Yes	ingestion	future adult	NA	2.37E-6	NA	NA
Radium-226	No[3]	ingestion	future adult	NA	2.22E-6	NA	2.57E-6
Tritium	No[3]	ingestion	future adult	NA	2.01E-6	NA	2.07E-6

(1) Noncarcinogen Hazard Quotient (HQ) effects. Per EPA guidance, noncarcenogenic risk is present if HQ exceeds 1.0.
(2) Excess lifetime cancer risk. Per EPA guidance, cancer risk is present if excess lifetime cancer risk exceeds 1.0E-6.
(3) Contaminant exceeded EPA risk levels for cancer (1.0E-6) and/or noncancer (1.0) but risk associated with contaminant at site is indistinguishable from risk associated with contaminant in background.
Note: The greatest cancer risk associated with plutonium-238 is 1.00E-7 (ingestion - future industrial). The greatest cancer risk associated with thorium is 3.40E-8 (inhalation - future excavation).
NA Not applicable because HQ <1 or cancer risk <1.0E-6 or not calculated

The results of the human health BRA can be summarized as follows:

- No radionuclides in soil/sediment at the New Property were identified as COCs for human health because estimated risks do not exceed EPA cancer and noncancer targets.

- Benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene are COCs in soil/sediment for future commercial/industrial workers because the cancer risks from dermal exposure to these contaminants are estimated to be within the EPA target risk range. In addition, benzo(a)pyrene in soil/sediment is a COC for current adolescent trespassers.

- No COCs for human health were identified in seeps at the New Property because risks from dermal exposure to constituents in seeps do not exceed EPA cancer and noncancer targets.

- The risk from the ingestion of groundwater from the New Property is above the EPA noncancer and cancer targets for future off-site residents. Arsenic, beryllium, chromium, manganese, nickel, and americium-241 are COCs because the noncancer risks exceed the EPA target HI of 1 or the cancer risks exceed the target value of one in one million.

ES.6.2. Ecological Baseline Risk Assessment

The objectives of the ecological BRA were to define and evaluate the current and future baseline risks of harmful effects on plants and animals from exposure to chemical contamination. Radionuclides were not evaluated because the available toxic effects data are based on experimental exposures much higher than those at the New Property.

The ecological BRA identified no ecological contaminants of concern (ecoCOCs). It was determined that contaminants at the New Property: (1) are not present at the New Property at concentrations greatly exceeding background and other exposure units; (2) are unlikely to bioaccumulate in prey (such as insects) at high levels, which in turn expose their predators; and/or (3) have published toxicity thresholds (dietary limits and effects levels) that indicate no harmful effects on organisms at observed concentrations.

ES.7. CONCLUSIONS

The RI at the New Property was performed to characterize the nature and extent of contamination, determine the potential for contaminant migration, evaluate risk to human health and the environment, and provide data necessary to assess the need for site remediation.

The conclusions of this RI Report are:

- Radionuclides were detected in soils and groundwater at the New Property; however, concentrations were low and occurrences were infrequent. Radionuclides, including plutonium, thorium, and tritium, are not significant contaminants at the New Property because they do not pose risk to human health or the environment.

- With the exception of isolated high concentrations of metals in the former "farm trash area," contaminants that were detected in groundwater and seeps do not appear to have a source within the New Property. Groundwater occurrences of contamination do not have apparent relationships to soil occurrences of the same contaminants (Section 4). Consequently, the New Property does not appear to be impacting the quality of the groundwater resources in the area.

- Metals and PAHs are ubiquitous in soils; therefore no relation can be drawn between their occurrence at the New Property and operations at the Mound Plant. Although past Mound Plant activities may have contributed to metals and PAH contamination at the site, offsite sources may also be contributing to the occurrence of these compounds at the New Property. For example, arsenic was found in both soils and groundwater at concentrations that cause risks within EPA target ranges. However, the risks due to arsenic in background soils are greater than risks associated with the New Property (see Table ES.1).

In some cases, New Property risks appear to be higher than the background risks; in others, background risks appear to be higher. Thus, differences between background and New Property risks are not sufficiently large to require remediation at the New Property.

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Section 1

1. INTRODUCTION

The U.S. Department of Energy (DOE) Mound Plant in Miamisburg, Ohio was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priority List (NPL) on November 21, 1989 (54 Federal Register 48184). In accordance with its NPL status, DOE signed a CERCLA Section 120 Federal Facility Agreement (FFA) with the U.S. Environmental Protection Agency (EPA), which became effective October 11, 1990 (EPA 1990). The Ohio Environmental Protection Agency (OEPA) became a signatory on July 15, 1993 (EPA 1993a).

The terms of the FFA require that DOE develop and implement remedial investigations (RIs) and feasibility studies (FSs) and conduct ongoing remedial actions to ensure that environmental impacts associated with past and present activities at the Mound Plant are thoroughly investigated and appropriate action is taken to protect human health and the environment. The FFA also requires DOE to produce a site-wide RI/FS report to assess the nature and extent of contamination and to determine potential impacts of this contamination on human health and the environment.

To accomplish the objectives of the FFA statement of work, the Environmental Restoration (ER) Program has been developed at the Mound Plant. The ER Program has two primary goals: (1) to reduce adverse impacts on human health and the environment by reducing releases of hazardous or radioactive materials, and (2) to bring all inactive waste sites requiring remediation into compliance with existing state and federal regulations and requirements.

The ER Program is patterned after the EPA CERCLA program and consists of three phases. The first phase, a preliminary assessment/site inspection, was completed at the Mound Plant in 1986 during the Mound Site Survey Project (Stought et al. 1988). The second phase, a RI/FS, is currently underway at the Mound Plant. The third phase, remedial design/remedial action will implement the remedial alternatives chosen in the FS.

Because of the size and complexity of the Mound Plant, the site has been divided into several operable units (OUs) by the ER Program as a way to manage the RI/FS investigation. A RI/FS will be completed for each of these OUs and the data and information will be aggregated to provide a cohesive, unified understanding of radioactive and chemical contamination at the Mound Plant. Additional discussion of

the Mound Plant ER Program including compliance strategy, guidance documents, laws of authorization, history, and descriptions of the Mound Plant OUs, can be found in the OU1 RI Report (DOE 1994a).

This document constitutes the RI report for the portion of OU5 known as the New Property. It summarizes the results of the completed RI, including a baseline risk assessment (BRA). The physical and chemical characteristics of the New Property, the nature and extent of contamination, and contaminant migration are addressed. Findings and data analyses are combined to form a conceptual model of potential contaminant release and transport mechanisms at the New Property. The BRA utilizes contaminant occurrence data to quantify risks to human health and the environment posed by these contaminants.

The New Property has never been used by the DOE for plant processes, production, or operations, nor has the New Property been identified as a contaminant source. Thus, DOE intends to release the majority of the New Property for non-DOE use and/or release of DOE ownership, on an expedited basis. An RI field program was performed according to the OU5 South Property RI/FS Work Plan (DOE 1993a) to support these goals. A Phase 1 reconnaissance field program that included a soil gas survey, a surface radiological survey, and seep sampling was conducted in February and March, 1994. The results of these activities are presented in the New Property Phase 1 Field Report (DOE 1994b).

Shortly after completion of Phase 1 activities, the Extended Phase field program was conducted from June through August, 1994, and consisted of the drilling of soil borings, the installation of monitoring wells, and the collection of soil, groundwater, and sediment samples. The results of this investigation are presented in the New Property Extended Phase Field Report (DOE 1995a). Data collected during these two investigations (Phase 1 and Extended Phase), the Fall of 1993 and the Spring of 1994 OU9 Groundwater Sweeps Program (DOE 1995b), the OU9 Regional Soils Investigation (RSI) (DOE 1995c), and the OU9 Site-Wide Ecological Characterization Study (DOE 1994c) were used to perform the BRA and prepare this RI report.

The following sections describe the scope of the New Property RI report, provide a site description and background, and review previous field investigations. The closing section presents the organization of the remainder of the report.

1.1. PURPOSE AND SCOPE

The purpose of this RI report is to describe the investigations undertaken at the OU5 New Property and to provide a description of the current conditions in this specific area of the Mound Plant. The RI was conducted to characterize the nature and extent of contamination and to evaluate any potential risks to human health and the environment at the New Property. The specific objectives of the RI were:

- Identify the presence, nature, and extent of potential contamination in groundwater, surface water, soils, and sediment.
- Identify contaminants and establish their concentration ranges with respect to background levels or applicable or relevant and appropriate requirements.
- Identify site geologic features that affect the fate and transport of contaminants.
- Provide groundwater data and hydrogeologic parameters to assess groundwater flow directions and rates that will affect the fate and transport of contaminants.
- Provide chemical and radiological data on the quality of groundwater, surface water, soils, and sediments that will support a BRA.
- Perform the BRA.
- Provide data for the FS alternatives screening and provide data necessary to assess the need for site remediation.

Current and previous field and laboratory investigations are used to characterize the New Property. These investigations include cultural and ecological surveys, soil mapping, a soil gas survey, radiological screening of soils, borehole drilling and soil sampling, monitoring well installation and groundwater sampling, seep sampling, and sediment sampling.

Groundwater quality at the New Property will be evaluated and discussed in this RI report; however, site-wide groundwater quality impact issues are part of the OU9 Site-Wide Groundwater Monitoring Program and will not be addressed as part of this report.

1.2. SITE BACKGROUND

The following subsections describe the geographic setting and history of the Mound Plant and the New Property.

1.2.1. Site Description

1.2.1.1. The Mound Plant

The Mound Plant is a government-owned and contractor-operated facility. The plant occupies a 306-acre site on the outskirts of the city of Miamisburg in Montgomery County, Ohio (Figure 1.1). The Mound Plant is located approximately ten miles south-southwest of Dayton and 45 miles north of Cincinnati. The northern boundary of the Mound Plant is approximately 0.13 miles south of Mound Avenue in Miamisburg. Benner Road forms the southern boundary of the Mound Plant, and the Conrail Railroad (formerly the Penn Central) roughly parallels the western boundary at a distance of 50 to 200 feet (Carfagno, D.G. and B.M. Farmer 1985).

The Mound Plant consists of the main plant, or the Operational Area, to the north of the east-west access road and the New Property to the south of this road (Figure 1.2). The Operational Area encompasses two adjoining hills (the Main Hill and the Special Metallurgical/Plutonium Processing (SM/PP) Hill) consisting of bedrock shales and limestones covered by a thin veneer of unconsolidated deposits. The two hills are separated by the plant drainage ditch which is underlain by interbedded till, sand, and gravel deposits. Much of the original surface of these two hills has been regraded and reworked during plant construction.

Currently, there are 120 buildings at the Mound Plant, all located in the Operational Area. There are no buildings in the New Property. A railroad siding enters the plant from the west and services the lower plant valley. Details of the plant property boundaries, fencing, and utilities are included in the OU9 Site Scoping Report: Volume 4, Engineering Map Series (DOE 1992a).

Certain interim remedial actions (IRAs) are underway at operable units within the Mound Plant that may reduce the potential future risk from contaminants migrating to and from the New Property. At OU1, collection, treatment, and disposal of groundwater contaminated with VOCs is planned. This IRA will influence hydraulic gradients at the New Property and reduce the migration of VOCs via groundwater (DOE/MB, 1995). Along the northern boundary of the New Property, an IRA is underway to control stromwater drainage. Surface soils contaminated with thorium and plutonium in the Operational Area will be prevented from migrating onto the New Property via stormwater runoff (DOE/MB, 1994). Both of these IRAs may favorably impact the nature and extent of contamination at the New Property.

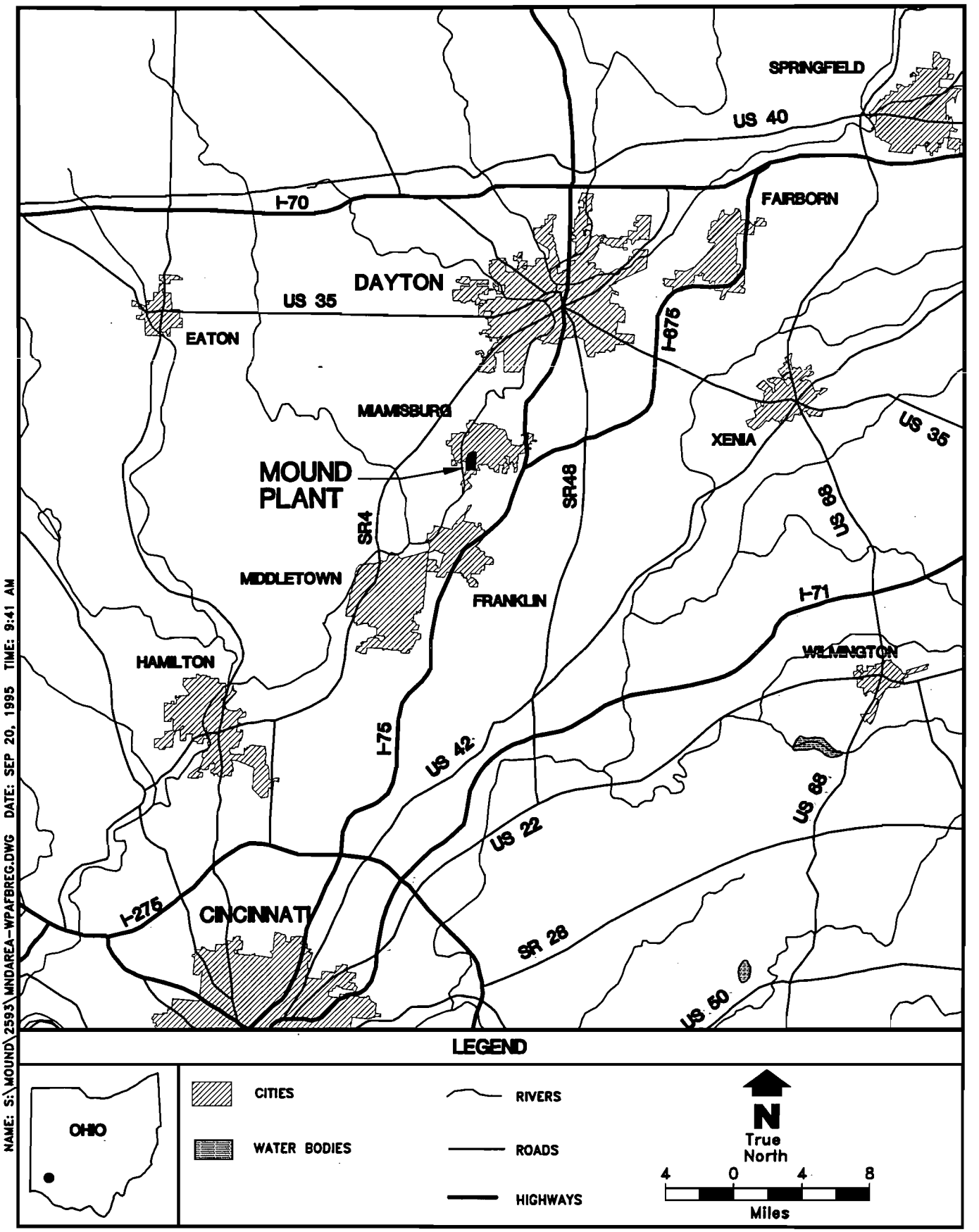

Figure 1.1. Location of the Mound Plant, Miamisburg, Ohio

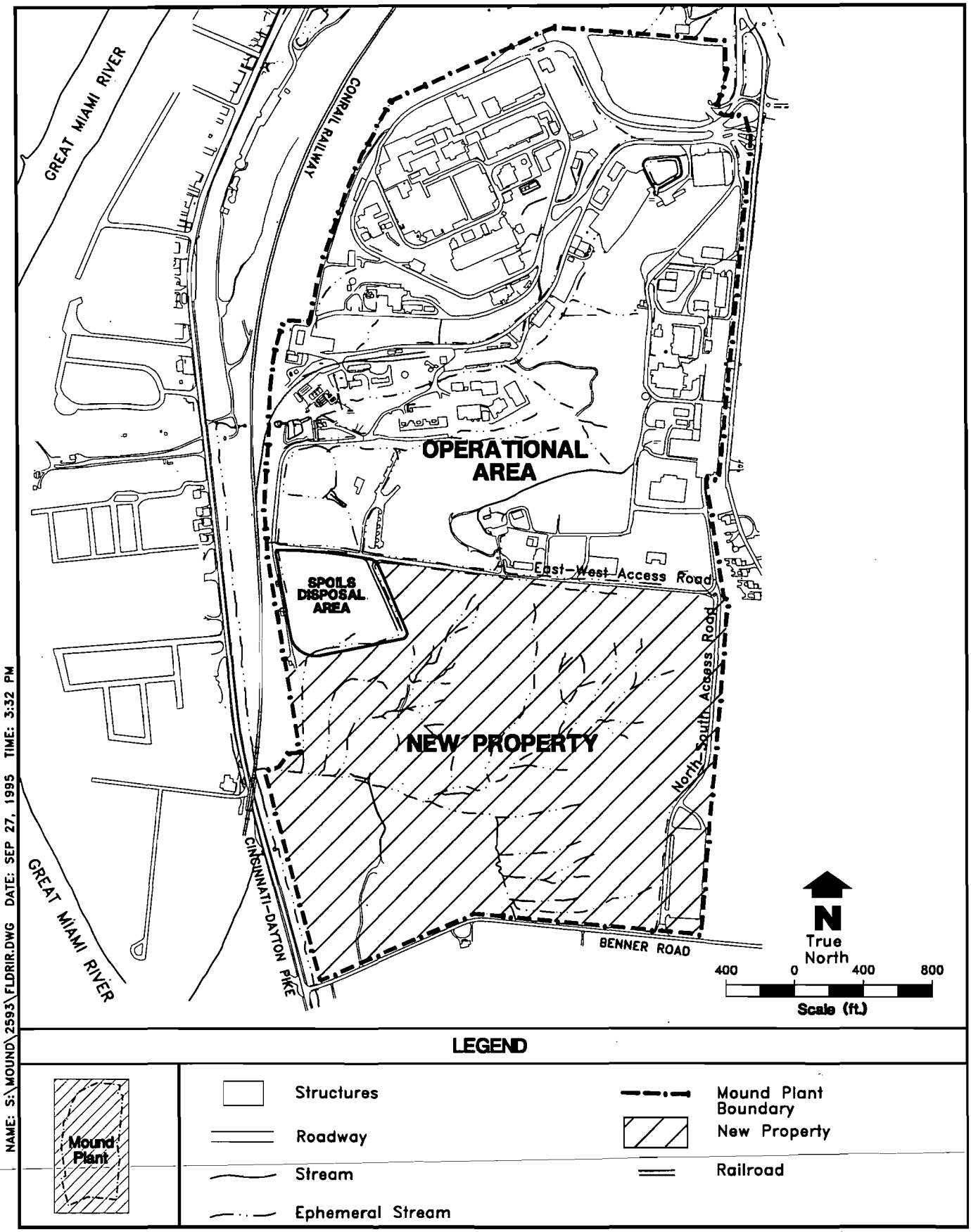

Figure 1.2. Map of the Mound Plant

1.2.1.2. The New Property

The New Property (Figure 1.3) is located immediately south of the Operational Area. It is bordered by the Operational Area to the north, by Cincinnati-Dayton Pike to the west, by the north-south access road to the east, and by Benner Road to the south. Area 1, which is part of the OU6 Decontamination and Decommissioning Program, includes the vicinity around Building 21 in the Operational Area, an old plutonium waste package storage area to the east, and an "arm" that extends into the New Property. The Area 1 "arm", which extends to the south along a drainage channel, was defined based on results from the OU9 Site Scoping Report: Volume 3, Radiological Site Survey (DOE 1993b). Because the "arm" is partially located within the New Property, the analytical results of this area are discussed in this report. The Spoils Disposal Area (Figure 1.3), is excluded from the New Property because it was used by the Mound Plant for waste disposal.

Cultural features in the New Property include a paved access road parallel to the east boundary, a contractors' parking lot at the junction of Benner Road and the access road, an undeveloped dirt road that penetrates the southwest quadrant of the property, and an above-ground power line running approximately north-south through the center of the New Property. There is also a small area (approximately 20' x 20') containing some tires and metal debris near the north end of the undeveloped dirt road, immediately southeast of the ephemeral stream that transects the study area.

Current institutional controls (fence, guarded entrance) prohibit unrestricted access to the Operational Area from the New Property and to the New Property from offsite. These controls will be maintained if the New Property is released before the Operational Area.

The New Property is topographically characterized by relatively steep hillsides in the north and east (maximum surface elevation 880 feet above mean sea level (MSL)) and flat-lying lowlands along the western edge of the property (minimum surface elevation 710 feet above MSL) (Figure 1.3). The topographic highs are bedrock expressions of interbedded Ordovician limestones and shales. The New Property is covered with a layer of unconsolidated Quaternary till and outwash deposits which ranges in thickness from one to eight feet on the hillsides to greater than 195 feet on the flat-lying lowlands (DOE 1992b). The land, which was historically used for farming, is undeveloped. Vegetation consists of grasses, small trees, and brush.

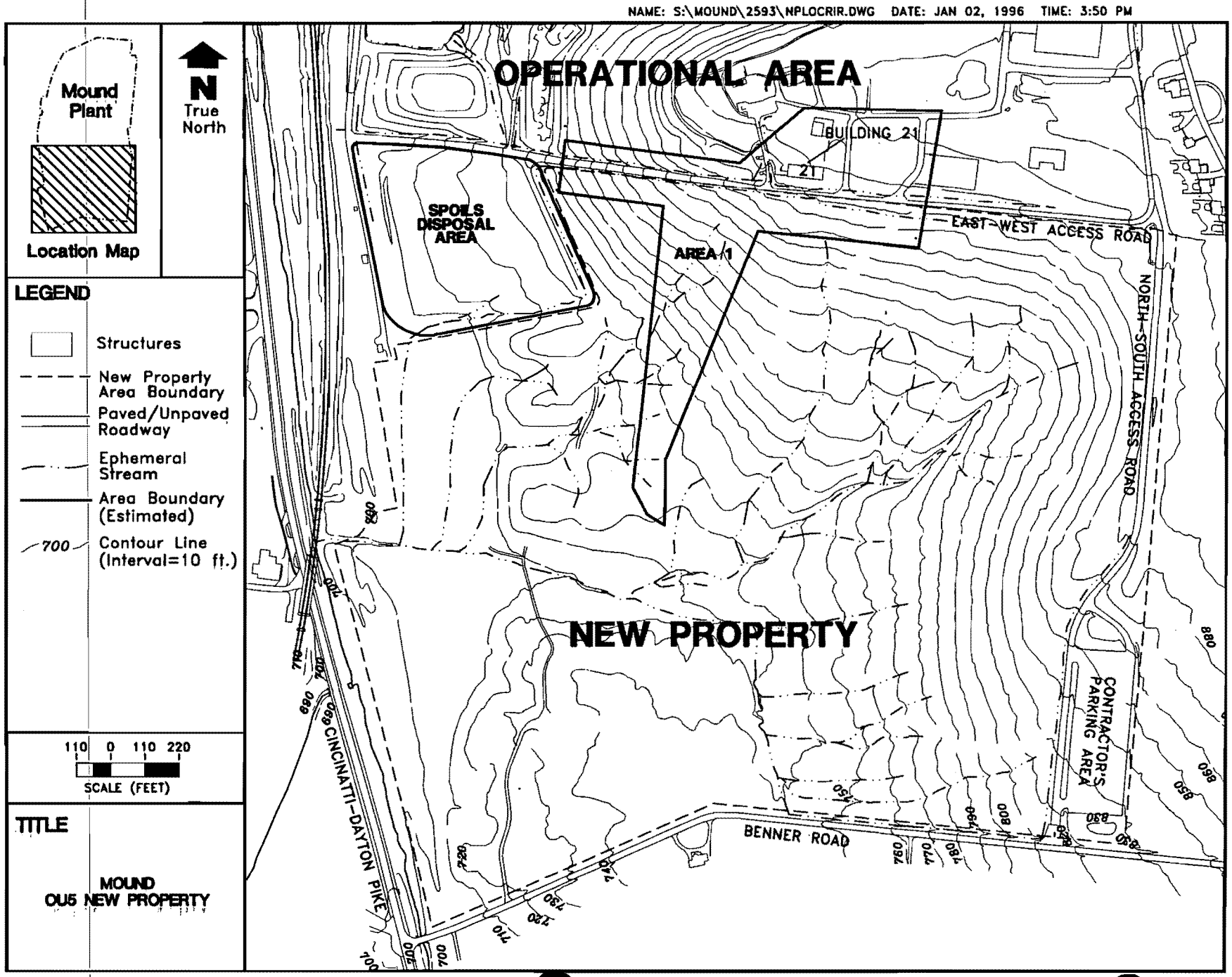

Figure 1.3. Operable Unit 5 New Property

1.2.2. Site History

1.2.2.1. The Mound Plant

The Mound Plant originated in 1943 as part of the Manhattan Engineer District, which became known as the Manhattan Project. Its purpose was to determine the chemical and metallurgical properties of polonium (DOE 1986). The work was performed for the United States Army at several locations in Dayton, Ohio. In 1946, 182 acres on the outskirts of Miamisburg, Ohio, were purchased for the location of the permanent research facility to support the Manhattan Project. In 1948, work being performed at the Dayton units was moved to this site and, in January 1949, radioactive operations began.

The early Mound programs investigated the chemical and metallurgical properties of polonium-210 and its applications for weapons and non-weapons use. Investigations involving other radioactive isotopes were conducted at Mound through the early 1960s as part of the national civilian power reactor program. Through the present time, Mound has used its unique radioactive research capabilities to contribute to breeder reactor research, development of thermoelectric generators, space exploration, medical applications, and other military and non-military programs.

In the early 1970s, the Mound Plant expanded its comprehensive programs in environmental control, waste management, and energy conservation. In January 1975, the Mound Plant formally came under the jurisdiction of the Energy Research and Development Administration upon dissolution of the Atomic Energy Commission. In October 1977, the Mound Plant was incorporated into the DOE complex. Additional details about the Mound Plant history and programs can be found in the OU9 Site Scoping Report: Volume 7, Waste Management (DOE 1993c).

1.2.2.2. The New Property

The New Property was purchased by the DOE on August 26, 1981 from previous owners. A portion of the New Property, approximately 80 acres, was purchased from the Penrod estate. The estate was located on the undeveloped road in the southwest quadrant of the New Property, south of the ephemeral stream. 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 DOE, and were subsequently either moved or razed.

Aerial photos dated 1938, 1949, 1968, and 1980 indicate that the property was historically used for farming and showed no signs of construction or excavation activities. An environmental audit was not conducted before DOE purchased any of the parcels of land which now make up the New Property. The New Property has not been used by the DOE for plant processes or for disposal of waste.

1.3. REPORT ORGANIZATION

This RI report is prepared in accordance with EPA guidance and recommended format (EPA 1988). The report consists of an Executive Summary, Sections 1 through 8, and appendices. Section 1 describes the purpose and the organization of the report. In addition, a description and history of the Mound Plant and the New Property is presented. The objective of this section is to provide a historical perspective to be used in evaluating human health and environmental impacts associated with the New Property in OU5.

The environmental investigations conducted to support the RI of the New Property are summarized in Section 2. Previous investigations of the New Property are also described. This section presents the specific data objectives and methodology employed for each data collection and analysis activity, as well as a description of the RI contract laboratory program (CLP) and the data management approach used for the project.

Section 3 describes the physical characteristics of the OU5 study area, including the geography, geology, hydrology, and ecology of the study area and vicinity. Data relevant to the physical characteristics of the study area are presented from a regional, local, and site perspective, as appropriate.

Section 4 presents the data gathered during the RI and discusses the nature and extent of contamination at the New Property. Background chemical data are provided. The nature and extent of contamination at the New Property is discussed with respect to the environmental media studied.

An evaluation of the probable fate and transport of the contaminants of potential concern is presented in Section 5. Fate and transport characteristics are considered and conceptual models of contamination migration are presented.

Section 6 presents the human health baseline risk assessment and the baseline ecological risk assessment. Data and evaluations supporting the risk assessments and the uncertainties associated with the BRA are presented in Appendix E.

Section 7 summarizes the results and conclusions drawn from data relevant to the New Property RI, and Section 8 lists the references used in the preparation of this document.

The appendices contain data relevant to the RI at the New Property. Boring logs and well construction diagrams, analytical data tables, a data quality assessment, statistical tests used to determine contaminants of potential concern (COPCs), and risk assessment calculations are provided to support the interpretations made in this RI Report.

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2. STUDY AREA INVESTIGATION

This section describes the field and analytical programs used to gather data on site characteristics and conditions before and during the RI at the New Property. The investigations were designed to meet the data quality objectives (DQOs) delineated in the OU5 RI/FS Work Plan (DOE 1993a) and the OU5 Quality Assurance Project Plan (QAPjP) (DOE 1993d), and to supplement the information provided by previous field investigations. The field and analytical programs were conducted in accordance with the OU5 RI/FS Work Plan, the OU5 QAPjP, and the OU9 QAPjP (DOE 1993e). Investigation objectives, rationale, sampling methods, and sampling locations are discussed in this section. The results of these investigations are discussed in subsequent sections of this report. Previous field investigations and their results are also summarized in this section.

2.1. FIELD INVESTIGATIONS

This RI of the New Property consisted of a Phase 1 reconnaissance survey and an Extended Phase investigation. The purpose of the Phase 1 reconnaissance investigation, conducted in early 1994, was to characterize areas of contamination that required further investigation. Phase 1 activities 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 (Pu-238) and thorium-232 (Th-232); and (4) sampling of seep water to screen for organic, inorganic, and radiological contamination. Results from the Phase 1 investigation are documented in the New Property Phase 1 Field Report (DOE 1994b). The Extended Phase investigation augmented the Phase 1 program with surface and subsurface soil sampling from borings, groundwater sampling from newly installed monitoring wells, and sediment sampling in the ephemeral streams. Results from the Extended Phase investigation are documented in the New Property Extended Phase Field Report (DOE 1995a). Analytical data from the groundwater, sediment, seep, and soil sampling were used to perform the BRA, presented in Section 6 of this RI Report.

Data collected before the 1994 Phase 1 and Extended Phase RI investigations were also used to support the RI and to perform the BRA. This includes groundwater data collected during the OU9 Groundwater Sweeps Program (DOE 1995b) and the corresponding lithologic logs from the monitoring wells which were previously installed on the New Property. It includes surface and subsurface soil data collected

during the 1994 OU9 Regional Soil Investigation (RSI) (DOE 1995c). It also includes ecological data collected during the OU9 Site-Wide Ecological Characterization Study (DOE 1994c) which investigated the entire Mound Plant.

Other previous investigations in the OU5 New Property were designed to assess the impacts of potential contamination released to soils by the site's previous owners, and assess the extent of migration, if any, of hazardous and radioactive materials from the Operational Area to the New Property. Because the New Property has never been used by the Mound Plant for plant processes or waste disposal, previous studies were reconnaissance studies that measured a broad array of indicators of radioactive or chemical contamination in surface or subsurface soils. Prior to 1994, surveys and sampling activities conducted as part of the Site Survey Project (Stought et al. 1988) included a FIDLER survey, surface and subsurface soil sampling, and soil screening at the Mound Plant Soil Screening Facility. Additional soil sampling, reported in the OU3 Miscellaneous Sites - Limited Field Investigations Report (DOE 1992c), was completed for organic and inorganic compounds.

The ambient air is continually monitored to ensure the Mound Plant is in compliance with the Clean Air Act. An archaeological survey was performed at the Mound Plant in 1991. Because it was not RI-quality, none of the data from these investigations (Site Survey Project, OU3 Limited Field Investigation, ambient air monitoring (DOE 1992d; DOE 1994d), or the archaeological survey (DOE 1991) were used to support the BRA; however, the data from some of these investigations do indicate areas of possible contamination at the New Property.

2.1.1. Surface Features

The New Property is topographically characterized by relatively steep hillsides in the north and east (maximum surface elevation 880 feet MSL) and flat lying lowlands in the southwest corner of the property (minimum surface elevation 710 feet MSL) (Figure 1.3). The New Property is situated approximately 0.4 miles east of the Great Miami River.

The overall topography of the New Property is influenced by surface erosion associated with the ephemeral streams that drain the area (Figure 1.3). Surface water runoff from the New Property and portions of the Operational Area of the Mound Plant passes through this drainage network. Most of the runoff from the New Property collects in the ephemeral stream that discharges off-plant to the southwest.

This ephemeral stream combines the Mound Plant surface water discharge with drainage from the south part of the Miami-Erie Canal, flows under Dayton-Cincinnati Pike, and into the Great Miami River. Water flows through the network of ephemeral streams in the spring and dries as summer approaches.

Aerial photos dated 1938, 1949, 1968, and 1980 were available from the Montgomery-Greene County Transportation and Development Planning Program and the Miami Valley Regional Planning Commission. These photos indicate that the property was historically used for farming and showed no signs of construction or excavation activities. The Spoils Disposal Area is still actively used by the Mound Plant; therefore, it is not defined as part of the New Property.

2.1.2. Seep and Sediment Sampling

Seeps and stream sediments constitute important sampling locations for characterizing potential chemical and radioactive contamination in the New Property. The ephemeral streams and the low lying area south of the Spoils Disposal Area are logical sites for the accumulation of contaminants transported by surface runoff from the Operational Area, Spoils Disposal Area, and Area 1 of the Mound Plant. Investigation of the seeps and sediments also provides important data used in assessing risks to human health and the environment.

Seep and sediment sampling was conducted in 1994 according to the OU5 RI/FS Work Plan (DOE 1993a) and the OU5 QAPjP (DOE 1993d). The following subsections present the sampling rationale and procedures.

2.1.2.1. Sampling Rationale

Seep sampling was conducted in March 1994 at eight seep locations in the New Property as part of the Phase 1 investigation (Figure 2.1). The purpose of the seep sampling was to characterize the seep water (near-surface) for the presence of any potential radioactive or chemical contaminants. Seep samples were analyzed for organic, inorganic, and radioactive constituents, per the OU5 QAPjP (DOE 1993d).

As part of the Extended Phase investigation, 27 sediment samples were collected from locations in the New Property ephemeral stream drainage system in July 1994 (Figure 2.1). Sediment samples were collected to determine if contaminated surface water runoff (potentially from the Spoils Disposal Area,

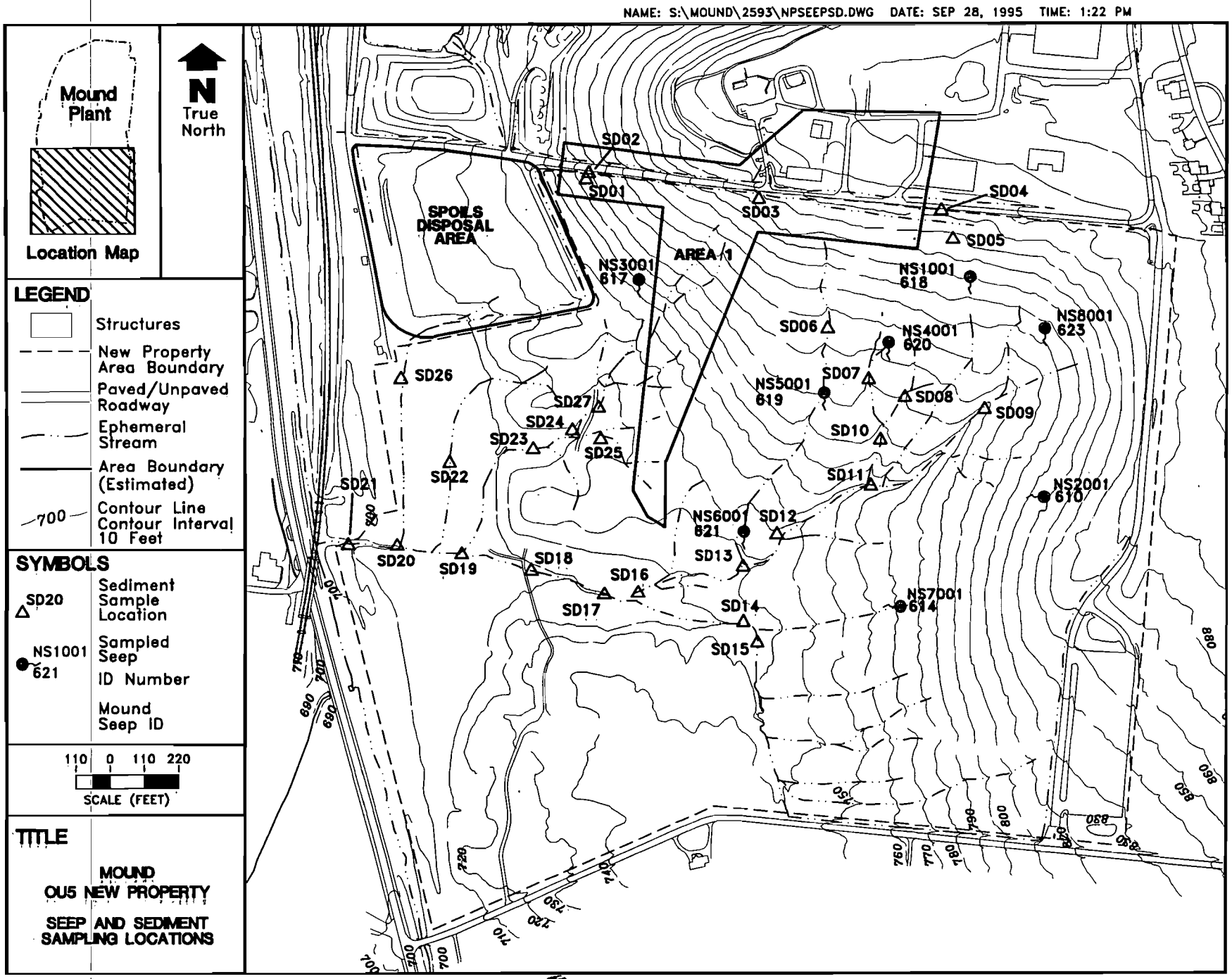

Figure 2.1. Seep and Sediment Sampling Locations in the New Property

Area 1, and the Operational Area) is collecting in the ephemeral stream systems and potentially exiting the Mound Plant Property at the southwest boundary of the New Property. Geotechnical samples were also collected and analyzed to characterize physical properties of the sediments from the ephemeral streams.

2.1.2.2. Sampling Procedures

Seep sampling was conducted in accordance with Mound Standard Operating Procedure (SOP) 2.2 *Field Measurements on Ground and Surface Water Samples*, SOP 2.8 *Sampling for Volatile Organics*, and SOP 2.9 *Surface Water Sampling*. Samples were collected, packaged, and shipped to an OU9 QAPjP-approved laboratory according to Mound 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*. Seep samples were analyzed for chemical and radioactive parameters per the OU5 QAPjP (DOE 1993d).

Sediment samples were collected according to SOP 5.2 *Soil Sampling with a Spade and Scoop* using decontaminated (clean) equipment. Samples were collected, packaged, and shipped to an OU9 QAPjP-approved laboratory according to Mound SOPs 1.3, 1.4, and 1.5 for chemical and radioactive analysis.

Immediately following the collection of the chemical and radiological samples, geotechnical samples were collected at ten locations (SD03, SD07, SD08, SD09, SD12, SD13 SD15, SD16, SD20, and SD23) 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, liquid limit, plastic index, and pH. Geotechnical results are presented in Table II.1.

2.1.3. Soil Investigation

Nine boreholes were drilled on the New Property in June 1994 as part of the OU5 New Property Extended Phase investigation (DOE 1995a). Soil samples were collected for radioactive, chemical, and geotechnical analysis, per the OU5 QAPjP.

Table II.1. Summary of Geotechnical Analyses of New Property Sediment Samples

Sample Number	Soil Symbol	Natural Moisture (%)	Specific Gravity	Grain Size Analysis					Atterberg Limits		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	6
SD0721[B]	CL	21.1	2.72	10	22	25	43	NA	37	17	7.2
SD0821[B]	CL	20.6	2.68	23	24	18	35	NA	36	16	7.2
SD0921[B]	SC	33.5	2.75	31	41	17	11	0.0033	33	11	7
SD1221[B]	SC	14.1	2.72	22	45	13	20	0.0006	35	13	7.1
SD1321[B]	CL	21.4	2.7	23	24	41	12	NA	35	14	7
SD1521[B]	GC	14.9	2.74	42	31	12	15	0.0007	32	11	7
SD1621[B]	GC	14.7	2.71	43	24	13	20	0.001	37	14	7.3
SD2021[B]	CL	21.4	2.68	14	16	37	33	NA	39	17	7
SD2321[B]	ML/CL	23.3	2.69	15	33	29	23	NA	39	14	6.8

[B] geotechnical bucket sample
D^{10} 10% of sample had smaller grain size diameter than this number
mm millimeters
CL clay
GC clayey gravel
GM silty gravel
ML inorganic silts with slight plasticity
pH acidity or alkalinity index
SC clayey sand
NA not analyzed

2.1.3.1. Sampling Rationale

Borehole locations are presented in Figure 2.2. Three boreholes (B398, B403, and B404) were located near the boundary between the New Property and the Operational Area of the Mound Plant to detect possible contaminant migration in soil southward from the Operational Area. The six remaining boreholes (B401, B405, B406, B407, B408, and B409) were distributed around the site to provide for the general collection of radiological, chemical, and geological/geotechnical data over the New Property.

2.1.3.2. Sampling Procedures

Borehole Drilling and Abandonment

Borehole advancement and abandonment was completed in accordance with SOP 4.1 *Soil Borings*. All reusable sampling equipment was decontaminated at the beginning of the project and after each use per SOP 1.6 *General Equipment Decontamination*. A hollow-stem auger rig drilled the boreholes to the desired depth using eight-inch augers. When sampling was completed at each borehole, the hole was filled to the surface with grout and allowed to dry for 24 hours. Where settling occurred, additional grout was added to fill the borehole.

Sampling

Surface and subsurface soil samples and geotechnical samples were collected from the New Property soil borings. Pertinent sampling information was recorded according to SOP 4.1 and SOP 5.1 *Soil and Rock Borehole Logging and Sampling*. Borehole logs are presented in Appendix A of this report. Two soil samples were collected from each borehole (where possible): 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. 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 in order to collect the subsurface sample. This occurred when the target subsurface sampling depth was exceeded in the first boring. After collection, samples were packaged and shipped to an OU9 QAPjP-approved analytical laboratory per SOPs 1.3, 1.4, and 1.5.

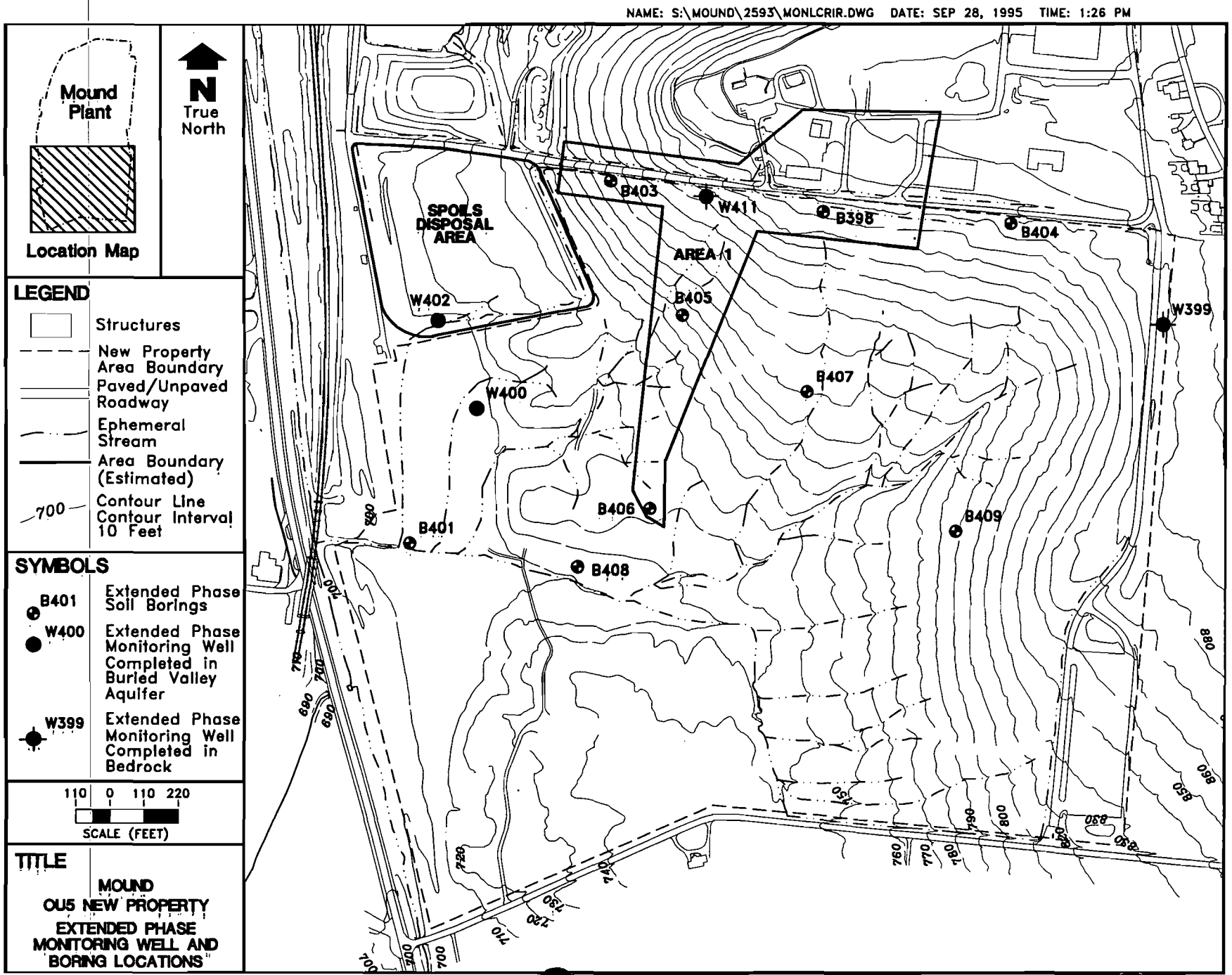

Figure 2.2. Borehole and Monitoring Well Locations in the New Property

Surface soil samples were collected per SOP 5.2. 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 for final labeling and shipping.

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 as described above, all samples were collected and placed in a cooler with blue ice for final labeling and shipping.

Soil samples at the surface and subsurface sampling depths were also collected for analysis of Pu-238 and Th-232 at the Mound Plant Soil Screening Facility. Groundwater was encountered in sufficient quantity to collect grab samples from borings B401 and B408, during drilling, as described in Section 2.1.4.2.

Geotechnical Samples

Geotechnical samples were collected from each distinct soil horizon encountered during drilling. Samples were collected using a three-inch outer diameter, 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, liquid limit and plastic index (Atterberg limits), permeability, cation exchange capacity (CEC), and pH. Geotechnical results are presented in Table II.2.

2.1.3.3. Previous Soil Investigations

Regional Soils Investigation (RSI)

From April to June 1994, the RSI was conducted as part of the OU9 Site-Wide RI in accordance with the OU9 RI/FS Site-Wide Work Plan (DOE 1992d). The primary objectives of this investigation were to determine regional and local extent of soil contamination from the Mound Plant airborne emissions. Surface and subsurface soil samples were collected at locations within a 20-mile radius of the Mound

Table II.2. Summary of Geotechnical Analyses of New Property Soil Samples

Sample Number	Soil Symbol	Natural Moisture (%)	Specific Gravity	Grain Size Analysis					Atterberg 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	2.9×10^{-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	9.1×10^{-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	1.7×10^{-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	1.1×10^{-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	9.3×10^{-7}	NA	NA

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

Plant. Six locations within the New Property were specifically sampled for chemical and radioactive constituents to verify hot spots identified during the 1994 Phase 1 soil gas survey. In addition, eleven other locations within the New Property were also sampled for chemical and radioactive constituents (Figure 2.3). The results of this investigation are presented in the OU9 RSI Report (DOE 1995c) and are summarized in Appendix B. These data were used to support the RI and to perform the BRA.

OU3 Miscellaneous Sites Field Investigation

Additional soil samples were collected in the New Property during the 1992 OU3 Miscellaneous Sites Limited Field Investigation (DOE 1992c). Surface and subsurface soil samples were collected from two depth intervals at three locations from the "farm trash area". This refers to the site of the Penrod estate (razed in 1981) located on the undeveloped road in the southwest quadrant of the property, south of the ephemeral stream. The samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and inorganic compounds, but not for radioactive constituents. No VOCs, SVOCs, or pesticides/PCBs were found in any of the samples. One of the sampling locations produced results above laboratory detection limits (but below proposed action levels) for 22 metals. The analytical results for this sampling location are presented in the OU3 Miscellaneous Sites - Limited Field Investigation Report (DOE 1992c). This data was not used to support the BRA because the field work was performed prior to the OU9 QAPjP (DOE 1993e); therefore, the data were not comparable.

2.1.4. Groundwater Investigation

Four monitoring wells were installed in the New Property in June 1994 to monitor groundwater quality. Groundwater samples were collected for radioactive and chemical analysis per the OU5 QAPjP (DOE 1993d). Lithologic information and soil samples were also collected from the monitoring wells as described in Section 2.1.3.2.

2.1.4.1. Sampling Rationale

Monitoring well locations are presented in Figure 2.2. Well W411 was located near the boundary between the New Property and the Operational Area of the Mound Plant to detect possible contaminant migration in groundwater southward from the Operational Area. Well W399 was located along the eastern boundary

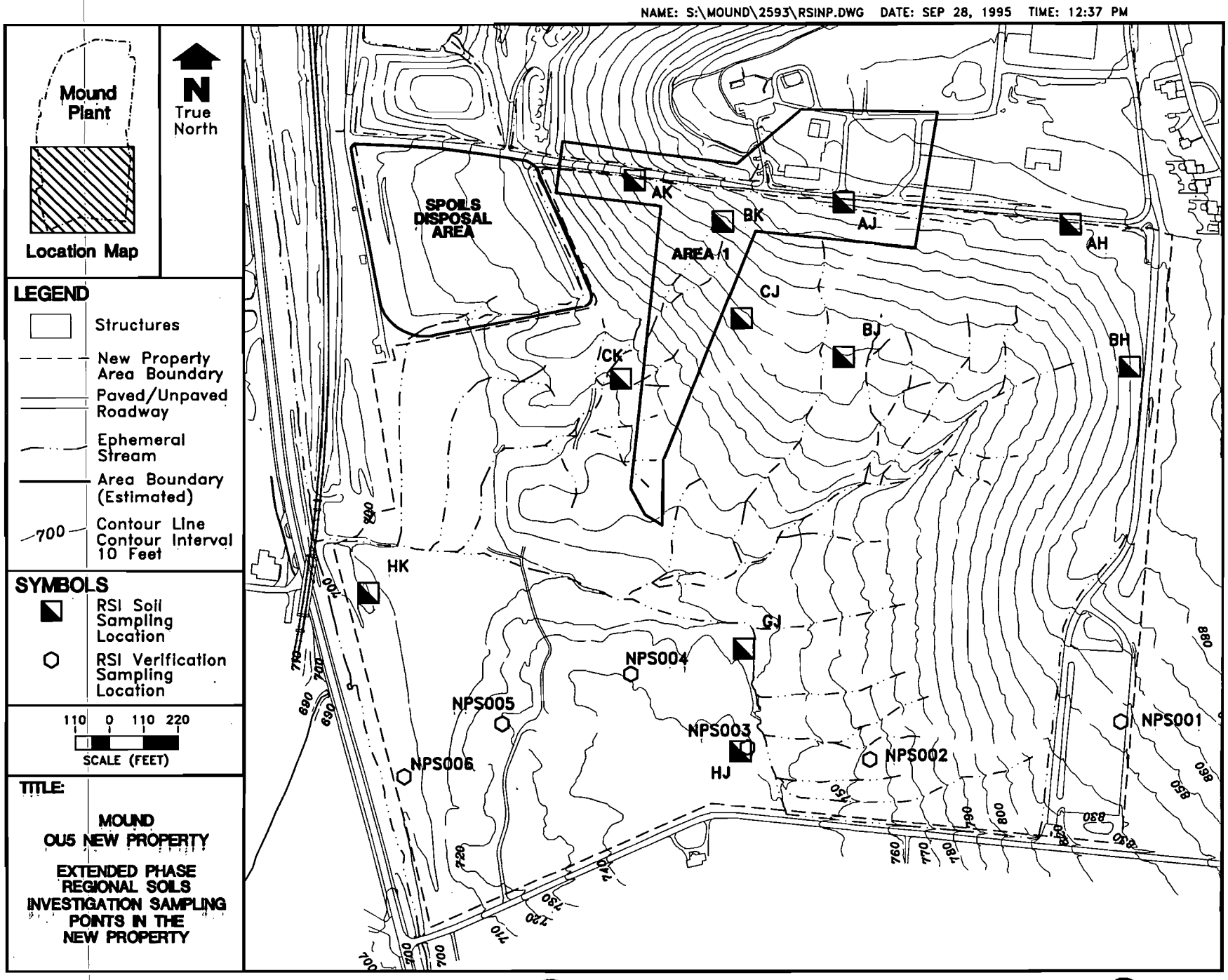

Figure 2.3. RSI Sampling Points in the New Property

of the New Property to monitor groundwater quality potentially migrating on-site from the vicinity of Mound Road. Well W402 was located at the southern edge of the Spoils Disposal Area in the northwest corner of the New Property to detect possible contamination from that site. Well W400, located downgradient of Area 1, was installed to monitor for potential groundwater contamination from Area 1. B398 was intended to be a well but because no water was encountered during drilling, a well was not installed and the borehole was abandoned after collecting a surface soil sample.

Historical data are also available for seven monitoring wells installed on the New Property as part of Mound Plant's ER groundwater monitoring network (Section 2.1.4.3). Information detailing the specifics of the ER Monitoring Network is available in the "Groundwater and Seep Water Quality Report through the First Quarter" (DOE 1992e).

2.1.4.2. Sampling Procedures

Monitoring Well Installation and Development

A cable-tool rig was used to advance the boreholes. Borehole advancement was completed in accordance with SOP 4.1. Once the borehole was advanced to the specified depth, well installation proceeded according to SOP 4.3 *Monitoring Well Installation*. A stainless steel screen and riser were used in the installation with a filter pack 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 the top of each well to a depth of approximately 2.5 feet and a square concrete pad was constructed around the protective casing to complete the installation. Monitoring well logs are presented in Appendix A. Monitoring wells W399, W400, W402, and W411 were developed using a submersible pump according to SOP 4.4 *Monitoring Well Development*. All reusable sampling equipment was decontaminated at the beginning of the project and after each use per SOP 1.6.

Sampling

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* (OU5 QAPjP: Attachment 1 (DOE 1993d)).

Before sampling, the wells were 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 levels were measured to determine the stable elevation to be used in the final purge volume calculations. 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 quality parameters was taken.

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.

2.1.4.3. Previous Groundwater Sampling

Seven groundwater monitoring wells previously installed in the New Property are suitable for groundwater sampling (Figure 2.4). These wells are part of the groundwater monitoring network established for several ER Program RIs, and they have been sampled periodically since 1983. Not all wells were sampled during each sampling event, nor were analyses performed for all potential contaminants. Analytical data collected from these wells during the OU9 Groundwater Sweeps Program (DOE 1995b) were used to support the BRA.

Boring logs for the previously existing monitoring wells located in the New Property are presented in Appendix A of this report.

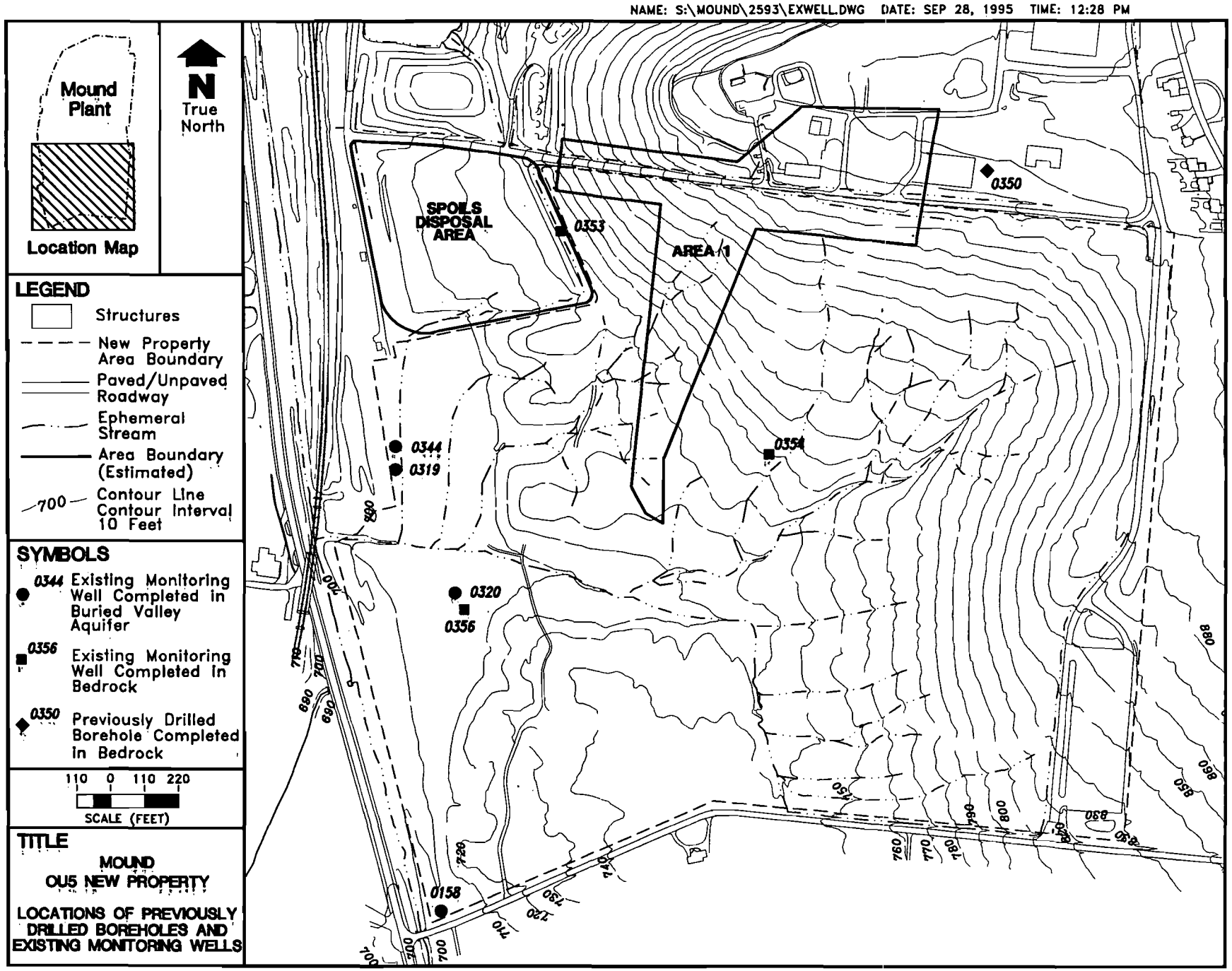

Figure 2.4. Previously Installed Monitoring Wells in the New Property

2.1.5. Radiological Survey

2.1.5.1. FIDLER Survey

FIDLER surveys were performed in 1983 as part of soil sampling during the Site Survey Project (Stought et al. 1988). A FIDLER was used to screen areas for Pu-238 and thorium contamination in soils. Volume 3 of the OU9 Site Scoping Report (DOE 1993b) states that 4,000 FIDLER readings were taken in the New Property during this investigation; however, the report does not present the coordinates of the points surveyed or the results collected.

2.1.5.2. Soil Sampling

Surface and subsurface soils were sampled in 1983 and 1984 during the Site Survey Project (Stought et al. 1988) and analyzed at the Mound Plant Soil Screening Facility for Pu-238 and Th-232. In the New Property (exclusive of Area 1), approximately 30 core locations (sampled to a maximum depth of 25 feet) and 22 surface soil sample locations (sampled to a depth of four inches) were analyzed. Selected samples were also analyzed for tritium, cobalt-60 (Co-60), cesium-137 (Cs-137), radium-226 (Ra-226), and americium-241 (Am-241). In the "arm" portion of Area 1 within the New Property, four core locations and 84 surface soil samples were analyzed for these constituents.

The results of this sampling are reported in the OU9 Site Scoping Report: Volume 3, Radiological Site Survey (DOE 1993b). In the New Property (exclusive of Area 1), Pu-238 concentrations ranged from 0.01 to 1.32 picocuries per gram (pCi/g) except for the highest concentration of 3.88 pCi/g, which was found in a single surface soil sample from the north central portion of the property. Th-232 concentrations were less than or equal to 2 pCi/g in all samples. Ra-226 was found at 2.8 pCi/g in the southeastern portion of the New Property near Benner Road. Tritium, Co-60, Cs-137, and Am-241 were not detected in any of the soil samples.

Area 1 was originally outlined in the Mound Site Survey Project using the Pu-238 and Th-232 data collected in that survey. The boundary of the area was based upon the concentrations of Pu-238 and Th-232 at 10 pCi/g (Stought et al. 1988). The boundary was modified in Volume 3 of the Site Scoping Report (DOE 1993b). This boundary was drawn using an isopleth map of the Pu-238 data collected during the Site Survey Project (Figure 2.5). Contours were drawn at 5 pCi/g, 10 pCi/g, and 50 pCi/g of

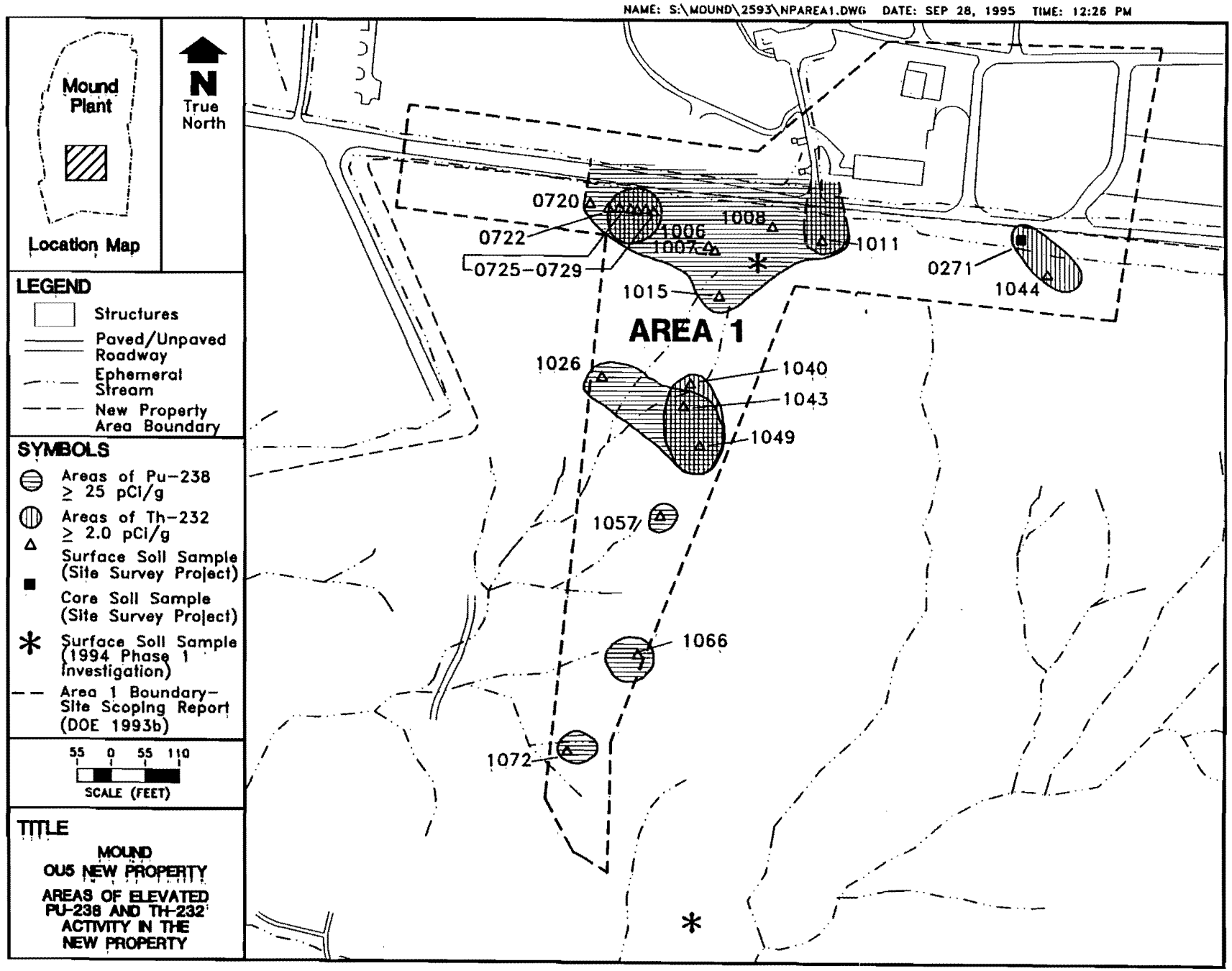

Figure 2.5. Areas of Elevated Pu-238 and Th-232 Activity in the New Property - Site Survey Project (Stought et al. 1988)

Pu-238 (DOE 1993b). The upper portion of Area 1 is similar in both reports, however the "arm" of Area 1 reaches farther into the New Property in the boundary depicted in Volume 3 of the Site Scoping Report (DOE 1993b).

The Area 1 boundary in the New Property has been redefined in Figure 2.5. The Area 1 boundary was redefined based upon the results of the New Property Phase 1 Investigation and a re-evaluation of the existing data from Site Survey Project. The "hatched areas" shown in Figure 2.5 represent areas where the concentrations of Pu-238 and Th-232 are above the Mound Plant Soil Screening Facility detection levels of 25 pCi/g and 2.0 pCi/g, respectively. Table II.3 presents the data depicted in Figure 2.5. Nine surface soil samples, located in three separate areas, showed both Pu-238 and Th-232 concentrations above the Mound Plant Soil Screening Facility detection levels. Analytical data from the Site Survey Project were not used in the BRA because the field work was performed prior to the OU9 QAPjP (DOE 1993e).

2.1.6. Ecological Studies

Ecological studies of the Mound Plant and the New Property were performed to provide ecological information for the RI/FSs being conducted at the various OUs and to assess the impact of the Mound Plant on the surrounding environment. This section presents a brief discussion on the three studies that have been previously performed at the Mound Plant, including the New Property. The information from these investigations provides baseline data to support the ecological risk assessment which is discussed in Section 6.2 of this report.

2.1.6.1. OU9 Ecological Characterization Report

The ecological characterization of the Mound Plant was performed in a phased approach for all areas included in OU9. An ecological assessment (Phase 1) of the Mound Plant, including the New Property, was completed in accordance with the OU9 Site-Wide RI/FS Work Plan (DOE 1992d). The purpose of the Phase 1 investigation was to provide baseline data to support an ecological risk assessment (Phase 2).

The objectives of the OU9 ecological characterization were to (1) identify the flora and fauna in and around the site, (2) identify sensitive environments in and around the site (e.g., wetlands, floodplains, wildlife breeding areas, etc.), and (3) identify endangered species and their habitats in and around the site. Flora, fauna, and aquatic surveys were conducted on and adjacent to the Mound Plant and the New

Table II.3. Mound Site Survey Project Analytical Results - Area 1, 1982-85

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium (pCi/g)
S0720	3560	4015	10463	08-85	0	25.00	b
S0722	3570	4000	10461	08-85	0	28.30	10.20
S0725	3575	3990	10460	08-85	0	119.00	8.50
S0726	3580	3980	10459	08-85	0	163.00	32.60
S0727	3583	3975	10458	08-85	0	36.80	6.10
S0728	3585	3970	10457	08-85	0	116.00	20.40
S0729	3590	3960	10456	08-85	0	45.90	b
S1006	3720	3820	E-22	03-82	0	396.40	b
S1007	3725	3820	E-8	03-82	0	216.30	b
S1008	3730	3755	9137	05-85	0	124.20	b
S1011	3760	3710	9136	05-85	0	56.20	8.79
S1015	3780	3870	E-18	03-82	0	30.00	b
S1026	3830	4130	E-10	03-82	0	33.70	b
S1040	3900	4000	10533	08-85	0	5.58	2.50
S1043	3930	4030	10534	08-85	0	52.30	5.80
S1044	3940	3480	9221	05-85	0	0.87	5.60
S1049	3980	4060	10560	08-85	0	36.90	5.60
S1057	4150	4220	10539	08-85	0	28.70	b
S1066	4320	4320	10568	08-85	0	55.40	b
S1072	4410	4480	10546	08-85	0	36.90	b
C0271	3865.9	3483.1	None	04-84	12	NR	2.6

[a]Map locations are given an "S" to designate surface locations and a "C" to designate core locations.
[b]Thorium results of <2 pCi/g are listed as "b"
Mo-Yr - month and year
MRC ID - Monsanto Research Corporation identification
None - No MRC ID was assigned because *in situ* gamma spectroscopy for thorium-232 was performed.
NR - No result given
pCi/g - picocuries per gram

Reference: Stought et al. 1988

Property from the spring of 1992 through the fall of 1993. A more detailed discussion of the ecological field assessment work is presented in the OU9 Ecological Characterization Report (DOE 1994c).

The information obtained from the ecological assessment of the New Property has been used to evaluate the environmental impacts of the contaminants of concern (COCs) and will assist in the identification of potential effects of the implementation of remedial actions at the site. This is especially important as the New Property has remained virtually undeveloped and therefore supports a variety of biological communities (Section 3.4 of this report).

2.1.6.2. Wetlands

In support of the ecological characterization of the Mound Plant site, investigations were conducted involving the identification of sensitive environments, including wetlands on and adjacent to the plant, in accordance with plans described in the OU9 Site-Wide RI/FS Work Plan (DOE 1992d). The work plan recognized that potential wetlands occur at the site in the form of ponds, basins and canals, drainage ditches, low-lying flood plain areas, and seepage areas. A preliminary wetlands assessment using remote sensing techniques was performed in January 1992 for planning purposes. Wetlands investigation/delineations of all onsite and offsite areas included in OU9 were conducted in 1992 and 1993. Results of the wetlands investigation at the Mound Plant are presented in the OU9 Hydrogeologic Investigation: Wetlands Determination Report (DOE 1994e).

2.1.6.3. Final Environmental Impact Statement

The Final Environmental Impact Statement (FEIS) (DOE 1979) was prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 by DOE to assess the environmental implications of the continuing and future programs at the Mound Plant. The majority of the activities at the Mound Plant were in operation before Congress enacted NEPA; therefore no environmental impact statement within the context of NEPA was required for this facility prior to construction and operation. The FEIS describes the activities performed at the Mound Plant and discusses their actual and potential primary and secondary impacts on the surrounding environment. Impacts of routine and accidental releases are addressed. General information concerning the flora and fauna common to the site region is also presented. Additional information can be found in the FEIS for the Mound Plant (DOE 1979).

2.1.7. Ambient Air Surveys

Historical information on the types and quantities of emissions released from the Mound Plant is contained in the FEIS (DOE 1979). Pollutants were released from test firing operations, the steam generator, the burning of explosive wastes, and the processing of tritium and Pu-238. Emissions from these operations include particulates, carbon monoxide, carbon dioxide, oxides of nitrogen, water vapor, particulate Pu-238, and tritium.

An extensive air quality surveillance program, including 22 air quality monitoring stations, is now in existence at the Mound Plant. Sampling occurs on a scheduled basis for plutonium, tritium, uranium, and particulates. A more detailed discussion of onsite and offsite air monitoring is presented in the OU9 Site-Wide RI/FS Work Plan (DOE 1992d). An annual report, *Mound Site Environmental Report*, presents the results of the Mound Plant's efforts to determine its impact on the surrounding environment. This section presents a brief discussion on the air sampling conducted at the Mound Plant. Air quality impact issues, however, have been assigned to the OU9 Site-Wide Program and will not be addressed as part of this report or the BRA.

2.1.7.1. Sampling Strategy

Since 1985, the Mound Plant has been computing and reporting to the EPA the results of environmental monitoring and modeling of the effective dose equivalent to the public from ambient air. This is performed to comply with the Clean Air Act.

The air sampling network, consisting of seven onsite sampling stations (Figure 2.6) and 15 offsite sampling stations, is used for sampling tritium oxide, Pu-238, plutonium-239/240 (Pu-239/240) and uranium. Ten of the 15 offsite sampling locations are located within a one mile radius of the Mound Plant and are used to determine the impact from stack emissions. Four stations are located in or near population centers, and the remaining sampler is approximately 28 miles from the Mound Plant in the least prevailing wind direction.

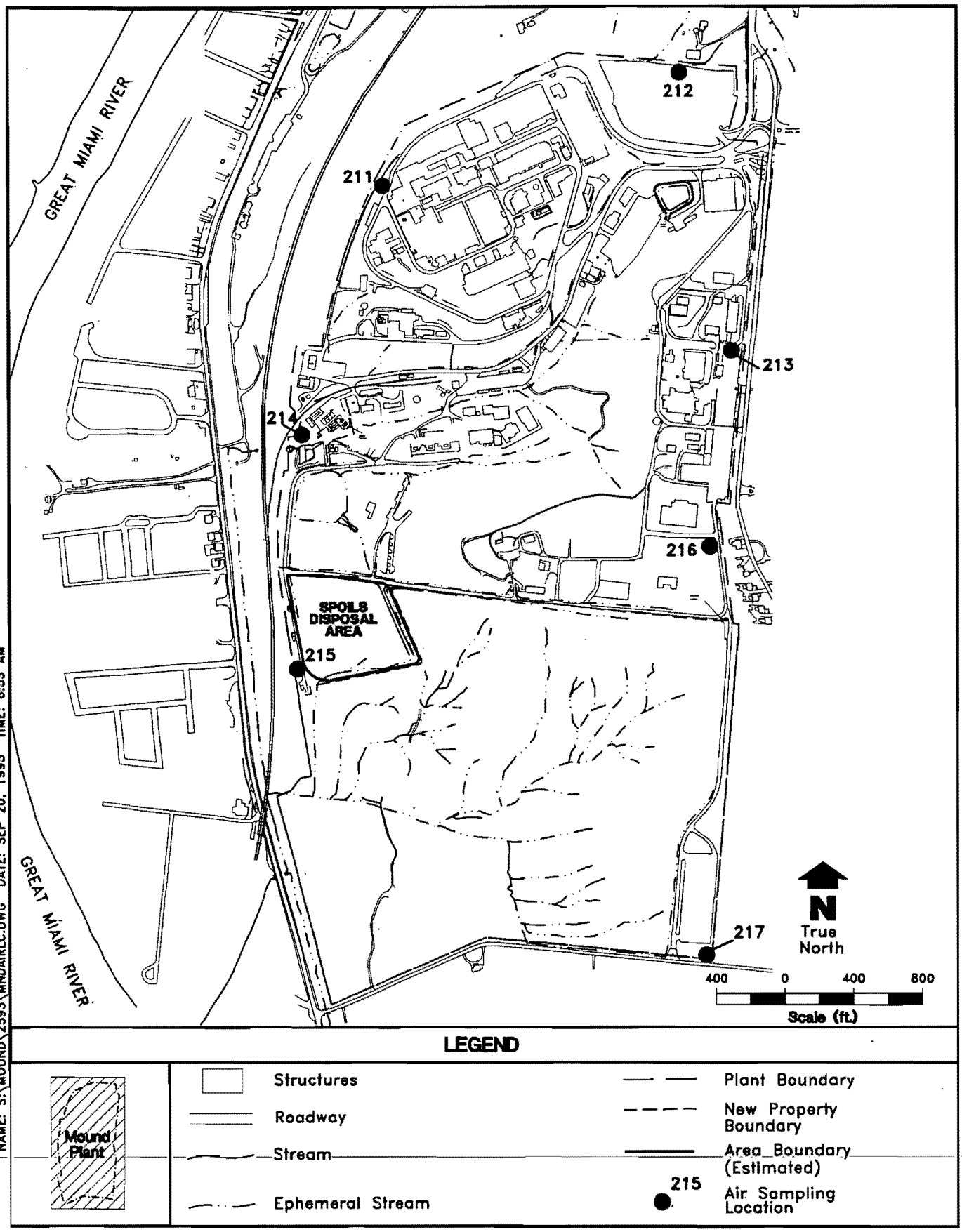

Figure 2.6. Locations of Onsite Air Sampling Stations at the Mound Plant

2.1.7.2. Radionuclide Emissions

Two types of samples are collected from each station. One is a particulate air sample which is analyzed for Pu-238 and Pu-239/240 and uranium. The other sample, collected from a bubbler-type sampler, is analyzed for tritium oxide. Plutonium analyses are performed on a monthly composite for each onsite sampling location and three of the offsite sampling locations, and on quarterly composites for the other offsite locations. Tritium analyses are performed on a weekly composite. Tritium oxide in the air is collected in solution. Tritium oxide rather than elemental tritium is sampled and analyzed because tritium oxide is the more radiotoxic form of tritium. The dose that would result from a given amount of tritium oxide would be 25,000 times greater than from the same amount of elemental tritium (DOE 1994d).

According to data collected by previous investigations (DOE 1979; DOE 1994d), the impact related to radiological emissions in air from the Mound Plant is considered to be small or negligible.

2.1.7.3. Nonradioactive Emissions

Nonradioactive emissions due to normal plant operations consist of particulates, sulfur oxides, and organics. Nonradioactive emission samples are collected in conjunction with the onsite and offsite air sampling for Pu-238. Particulate concentrations are measured weekly.

According to the *Mound Site Environmental Report for Calendar Year 1993* (DOE 1994d), all routine nonradioactive air emissions fell within applicable standards and any nonradioactive airborne emissions at the Mound Plant had minimal impact on ambient air quality. The report also states that a preliminary survey of all emission points at the Mound Plant was conducted in 1991. Based upon the survey, it was shown that the amounts of criteria pollutants, hazardous air pollutants, or ozone-depleting chemicals discharged by the Mound Plant are well below applicable regulatory thresholds.

2.1.8. Cultural Studies

Historical and archaeological studies have been completed and approved by the Ohio Historical Society, Ohio Historic Preservation Office. An archaeological survey of the Mound Plant and the drainage ditches leaving the Mound Plant was completed in March 1991. An attempt was made to locate two crescent shaped earthworks (Mills 1914) within the Operational Area. No evidence of the earthworks was found.

Prehistoric sites were not discovered in the New Property nor in the drainage area leaving the Mound Plant. None of the historical sites met the minimum requirements for inclusion into the National Register of Historic Places (DOE 1991).

2.2. LABORATORY PROGRAM

The sampling and analysis programs conducted under the RI at the New Property involved the collection and analysis of soil, sediment, groundwater, and surface water samples. Field radiological screening of soil and sediment samples was conducted at each sampling location using a FIDLER. Surface soil and sediment samples were collected and screened for Pu-238 and Th-232 at the Mound Plant Soil Screening Facility. Soil, sediment, groundwater, and surface water samples were analyzed by an independent analytical laboratory under contract for the investigation. Table II.4 provides a summary of the analytical program, including laboratories used for this study, the media analyzed, the analytical methods used, and detection limits of the analytical methods.

Samples were collected and analyzed according to the OU5 and OU9 QAPjPs (DOE 1993a, 1993e). Prepared in accordance with EPA guidance, the QAPjPs outline the organization, objectives, intended data uses, and quality assurance/quality control (QA/QC) activities to achieve the desired DQOs and maintain defensibility of the data. The project Target Compound List (TCL) for the planned analytical methods is provided in the OU5 QAPjP. Criteria for establishing sample locations for soil, sediment, groundwater, and surface water are outlined in the OU5 RI/FS Work Plan (DOE 1993a) and the OU5 Field Sampling Plan (FSP) (DOE 1993d).

The project DQOs delineated in the OU5 QAPjP were developed with the understanding that the New Property is an NPL site. Therefore, the requirements for sample collection, handling, and analysis criteria, the project target compounds, laboratory quality levels, and data validation for the New Property are consistent with EPA requirements for NPL sites.

Strict adherence to the requirements set forth in the OU5 QAPjP was required of the analytical laboratories so conditions adverse to quality would not arise. The laboratories were required to perform all organic (except total organic carbon (TOC)) and inorganic chemical analyses at EPA Level IV analytical protocols. Level IV and V requirements include regulatory approval of laboratory QA plans, successful analysis of inter-laboratory check samples, and laboratory audits following approved procedures. Radiological

Table II.4. Summary of New Property RI Chemical and Radiological Analytical Program
Page 1 of 2

Laboratory	Compounds Analyzed	Sample Matrix	Method	Method Detection Limit
New Property Phase 1				
Quanterra (formerly IT)	Volatile Organic Compounds	Surface Water	SOW 3/90[a]	Table VI.1[c]
	Semivolatile Organic Compounds		SOW 3/90[a]	
	Pesticides/PCBs		SOW 3/90[a]	
	Inorganics (including cyanide)		SOW 3/90[a]	
	Common Anions - Fluoride		SOP E340.2[a]	
	Common Anions - Chloride		SOP E325.1[a]	
	Common Anions - Sulfate		SOP E375.2[a]	
	Common Anions - Nitrate/nitrite		SOP E353.2[a]	
	Total Nitrogen		SOP E351.2[a]	
	Total Phosphorus		SOP E365.4[a]	
	Total Dissolved Solids		SOP E160.1[a]	
	Alkalinity		SOP E310.1[a]	
	Explosives		SW8330[a]	
	Ammonia		SOP E350.1[a]	
Pace, Inc.	Radiochemistry		Various[b]	
New Property Extended Phase				
CompuChem	Volatile Organic Compounds	Soil, sediment, water Purgeable Halocarbons	SOW 3/90[a] SW8010[a]	Table VI.1[c]
	Semivolatile Organic Compounds	Soil, sediment, water	SOW 3/90[a]	
	Inorganics (including cyanide)	Soil, sediment, water	SOW 3/90 (Mod. A)[a]	
	Lanthanides	Soil, sediment	SOW 3/90 (Mod. C)[a]	

Table II.4. Summary of New Property RI Chemical and Radiological Analytical Program
Page 2 of 2

Laboratory	Compounds Analyzed	Sample Matrix	Method	Method Detection Limit
New Property Extended Phase (Continued)				
Compuchem	Common Anions - Fluoride	Soil, sediment, water	SOP E340.2[a]	Table VI.1[c]
	Common Anions - Chloride	Soil, sediment Water	SW9250[a] SOP E325.1[a]	
	Common Anions - Sulfate	Soil, sediment, water	SOP E375.2[a]	
	Common Anions - Nitrate/nitrite	Soil, sediment, water	SOP E353.2[a]	
	Total Organic Carbon	Soil, sediment, water	SW505[a]	
	Total Nitrogen	Water	SOP E351.2[a]	
	Total Phosphorus	Water	SOP E365.4[a]	
	Total Dissolved Solids	Water	SOP E160.1[a]	
	Total Suspended Solids	Water	SOP E160.2[a]	
	Alkalinity	Water	SOP E310.1[a]	
	Radiochemistry	Soil, sediment, water	lab-specific SOPs [b]	
Singleton	Cation Exchange Capacity	Soil, sediment	SW9081[a]	
	Particle Size Analysis	Soil, sediment	ASTM D422-63[a]	NA
	Specific Gravity	Soil, sediment	ASTM D854-83[a]	
	Moisture Content	Soil, sediment	ASTM D-2974[a]	
	Organic Content	Soil, sediment	ASTM D-2974-87[a]	
	Atterburg Limits	Soil, sediment	lab-specific SOP [b]	

a EPA or ASTM methods
b Lab-specific EPA-approved methods
c Table VI.1 of OU5 QAPjP (DOE 1993d)

SOW Statement of Work
ASTM American Society of Testing and Materials
SOP Standard Operating Procedure

analyses were performed at EPA Level V and TOC analyses at Level III. Level III analytical protocols are less stringent than those of Levels IV and V.

The DQOs for this project included precision, accuracy, representativeness, completeness, and comparability (PARCC) for the measurement of data. Appendix C of this report presents an assessment of those objectives as they applied to the analytical program.

Validation of both CLP and some non-CLP data was performed according to the procedures in the OU5 QAPjP. Other non-CLP data (e.g., TOC) were reviewed for content and completeness.

2.2.1. Contract Laboratory Program Overview

CLP analytical procedures followed for VOCs, SVOCs, pesticides, PCBs, metals, and cyanide were consistent with EPA requirements for NPL sites. The CLP supports Superfund studies by providing standardized routine and special analytical services of known quality. The contracted laboratories (CompuChem and Quanterra) provided CLP analytical procedures on the aforementioned compounds.

The DQOs of the analytical program required that CLP procedures be followed, except for those parameters of interest for which CLP methods do not exist. These were analyzed using project-specific SOPs developed from EPA-published methods. These specific SOPs were prepared by the individual contract laboratory, based on the required detection limits. Each SOP specifies procedures for sample preparation, instrument performance checks, and QA/QC requirements as described in the OU5 QAPjP (DOE 1993d). Laboratory-specific SOPs for non-CLP procedures were approved prior to implementation.

2.2.2. Field Screening Program Overview

Soil and sediment samples were screened at the sampling location for radioactive contamination using a FIDLER. The purpose of the screening is to monitor the soil or sediment for the presence of low-energy gamma radiation that accompanies some alpha emissions. In addition, soil and sediment samples were collected and further screened for Pu-238 and Th-232 at the Mound Plant Soil Screening Facility. At the facility, each soil or sediment sample was pulverized, placed in a lead cask, and screened using a sodium iodide detector (manufactured by Bicron) coupled to a portable multi-channel analyzer (FIDLER).

Monitoring was also conducted during soil sampling for combustibles and volatile emissions per SOPs 6.1, 6.2, and 6.3. Results of this monitoring were recorded in the soil boring logbooks.

2.3. DATA MANAGEMENT

The primary purpose of data management is to support the RI by managing data of known quality that are complete, accurate, and consistent. Active data management improves the validity and accessibility of data that supports the data analyses and risk assessments.

To meet the regulatory requirements for the acquisition of technically and legally defensible data, an audit trail was established from the development of the sampling plan through the archiving of data. Each step of the data management process (including deviations) was documented as outlined in the OU5 FSP and QAPjP (DOE 1993d). To meet this requirement, the OU5 New Property Investigation included a documented process of collection, management, storage, and analysis of all the site characterization data.

During the planning process, standardized field data collection forms were prepared for field sampling, well construction, borehole logs, lithology, field measurements, instrument calibrations, and chain-of-custody. Applicable sampling and analysis data recorded on the sample forms during the field investigations were manually entered into the appropriate computer-based data tables. Specific data entered into the database include sample identifications, sample and station survey coordinates and elevations, sample depths, sample media, number of samples, sample container types and volumes, types of analyses, and field QA/QC data.

Preprinted field logbooks and sample labels were generated using information from the OU5 FSP and QAPjP (DOE 1993d). Field forms were bound together into logbooks and distributed to field personnel. Field personnel were trained in: (1) the proper methods for completing field data sheets and chain-of-custody forms; (2) the use of appropriate reporting units and site characterization codes; and (3) the documentation of any deviations from the FSP and QAPjP following standardized nonconformance reporting procedures.

As samples were collected in the field, the logbooks were completed with sample identification data and field measurements as specified in the OU5 FSP and QAPjP (DOE 1993d). Deviations were noted, and the logbooks were signed by the data recorder, verified by sample team support personnel, and submitted

to the data manager for database entry and archiving. Sample collection and measurement information, well construction data, lithologic data, and other field characterization information were recorded in the field logbooks and manually entered into the project database.

The analytical data received from the offsite laboratories were reviewed and verified using verification procedures and checklists specific to the analytical method employed by the laboratory. Upon receipt of the data, the data were uploaded to the database for preliminary analysis. Automated data verification was conducted for the CLP analyses using the EPA Contract Compliance Screening (CCS) software. Automated data validation was conducted using Computer-Aided Validation and Evaluation Analysis Tool (CAVEAT) software. The output from both CCS and CAVEAT were transmitted along with the original data to the data validators to aid in the validation process. The data validators used this information, data validation SOPs delineated in the OU5 QAPjP (DOE 1993d), and their professional judgement and experience to assign data qualifiers and usability flags to each analytical result. The data qualifiers and usability flags were manually entered into applicable data tables. Analytical data packages, summary reports, and supporting documentation were classified, indexed, and transferred to the project file.

The site characterization data have been presented in this report using standardized analyses and geographical methodologies. Spatial and attribute data subsets were extracted and combined for analysis and mapping using data retrieval application programs. Database subsets for analysis (including combinations of site, location, station, sampling date, analysis type, analyte, data quality flag, and upper and lower data values) were then passed to specific data analysis applications. The combined data sets were also used with a geographic information system to perform spatial data analysis and mapping.

Hard copies of original field and analytical results, data packages and associated QA/QC information, and chain-of-custody forms were classified, indexed, and filed appropriately by group and series in the project file. Electronic versions of the site characterization data were copied and archived following standard procedures which included provisions for duplicate storage at a remote location.

Field collection and measurement data, chain-of-custody data, analytical results, applicable QA/QC information, and validation flags were output from the database for submission to the Mound Environmental Information Management System (MEIMS). Electronic data transformation to MEIMS was implemented in a standardized and tested methodology using documented data transfer protocols.

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Section 3

3. PHYSICAL CHARACTERISTICS OF THE STUDY AREA

The purpose of this section is to describe the physical characteristics of the New Property portion of the OU5 study area including the geography, geology, hydrogeology, and ecology. Physical characteristics are presented from a regional, local, and site perspective.

3.1. GEOGRAPHY

The following subsections present the climatology, meteorology, topography, surface water hydrology, and cultural geography of the New Property.

3.1.1. Climatology and Meteorology

The climate of the Miamisburg area is temperate continental, with hot, humid summers and moderately cold winters (DOE 1992d). The average daily maximum temperature in summer is 86.9°F, with an average humidity of 85%. In winter, the average daily minimum temperature is 23.1°F, and the average humidity is 50%. The greatest amount of precipitation falls in the spring (April through June). Autumns (August through December) are generally dry, although precipitation occurs in all seasons. Average annual precipitation is 40 inches.

The prevailing winds are from the southwest, with an average speed of 10 miles per hour (mph). Specific wind conditions are well characterized within the Mound Plant. Wind direction and frequency data have been collected continuously at the Mound Plant since the 1970's.

Severe weather consists of occasional ice storms in the winter and heavy thunderstorms (including hail or flash flooding) and infrequent tornadoes in the summer.

3.1.2. Topography and Surface Water Hydrology

The dominant surface features within and around the study area are a prominent bluff, on which the Mound Plant is located, and the Great Miami River, which occupies a wide valley. The bluff and the adjoining hills were formed by deep erosion of the Ordovician shales along the Great Miami River valley.

The New Property is situated to the south of the plant site, approximately 0.4 miles east of the Great Miami River.

Relief in the New Property is characterized by moderately southwestward to westward sloping terrain. The steepest slopes are found in the extreme northeast corner of the New Property, and nearly flat lowlands lie in the southwestern portion. Elevations range from 700 feet above MSL in the southwestern quadrant, to approximately 880 feet above MSL in the northeast corner (Figure 1.3). The overall topography is the result of erosion by the ephemeral streams that drain the area. Although parts of the New Property were probably tilled for agriculture, there is no evidence of extensive resurfacing and filling similar to that which resulted in changes to the topography within the Operational Area of the Mound Plant.

Topographic highs are discontinuous bedrock exposures of thinly bedded shales and limestones. Thin veneers of unconsolidated Quaternary tills and outwash deposits range in thickness from zero feet at the bedrock exposures to more than 195 feet on the western edge of the New Property. These deposits are the materials that make up the Buried Valley Aquifer (BVA) that underlies the western portion of the New Property (Section 3.2).

A natural topographic divide immediately north of the New Property boundary creates a watershed system within the New Property. The Mound Plant has been divided into five subwatersheds that reflect natural and artificial surface water drainage systems. The New Property is wholly contained in the largest of these, Subwatershed 3 (DOE 1992d). Runoff from the New Property and part of the Operational Area of the Mound Plant passes through this drainage network. All of the streams on the New Property are intermittent; some may be fed by groundwater, although the extent of connection between the surface water and groundwater systems is not known. Most of the water and sediment collect in the ephemeral stream and discharge off-plant to the southwest. This stream combines the Mound Plant surface water with the drainage from the southern portion of the Miami-Erie Canal and ultimately discharges into the Great Miami River.

The Great Miami River is the most significant surface water feature near the Mound Plant. After the 1913 flood (the greatest flood on record in the Miami Valley), the Miami Conservancy District was formed and subsequently constructed five dams to control flooding. The typical non-flood stage of the Great Miami River is at an elevation of 682 feet above MSL. The westernmost edge of the New Property

lies within the 100-year floodplain of the Great Miami River, circumscribed by the 710-ft topographic contour.

3.1.3. Cultural Geography

3.1.3.1. Cultural Geographic Features

A 1990 field survey and literature review of the Mound Plant and vicinity did not reveal any sites still in existence that meet the minimum requirements for inclusion in the National Register of Historic Places. Although crescent-shaped earthworks built by pre-Colombian native Americans have been documented within the main plant boundary, none have been discovered in the New Property.

As stated in the OU5 New Property Phase 1 and Extended Phase Field Reports (DOE 1994b, 1995a), the New Property was historically used for farming. The property contained a two-story house, a barn, a frame tool shed, a costume shop, and an outhouse. These structures were either moved or destroyed when DOE purchased the property. An undeveloped dirt road in the southwestern corner of the property ends at the approximate location of these buildings.

Other cultural features associated with the New Property are the paved contractors' entrance road and gravel parking lot, aboveground electrical power lines, and a small area of tires and metal debris. The debris was found near the north end of the undeveloped dirt road, on its east side (DOE 1994b).

3.1.3.2. Land Use

Land use in the immediate area surrounding the New Property is industrial (Mound Plant), recreational (Miamisburg city parks), residential, and commercial. Much of this development is located in the Great Miami River floodplain, while uplands closer to the New Property are used for open space, agriculture, and residences. Immediately next to the western boundary of the New Property is a CONRAIL rail line. Current land use within a 5-mile radius of Mound Plant is summarized in the OU9 Site-Wide RI/FS Work Plan (DOE 1992d).

3.1.3.3. Demographics

The 1990 census gives the population of Miamisburg as 17,834, Dayton as 182,044, and Montgomery County as 573,809 (U.S. Census Bureau 1991). Population is stable throughout the year, although in summer months there are larger numbers of people using the recreational facilities close to the Mound Plant. A detailed breakdown of area demographics based on 1990 census data is provided in Table III.1. The Mound Plant employs approximately 1100 people at the facility between 6:00 a.m. and 5:00 p.m. during a four-day work week. Fewer than 100 employees work during nights and weekends. During regular business hours, most employees are concentrated in the northwest quadrant of the plant.

The New Property is not populated and is not open to the public. Some residences are located on Benner Road and Cincinnati-Dayton Pike, which are parallel to the perimeter of the New Property.

3.2. GEOLOGY

This section describes the geologic setting of the Mound Plant and the New Property from three scaled perspectives: regional, local, and site. First, the regional geologic framework of southwestern Ohio is briefly discussed. Next, the local geology at and around the Mound Plant is described. Finally, the geology specific to the New Property is presented. The New Property geology is based principally on the studies conducted for the RI, and includes descriptions of unique characteristics encountered that may influence the migration of potential contaminants.

3.2.1. Regional Geology

This section briefly describes the geologic history and resulting stratigraphy surrounding the Mound Plant on a regional scale. The discussion is restricted to the geologic events that shaped Southwestern Ohio and the Miamisburg area. The information presented in this section is compiled and excerpted from the OU9 RI/FS Site-Wide Work Plan (DOE 1992d) and the OU1 RI Report (DOE 1994a). The reader is directed to these references for a more detailed discussion of Ohio geology.

The oldest exposed rocks in Southwestern Ohio belong to the Ordovician Period (505-438 million years ago) of the Paleozoic Era. These rocks, sedimentary in origin, consist of interbedded shale and limestone that were deposited in a shallow sea that flooded the continental crust early in the Paleozoic Era. In the

Table III.1. Montgomery County and Miamisburg City Demographics

	Montgomery County	Miamisburg City
Population	573,809	17,834
Households	226,192	6,671
Percentage of Renter Occupied Housing*	37.1%	35.8%
Percentage of Owner Occupied Housing*	62.9%	64.2%
Median Family Income	$36,069	$37,752
Median Contract Rent (monthly)	$316	$405
Percentage Below Poverty Level	12.6%	7.7%
Persons per Household	2.49	2.7
Race		
White	80.8%	98.2%
Black	17.7%	0.8%
American Indian**	0.0%	0.0%
Asian	1.0%	0.7%
Other**	0.0%	0.0%
Education (Age, 25 + years)		
<9th grade	7.6%	9.3%
9th to 12th, no degree	14.6%	13.7%
High School Graduate	30.8%	37.4%
Some College, no degree	20.4%	18.0%
Associate's Degree	6.5%	6.7%
Bachelor's Degree	13.0%	10.7%
Graduate/Professional Degree	7.0%	4.1%
TOTAL (High School or Higher)	77.7%	77.0%

* Calculated from 1990 census data
** Percentages are in the thousandths and rounded to 0%

Data compiled from 1990 census

Miamisburg area, these shale and limestone deposits, also known as bedrock, are exposed in stream beds and along manmade cuts throughout the region. The Richmond Group of the Upper Ordovician Period, consisting of thinly bedded limestone and calcareous shale, is present near the surface at the Mound Plant and underlies most of Montgomery County.

Following the deposition of Paleozoic marine sediments and the retreat of the Paleozoic seas, no further geologic features were formed in Southwestern Ohio until the area was repeatedly covered by several glaciers during the Pleistocene Epoch of the Quaternary Period (two million to 10,000 years ago). As they advanced and retreated, these glaciers moved massive amounts of broken rock and sediment that were deposited over the bedrock. Depending on the mechanics of deposition, these sediments range from clay-size particles to boulders and may be poorly sorted or well sorted.

Quaternary glacial deposits found in southwestern Ohio are generally of two types: (1) water-laid deposits, and (2) ice-laid deposits. The water-laid deposits, or outwash, were formed when glacial meltwater streams incised deep channels (up to 200 feet) into the underlying topography and reworked and subsequently deposited sediments into the channels as valley train. Outwash deposits tend to be well-sorted and coarse-grained, with particle sizes ranging from silt to gravel. The well-sorted outwash deposits have high permeabilities compared to the tills and form the regional groundwater storage units (aquifers), discussed further in Section 3.3.1.2.

The ice-laid deposits, or tills, were formed of material carried by the glacier and deposited when the glacier advanced and retreated. Since till is deposited by moving ice, it is neither size-sorted nor layered and consists of a jumbled mass of clay, silt, sand, gravel, and boulders (i.e., any material carried by the moving glaciers). Till is found in ridges, known as terminal or end moraines, or in chaotic, hummocky sheets known as ground moraines. In some places, till deposits form layers that are traceable in the subsurface across entire valleys. At other locations, till deposits may be laterally discontinuous or nonexistent. The location and extent of till deposits are important controls on subsurface water movement because they are less permeable than the outwash deposits and may be barriers to groundwater flow (aquitards). Near the ground surface, till may form surface soils. In the vicinity of the Mound Plant, the till consists predominantly of compact clay.

The youngest deposits in Southwestern Ohio are Holocene alluvial deposits associated with the tributaries of the present Ohio River system. These deposits include river-borne sediments deposited since the retreat of the last glaciers about 12,000 years ago (DOE 1992d).

3.2.2. Mound Plant Geology

The following section describes the geology of the Mound Plant and its immediate vicinity with an emphasis on those features that control the hydrogeology of the area. Stratigraphic units encountered at the Mound Plant include, from deep (oldest) to shallow (youngest), Paleozoic bedrock, Quaternary glacial deposits (outwash and till), and surface soil. In addition, fill material is present in several locations at the Mound Plant as a result of historical construction activities.

Bedrock

A detailed description of the bedrock geology at the Mound Plant is provided in the OU9 Hydrogeologic Investigation: Buried Valley Aquifer Report (DOE 1994f) and the OU1 RI Report, Appendix C (DOE 1994a). The following subsection is summarized from those two reports with some detail provided from the OU9 RI/FS Site-Wide Work Plan (DOE 1992d).

The bedrock lithology at the Mound Plant is consistent with the regional bedrock stratigraphy described in Section 3.2.1. Cambrian and Ordovician-aged sedimentary units comprise the bedrock at the Mound Plant. Within the Mound Plant the Main Hill and SM/PP Hill are topographic bedrock highs consisting of interbedded shales and limestones of the Ordovician-age Richmond Group.

Bedrock geology of the Mound Plant has been interpreted by logging continuous core samples from six boreholes, by mapping bedrock exposed in railroad cuts west of the Mound Plant, and by geophysical measurements from the six boreholes (DOE 1994a). The correlation of lithology and the borehole geophysical data indicate that:

- no apparent stratigraphic controls of groundwater movement in bedrock exist;
- groundwater flow in bedrock is controlled by a network of shallow fractures that penetrate the bedrock to a uniform depth along the bedrock topography; and,
- the fracture density and occurrence of fractures decrease with depth.

The occurrence and density of bedrock fractures are of particular interest because these fractures control groundwater movement in the bedrock. The contribution of groundwater flow in the bedrock to the overall hydrogeologic system at the Mound Plant is discussed in Section 3.3.2.2 of this report.

Quaternary Glacial Deposits

Quaternary glacial deposits at the Mound Plant consist of Pleistocene outwash and till. Figure 3.1 is an isopach map (contours of equal thickness) of unconsolidated deposits at the Mound Plant. As shown on the map, these deposits occur in a thin band between the Main and SM/PP Hills and in the BVA. This narrow glacial valley train deposit joins the regional BVA at the base of the northwestern slope of the SM/PP hill. The BVA, which lies adjacent to Mound Plant to the west, also underlies the western portion of the New Property.

Surface Soils

A detailed soil survey of Montgomery County was published by the U.S. Department of Agriculture (USDA) Soil Conservation Service in June 1976 (USDA 1976). The following paragraphs summarize that report.

Soils near the Mound Plant are primarily of the Miamian-Celina association. These soils are moderately to well-drained with fine textured subsoil. They are formed in thin loess (wind deposited sediment) and glacial till. The Fox-Ockley association is also present near the Mound Plant, though in a smaller proportion than the Miamian-Celina association.

The Mound Plant lies within the Ross-Medway and the Milton-Ritchey-Millsdale soil associations. The Ross-Medway association is found in the Great Miami River floodplain and beyond, and consists of deep, nearly level, well-drained soils with coarse textured subsoil. These soils typically are formed in loamy alluvium. The Milton-Ritchey-Millsdale association contains moderately deep to shallow, nearly level to very steep, very poorly drained to well-drained soils with fine textured subsoil. These soils are formed in glacial till overlying limestone.

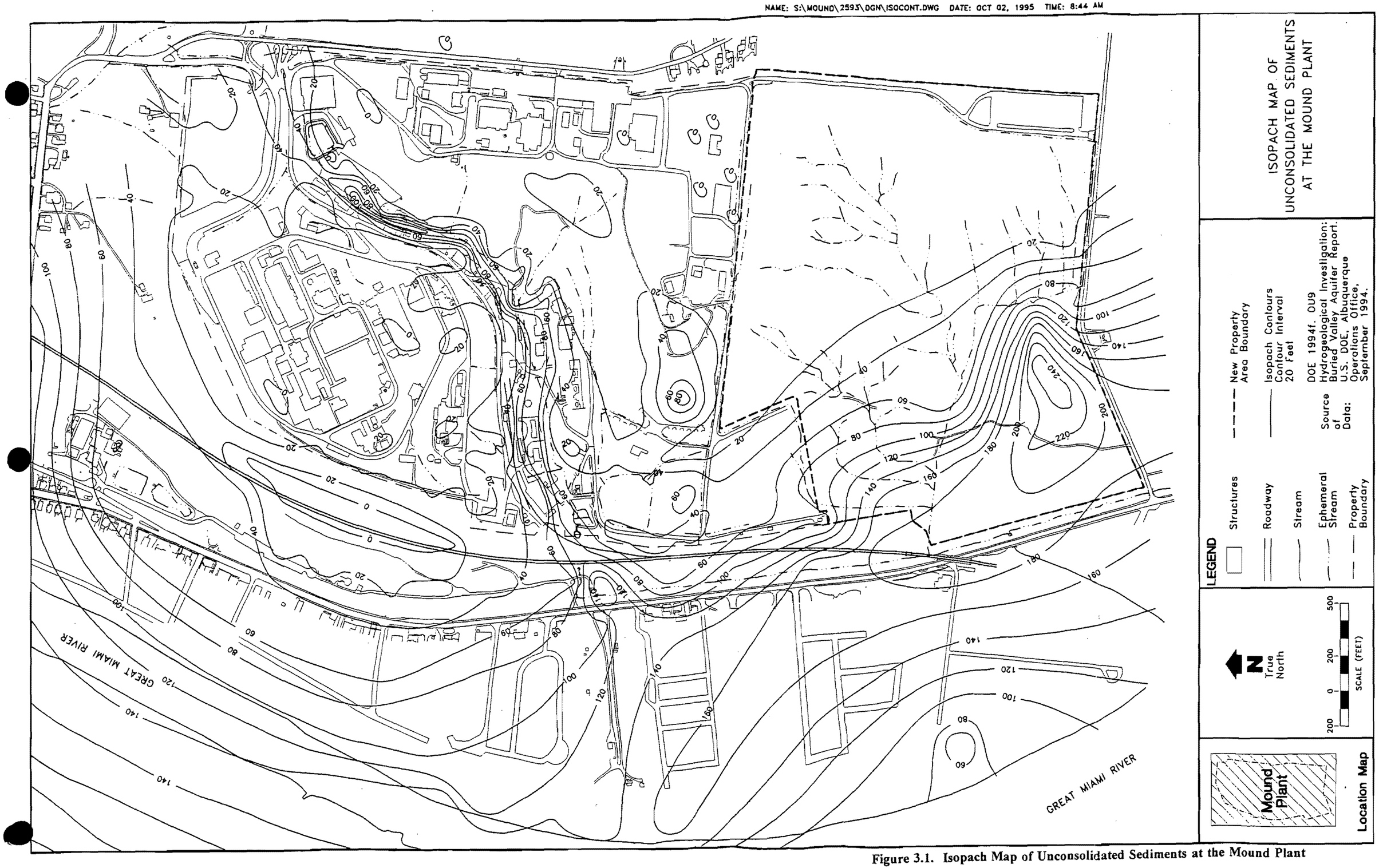


Figure 3.1. Isopach Map of Unconsolidated Sediments at the Mound Plant

It should be noted that much of the soil at the Mound Plant was mapped by the USDA Soil Conservation Service as Made Land, or soil that has been extensively reworked. Since the time of the report, there has been additional excavation and building at the plant.

3.2.3. New Property Geology

Geology of the New Property is interpreted from current and previous investigations. The lithologic logs of nine soil borings and four monitoring wells installed during this investigation (Figure 2.2) were used along with lithologic descriptions from 24 other historical borings installed in the New Property. Two cross sections constructed through the New Property were used with cross section DD' on Plate 4 of the OU9 Hydrogeologic Investigation: Buried Valley Aquifer Report (DOE 1994f) to illustrate geologic strata and provide an interpretive base (Section 3.2.3.2).

Some limitations and uncertainties exist in the lithologic interpretation of the New Property. The heterogeneity and depositional variability of glacial deposits make stratigraphic correlations difficult. Also, boreholes are sparse in the New Property and all descriptions were derived from cuttings (except the description from core hole 0350) rather than undisturbed core samples. Most of the monitoring wells were drilled with a cable-tool rig that produces a cuttings slurry that is also difficult to log accurately. Even with these uncertainties and data limitations, interpretations are generally consistent with the geologic conceptual model of the New Property extrapolated from more detailed investigations to the north in the Operational Area. Data collected in the New Property during this investigation do not significantly alter this conceptual model.

The geology of the New Property can be summarized as a silty/clayey surface soil underlain by Quaternary glacial deposits underlain by bedrock, as shown in the two cross sections on Plate 1. The glacial deposits consist of interbedded outwash and till which are thickest throughout the western half of the property, where they form the BVA. Conversely, till deposits form only a thin veneer over the eastern, elevated portion of the property and outwash deposits are absent.

In the following sections the New Property stratigraphy is presented using data from this and previous investigations. Two New Property cross sections are also presented. These cross sections were constructed from selected boreholes and represent a two-dimensional vertical "slice" through the study area to help the reader visualize the subsurface stratigraphy.

3.2.3.1. New Property Stratigraphy

Stratigraphic units encountered at the New Property from deep (oldest) to shallow (youngest) include Paleozoic bedrock, Quaternary glacial deposits (outwash and till), and surface soil. In addition, fill material was logged in piezometer P015 in the Spoils Disposal Area.

Paleozoic Bedrock

Bedrock in the New Property consists of interbedded marine limestones and shales of the Richmond Group (DOE 1994g). It was described in the field as weathered interbedded shale and limestone; dark gray, fissile, fossiliferous shale; lime-gray shale; and silty shale with fossiliferous limestone lenses. Core hole 0350 (Figure 2.4), located just north of the northeast corner of the New Property, provides a representative lithologic description of the bedrock at the site (DOE 1994h). This core hole was drilled in 1993 to a depth of 250.5 feet. The lithology was primarily fossiliferous limestone with interbedded shale, though at greater depths, there were beds of fossiliferous and clayey shale with some interbedded limestone.

Bedrock does not crop out in the New Property but occurs very near the surface in the northeast corner of the property. This is seen in borehole B398 (Figure 2.2) where bedrock was encountered at 1.5 feet below ground surface (BGS). Depth to bedrock increases toward the southwest corner of the property, as found in monitoring well 0356, in which bedrock was encountered at 181.5 feet BGS.

Quaternary Glacial Deposits

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 (Figure 3.1).

Outwash deposits in the New Property consist of sand and gravel with varying proportions of silt and clay. The sand units tend to be distinctly layered with well defined upper and lower contacts and range in thickness from about five to 25 feet. They are moderately to well sorted, medium to coarse grained (though occasionally fine grained), subrounded to subangular, and vary in color from light gray to brown to yellowish brown. In places, the sand units may contain thin lenses of silt and some gravel. These sand layers are well represented and described in monitoring well 0356.

Gravel deposits in the New Property generally contain varying proportions of clay, silt, and sand, and were consistently logged as poorly sorted. Colors range from light gray to brown to yellowish brown. The gravel is usually subrounded to subangular, and in places contains angular fragments of limestone. These beds range from about five to 30 feet thick, and often have gradational upper and lower contacts. Monitoring well 0356 intercepted lithology characteristics of the gravel units.

Till deposits in the New Property consist of clay and silt with minor amounts of sand and gravel. Till deposits may also be combinations of these sediments such as sandy, clayey silt; sandy clay; silty clay; and silty, sandy clay. Till units are generally brown in color with some red and yellow hues and mottling due to limonite and hematite (iron oxide) staining and weathering. Overall, the clays are fairly stiff and plastic, though occasionally they are sticky and soft, especially when saturated.

Surface Soils

In the field, most surface soils were logged as variations of silt and clay with roots and organic material. Since there has been little if any disturbance at the New Property since 1976, soil units probably remain as stated in the Soil Survey of Montgomery County, Ohio (USDA 1976). The following information on surface soil types was excerpted from the Soil Survey of Montgomery County, Ohio (USDA 1976).

Six soil types are predominant at the New Property (Figure 3.2). All have a soil permeability estimated to range between 0.63 and 2.0 inches/hour. They include:

- Fairmount silty clay loam (map symbol FaE2). These soils are shallow and form over steep (12 to 25 percent) slopes of limestone and clay shale bedrock. They are well-drained and have moderately low permeabilities and a low available moisture capacity. This soil type is found in a broad north-south swath along the eastern edge of the property and comprises just less than a third of the total land surface. It is also found in a lobe along the northern border of the property, east of the Spoils Disposal Area.

- Corwin silt loam (map symbol CoB). These soils are formed over gentle slopes (2 to 6 percent) of calcareous glacial till or outwash. They are well-drained and have a medium to high available moisture capacity. This soil type is found in a lobe extending from the south to the center of the property, west of the Fairmount silty clay loam. There is also a small lobe in the northwest portion of the property.

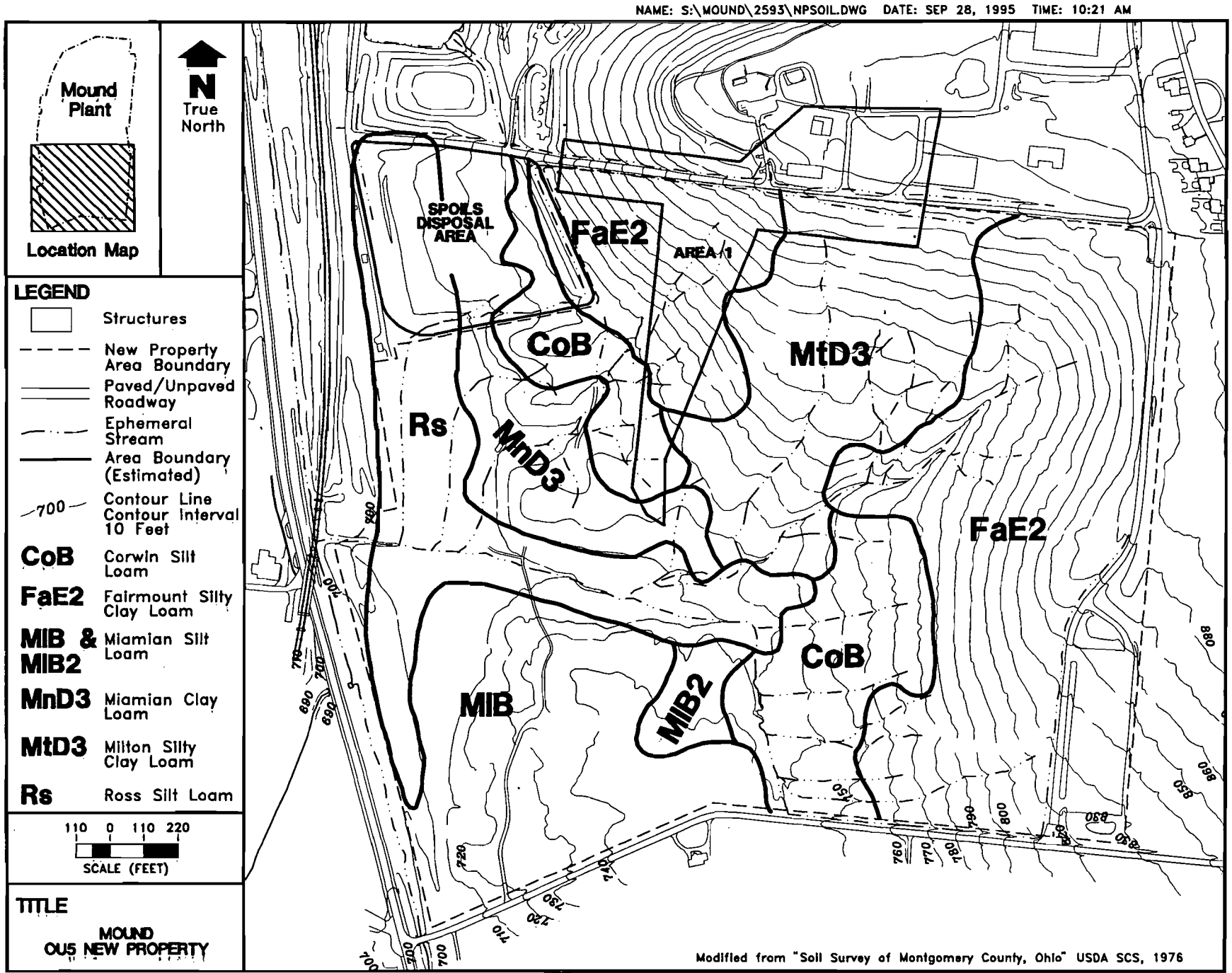


Figure 3.2. Map of OU5 New Property Soil Types

- Milton silty clay loam (map symbol MtD3). These soils are formed over fairly steep (six to 18 percent) slopes of limestone and clay shale bedrock. They are fairly deep, well-drained, and have moderately low permeability and a medium to low available moisture capacity. This soil type is found in a lobe in the north central portion of the property and extends to the south to about the center of the property.

- Miamian clay loam (map symbol MnD3). These soils are generally found on uplands or terraces but may slope to 18 percent. They are well-drained and have a medium available moisture capacity. This soil type is found in a thin swath in the northwest portion of the property, extending from the north to about the center of the property.

- Ross silt loam (map symbol Rs). These soils are dark colored and well-drained. They are nearly level and occupy flood plains along streams that occasionally overflow. Permeability is medium to high and available moisture capacity is low to high. This soil type is found in a swath along the western edge of the property and extends along the flat portion of the New Property ephemeral stream.

- Miamian silt loam (map symbols MlB and MlB2). These soils are formed over gentle (2 to 6 percent) slopes and are well-drained with loamy subsoil. They have moderately low permeability and a medium available moisture capacity. This soil type is found in a lobe along the low lying area in the southwest corner of the property.

Fill

The only known occurrence of fill in the New Property is in the Spoils Disposal Area. Piezometer P015, installed in 1992, penetrates this horizon to a depth of 25 feet. The fill was described as yellowish brown silt, clay, sand, and gravel; grayish brown clayey silt; and sticky, soft clay and silt with pockets of organic sludge.

3.2.3.2. Cross Sections

Two cross sections, AA' and BB', were constructed through the New Property. They are displayed on Plate 1 at the end of this report and their locations are shown in Figure 3.3.

Cross Section AA'

Cross section AA' runs from west to east through the center of the New Property and intersects borings B401, 0356, B408, B406, 0354, 0812, 0817, 0832, and W399 (borings 0812, 0817, and 0832 were used only for cross-sections). This cross section is perpendicular to the eastern edge of the BVA and illustrates the contact between the BVA and bedrock.

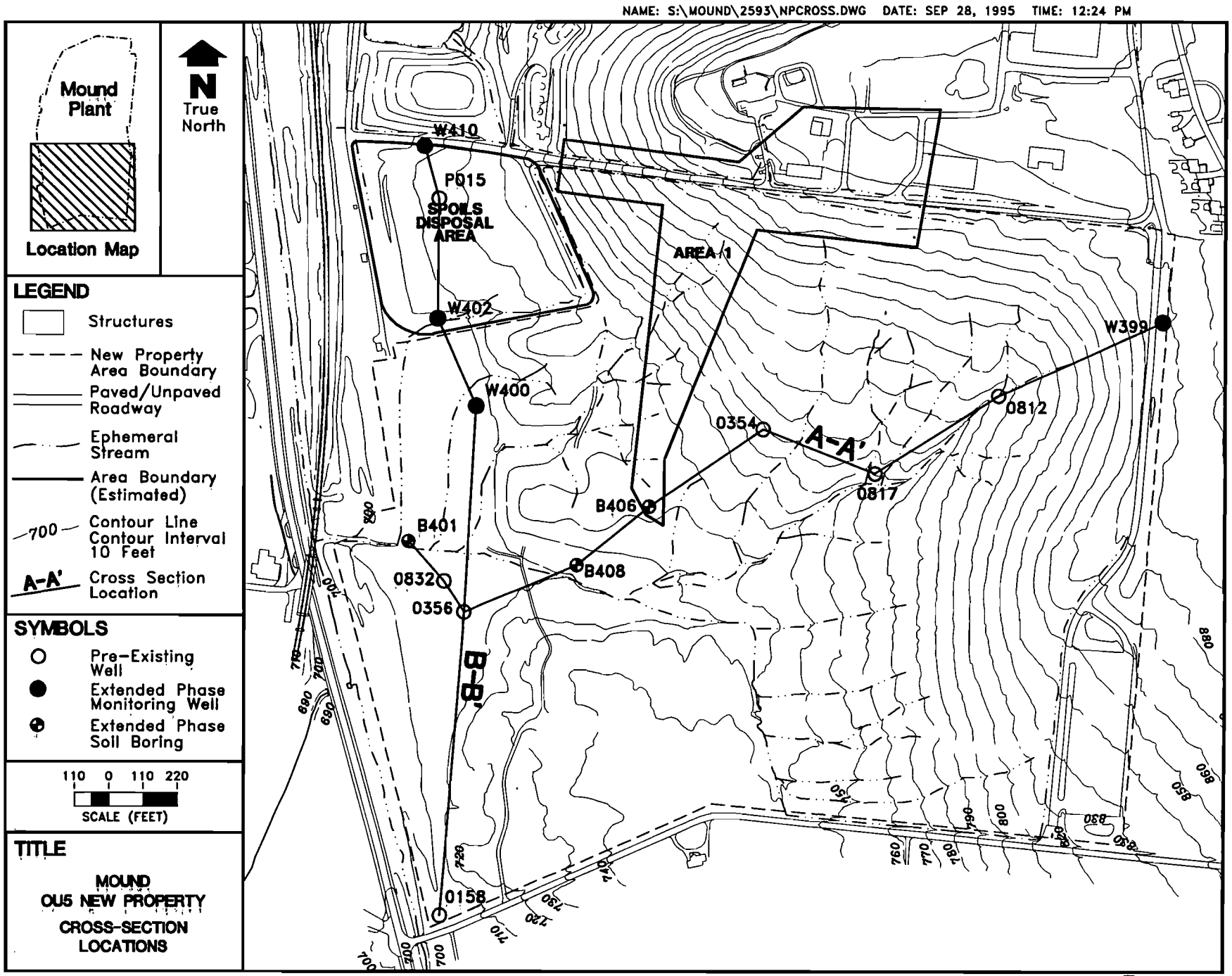


Figure 3.3. Map of Cross Sections A-A' and B-B'

AA' shows a thin, fairly upper, continuous silty soil horizon. Below that is a continuous till layer of clay (with minor and varying amounts of silt, sand, and gravel) which is about five feet thick to the west in well 0832 and thickens to 18 feet to the east in boring B406 near the BVA/bedrock contact. Further east of the BVA, this clay till is the only lithology present above bedrock.

Below the clay till is a thick outwash deposit consisting of gravel, sand and gravel, and sandy, silty gravel. This unit extends to bedrock to the west in the BVA and is not present above bedrock to the east. As shown in well 0356, this outwash deposit contains a 15-foot thick lens of silty clay and sandy silt till at 25 to 40 feet BGS. This lens does not appear to be laterally continuous and pinches out to the west and east.

In the BVA, the water table is relatively flat at 680 feet above MSL. The water table lies at the top of the till lens encountered in well 0356 and boring B408, and within a silty, sandy, gravel layer in boring B401. In the bedrock portion of the cross section, the water table rises to the east (as does surface topography), and thus appears to be roughly controlled by surface topography. Bedrock was encountered at 181.5 feet BGS in well 0356 to the west, and at 3.8 feet BGS in well W399 to the east.

Cross Section BB'

Cross section BB' runs from north to south and intersects borings W410, P015, W402, W400, 0356, and 0158. This cross section is contained wholly in the BVA and shows the BVA thickening to the south. The primary lithology illustrated in BB' is outwash composed of sands and gravels, as described above. Within the outwash is a 15-foot thick till lens at 25 to 40 feet BGS in well 0356. This till lens appears to pinch out to the north and south.

Above the outwash is a till deposit that is fairly continuous over the northern portion of the cross section, however, it appears to thin, then pinch out and intersperse with outwash deposits to the south. The till is about 15 feet thick to the north in W410 and P015 and thins to less than eight feet thick in 0356. At this point it may pinch out, but is found again at less than five feet thick in 0158.

Bedrock is 40 to 50 feet BGS on the northern end of the cross section and deepens to 181.5 feet BGS in well 0356. It was not encountered in well 0158, the boring furthest to the south in this cross section, but interpolations from existing data (DOE 1994f) suggest the bedrock is about 190 feet BGS at this location.

The water table is relatively flat, lying at 685 above MSL throughout this cross section. It drops to 675 feet above MSL in well 0158 to the far south.

3.3. HYDROLOGY

This section describes the hydrology of the Mound Plant and the New Property from the regional, local, and site perspectives. First, the regional hydrogeology of southwestern Ohio is presented. Next, the local and site hydrology at the Mound Plant, including the New Property, are presented.

3.3.1. Regional Hydrology

The description of the regional hydrology is based mostly on published information, while the data on local hydrologic conditions near the Mound Plant is summarized from the OU9 RI/FS field studies.

3.3.1.1. Surface Water

Montgomery County lies almost entirely within the Great Miami River Basin, except for the southeast corner, which drains into the Little Miami River. The Great Miami River, which is the fourth largest river in Ohio, drains an area of approximately 2,700 square miles upstream of Miamisburg. Three tributaries, the Mad River, Stillwater River, and Wolf Creek, converge from the north to join the Great Miami River at Dayton (Figure 3.4). The Great Miami River continues southward through the county and eventually discharges into the Ohio River near the Ohio-Indiana border.

The Great Miami River is the major surface water body near the Mound Plant and occupies a broad, sediment-filled valley just west of the Plant. The river flows from northeast to southwest through Miamisburg, but near the Mound Plant flow is essentially from north to south through broad meanders. West of the Mound Plant, the river is approximately 150 to 200 feet wide.

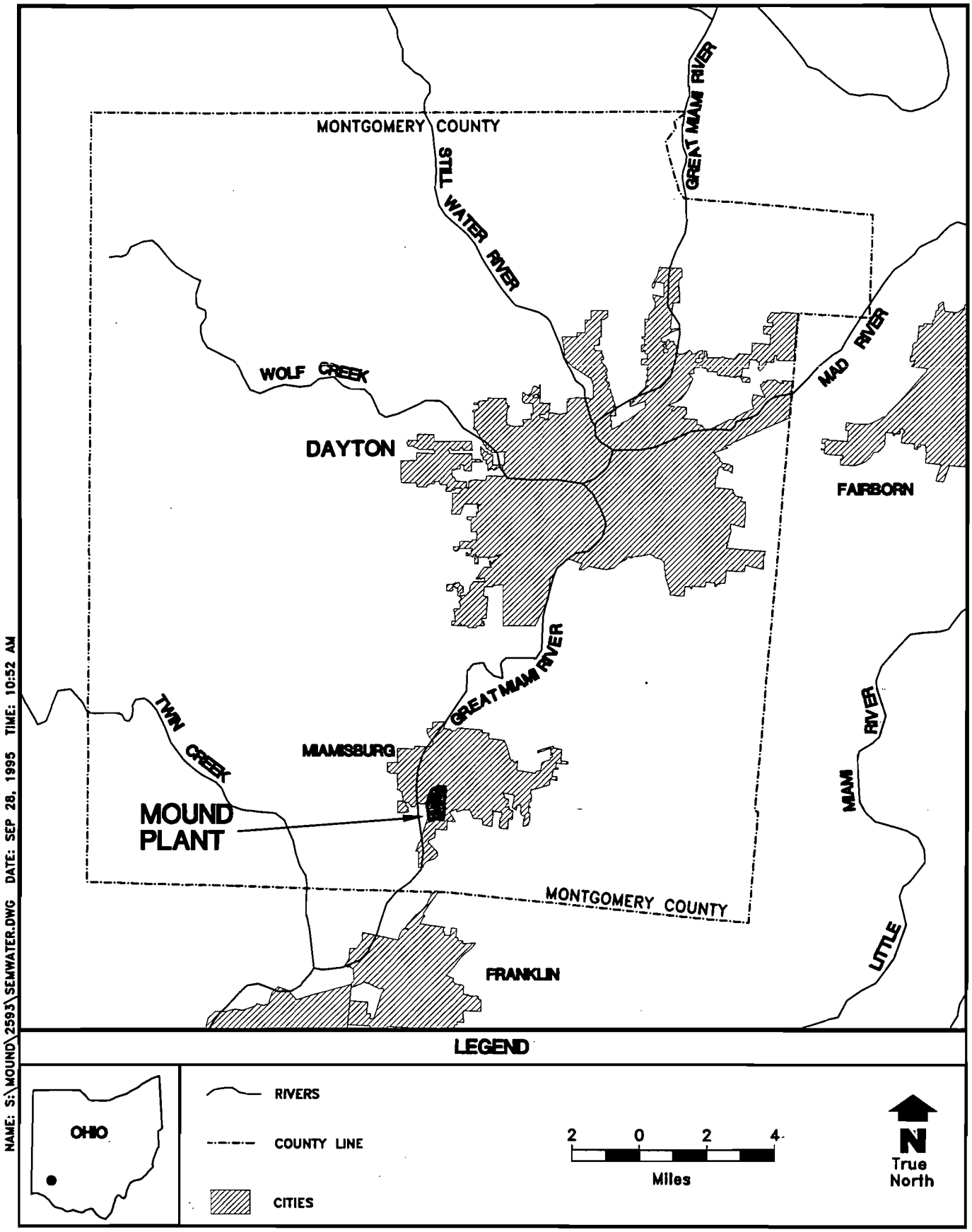


Figure 3.4. Map of Regional Surface Water Features

3.3.1.2. Groundwater

The general hydrogeologic setting of southwestern Ohio is that of buried pre-glacial or interglacial river valleys eroded into relatively flat-lying sedimentary bedrock layers as discussed in Section 3.2.1. These wide, deeply cut valleys were partially filled with sediments, which left the terrain with its present appearance. Many of the partially filled valleys are now occupied by rivers and streams that comprise the present surface water drainage network. The sediments filling the valleys consist principally of permeable sand and gravel outwash deposits, and impermeable glacial till which occurs as lenses and layers interbedded within the sand and gravel.

Regionally, the permeable deposits in the valley underlying the Great Miami River are referred to as the BVA. These deposits are composed primarily of sand and gravel outwash and provide the primary source of the large groundwater supplies pumped for municipal and industrial use. Because of high groundwater productivity and usage, parts of the BVA have been designated as a sole source aquifer. Additionally, the aquifer has been listed as a Class I aquifer by the EPA to assist in groundwater protection.

In some parts of the BVA, well-defined impermeable till sheets extend almost entirely across the valley and separate the outwash deposits into two or more distinct aquifers. In other parts of the BVA these till sheets occur discontinuously and exist as scattered lenses and masses of till within the sand and gravel deposits. Because it is relatively impermeable, till is a major influence in the hydrologic cycle in the region as it slows recharge to underlying permeable deposits. In the BVA immediately south of Miamisburg, the till is either absent from the sand and gravel deposits or consists only of a few scattered lenses. As a result, the till in this region probably does not greatly affect the movement of groundwater, either laterally or vertically.

The bedrock bounding the glacial outwash deposits (BVA) generally consists of shale interbedded with thin layers of crystalline limestone. In the upper few feet, where the bedrock has been subjected to weathering, fractures and openings along bedding planes (the interface between layers of bedrock) can convey minor amounts of groundwater to wells. The remainder of the bedrock is generally considered impermeable.

Upland glacial deposits, consisting mostly of till and clay with minor amounts of sand and gravel, overlie the bedrock along the aquifer boundaries or valley walls and provide some recharge to the BVA. For the

most part, however, the upland deposits and the bedrock are unimportant as sources of water except for farm and domestic supplies.

Groundwater flow in the BVA is generally to the south, following the southward course of the Great Miami River. In evaluating the groundwater resources of the region, the extensive development of the Miamisburg area and the potential for reversed groundwater flow directions due to heavy municipal and industrial pumping was noted (DOE 1994f). Reversals in groundwater flow directions were also noted around the Miamisburg municipal and Dayton Power & Light Hutchings Station well fields.

3.3.2. Local and Site Hydrology

3.3.2.1. Surface Water

Surface water flow from the hill slopes at the Mound Plant is collected by roads or lined open ditches and culverts. The natural surface drainage patterns on much of the Mound Plant property have been altered by roads and structural modifications. During facility expansions, a plant drainage ditch was engineered to control surface water storage and discharge. The storm water retention and discharge system (SRDS) was developed as a network of sediment settling basins along the plant drainage ditch to control the release of sediments produced by erosion of surficial soils within the Plant. The plant drainage ditch follows approximately the original course of the natural stream in the Mound Plant tributary valley, between the Main Hill and SM/PP Hill (Figure 3.5).

The asphalt-lined pond located in the northeastern portion of Mound Plant receives non-contact cooling water and rainfall runoff from the hillside south of the pond. The pond provides temporary storage, flow equalization, and retention time for removing suspended solids before discharging the effluent to the retention basins through the plant drainage ditch (RFA 1988). Runoff from the extreme northeastern portion of Mound Plant drains offsite in a northeasterly direction. Storm water runoff and sediment from the south portion of the Main Hill are conveyed through the SRDS before being released through the National Pollutant Discharge Elimination System (NPDES) Outfall 002. Runoff flows westward, through the NPDES Outfall 002, into a drainage ditch and through a pair of concrete box culverts running beneath the Conrail railroad tracks before joining the south segment of the abandoned Miami-Erie Canal. Flow is then directed into the overflow creek that empties into the Great Miami River (DOE 1992d).

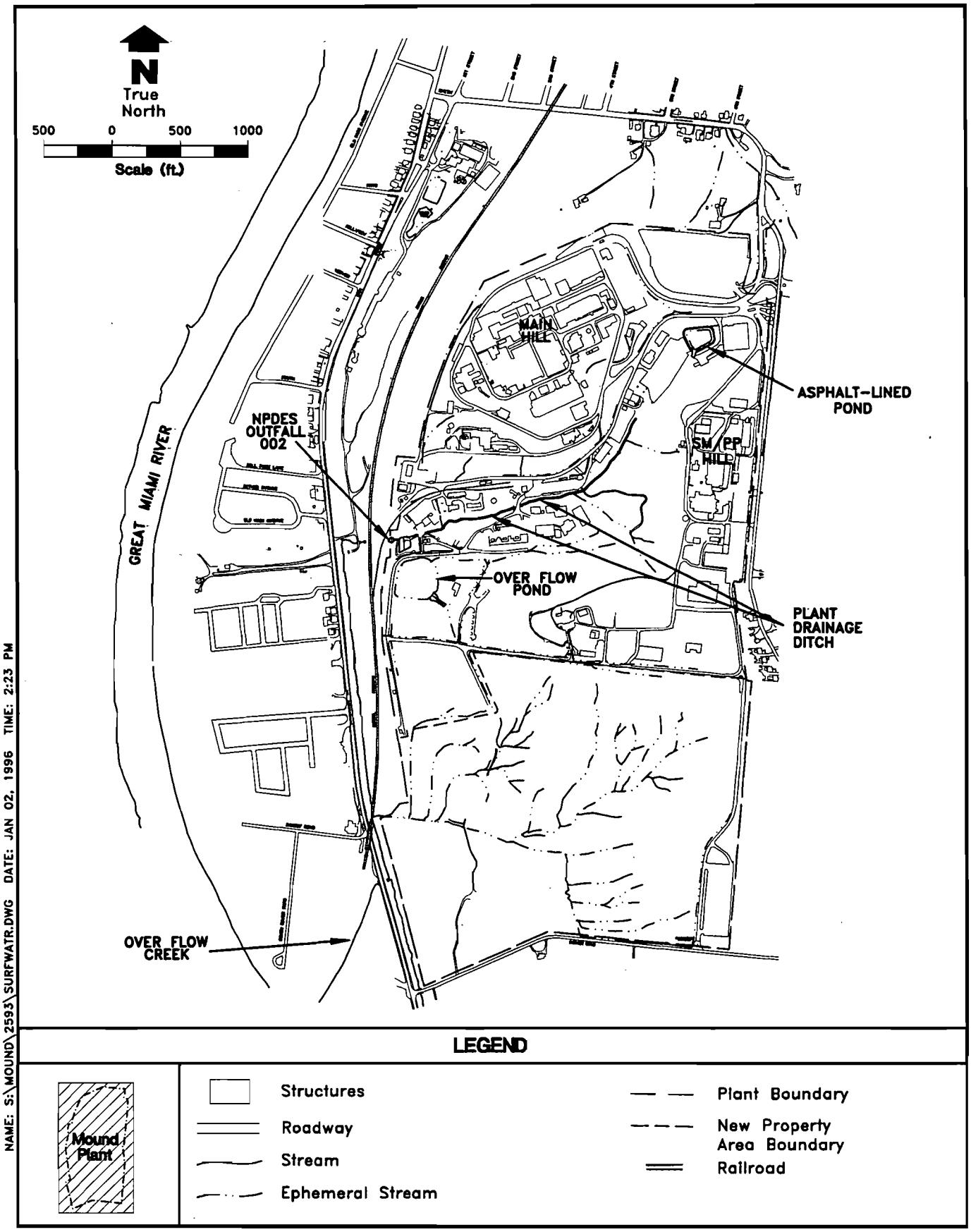


Figure 3.5. Map of Local Surface Water Features

Runoff from the central portion of the SM/PP Hill flows toward the overflow pond that eventually discharges through NPDES Outfall 002. On the northwest side of the SM/PP Hill, runoff is diverted through the tributary valley and into the overflow pond. Near the southern part of the SM/PP Hill, runoff is carried westward down a concrete-lined channel where it is diverted into the overflow pond to allow for retention of eroded surface soils. Further south, on the New Property, the south side of the SM/PP Hill is drained by a system of natural surface runoff channels. These channels are ephemeral (flow intermittently) and collect in a single ephemeral stream that discharges offsite toward the southwest. The low topography along the western edge of the New Property may allow temporary local ponding of water and sediment.

3.3.2.2. Groundwater

The groundwater system at the Mound Plant consists of two different hydrostratigraphic environments: (1) flow through the bedrock beneath the Main Hill and SM/PP Hill, and (2) flow within the unconsolidated glacial deposits and sediment associated with the BVA. Groundwater flow within the bedrock system is dominated by fracture flow, whereas flow within the sediments of the BVA is characterized as porous groundwater flow.

Occurrence and Movement of Groundwater in the Bedrock

Bedrock beneath the Mound Plant consists of a sequence of thin alternating beds of calcareous shale and limestone (Section 3.2.2.). Groundwater flow in the bedrock beneath the Main Hill and SM/PP Hill is strongly controlled by the density (or spacing), orientation, and size of the fractures in the fracture carapace. The fracture carapace is a fracture network in the upper portion of the bedrock. These partings and fractures decrease in frequency and interconnection with depth from the surface; therefore, the bedrock becomes less permeable with depth.

Analysis of the hydrogeologic properties of the bedrock that underlie the Mound Plant was conducted as part of the OU9 Hydrogeologic Investigations (DOE 1994f, 1994g). "Falling head tests" conducted within the upper fracture carapace bedrock zone at the Main Hill and SM/PP Hill were done to assess the relationship between the upper and lower bedrock zones and to determine hydraulic conductivity values (a measure of permeability, i.e., a coefficient describing the rate at which water can move through a permeable medium) in the fracture carapace. Measured hydraulic conductivities from both locations were

similar and ranged from 0.09 to 0.93 feet/day. Other testing conducted in the fracture carapace zone yielded similar results with hydraulic conductivities of 0.60 feet/day (DOE 1994g) and 0.27 to 1.02 feet/day (Dames & Moore 1973). Testing conducted in bedrock below the fracture carapace zone by Dames & Moore produced significantly lower values of hydraulic conductivity ranging from 0.0013 to 0.029 feet/day.

A conceptual model of the bedrock flow system, presented as part of the OU9 Hydrogeologic Investigations (DOE 1994g), subdivides the fracture carapace zone into two parts: (1) an upper zone of interconnecting fractures that appear to be unsaturated, and (2) a lower zone of poorly interconnecting fractures that appear to be saturated. The degree of interconnection between fractures is interpreted to decrease with depth through the lower zone until the magnitude of permeability approaches that of the primary value of bedrock. The bottom of the fracture carapace zone is considered to be a no-flow boundary where groundwater flow is almost completely blocked by the exceedingly low permeability of the underlying bedrock.

Surface water is believed to migrate vertically by infiltration until it reaches the water table. Bedding plane fractures may intercept flow to divert groundwater horizontally, but the dominant migration pathway is believed to be downward to the water table. Within the saturated fractures, the decreasing interconnection between fractures serves to reduce vertical permeability, thus diverting groundwater flow horizontally through the shallower, more permeable bedrock zones until it emerges at hillside seeps. Horizontal flow is controlled largely by open vertical fractures and bedding plane fractures. A jointed network of fractures exists where these two types of fractures intersect, creating a twisted path for horizontal groundwater flow.

The Main Hill is interpreted as a different hydrogeologic environment than the SM/PP Hill. The Main Hill is much more intensely fractured than the SM/PP Hill -- the fracture carapace extends to greater depths, approximately 100 feet, about twice that of the SM/PP Hill.

Occurrence and Movement of Groundwater in the BVA and the Mound Tributary Valley

Regionally, the contemporary Great Miami River follows the course of the BVA. However, a major portion of the BVA makes a broad easterly meander through the south part of the Mound Plant. Based on results of the OU9 Hydrogeological Investigations (DOE 1994f), the axis of the BVA lies east of the

Great Miami River, both north and south of the Mound Plant, and is immediately adjacent to the southern portion of the New Property (Figure 3.6).

At the Mound Plant, the BVA is bound to the east by the bedrock highs of the Main Hill, SM/PP Hill, and the northeastern portion of the New Property. The tributary valley, which lies between the Main Hill and SM/PP Hill, joins the BVA near the Mound Plant boundary (Figure 3.6).

Fluctuations in the stages of the Great Miami River directly impact groundwater levels in monitoring wells located throughout the BVA. Comparison of river stage elevations to groundwater elevations in hydrographs from 18 wells monitored continuously showed that hydraulic head changes in the BVA mirror the fluctuations in river stage. A lag time of 24 to 36 hours is observed between river stage rise and groundwater level rise (DOE 1994f). All of the wells within the BVA, including Mound Plant production wells and Miamisburg Water District wells, regardless of completion depth, show a similar response. This phenomenon, and information provided by borehole logs, indicates that a continuous unconsolidated aquifer extends from the Great Miami River to the western edge of the Mound Plant and that the BVA is hydraulically connected to the Great Miami River.

In the BVA adjacent to the Mound Plant no continuous till layers exist and, as observed in well clusters completed near the middle of the valley, the hydraulic gradients between the BVA and the bedrock are oriented vertically downward toward the bedrock. The relationship between groundwater elevations in nearby piezometers and the Great Miami River stage suggests that the direction of flow is generally from the river to the groundwater (where the Great Miami River acts as a losing river), but reversals for short periods do occur. It is believed the Great Miami River acts as a recharge source to the BVA over most of the year, creating a local groundwater ridge near the river that acts as a barrier to groundwater flow from the Mound Plant. Within the vicinity of the Mound Plant production wells, infiltration from the Miami-Erie canal appears to be a major source of recharge to the BVA.

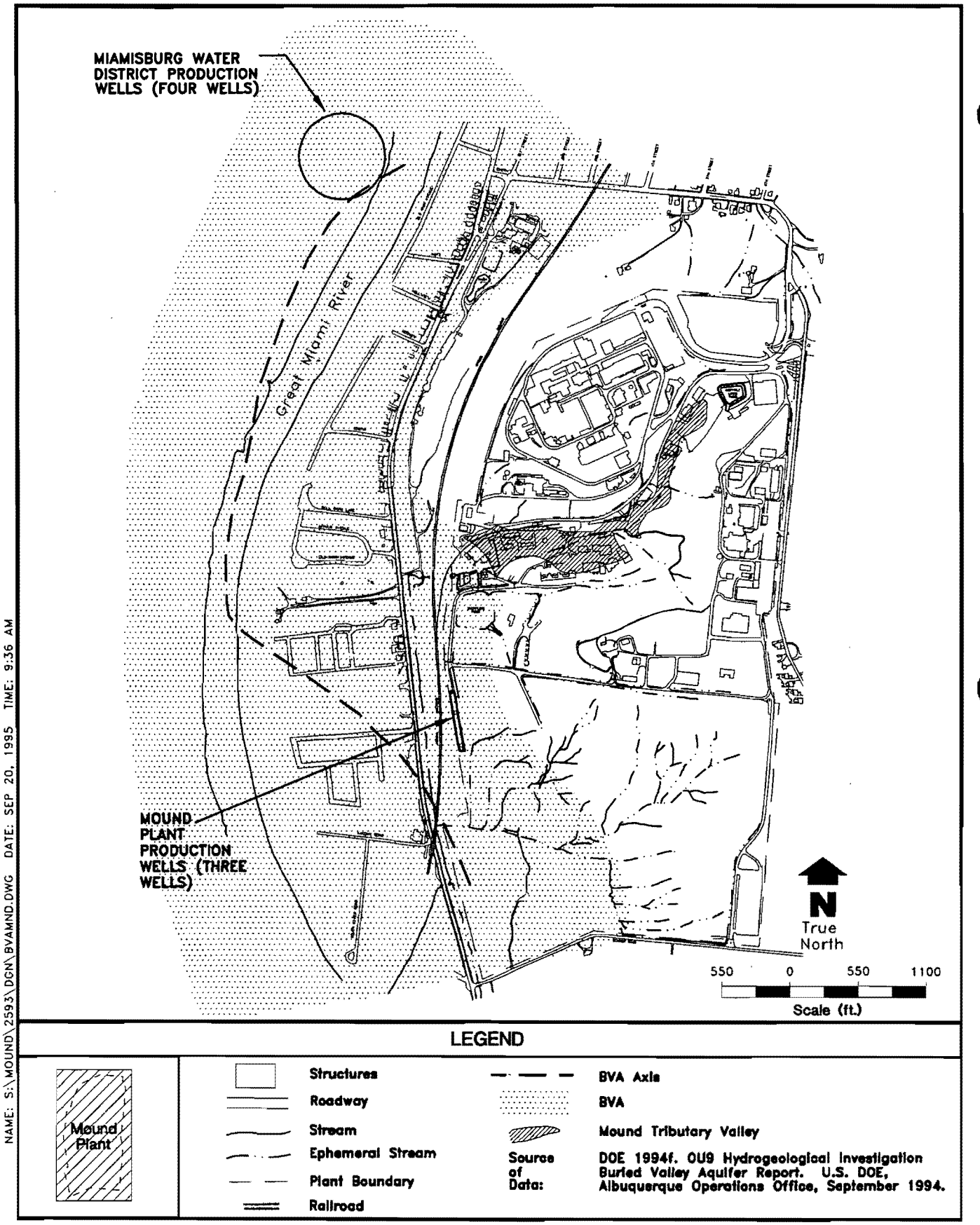


Figure 3.6. BVA at the Mound Plant

There appear to be several distinct areas of groundwater flow within the BVA near the Mound Plant (Figure 3.7).

- North of the Mound Plant, the valley is wide and groundwater hydraulic gradients indicate flow to the southwest. The groundwater flow in this area is likely controlled by the river stage and the pumping of the Miamisburg municipal production wells.

- Northwest of the Mound Plant, groundwater flow in the BVA is to the southwest, but may be controlled by the narrowing of the river valley and the shallower depth to bedrock. The smaller cross-sectional area of the BVA results in a steepening of the hydraulic gradients.

- West of the Mound Plant, pumping for the Mound Plant water supply (Figure 3.6) has disrupted the southerly groundwater flow direction observed in adjacent areas. Sporadic pumping at Miamisburg Municipal Well Number 2 also alters the natural groundwater flow in this vicinity. These artificial influences affect the groundwater along the eastern edge of the BVA flow by creating a local groundwater depression.

- South of the Mound Plant, at the New Property, the groundwater flow in the BVA is again toward the south under small hydraulic gradients. The effect of the localized pumping in the BVA appears to be diminished.

In addition to the groundwater flow in the main portion of the BVA, there is flow within the glaciofluvial sediments beneath the Mound Plant tributary valley between the Main and SM/PP Hills. This subsurface ravine appears to exist beneath the modern Mound Plant tributary valley and is not considered a major groundwater pathway as the ravine is locally filled with dense glacial till (i.e., low permeability). Groundwater flow within the sediments is to the west and southwest, aligned with the tributary valley topography. Steep horizontal gradients, and a lack of response in the tributary valley to seasonal groundwater level changes in the BVA, indicate that the tributary valley is not part of the main aquifer system. However, the tributary valley does contribute minor amounts of groundwater flow to the BVA. Water levels in the tributary valley are interpreted to be controlled by precipitation and by the slope of the underlying bedrock.

The hydrogeologic properties of the BVA were analyzed as part of a multiple well pumping test for the OU1 RI (DOE 1994a). The test was conducted in the BVA in an area that lies to the west and underlies part of the Mound Plant. The test measured physical properties of the aquifer material including transmissivity (a measure of permeability, i.e., the rate at which water is transmitted through a unit area of an aquifer), hydraulic conductivity, and storativity (a measure of the ability of an aquifer to contain or

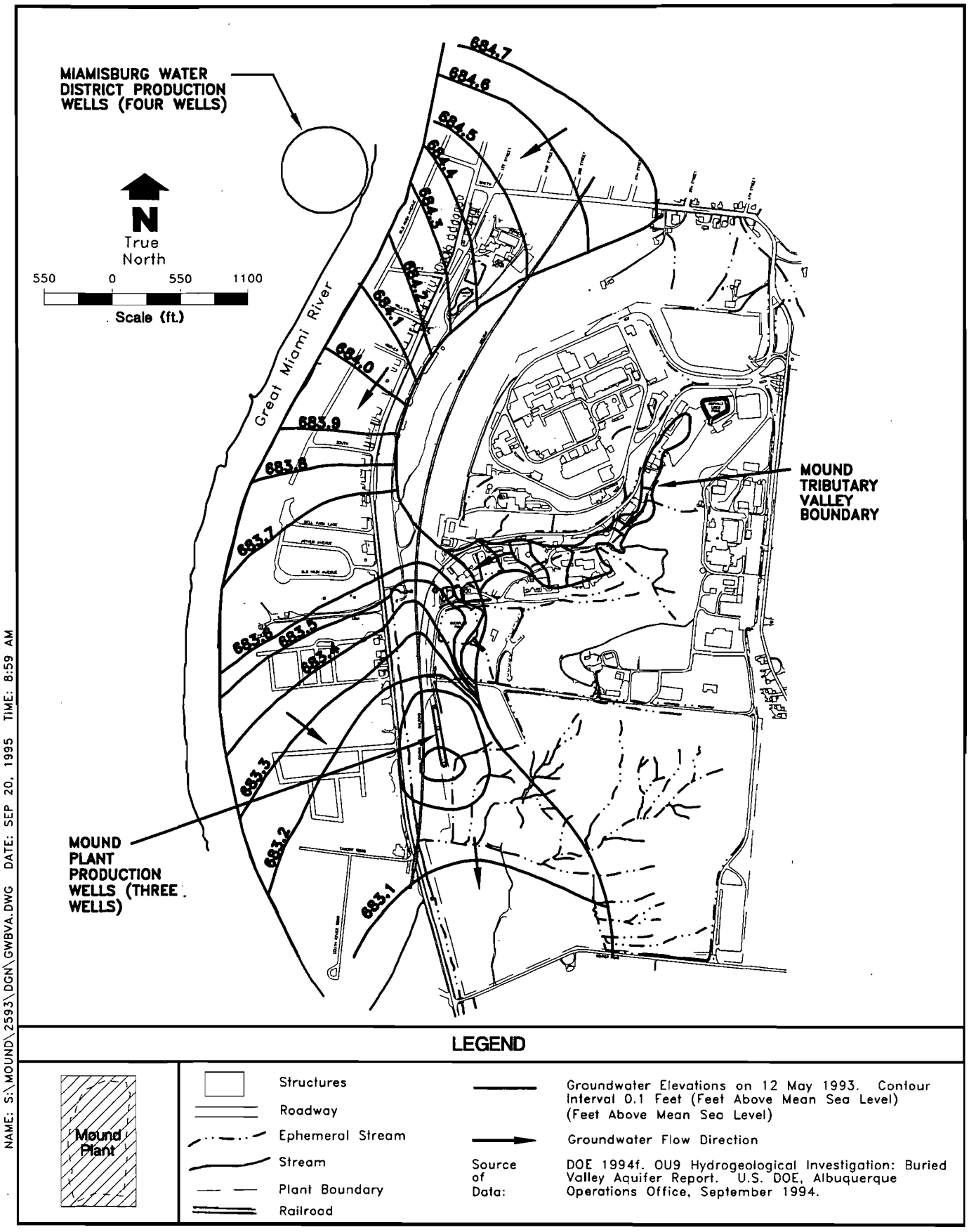


Figure 3.7. Generalized Groundwater Flow Directions in the BVA and Tributary Valley at the Mound Plant

store a volume of water). The aquifer transmissivity values calculated from this test ranged from 27,500 feet^2/day to 55,200 feet^2/day. Values of hydraulic conductivity estimated from this test ranged from approximately 500 to 900 feet/day. Storativity values ranged from 0.01 to 0.34 for this test. These results are consistent with results from previous aquifer testing and are summarized in the OU9 RI/FS Site-Wide Work Plan (DOE 1992d).

A conceptual model of the BVA flow system adjacent to the Mound Plant, based on the work of the OU9 site-wide investigations, depicts the BVA as a single aquifer unit (DOE 1994f). Glacial tills are present throughout the valley, but they are not continuous and do not significantly impede groundwater flow. Horizontal flow directions in the BVA are generally to the south, following the course of the Great Miami River. Vertical flow directions near the Mound Plant are predominantly downward, indicating that the Great Miami River serves as a recharge boundary to the BVA and a barrier to westward groundwater flow from the Mound Plant. The pumping of production wells has created groundwater depressions that alter local groundwater flow directions.

Groundwater Relationship Between the Bedrock and the BVA

The degree of interconnection between the bedrock and the BVA varies at the Mound Plant. The bedrock wells at higher elevations on the Main and SM/PP Hills show no response to changes in groundwater elevations in the BVA. Water levels in the bedrock wells and piezometers located along the flanks of the BVA and in the floodplain of the Great Miami River respond to changes in river stages in a manner similar to water level changes in wells completed in the BVA. Groundwater levels in well clusters near the valley margin at the Mound Plant suggest that the bedrock may be providing some recharge to the BVA. This recharge is not considered a primary source as groundwater in the bedrock has a much smaller volume and moves at a much slower velocity compared to the BVA. There is no evidence that a continuous groundwater flow path exists from the bedrock under the SM/PP Hill to the bedrock in the main valley and from there upward into the BVA.

3.4. ECOLOGICAL RESOURCES

The ecological resources of the Mound Plant have been evaluated in two documents: 1) the FEIS (DOE 1979), and 2) the OU9 Ecological Characterization Report (DOE 1994c).

The following five habitats were identified at the New Property: subxeric grasslands, mesic grasslands, early successional scrub/shrub, south-facing slope forests, and riparian forests. No perennial streams or ponds are present on the New Property; however, several ephemeral streams and seeps are present in the area. Thus, the ecological resources of the New Property consist primarily of terrestrial plants and animals. A more detailed summary of the habitats and populations, sensitive areas, and threatened or endangered species is included in the Baseline Ecological Risk Assessment (Section 6.2 of this report).

3.4.1. Habitats and Plants

Subxeric and mesic grasslands resemble one another superficially in that grass species dominate the plant community; however, the greater soil moisture in the mesic areas has resulted in a substantially different species composition. Sod-forming grasses such as meadow fescue, Kentucky blue grass, and Canada blue grass are common in the subxeric grasslands. Johnson grass, Canada thistle, and common brome grass are frequently encountered in the mesic grasslands. While both communities are composed primarily of herbaceous species, the species composition of the mesic community is slightly more diverse (136 species identified) than the subxeric community (111 species identified). However, the mesic grasslands cover much less area (2.7 hectares (ha)) than the subxeric grasslands (20.7 ha).

The early successional scrub/shrub community is a transitional stage between the grasslands and the woody forests, and is present in the central and eastern areas of the New Property. A total of 114 plant species was inventoried within this community. Dominant woody species include black locust trees in the overstory and Amur honeysuckle in the middle- and understories. More than 30 herbaceous species were observed in this community.

The south-facing slope forest is the oldest community on the New Property (average tree age was 37 years during sampling) and is present on the southern slope of the SM/PP Hill and bordering flats. The overstory consists mainly of deciduous tree species with American elm and white ash present in the highest frequencies. A dense layer of woody Amur honeysuckle is present in the understory. Forty-three

plant species were identified in this community. However, only two herbaceous species, garlic mustard and field garlic, were observed.

The riparian forest is present along the western border of the New Property near the Miami-Erie canal. Average tree age is younger in this forest (22 years) compared to the slope forests. Soil moisture is high in this area, which has enabled the colonization of the community by moisture-loving, shade-tolerant herbaceous species in the understory and typical riparian tree species such as boxelder in the overstory. A total of 105 plant species was inventoried in this community of which less than 20 were herbaceous. In the overstory, American elm is present in greatest number.

3.4.2. Animals

The Mound Plant, especially the New Property, provides abundant and diverse habitats for animal species. On the entire Plant site, 81 bird species, 16 mammal species, seven reptile species, and three amphibian species were sighted and/or collected during the ecological survey (DOE 1994c). The three most frequently sighted bird species were American robin, European starling, and northern cardinal. White-tailed deer was the most common large mammal encountered on the New Property. Common small mammals included eastern chipmunks and *Peromyscus* mice. Few reptiles and amphibians were encountered during the survey, but the American toad, blue racer, rat snake, and bullfrog were collected on the New Property.

Benthic macroinvertebrates were sampled in two of the ephemeral streams. In the spring, the insect community was composed of species typically found in erosional conditions such as those present in the streams. In the fall, species associated with depositional environments were collected in small isolated pools. Due to their small size and intermittent nature, it is unlikely that these streams support fish populations; consequently, fish sampling was not conducted in these streams during the ecological survey (DOE 1994c).

3.4.3. Environmentally Sensitive Areas

The habitats on the New Property are diverse and support abundant plant and wildlife species. They are typical of many habitats in the area surrounding the Mound Plant. Many state and local conservancy reserves such as the Germantown and Sugarcreek Reserves are present within a few miles of the Mound

Plant. The habitats present on the New Property are similar to these reserves and would become locally important only if substantial habitat loss occurred in these surrounding areas.

3.4.4. Threatened and Endangered Species

The FEIS for the Mound Plant (DOE 1979) concluded that it was unlikely that threatened or endangered species were present at the Mound Plant; however, no field investigation for threatened or endangered species was conducted. Consequently, field reconnaissance for threatened or endangered species was conducted as part of the ecological survey (DOE 1994c). Two state designated endangered species, inland rush (*Juncus interior*) and dark-eyed junco *(Junco hyemalis)*, were located during this study, but no federally designated threatened or endangered species were sighted.

One specimen of inland rush, a prairie plant, was found near a small seep located in the subxeric grasslands of the New Property. Ohio is at the extreme eastern edge of the natural range of this species. Because only one specimen was found, it was concluded that the Mound Plant does not support a viable breeding population of this species. Several dark-eyed juncos, a bird species, were sighted foraging in the grasslands, scrub/shrub, and forests on the New Property; however, their endangered status is designed to protect breeding populations in the extreme northeast corner of Ohio, not winter visitors in the southern portion of the state. Because of the ranges and requirements of these two species, the New Property is unlikely to become an important habitat for them.

Section 4

4. NATURE AND EXTENT OF CONTAMINATION

This section discusses the nature and extent of contamination found in surface and subsurface soils, sediments, groundwater and seeps at the New Property. Section 4.1 presents the background data used and the statistical analyses performed to establish contaminants of potential concern (COPCs) for the human health and the ecological risk assessment. Section 4.2 identifies these COPCs by describing the methods used to differentiate contaminants from background levels. Section 4.3 identifies the nature and extent of contaminants found in the various New Property media. Results are presented in tables and maps, as appropriate. Section 4.4 identifies known or suspected sources of contamination, both onsite and offsite, and Section 4.5 summarizes the nature and extent of contamination at the New Property.

4.1. BACKGROUND CHEMICAL DATA

Background chemical concentrations for soil and groundwater were derived from background investigations performed by DOE. Background sample locations were selected for groundwater and soils that best represent locations not likely to be influenced by contamination from the New Property. Furthermore, background samples were collected from locations that were not directly affected by activities at the Mound Plant. Because no background sediment samples were collected, sediment concentrations from this investigation are compared to background soil concentrations. Media-specific background sampling locations are shown in Figures 4.1 and 4.2.

Sixteen locations, representing the mappable soil units present on the Mound Plant site, were sampled outside the plant in 1993 in the first phase of the OU9 Background Soil Investigation (DOE 1994i). Sampling locations were selected within one mile of the Mound Plant, and were required to be at least 50 feet away from roadways or paved areas, railroad tracks, drainage ditches, heavily forested areas, or crop or garden areas (Figure 4.1). Three samples were collected at each of the 16 locations. These sampling locations were selected to provide data that are representative of area soils and consistent with the soil types found within the Mound Plant boundaries. Six of the soil types occur in the New Property. Background soil samples were collected in accordance with methods identified in the OU9 QAPjP (DOE 1993e). Sampling procedures are outlined in the Background Soils Field Sampling Plan and follow the Mound Plant Environmental Restoration Program SOPs (SOPs 5.1, 5.2, 5.3, and 5.8).

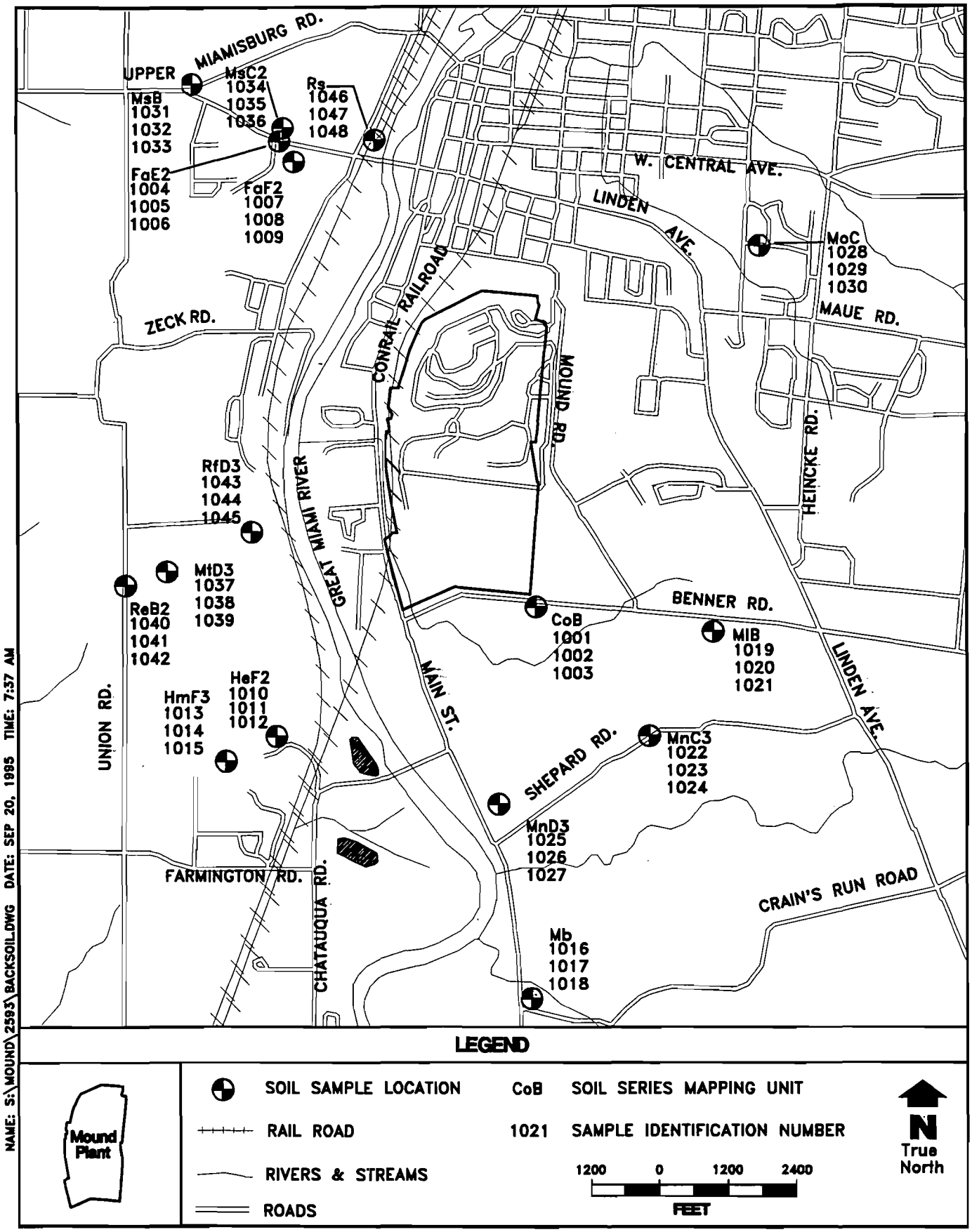


Figure 4.1. Background Soil Sample Locations

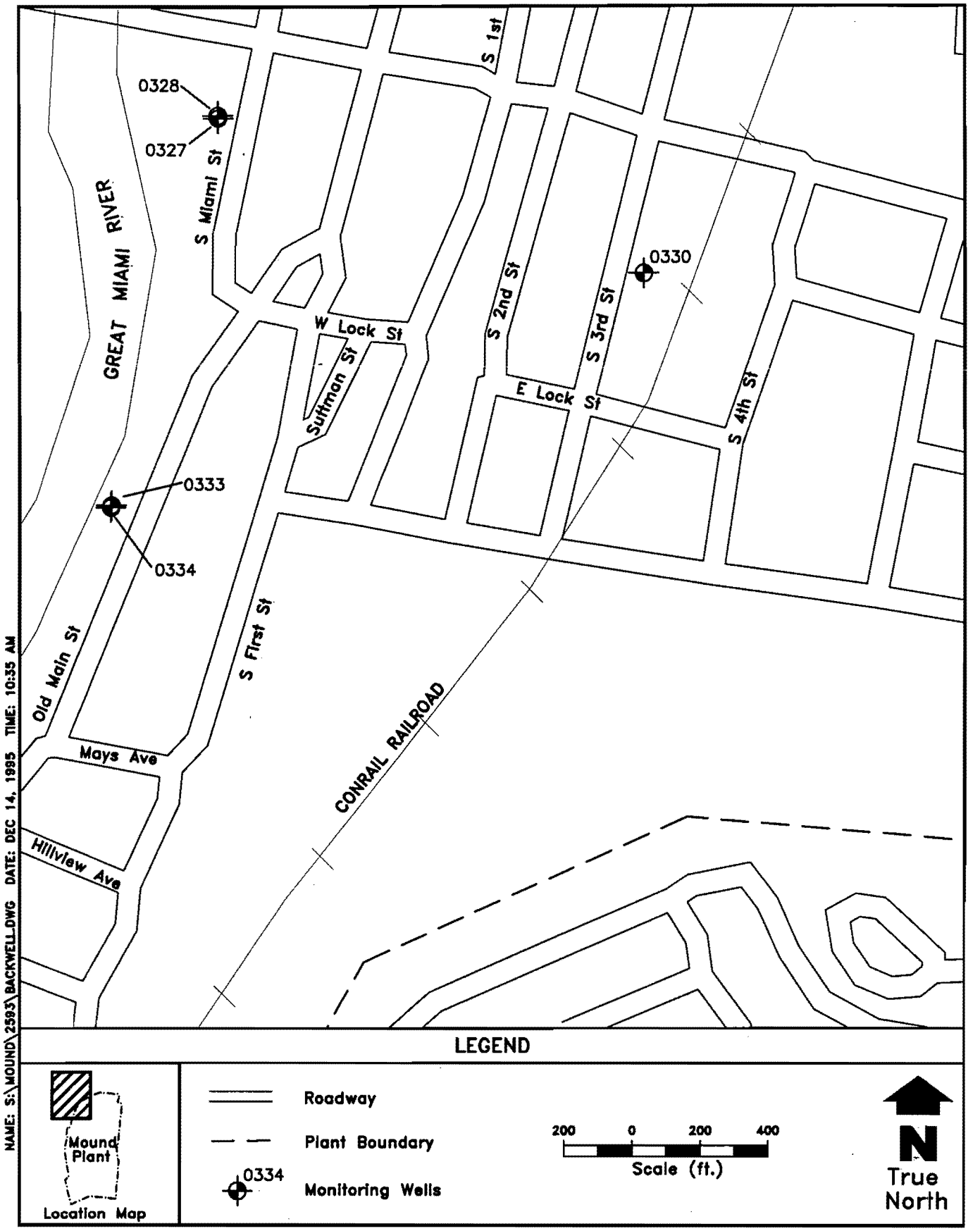


Figure 4.2. Background Groundwater Sample Locations

New Property soil and sediment results were compared to data from the OU9 Background Soils Investigation (DOE 1994i), as described below in Section 4.1.1. The background soils were evaluated for metals, pesticides, PCBs, and radionuclides. No other organic compounds (i.e., volatile or semi-volatile organics) were analyzed during the study. The background criteria for soils and sediments are presented in Table IV.1. The raw laboratory analytical data are provided in the OU9 Background Soils Investigation: Soil Chemistry Report (DOE 1994i).

Onsite groundwater and seep sampling results have been compared to chemical and radiological laboratory results for the OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995b). The methodology for this comparison is described in Section 4.1.1. The background groundwater sampling sites are all located within two miles of the New Property (Figure 4.2). All data were validated according to procedures similar to those used in the OU9 Background Soils Investigation (DOE 1994i) to obtain a 95% upper tolerance level (UTL) value. This value is the background criterion used for each chemical. The background groundwater samples were evaluated for metals, total organic carbon, anions, VOCs, SVOCs, explosives, pesticides/PCBs, and radionuclides. The background criteria for groundwater and seeps are presented in Table IV.1. The raw laboratory analytical data are provided in the OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995b).

4.1.1. Comparison of Site Chemical Concentrations with New Property Background Data

A statistical analysis of the background and New Property site data was used to make an objective comparison between media-specific background concentrations and site concentrations for each detected compound. The methods used to compare New Property onsite data to background results were based on EPA guidance (Ohio EPA 1991; EPA 1989a; EPA 1992a). The 95% UTL for the background samples for a given compound was compared to each site sample concentration for that same compound for each media. In soils, background comparisons were limited to metals, pesticides, and radionuclides. If the onsite sample concentration was greater than the UTL, that compound was considered to be above the background concentration (Ohio EPA 1991). In soils, for organics other than pesticides, an analyte that was detected at least once was considered to be above background.

Chemical concentrations in various media at the New Property were compared to background data to quantify the significance of chemical occurrences. This was accomplished using the statistical tests described above. Based on these comparisons, analytes were placed in the following categories: (1)

Table IV.1. New Property RI Background Criteria for Soil, Sediment, Groundwater, and Seeps
Page 1 of 4

Parameter	Background Criteria	
	Soil and Sediment[a]	Groundwater and Seeps[b]
Pesticides/PCBs	ug/kg	ug/L
4,4'-DDD	4.20	0.055
4,4'-DDE	4.30	0.055
4,4'-DDT	13.00	0.055
Aldrin	1.90	0.028
Aroclor-1016	--	0.281
Aroclor-1221	--	0.281
Aroclor-1232	--	0.281
Aroclor-1242	--	0.281
Aroclor-1248	--	0.281
Aroclor-1254	58	0.281
Aroclor-1260	--	0.281
Dieldrin	3.78	0.055
Endosulfan I	1.90	0.028
Endosulfan II	1.90	0.055
Endosulfan Sulfate	--	0.055
Endrin	3.78	0.055
Endrin Aldehyde	3.78	0.055
Endrin Ketone	3.78	0.055
Heptachlor	1.90	0.028
Heptachlor Epoxide	1.90	0.028
Toxaphene	--	2.810
alpha-BHC	--	0.028
alpha-Chlordane	1.90	0.028
beta-BHC	--	0.028

Table IV.1. New Property RI Background Criteria for Soil, Sediment, Groundwater, and Seeps
Page 2 of 4

Parameter	Background Criteria	
	Soil and Sediment[a]	Groundwater and Seeps[b]
PESTICIDES (continued)	ug/kg	ug/L
delta-BHC	1.90	0.028
gamma-BHC (Lindane)	--	0.028
gamma-Chlordane	1.90	0.028
Methoxychlor	30	0.281
ANIONS	mg/kg	mg/L
Chloride	107.00	248.455
Fluoride	6.70	0.412
Nitrate-Nitrite-N	26.00	6.457
Sulfate	150.00	134.555
METALS	mg/kg	ug/L
Aluminum	19,000.00	121.983
Antimony	0.45	0.539
Arsenic	8.60	28.167
Barium	180.00	315.005
Beryllium	1.30	0.241
Bismuth	39.00	16.437
Calcium	310,000.00	123,303.125
Cadmium	2.10	0.518
Chromium	20.00	135.959
Cobalt	19.00	2.163
Copper	26.00	3.422
Cyanide	1.14	6.476
Iron	35,000.00	3,777.946
Lead	48.00	1.442

Table IV.1. New Property RI Background Criteria for Soil, Sediment, Groundwater, and Seeps
Page 3 of 4

Parameter	Background Criteria	
	Soil and Sediment[a]	Groundwater and Seeps[b]
METALS (continued)	mg/kg	ug/L
Lithium	26.00	50.275
Magnesium	40,000.00	41,401.844
Manganese	1,400.00	214.082
Mercury	0.15	0.050
Molybdenum	27.00	6.359
Nickel	32.00	152.457
Potassium	1,900.00	5,381.303
Selenium	0.59	1.853
Silver	1.70	0.786
Sodium	240.00	105,374.192
Thallium	0.46	1.102
Tin	20.00	34.744
Vanadium	25.00	18.132
Zinc	140.00	100.153
RADIONUCLIDES	pCi/g	pCi/L
Americium-241	--	0.124
Bismuth-207	--	6.975
Bismuth-210	--	8.056
Cesium-137	0.42	9.048
Cobalt-60	1.00	10.536
Potassium-40	37.00	155.507
Plutonium-238	0.13	0.085
Plutonium-239/240	0.18	0.055
Radium-226	2.00	1.024

Table IV.1. New Property RI Background Criteria for Soil, Sediment, Groundwater, and Seeps
Page 4 of 4

Parameter	Background Criteria	
	Soil and Sediment[a]	Groundwater and Seeps[b]
RADIONUCLIDES (continued)	pCi/g	pCi/L
Strontium-90	0.72	0.973
Thorium-228	1.50	0.801
Thorium-230	1.9	0.276
Thorium-232	1.40	0.233
Tritium	1.60	1,379.201
Uranium-234	1.10	0.771
Uranium-235	0.11	0.038
Uranium-238	1.20	0.683

a Soil and sediment background criteria from the OU9 Background Soils Investigation: Soil Chemistry Report (DOE 1994i).

b Groundwater and seep background criteria from the OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995b).

-- Background samples were not analyzed for these constituents, therefore no background criteria are available.

analytes never detected; (2) analytes detected at concentrations less than the background criteria; and (3) analytes detected above the background criteria. The discussion of the nature and extent of contamination that follows in Section 4.3 relies on comparisons with the background data to establish contaminants detected at the site that may be of concern (see Appendix B). In addition, the risk assessment in Section 6 addresses all contaminants detected above background levels.

4.2. IDENTIFICATION OF CONTAMINANTS OF POTENTIAL CONCERN

The methodology for determining human health COPCs is described in Section 6.1.2.5. Analytes detected above background in less than 5% of the samples were not considered COPCs if the onsite and background distributions were not significantly different based on the Wilcoxon Rank Sum test. Analytes without background criteria were not considered COPCs if they were detected in less than 5% of the samples and the maximum detect was less than five times the contract required detection limit (CRDL). Although present above background in some soil or water samples, calcium, chloride, iron, magnesium, potassium, and sodium were eliminated from consideration as COPCs because these analytes are essential nutrients and are only toxic at very high doses.

Outlined below are the steps that were used to identify COPCs at the New Property for the human health risk assessment:

- Determine compounds that were not detected onsite for each medium. If a compound was not detected onsite, the compound was dropped from further consideration.

- The 95% UTL values for soil were taken from the OU9 Background Soils Investigation: Soil Chemistry Report (DOE 1994i). The 95% UTL values for groundwater and seeps were taken from the OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995b).

- Compare individual sample results for each compound to the background UTL. If any result exceeds the UTL (or the maximum background value), the compound is considered a COPC.

- Analytes detected above background in fewer than 5% of the samples were removed from the COPC list if the Wilcoxon Rank Sum test was not significant or the maximum concentration detected was less than five times the CRDL.

- Organics (e.g., VOCs, SVOCs), if detected in soils and sediment, were considered COPCs.

A summary of the statistical tests used in COPC determination is provided in Appendix D.

COPCs for groundwater, seeps, surface soil, sediment, and subsurface soils thus represent a subset of all analytes detected above background or CRDLs. Identification of an analyte as a COPC does not necessarily indicate that the analyte presents a threat to human health. COPCs are those analytes that must be subjected to a toxicity assessment, an exposure assessment, and risk characterization (as described in Section 6) in the human health risk assessment. These screening tests are performed to ensure that all COPCs contributing to risk are identified. Those COPCs that are shown to produce human health risk are then called contaminants of concern (COCs). COCs are discussed in Sections 5 and 6. Non-COPCs will not be carried through the risk assessment and will not be discussed in subsequent chapters of this report.

Methods for determining ecological contaminants of potential concern (ecoCOPCs) are slightly different, as described in Section 6.2.4.4. If the mean concentration of a particular analyte at the site does not exceed established toxicity thresholds, then the contaminant is not considered an ecoCOPC. If the mean concentration exceeds the toxicity threshold, or if no toxicity threshold exists, that contaminant is considered an ecoCOPC. EcoCOPCs are those analytes that are subjected to the ecological risk assessment described in Section 6.

It should be noted that many organic chemicals found at Superfund sites are common residues of human activity, and may come from many sources outside the site boundaries. An example is polycyclic aromatic hydrocarbons (PAHs). These SVOCs are generated during the combustion of organic matter. Possible sources of PAHs include incinerators, motor vehicles, fires, and coal-fired power plants. Pesticides, which are resistant to natural breakdown and may be dispersed by wind over large areas, are another class of compounds that may occur above background but may not be site-related. Because of their human-made

origins and widespread occurrence in the environment, it can be difficult to conclusively define the sources of organic compounds detected in samples.

Many inorganic analytes detected above background in samples are naturally occurring in the environment. Chemicals such as anions and metals (especially aluminum, iron, manganese, lead, potassium, and zinc) normally vary within a few percent of the 95% UTL background criteria. This occurs because of variations in parent geologic materials or other natural conditions. Thus, occurrences of such chemicals in concentrations slightly above background may not necessarily indicate contamination.

4.3. NATURE AND EXTENT OF CONTAMINATION

This section discusses those contaminants detected in surface and subsurface soil, sediments, groundwater, and seep samples above corresponding background criteria or laboratory detection limits. Each medium (surface soils and sediments, subsurface soil, groundwater, and seeps) is evaluated in a separate subsection. In each subsection, each contaminant group (i.e., anions, metals, total organic carbon, explosives, pesticides/PCBs, SVOCs, VOCs, and radionuclides) is discussed and distribution maps are presented per contaminant or contaminant group, as appropriate. Some of these contaminants have been identified as human health COPCs or as ecoCOPCs. Because these COPCs or ecoCOPCs potentially pose a risk to human health or the environment, they are of particular interest and are discussed accordingly. Non-COPC analytes are also discussed.

Of the TCL/Target Analyte List (TAL) analytes that were evaluated by the laboratories in the course of the RI, several were either never detected or not detected above background at the New Property. Table IV.2 lists these analytes for each of the three media groups studied (surface soils and sediments; subsurface soils; and groundwater and seeps).

Site data for groundwater, seeps, soil, and sediment were obtained from the OU5 New Property Phase 1 Field Report (DOE 1994b), the OU5 New Property Extended Phase Field Report (DOE 1995a), the OU9 RSI Report (DOE 1995c), and the OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995b).

Table IV.2. Analytes Below Background Criteria or Never Detected

SURFACE SOILS		
1,1,1-Trichloroethane	Aroclor-1248	N-Nitroso-di-n-propylamine
1,1,2,2-Tetrachloroethane	Aroclor-1254	N-Nitrosodiphenylamine
1,1,2-Trichloro-1,2,2-Trifluoroethane	Aroclor-1260	Nitrobenzene
1,1,2-Trichloroethane	Barium	Pentachlorophenol
1,1-Dichloroethane	Benzene	PETN
1,1-Dichloroethene	Benzyl Alcohol	Phenol
1,2,4-Trichlorobenzene	Beryllium	Plutonium-242
1,2-Dichlorobenzene	bis(2-Chloroethoxy)methane	Potassium-40
1,2-Dichloroethane	bis(2-Chloroethyl)ether	Praseodym
1,2-Dichloroethene	Bismuth-207	RDX
1,2-Dichloropropane	Bismuth-210	Samarium
1,2-Diethylbenzene	Bromodichloromethane	Silver
1,3,5-Trinitrobenzene	Bromoform	Styrene
1,3-Dichlorobenzene	Bromomethane	Terbium
1,3-Dinitrobenzene	Butylbenzylphthalate	Tetrachloroethene
1,4-Dichlorobenzene	Calcium	Tetryl
2,2'-oxybis(1-Chloropropane)	Carbon Disulfide	Toxaphene
2,4,5-Trichlorophenol	Cesium-137	trans-1,3-Dichloropropene
2,4,6-Trichlorophenol	Chlorobenzene	Trichloroethene
2,4,6-Trinitrotoluene	Chlorodibromomethane	Trichlorotrifluoroethane
2,4-Dichlorophenol	Chloroethane	Uranium-238
2,4-Dimethylphenol	Chloroform	Vinyl Acetate
2,4-Dinitrophenol	Chloromethane	Vinyl Chloride
2,4-Dinitrotoluene	cis-1,3-Dichloropropene	Ytterbium
2,6-Dinitrotoluene	Cobalt	
2-Amino-4,6-dinitrotoluene	Cobalt-60	
2-Benzyl-4-Chlorophenol	Cyanide	
2-Chloronaphthalene	delta-BHC	
2-Chlorophenol	Di-n-octylphthalate	
2-Hexanone	Dieldrin	
2-Methylphenol	Diethylphthalate	
2-Nitroaniline	Dimethylphthalate	
2-Nitrophenol	Dypsprosium	
3,3'-Dichlorobenzidine	Endosulfan I	
3-Nitroaniline	Endosulfan II	
4,4'-DDE	Endosulfan Sulfate	
4,4'-DDT	Endrin	
4,6-Dinitro-2-methylphenol	Endrin Aldehyde	
4-Bromophenyl-phenylether	Endrin Ketone	
4-Chloro-3-methylphenol	Erbium	
4-Chloroaniline	Gadolinium	
4-Chlorophenyl-phenylether	gamma-BHC	
4-Methyl-2-pentanone	gamma-Chlordane	
4-Methylphenol	Heptachlor	
4-Nitroaniline	Heptachlor Epoxide	
4-Nitrophenol	Hexachlorobenzene	
Acetonitrile	Hexachlorobutadiene	
Acrylonitrile	Hexachlorocyclopentadiene	
Actinium-227	Hexachloroethane	
Aldrin	HMX	
alpha-BHC	Holmium	
Americium-241	Iodomethane	
Aroclor-1016	Isophorone	
Aroclor-1221	Lanthanum	
Aroclor-1232	Methoxychlor	
Aroclor-1242	Molybdenum	

Table IV.2. Analytes Below Background Criteria or Never Detected

SUBSURFACE SOILS			
1,1,1-Trichloroethane	Aluminum	Endosulfan Sulfate	Trichloroethene
1,1,2,2-Tetrachloroethane	Americium-241	Endrin	Trichlorotrifluoroethane
1,1,2-Trichloroethane	Anthracene	Endrin Aldehyde	Tritium
1,1-Dichloroethane	Aroclor-1016	Endrin Ketone	Uranium-234
1,1-Dichloroethene	Aroclor-1221	Ethylbenzene	Uranium-238
1,2,4-Trichlorobenzene	Aroclor-1232	Fluoranthene	Vanadium
1,2-Dichlorobenzene	Aroclor-1242	Fluorene	Vinyl Acetate
1,2-Dichloroethane	Aroclor-1248	Fluoride	Vinyl Chloride
1,2-Dichloroethene	Aroclor-1254	gamma-BHC	Xylene, Total
1,2-Dichloropropane	Aroclor-1260	gamma-Chlordane	Zinc
1,2-Diethylbenzene	Arsenic	Heptachlor	
1,3,5-Trinitrobenzene	Barium	Heptachlor Epoxide	
1,3-Dichlorobenzene	Benzene	Hexachlorobenzene	
1,3-Dinitrobenzene	Benzo(a)anthracene	Hexachlorobutadiene	
1,4-Dichlorobenzene	Benzo(a)pyrene	Hexachlorocylopentadiene	
2,2'-oxybis(1-Chloropropane)	Benzo(b)fluoranthene	Hexachloroethane	
2,4,5-Trichlorophenol	Benzo(g,h,i)perylene	Hexane	
2,4,6-Trichlorophenol	Benzo(k)fluoranthene	HMX	
2,4,6-Trinitrotoluene	Benzoic Acid	Indeno(1,2,3-c,d)pyrene	
2,4-Dichlorophenol	Benzyl Alcohol	Iodomethane	
2,4-Dimethylphenol	Beryllium	Iron	
2,4-Dinitrophenol	beta-BHC	Isophorone	
2,4-Dinitrotoluene	bis(2-Chloroethoxy)methane	Lead	
2,6-Dinitrotoluene	bis(2-Chloroethyl)ether	Manganese	
2-Amino-4,6-dinitrotoluene	Bismuth-207	Mercury	
2-Benzyl-4-Chlorophenol	Bismuth-210	Methoxychlor	
2-Butanone	Bromodichloromethane	Methylene Chloride	
2-Chloronaphthalene	Bromoform	Molybdenum	
2-Chlorophenol	Bromomethane	N-Nitroso-di-n-propylamine	
2-Hexanone	Butylbenzylphthalate	N-Nitrosodiphenylamine	
2-Methylnaphthalene	Cadmium	Naphthalene	
2-Methylphenol	Calcium	Nickel	
2-Nitroaniline	Carbazole	Nitrate-Nitrite-N	
2-Nitrophenol	Carbon Disulfide	Nitrobenzene	
3,3'-Dichlorobenzidine	Carbon Tetrachloride	Pentachlorophenol	
3-Nitroaniline	Cesium-137	Phenanthrene	
4,4'-DDD	Chlorobenzene	Phenol	
4,4'-DDE	Chlorodibromethane	Plutonium-238	
4,4'-DDT	Chloroethane	Plutonium-239	
4,6-Dinitro-2-methylphenol	Chloroform	Plutonium-240	
4-Bromophenyl-phenylether	Chloromethane	Potassium-40	
4-Chloro-3-methylphenol	Chromium	Pyrene	
4-Chloroaniline	Chrysene	Radium-226	
4-Chlorophenyl-phenylether	cis-1,3-Dichloropropene	RDX	
4-Methyl-2-pentanone	Cobalt	Selenium	
4-Methylphenol	Cobalt-60	Silver	
4-Nitroaniline	Copper	Sodium	
4-Nitrophenol	Cyanide	Styrene	
Acenaphthene	delta-BHC	Tetrachloroethene	
Acenaphthylene	Dibenzo(a,h)anthracene	Thallium	
Acetonitrile	Dibenzofuran	Thorium-228	
Acrylonitrile	Dieldrin	Thorium-230	
Actinium-227	Diethylphthalate	Thorium-232	
Aldrin	Dimethylphthalate	Toluene	
alpha-BHC	Endosulfan I	Toxaphene	
alpha-Chlordane	Endosulfan II	trans-1,3-Dichloropropene	

Table IV.2. Analytes Below Background Criteria or Never Detected

GROUNDWATER		
1,1,1-Trichloroethane	4-Nitroaniline	Dieldrin
1,1,1-Trichloroethane	4-Nitrophenol	Diethylphthalate
1,1,2,2-Tetrachloroethane	Acenaphthene	Dimethylphthalate
1,1,2-Trichloro-1,2,2-Trifluoroethane	Acenapthylene	Endosulfan I
1,1,2-Trichloroethane	Acetone	Endosulfan II
1,1-Dichloroethane	Acetonitrile	Endosulfan Sulfate
1,1-Dichloroethene	Actinium-227	Endrin
1,2,3-Trichloropropane	Aldrin	Endrin Aldehyde
1,2,4-Trichlorobenzene	alpha-BHC	Endrin Ketone
1,2-cis-Dichloroethene	alpha-Chlordane	Ethylbenzene
1,2-Dichlorobenzene	Anthracene	Fluoranthene
1,2-Dichloroethane	Aroclor-1016	Flourene
1,2-Dichloropropane	Aroclor-1221	gamma-BHC
1,2-Diethylbenzene	Aroclor-1232	gamma-Chlordane
1,2-trans-Dichloroethene	Aroclor-1242	Heptachlor
1,3,5-Trinitrobenzene	Aroclor-1248	Heptachlor Expoxide
1,3-Dichlorobenzene	Aroclor-1254	Hexachlorobenzene
1,3-Diethylbenzene	Aroclor-1260	Hexachlorobutadiene
1,3-Dinitrobenzene	Benzene	Hexachlorocyclopentadiene
1,4-Dichlorobenzene	Benzo(a)anthracene	Hexachloroethane
1,4-Diethylbenzene	Benzo(a)pyrene	HMX
1-Chlorohexane	Benzo(b)fluoranthene	Indeno(1,2,3-c,d)pyrene
2,2'-oxybis(1-Chloropropane)	Benzo(g,h,i)perylene	Iodomethane
2,4,5-Trichlorophenol	Benzo(k)fluoranthene	Isophorone
2,4,6-Trichlorophenol	Benzoic Acid	Methoxychlor
2,4-Dichlorophenol	Benzyl Alcohol	Methylene Chloride
2,4-Dimethylphenol	beta-BHC	N-Nitroso-di-n-propylamine
2,4-Dinitrophenol	bis(2-Chloroethoxy)methane	N-Nitrosodiphenylamine
2,4-Dinitrotoluene	bis(2-Chloroethyl)ether	Naphthalene
2,6-Dinitrotoluene	Bismuth-207	Nitrobenzene
2-Amino-4,6-dinitrotoluene	Bismuth-210	Pentachlorophenol
2-Benzyl-4-Chlorophenol	Bromobenzene	PETN
2-Butanone	Bromodichloromethane	Phenanthrene
2-Chloroethylvinylether	Bromoform	Plutonium-238
2-Chloronaphthalene	Bromomethane	Potassium-40
2-Chlorophenol	Butylbenzylphthalate	Pyrene
2-Chlorotoluene	Cadmium	RDX
2-Hexanone	Carbazole	Silver
2-Methylnaphthalene	Carbon Disulfide	Strontium-90
2-Methylphenol	Carbon Tetrachloride	Styrene
2-Nitroaniline	Cesium-137	Tetrachloroethene
2-Nitrophenol	Chlorobenzene	Tetryl
3,3'-Dichlorobenzidine	Chlorodibromomethane	Tin
3-Nitroaniline	Chloroethane	Toxaphene
4,4'-DDD	Chloroform	trans-1,3-Dichloropropene
4,4'-DDE	Chloromethane	Trichlorofluoromethane
4,4'-DDT	Chrysene	Trichlorotrifluoroethane
4,6-Dinitro-2-methylphenol	cis-1,3-Dichloropropene	Vinyl Acetate
4,6-Dinitro-O-Cresol	Cobalt-60	Vinyl Chloride
4-Bromophenyl-phenylether	Cyanide	Xylene, Total
4-Chloro-3-methylphenol	delta-BHC	
4-Chloroaniline	Di-n-octylphthalate	
4-Chlorophenyl-phenylether	Dibenzo(a,h)anthracene	
4-Chlorotoluene	Dibenzofuran	
4-Methyl-2-pentanone	Dibromochloromethane	
4-Methylphenol	Dibromomethane	

Table IV.2. Analytes Below Background Criteria or Never Detected

SEEPS			
1,1,1-Trichloroethane	Anthracene	Endosulfan Sulfate	Uranium-238
1,1,2,2-Tetrachloroethane	Antimony	Endrin	Vinyl Acetate
1,1,2-Trichloro-1,2,2-Trifluoroethane	Aroclor-1016	Endrin Aldehyde	Vinyl Chloride
1,1,2-Trichloroethane	Aroclor-1221	Endrin Ketone	Xylene, Total
1,1-Dichloroethane	Aroclor-1232	Ethylbenzene	Zinc
1,1-Dichloroethene	Aroclor-1242	Fluoranthene	
1,2,4-Trichlorobenzene	Aroclor-1248	Fluorene	
1,2-Dichlorobenzene	Aroclor-1254	Fluoride	
1,2-Dichloroethane	Aroclor-1260	gamma-BHC	
1,2-Dichloroethene	Arsenic	gamma-Chlordane	
1,2-Dichloropropane	Barium	Heptachlor	
1,2-Diethylbenzene	Benzene	Heptachlor Epoxide	
1,3-Dichlorobenzene	Benzo(a)anthracene	Hexachlorethane	
1,4-Dichlorobenzene	Benzo(a)pyrene	Hexachlorobenzene	
2,2'-oxybis(1-Chloropropane)	Benzo(b)fluoranthene	Hexachlorobutadiene	
2,4,5-Trichlorophenol	Benzo(g,h,i)perylene	Hexachlorocyclopentadiene	
2,4,6-Trichlorophenol	Benzo(k)fluoranthene	Hexane	
2,4,6-Trinitrotoluene	Benzoic Acid	HMX	
2,4-Dichlorophenol	Benzyl Alcohol	Indeno(1,2,3-c,d)pyrene	
2,4-Dimethylphenol	Beryllium	Isophorone	
2,4-Dinitrophenol	beta-BHC	Lead	
2,4-Dinitrotoluene	bis(2-Chloroethoxy)methane	Lithium	
2,6-Dinitrotoluene	bis(2-Chloroethyl)ether	Manganese	
2-Amino-4,6-dinitrotoluene	bis(2-Ethylhexyl)phthalate	Mercury	
2-Benzyl-4-Chlorophenol	Bismuth	Methoxychlor	
2-Butanone	Bismuth-207	Methylene Chloride	
2-Chloronaphthalene	Bismuth-210	Molybdenum	
2-Chlorophenol	Bromodichloromethane	N-Nitroso-di-n-propylamine	
2-Hexanone	Bromoform	N-Nitrosodiphenylamine	
2-Methylnaphthalene	Bromomethane	Naphthalene	
2-Methylphenol	Butylbenylphthalate	Nickel	
2-Nitroaniline	Cadmium	Nitrate-Nitrite-N	
2-Nitrophenol	Carbazole	Nitrobenzene	
3,3'-Dichlorobenzidine	Carbon Disulfide	Pentachlorophenol	
3-Nitroaniline	Carbon Tetrachloride	Phenanthrene	
4,4'-DDD	Cesium-137	Phenol	
4,4'-DDE	Chlorobenzene	Plutonium-238	
4,4'-DDT	Chlorodibromomethane	Plutonium-239	
4,6-Dinitro-2-methylphenol	Chloroethane	Plutonium-240	
4-Bromophenyl-phenylether	Chloroform	Potassium	
4-Chloro-3-methylphenol	Chloromethane	Potassium-40	
4-Chloroaniline	Chromium	Pyrene	
4-Chlorophenyl-phenylether	Chrysene	Radium-226	
4-Methyl-2-pentanone	cis-1,3-Dichloropropene	RDX	
4-Methylphenol	Cobalt-60	Selenium	
4-Nitroaniline	Cyanide	Styrene	
4-Nitrophenol	delta-BHC	Tetrachloroethene	
Acenaphthene	Di-n-butylphthalate	Tetryl	
Acenaphthylene	Di-n-octylphthalate	Thorium-230	
Acetone	Dibenzo(a,h)anthracene	Thorium-232	
Acetonitrile	Dibenzofuran	Tin	
Acrylonitrile	Dieldrin	Toluene	
Aldrin	Diethylphthalate	Toxaphene	
alpha-BHC	Dimethylphthalate	trans-1,3-Dichloropropene	
alpha-Chlordane	Endosulfan I	Tritium	
Ammonia	Endosulfan II	Uranium-235	

4.3.1. Nature and Extent of Contamination in Surface Soil and Sediment Samples

A total of 59 soil and sediment samples were collected from 0.0 to 2.0 feet BGS and include 27 sediment samples, 17 RSI soil samples, and 15 surface soil samples from borings and wells. Surface soils and sediments were analyzed for anions, metals, TOC, explosives, pesticides/PCBs, SVOCs, VOCs, and radionuclides. Sediments were also analyzed for rare earth elements. Generally, contamination in soils and sediment is present at levels indistinguishable from background. With the exception of metals and radionuclides, the contaminants present at the New Property apparently do not originate from past or current activities at the site. Most of the metals that occur above background are found predominantly in two zones: along the northern perimeter road and immediately south of the Spoils Disposal Area. Radionuclide contamination consists mainly of Pu-238 in soils and sediment in and around Area 1. The highest concentration of any radionuclide was 21.87 picocuries per gram (pCi/g) of Pu-238 (below Mound's cleanup criterion) in a sediment sample downhill from Area 1. VOCs and SVOCs are found throughout the New Property, generally at low concentrations. All COPC PAHs are found in the main branch of the ephemeral stream. Alpha-chlordane, a pesticide, was found in one sample, and is a COPC. Four other SVOCs are COPCs based on their detection above background or detection limits in no more than six samples each. The greatest concentrations of these compounds are in the southwest quadrant of the New Property. Anions, metals, two non-PAH SVOCs, and radionuclides were also identified as ecoCOPCs.

The following discussion describes the results of the surface soil and sediment analysis in detail.

4.3.1.1. Anions

Four anions were detected in surface soil and sediment samples above background criteria: chloride, fluoride, nitrate-nitrite, and sulfate. None of these anions were identified as human health COPCs, but all were identified as ecoCOPCs. Anion concentrations above background are shown in Appendix B.3.

Chloride was detected in four surface soil and four sediment samples above background with a maximum concentration of 1,180 milligrams per kilogram (mg/kg) from RSI sample AK (Figure 2.3). Six of the samples were collected along the northern perimeter road. Concentrations ranged from 1.1 to 11.0 times background.

Fluoride was detected in one sediment and two surface soil samples above background with a maximum concentration of 20.5J mg/kg from well W411. The two surface soil samples (W411 and SD04) were collected within or very near the Area 1 "arm" along the northern perimeter road. Concentrations ranged from 1.1 to 3.1 times background.

Nitrate-nitrite was detected in five sediment samples above background with a maximum concentration of 10,500J mg/kg from sample SD21. The concentration in this sample was 404 times background. Two of these sediment samples (SD01 and SD03) were collected from the Area 1 "arm" along the northern perimeter road. The remaining samples (SD21, SD24, and SD26) were collected south of the Spoils Disposal Area.

Sulfate was the most widespread anion in surface soil and sediment samples. It was fairly evenly distributed over the New Property with the exception of the low-lying flatland in the southwest corner of the property. Sulfate was detected above background in 27 samples (16 sediment samples and 11 borehole samples) with a maximum concentration of 1,910J mg/kg from well W411. Concentrations ranged from 1.1 to 12.7 times background.

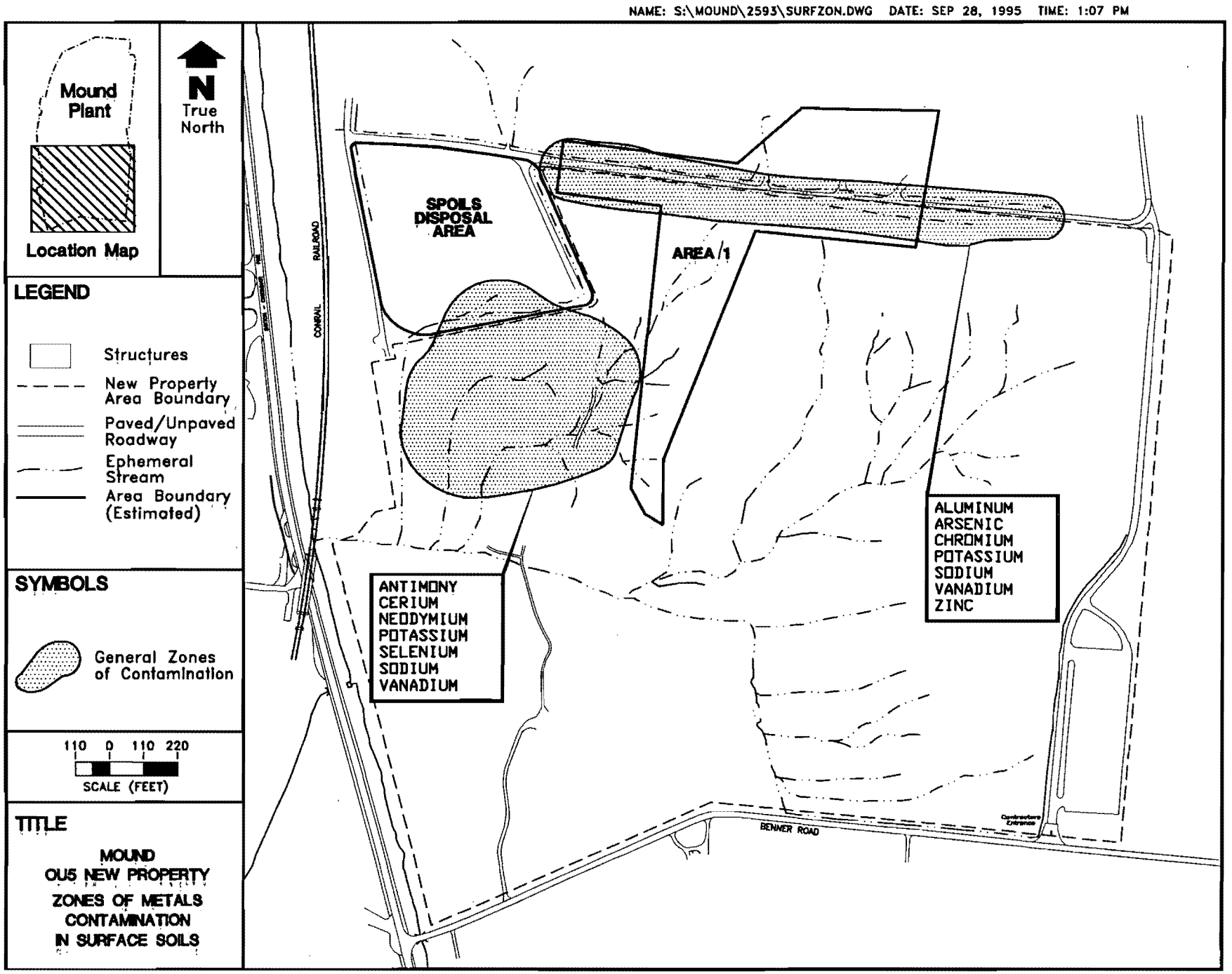
4.3.1.2. Metals

Twenty-three metals were detected in New Property surface soil and sediment samples above background criteria. Of these, antimony, arsenic, bismuth, cadmium, cerium, lead, manganese, mercury, neodymium, selenium, thallium, tin, vanadium, and zinc were identified as human health COPCs. The same metals, with the exception of lead and manganese, were identified as ecoCOPCs.

Some general observations can be made about metals contamination in New Property surface soil samples. First, although 23 metals were detected above background criteria, few of them were widespread over the New Property. Specifically, only cerium, neodymium, potassium, sodium, and vanadium were found above background criteria in more than 30% of the samples. Most of the remaining metals were found above background in only 2-7% of the samples.

Second, metals contamination is found in two general zones (Figure 4.3). The first zone is along the northern perimeter road including portions of the Area 1 "arm." Metals found here included aluminum, arsenic, chromium, potassium, sodium, vanadium, and zinc. The second zone is an area south of the

Figure 4.3. Zones of Metals Contamination in Surface Soils and Sediments



Spoils Disposal Zone and north of the main branch of the ephemeral stream. Metals found here included antimony, cerium, neodymium, potassium, selenium, sodium, and vanadium.

A third observation is that sediment sample SD09 collected in the northeast corner of the New Property (Figure 2.1) seems to be particularly contaminated with metals. Sixteen of the 23 metals detected above background values were found in this sample. In addition, this sample accounted for seven of the maximum detects (arsenic, cadmium, lead, manganese, thallium, tin, and zinc). Field notes show that glass and metal debris were found slightly upstream from this sampling point. This may indicate that there was an historic dumping ground used by the farmer tenant somewhere in the vicinity of SD09 and may be contributing to the metals detected in this sample and in other samples further down the ephemeral stream.

The following subsections describe the nature and extent of the 23 metals detected above background values in the New Property surface soil samples, beginning with the metals identified as COPCs. Concentrations are stated with a validation qualifier (J), as appropriate, for estimated values.

COPC Metals

Antimony

Antimony was detected in two surface soil and seven sediment samples above the background criteria of 0.45 mg/kg. The maximum concentration was 3.30J mg/kg from well W402. Concentrations are 2.9 to 7.3 times background. The only discernible patterns of antimony contamination are along the branches of the ephemeral stream draining the northeastern and eastern sections of the New Property, and a small zone in and south of the Spoils Disposal Area (Figure 4.4).

Arsenic

Arsenic was detected in seven surface soil and three sediment samples above the background criteria of 8.6 mg/kg. The maximum concentration was 17.1J mg/kg from sediment sample SD09. The only discernible pattern of arsenic contamination is along the northern perimeter road as shown in Figure 4.5; the remaining samples with concentrations exceeding background are randomly scattered over the New

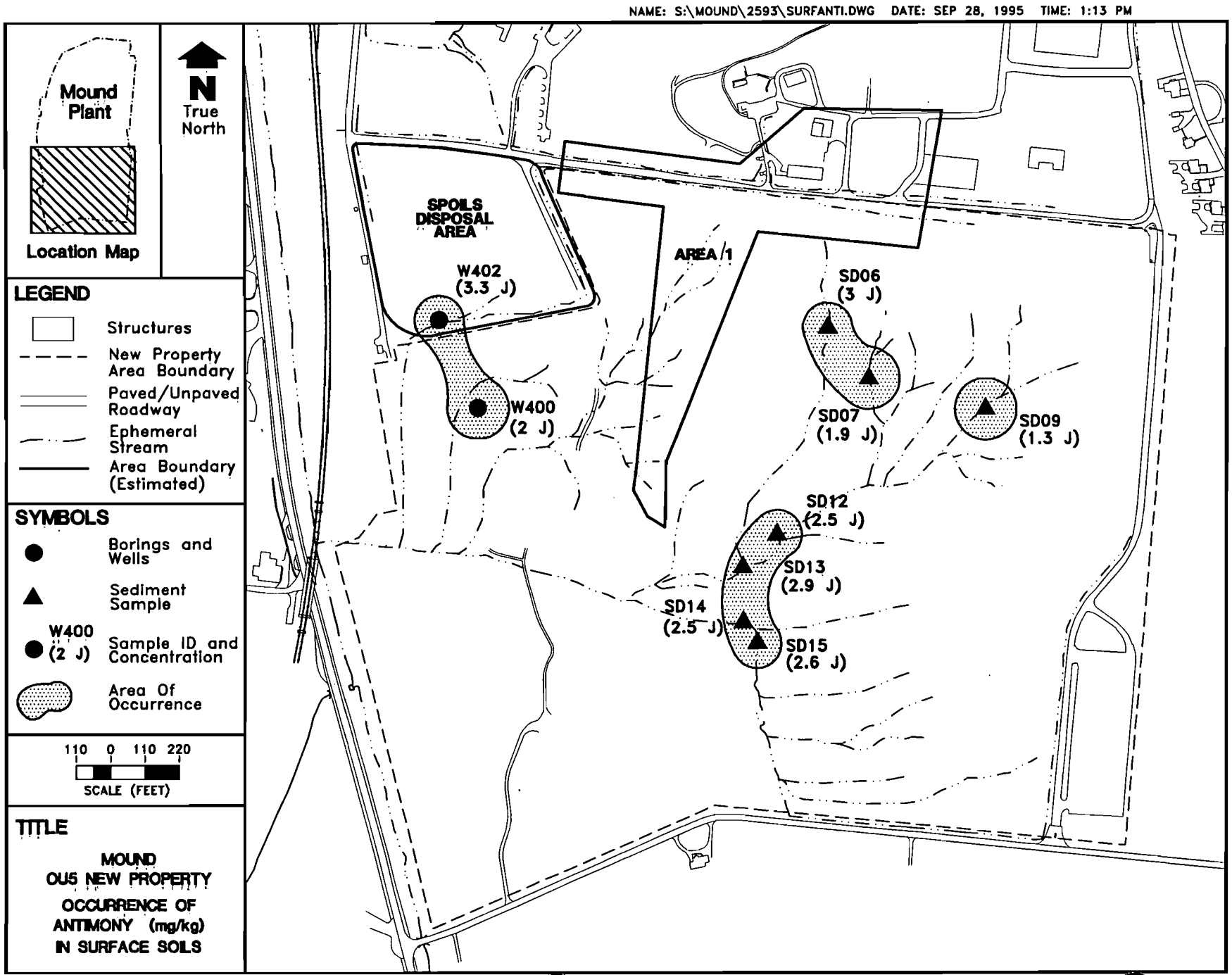


Figure 4.4. Occurrence of Antimony Above Background in Surface Soil and Sediment Samples (mg/kg)

NAME: S:\MOUND\2593\SURFARSE.DWG DATE: SEP 28, 1995 TIME: 1:05 PM

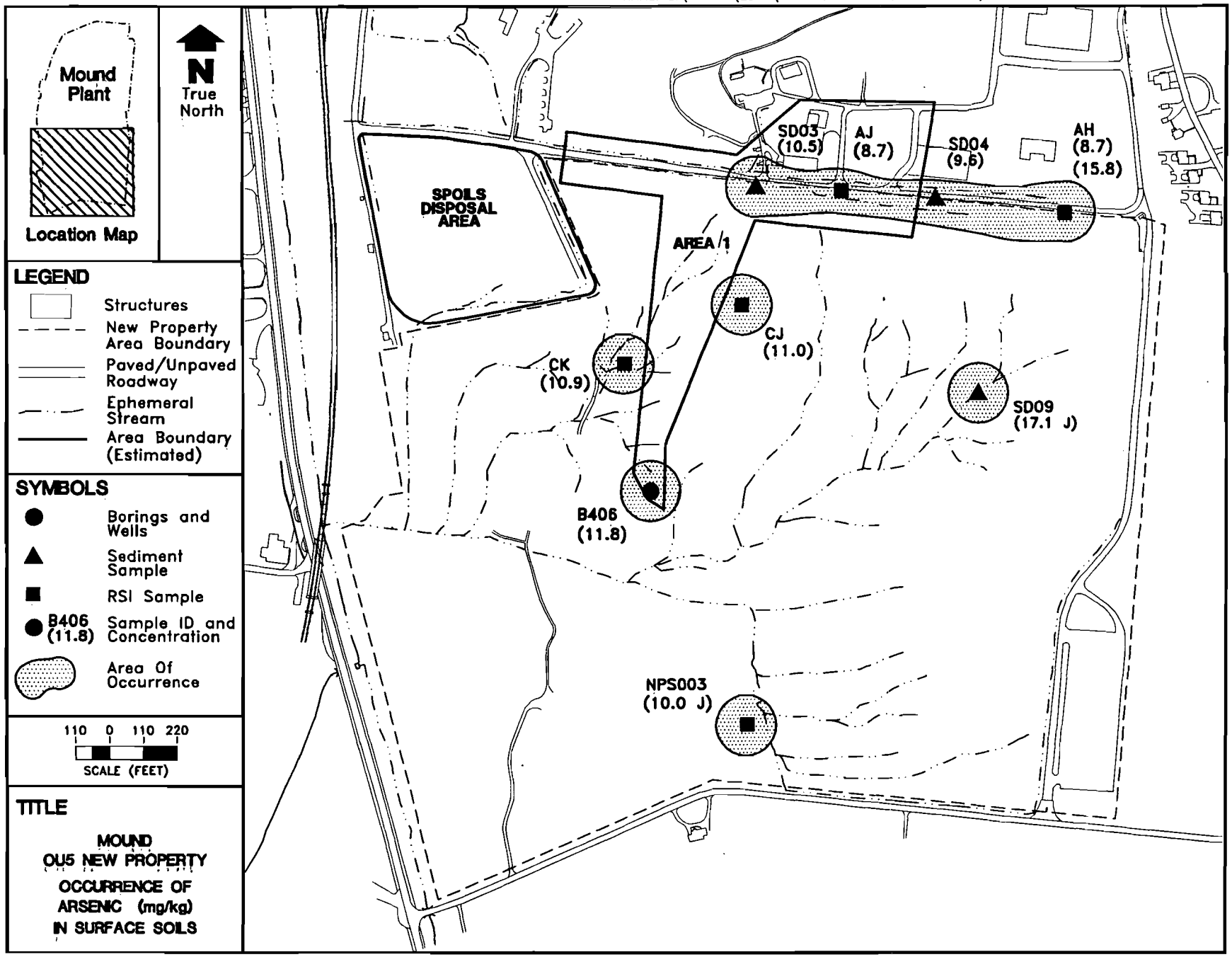


Figure 4.5. Occurrence of Arsenic Above Background in Surface Soil and Sediment Samples (mg/kg)

Property. Except for SD09 and RSI sample AH where the concentrations were about twice background, the remaining samples had arsenic concentrations from 1.0 to 1.4 times background criteria.

Bismuth

Bismuth was detected in four RI samples and four sediment samples above the background criterion of 39.0 mg/kg. The maximum concentration was 70.4 mg/kg from RSI sample CJ at a depth of 1.5 to 2.0 feet. There is an apparent pattern of bismuth contamination along the main branch of the ephemeral stream (Figure 4.6) where concentrations are fairly consistent at about 1.5 times background (i.e., concentrations do not tend to increase downstream).

Cadmium

Cadmium was detected in one sediment sample above the background criterion of 2.10 mg/kg. The concentration was 5.0J mg/kg from sediment sample SD09, which is 2.4 times the background criterion.

Cerium

Cerium was detected in seven sediment samples. No background criterion has been established for cerium. The maximum concentration was 50.90 mg/kg from sediment sample SD23. There are two zones of cerium contamination as shown in Figure 4.7. The first zone is south and downgradient from the Spoils Disposal Area and the second is a small area near the head of the ephemeral stream drainage in the east central portion of the New Property. Cerium was not detected downstream of this area, indicating that there may be a localized source of cerium contamination near this point and that cerium is not being transported in the stream.

Lead

Lead was detected in one sediment sample above the background criterion of 48.0 mg/kg. The concentration was 255.0J mg/kg from sample SD09, which is 5.3 times the background criterion.

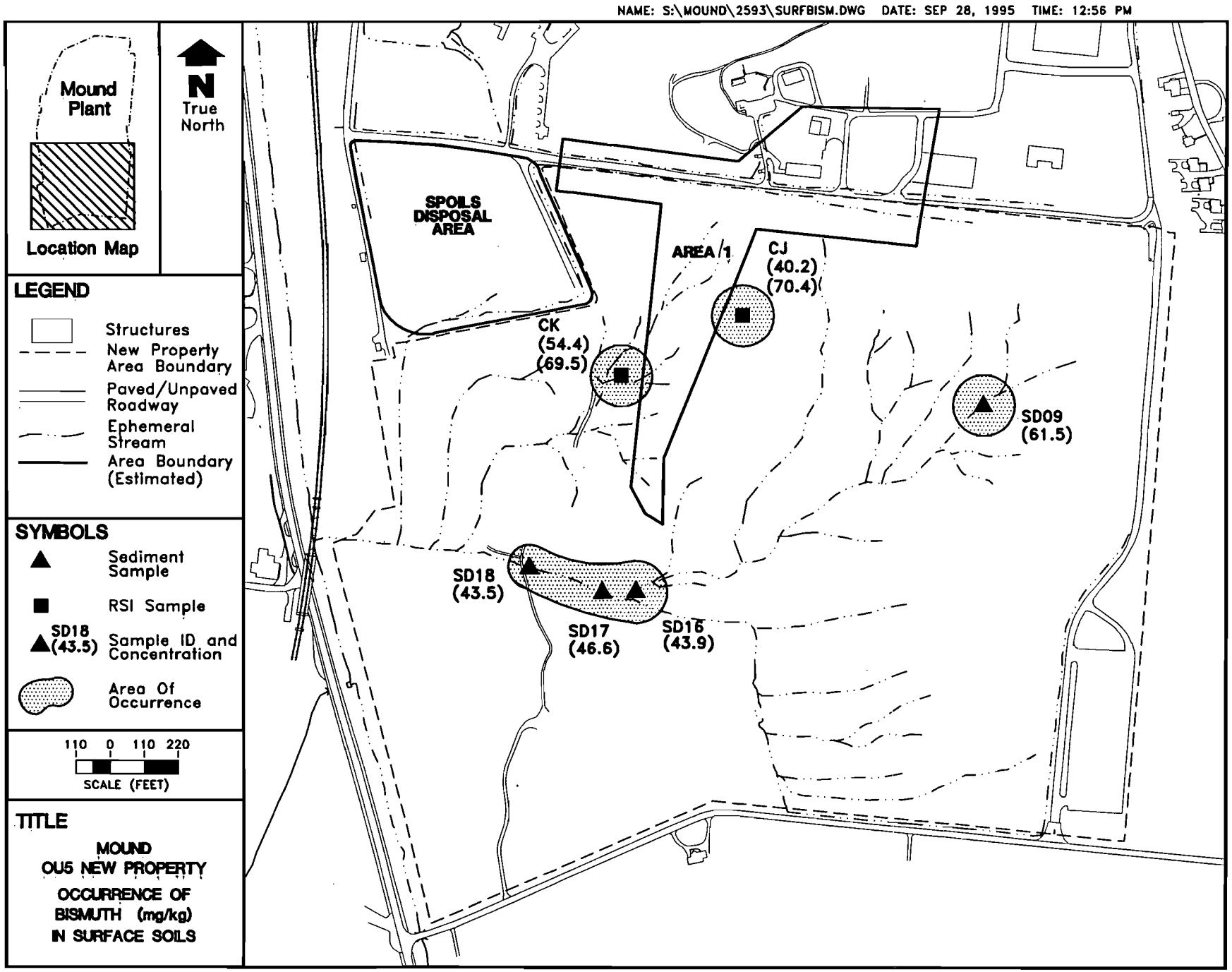


Figure 4.6. Occurrence of Bismuth Above Background in Surface Soil and Sediment Samples (mg/kg)

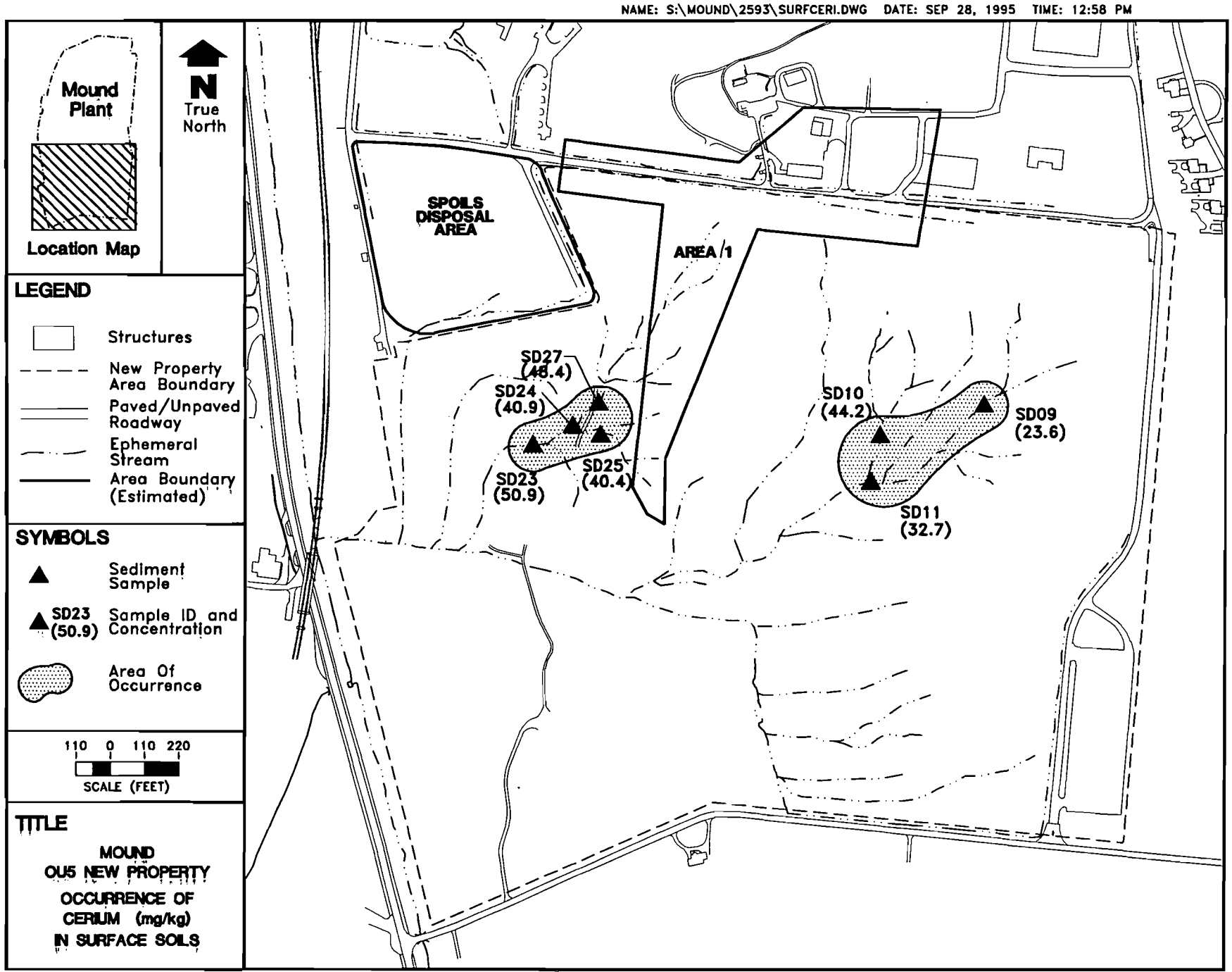


Figure 4.7. Occurrence of Cerium in Sediment Samples (mg/kg)

Manganese

Manganese was detected in one sediment sample above the background criterion of 1400 mg/kg. The concentration was 5,240J mg/kg from sample SD09, which is 3.7 times background.

Mercury

Mercury was detected in one surface soil sample above the background criterion of 0.15 mg/kg. The concentration was 0.42J mg/kg (2.8 times background) from RSI sample NPS006.

Neodymium

Neodymium was detected in six sediment samples. No background criterion has been established for neodymium. The maximum concentration was 33.4 mg/kg from sediment sample SD23. Neodymium contamination occurs in two zones as shown in Figure 4.8. The first zone (samples SD23, SD24, and SD27) is centered around the remnants of an old road south of the Spoils Disposal Area and the second zone (samples SD09, SD10, and SD11) is found along the upper reaches of the ephemeral stream drainage in the east central portion of the New Property. Neodymium was not detected downstream of these areas, indicating that there may be localized sources of neodymium contamination near these points and that neodymium is not being transported downstream.

Selenium

Selenium was detected in four surface soil and five sediment samples above the background criterion of 0.59 mg/kg. The maximum concentration was 2.2J mg/kg from RSI sample CJ at a depth of 0.0 to 0.5 feet BGS. Concentrations ranged from 1.3 to 3.7 times background. Selenium contamination in surface soil and sediment samples is fairly scattered over the New Property (Figure 4.9) although three detects (sediment samples SD26 and SD27 and RSI sample CK) are localized south of the Spoils Disposal Area.

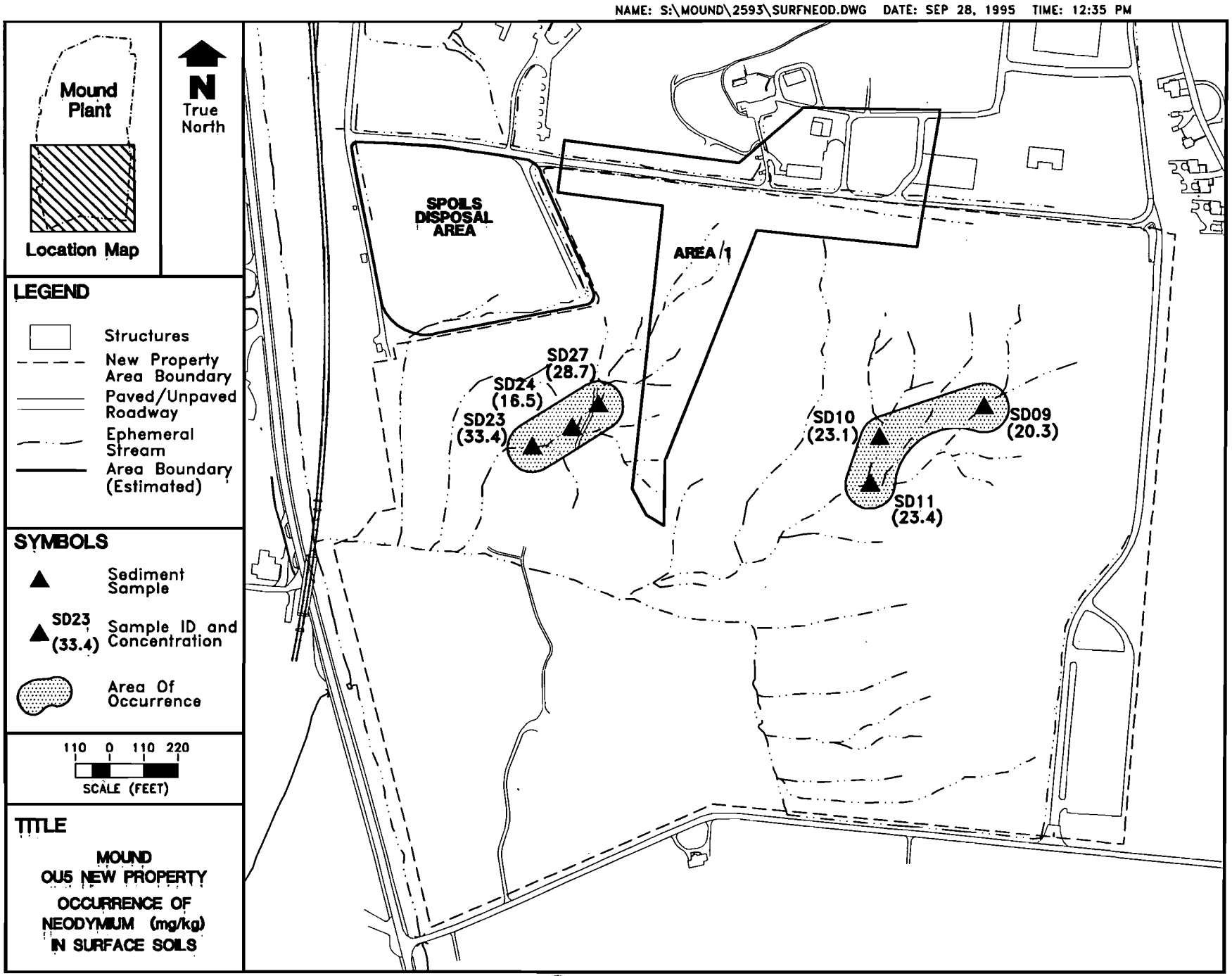


Figure 4.8. Occurrence of Neodymium in Sediment Samples (mg/kg)

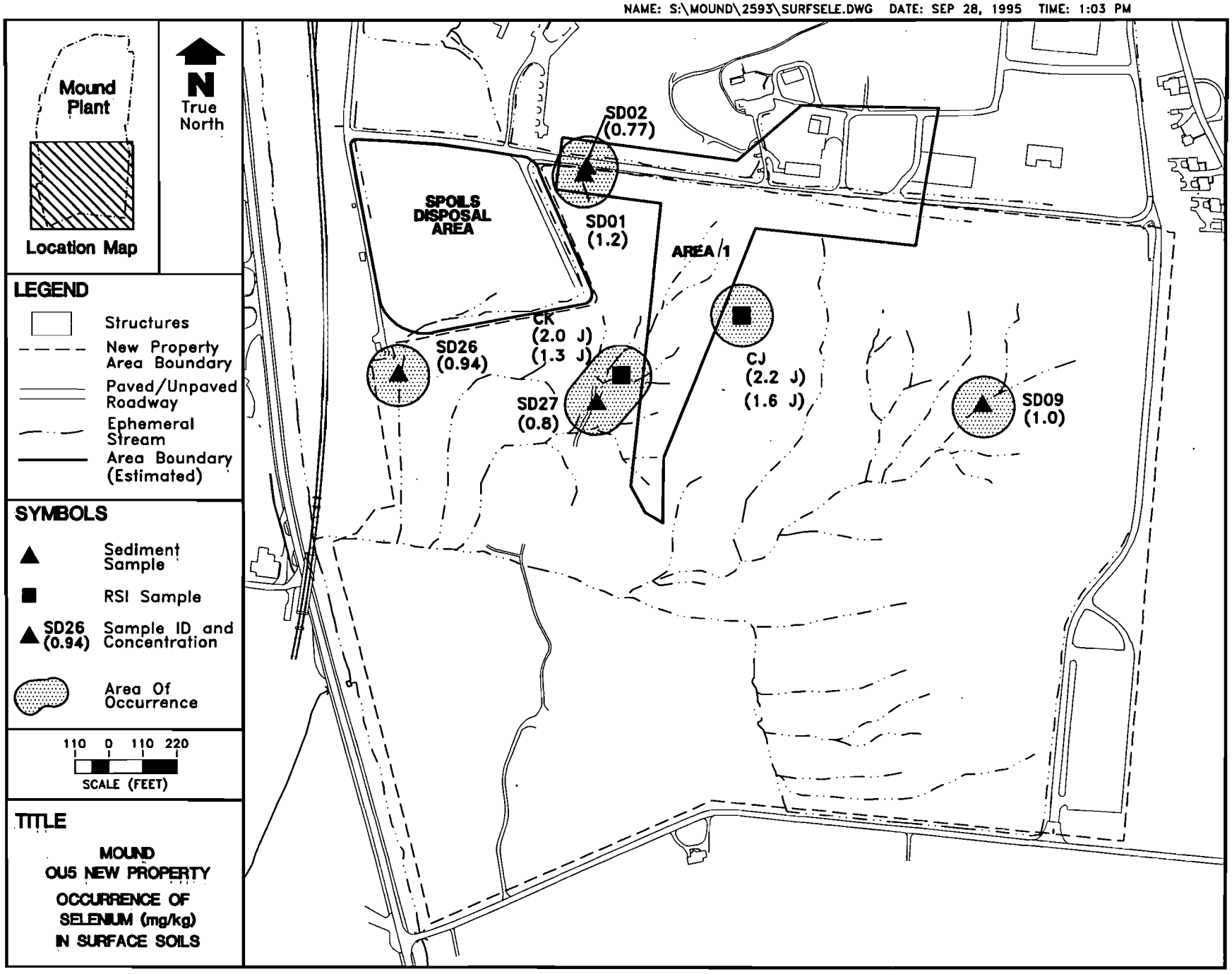


Figure 4.9. Occurrence of Selenium Above Background in Surface Soil and Sediment Samples (mg/kg)

Thallium

Thallium was detected in one surface soil sample (RSI sample CJ) and one sediment sample (SD09) above the background criterion of 0.46 mg/kg. The maximum concentration was 2.10J mg/kg from the sediment sample. Both these samples were collected from the upper reaches of the ephemeral stream.

Tin

Tin was detected in one sediment sample above the background criterion of 20.0 mg/kg. The concentration was 41.1 mg/kg (2.1 times background) from sample SD09.

Vanadium

Vanadium was detected in nine surface soil and ten sediment samples above the background criterion of 25.0 mg/kg. The maximum concentration was 38.3 mg/kg from RSI soil sample AH at a depth of 1.5 to 2.0 feet BGS. Concentrations were 1.0 to 1.5 times background. Vanadium contamination is found mostly in two zones as shown in Figure 4.10. The first zone is along the northern perimeter road and the second zone is an area south of the Spoils Disposal Area.

Zinc

Zinc was detected in one sediment and three surface soil samples above the background criterion of 140.0 mg/kg. The maximum concentration was 1,310J mg/kg (9.4 times background) from sediment sample SD09. The remaining samples (RSI soil samples AK, AJ, and AH) are scattered along the northern perimeter road and ranged from 1.6 to 2.0 times background (Figure 4.11).

Non-COPC Metals

Metals that are not COPCs but were detected above background criteria include aluminum, chromium, copper, iron, lithium, magnesium, nickel, potassium, and sodium. Aluminum and chromium were mainly detected above background along the northern perimeter road. Concentrations of these metals ranged from 1.0 to 1.5 times background criteria. Copper, iron, lithium, and magnesium were detected above background criteria from samples scattered over the New Property with no discernible contamination

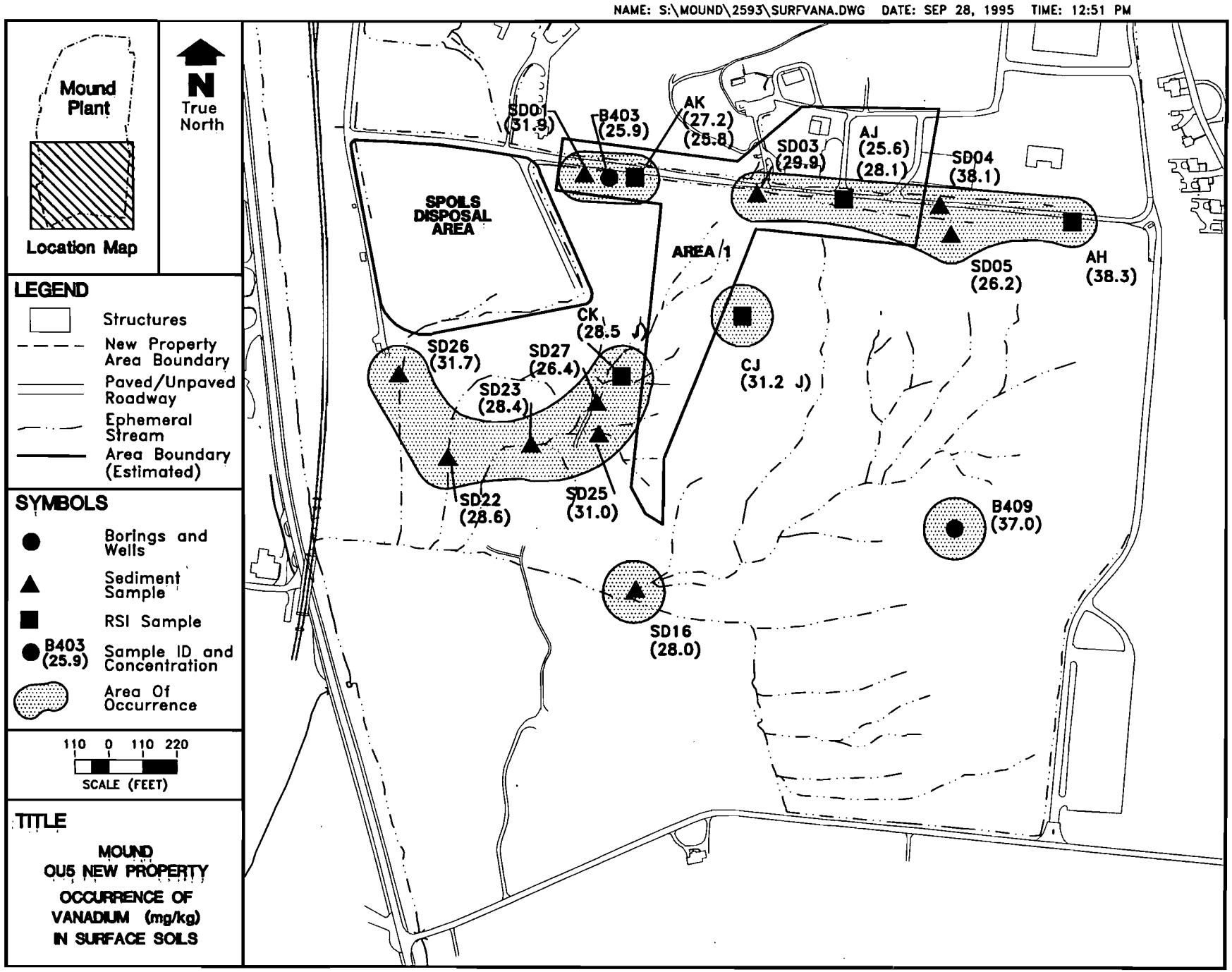


Figure 4.10. Occurrence of Vanadium Above Background in Surface Soil and Sediment Samples (mg/kg)

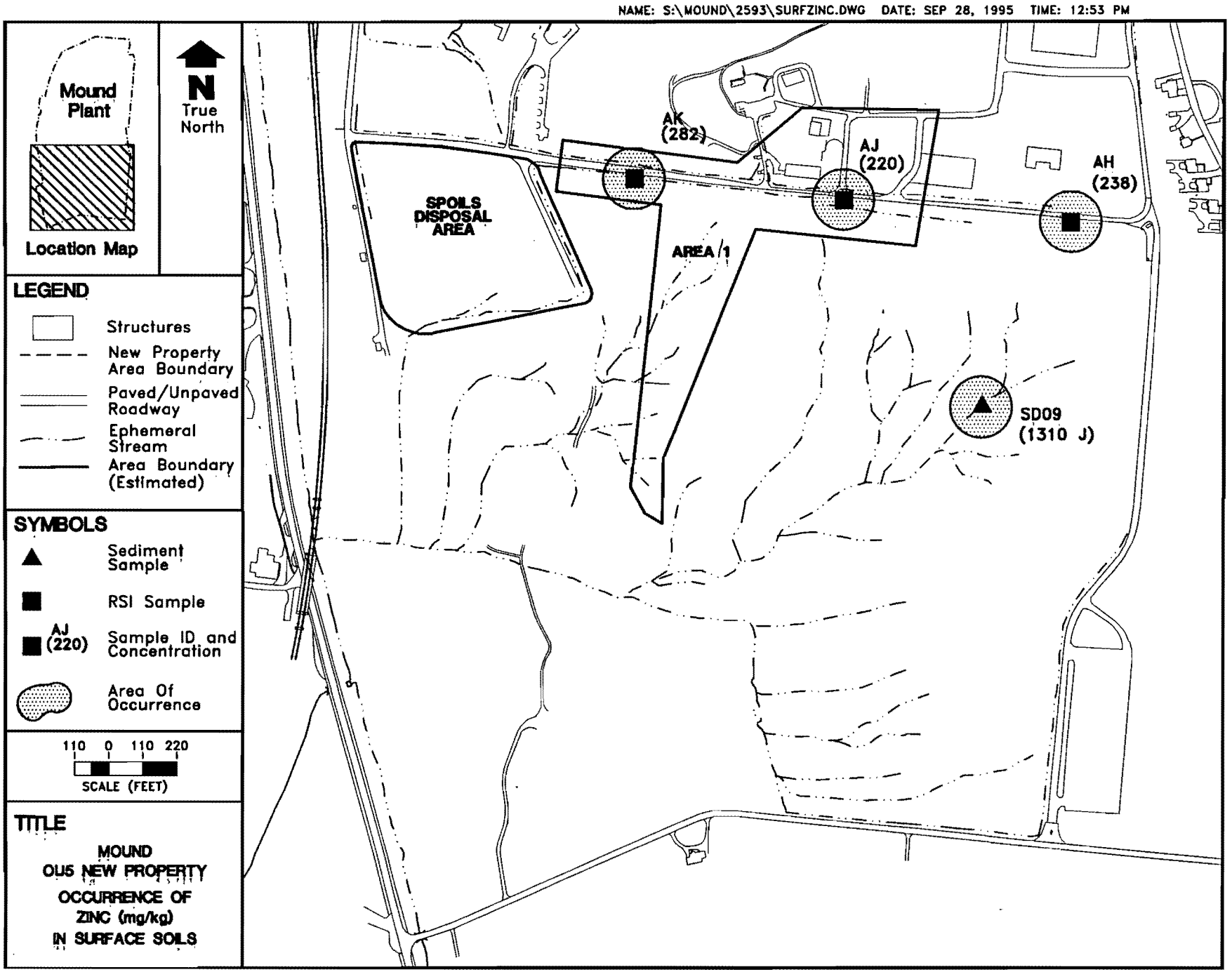


Figure 4.11. Occurrence of Zinc Above Background in Surface Soil and Sediment Samples (mg/kg)

trends. Nickel was detected only in RSI soil sample AH in the northeast corner of the property at 1.3 times the background criterion. Potassium and sodium contamination was generally widespread over the New Property except where absent in the flat-lying lowlands in the southwest corner of the property. However, concentrations of these metals were generally low, at 1.1 to 2.8 times background for potassium and 1.9 to 7.4 times background for sodium (excluding the maximum sodium concentration of 3450 mg/kg from sediment sample SD04).

4.3.1.3. Total Organic Carbon

TOC was detected above the background criterion of 28,000 mg/kg in three surface soil samples from borings B401, B403, and B408. Two of these boreholes (B401 and B408) are located along the main branch of the ephemeral stream. The average TOC concentration from B401, B403, and B408 was 33,275J mg/kg, 90,200J mg/kg, and 40,225J mg/kg, respectively.

4.3.1.4. Explosives

Two explosives were found above laboratory detection limits in New Property surface soil samples: 1,3-dinitrobenzene and 2,4,6-trinitrotoluene. Neither were identified as either human health or ecological COPCs. The two explosives were found in samples collected from borings B398 and B405, which are located in the northern portion of the site near the Area 1 "arm."

4.3.1.5. Pesticides/Polychlorinated Biphenyls

Three pesticides were detected in surface soil and sediment samples above background criteria or laboratory detection limits: 4,4'-DDD, alpha-chlordane, and beta-BHC. Of these, only alpha-chlordane was identified as a human health COPC. No PCBs were detected.

Alpha-chlordane was detected in one sediment sample above the background criterion of 1.9 micrograms per kilogram (μg/kg). Sample SD19 had a concentration of 3.50J μg/kg, which is 1.8 times background.

4,4'-DDD was detected in the surface soil sample from boring B409 above the background criterion of 4.2 μg/kg. The concentration was 6.6J μg/kg (1.6 times background). Beta-BHC was detected in RSI soil sample AJ at 0.18J μg/kg from a depth of 1.5 to 2.0 feet BGS (no background criteria has been

established for beta-BHC). There is no discernible trend to pesticide contamination; pesticides are widely dispersed over the New Property at low concentrations.

4.3.1.6. Semi-Volatile Organic Compounds

Twenty-two SVOCs were detected above laboratory detection limits in surface soil samples. No background criteria have been established for SVOCs.

COPC Semi-Volatile Organic Compounds

The following sections discuss COPC SVOCs in surface soil samples. For brevity of discussion, these SVOCs can be grouped as polycyclic aromatic hydrocarbons (PAHs), phthalate esters, and other SVOCs.

Polycyclic Aromatic Hydrocarbons

PAHs are a class of compounds consisting of polycyclic aromatic rings formed by the incomplete combustion of organic materials such as fuels. PAHs identified as human health COPCs include acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. These PAHs were also identified as ecoCOPCs, with the exception of benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluorene, and pyrene. The location and maximum and average concentration of each PAH is presented in Table IV.3.

For Figures 4.12 through 4.15, the following codes are used to identify the PAHs:

acenaphthylene	ACEN	chrysene	CHRY
anthracene	ANTH	dibenzo(a,h)anthracene	DBAH
benzo(a)anthracene	BZAA	fluoranthene	FLUT
benzo(a)pyrene	BZAP	fluorene	FLUO
benzo(b)fluoranthene	BZBF	indeno(1,2,3-cd)pyrene	I123
benzo(g,h,i)perylene	BGHI	phenanthrene	PHEN
benzo(k)fluoranthene	BZKF	pyrene	PYRE

Some general observations can be made about the extent of PAH contamination in New Property surface soil and sediment samples. The first observation is that PAHs were found in four zones. Zone 1 is along

Table IV.3. Summary of Polycyclic Aromatic Hydrocarbons Detected in New Property Surface Soil and Sediment Samples

Analyte	Maximum Concentration (μg/kg)	Location of Maximum Concentration	Average Concentration[a] (μg/kg)
Acenaphthylene	290J	SD15	200
Anthracene	690	SD15	206
Benzo(a)anthracene	2800	SD15	273
Benzo(a)pyrene	2500	SD15	270
Benzo(b)fluoranthene	4800	SD15	341
Benzo(g,h,i)perylene	250J	SD18	200
Benzo(k)fluoranthene	8600J	SD15	502
Chrysene	2400J	SD15	259
Dibenzo(a,h)anthracene	130J	SD15	197[a]
Fluoranthene	5000	SD15	336
Fluorene	460	SD15	201
Indeno(1,2,3-cd)pyrene	850	SD15	214
Phenanthrene	3700	SD15	297
Pyrene	3300	SD15	290

a The average concentration is the arithmetic mean of all detects of an analyte. Because of variable detection limits, the average concentration can exceed the maximum concentration

SD denotes sediment samples

μg/kg micrograms per kilogram

the main branch of the ephemeral stream, as shown in Figure 4.12. All of the identified PAH COPCs were found in Zone 1. In most cases, these PAHs were found in sediment samples although several of them were detected in surface soil samples from borings B401 and B408.

Zone 2 is the area drained by the upper reaches of the ephemeral stream to the northeast and east, as shown in Figure 4.13. PAHs detected in Zone 2 include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene. These PAHs were detected in sediment samples, in surface soil samples from borings B407 and B409, and well W399, and in RSI sample CJ.

Zone 3 is in the low-lying area south of the Spoils Disposal Area, as shown in Figure 4.14. PAHs detected in Zone 3 include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Most of these PAHs were detected in sediment samples although several were found in surface soil samples from wells W400 and W402.

Zone 4 is found along the northern perimeter road, as shown in Figure 4.15. PAHs detected in Zone 4 include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Most of these PAHs were detected in sediment samples although several were found in surface soil samples from borings B403 and B404, and RSI sample AJ.

The second observation is that benzo(b)fluoranthene, benzo(k)fluoranthene, and fluoranthene were the PAH COPCs detected most frequently, each in 46% of the samples analyzed. Acenaphthylene and dibenzo(a,h)anthracene were the PAH COPCs detected least frequently, each in 7% of the samples analyzed.

Finally, Table IV.2 shows that sediment sample SD15 accounts for all the maximum detects except for benzo(g,h,i)perylene where the maximum detect was found in SD18.

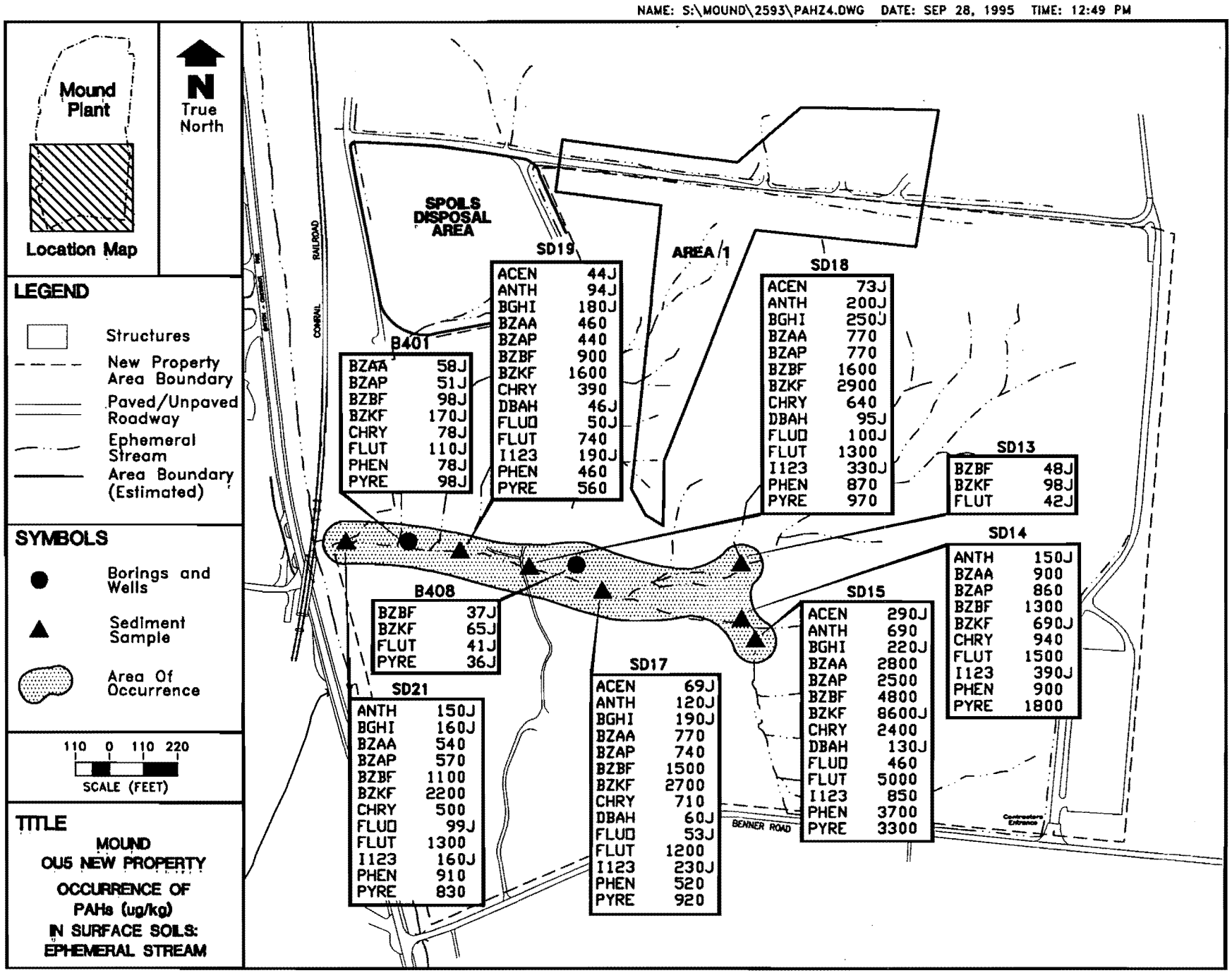


Figure 4.12. Occurrence of PAHs in Surface Soil and Sediment Samples (µg/kg) - Zone 1

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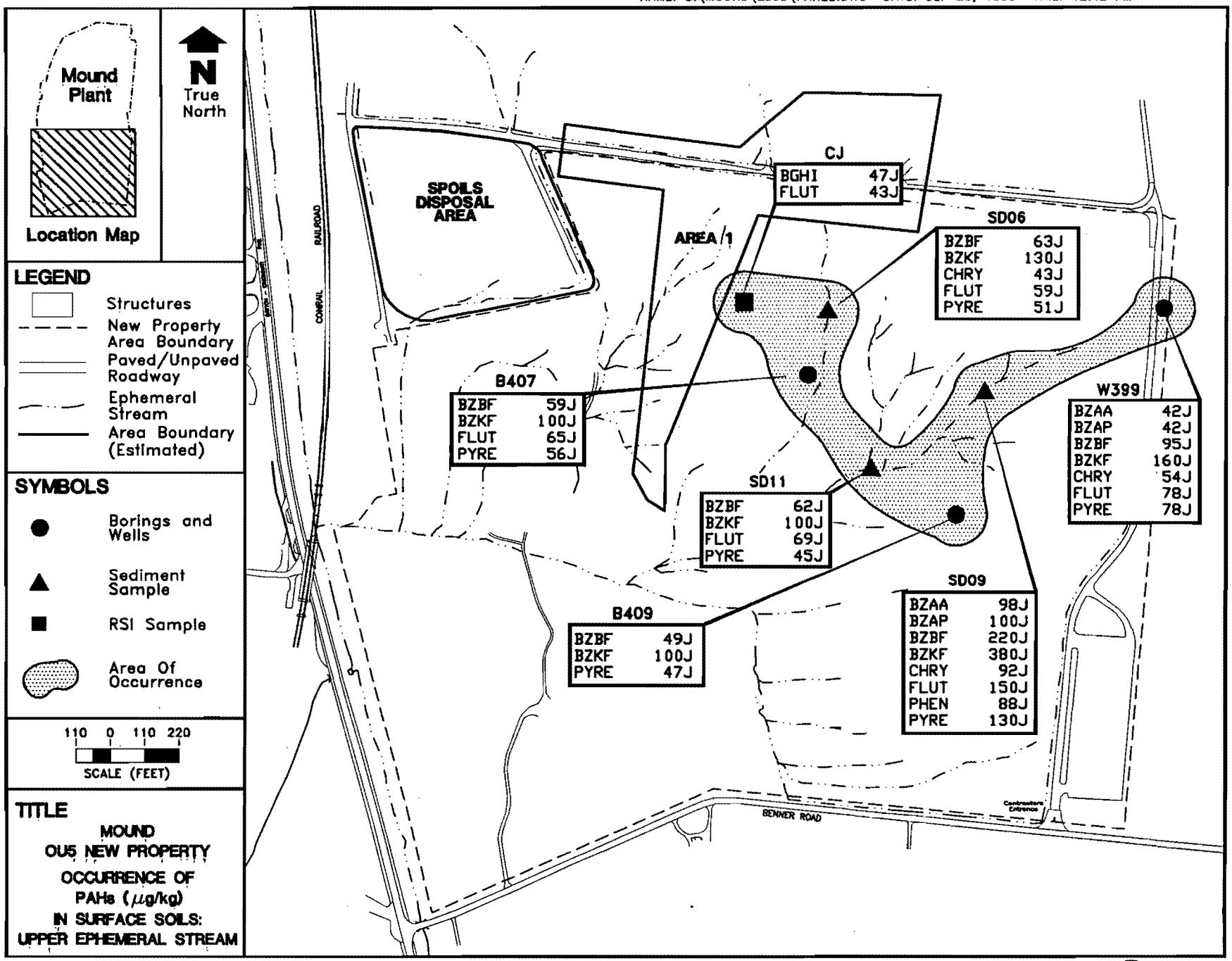

Figure 4.13. Occurrence of PAHs in Surface Soil and Sediment Samples (µg/kg) - Zone 2

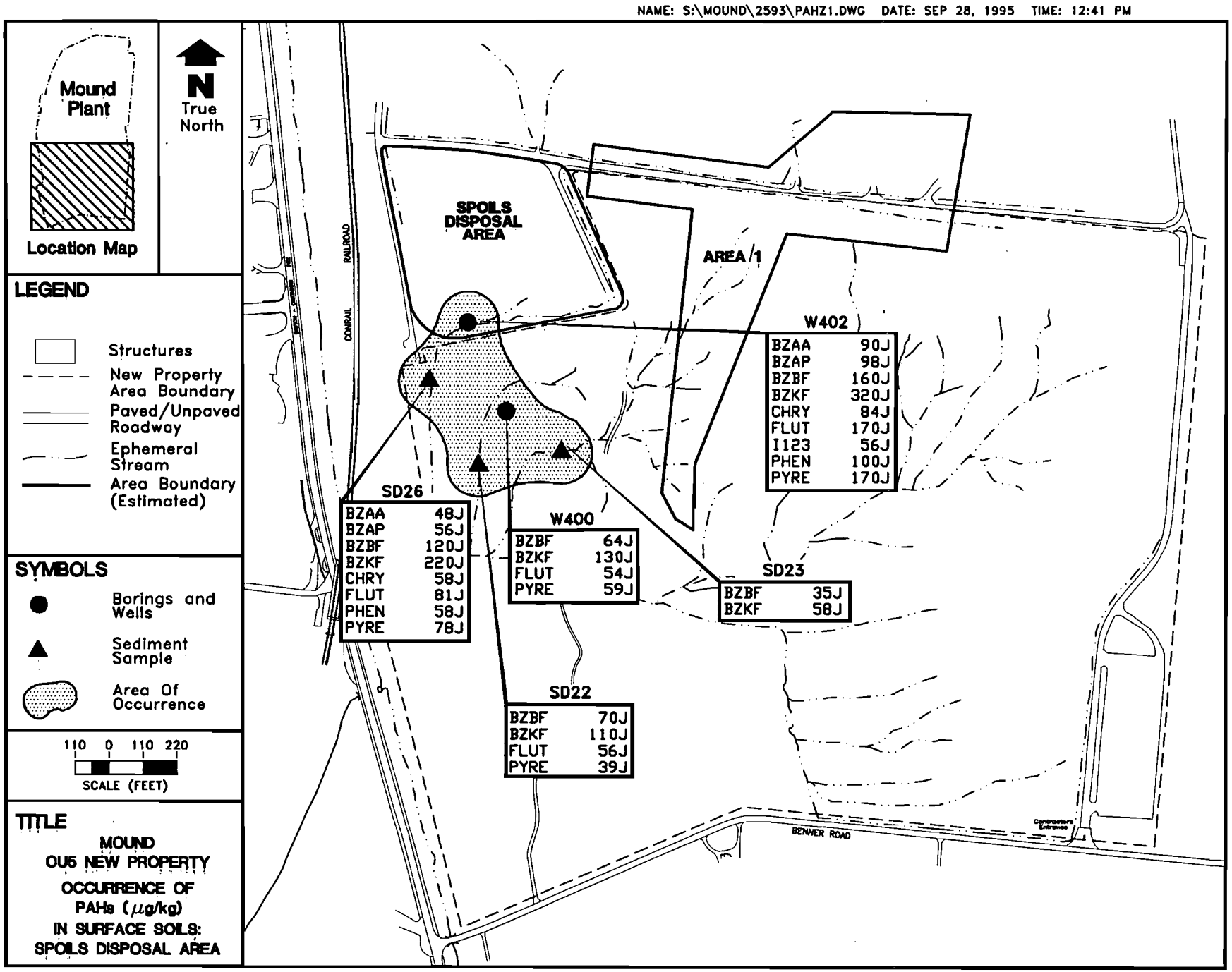

Figure 4.14. Occurrence of PAHs in Surface Soil and Sediment Samples (µg/kg) - Zone 3

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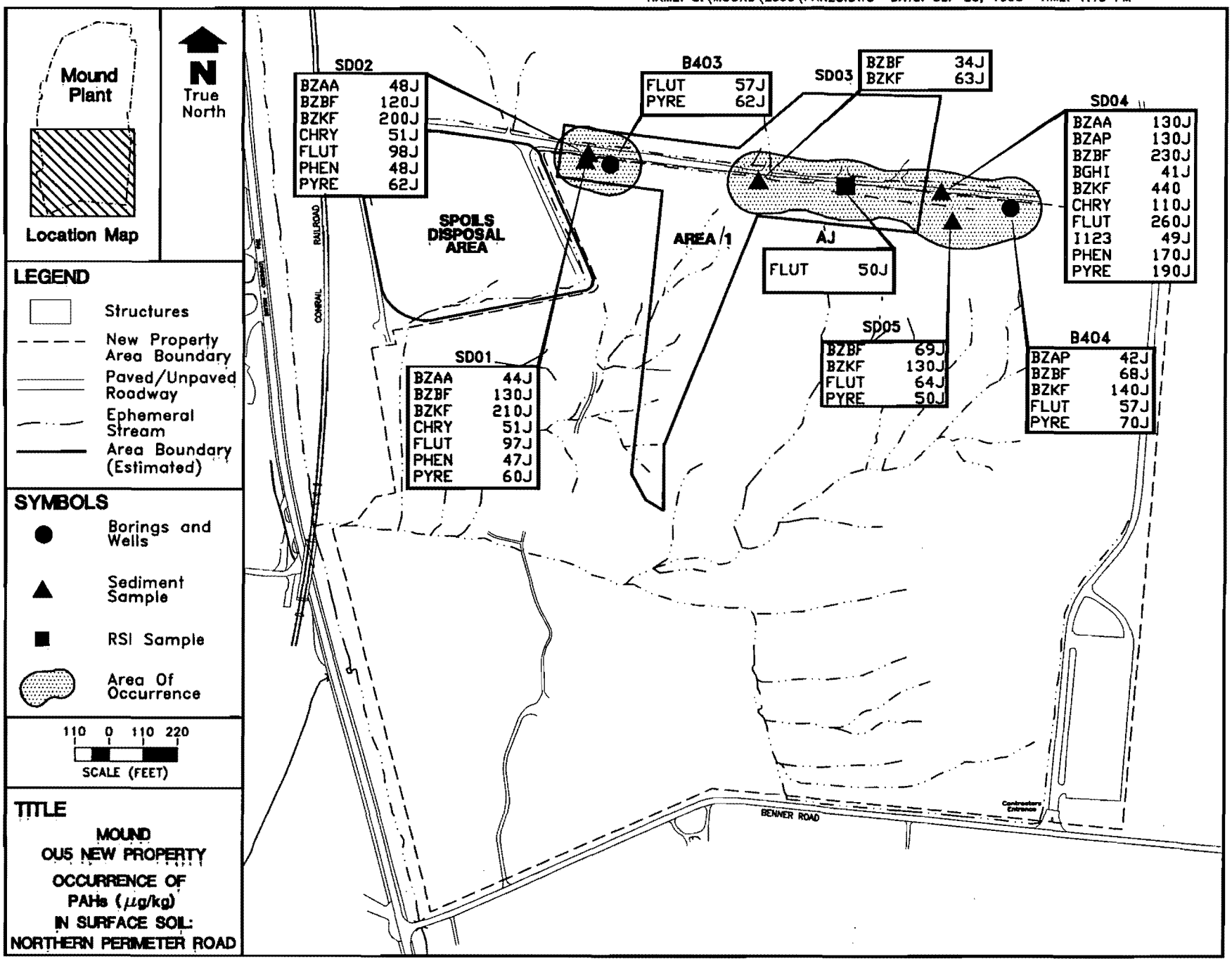


Figure 4.15. Occurrence of PAHs in Surface Soil and Sediment Samples (µg/kg) - Zone 4

Phthalate Esters

Phthalate esters are a class of compounds widely used as plasticizers. Phthalate esters identified as human health COPCs include di-n-butylphthalate and bis(2-ethylhexyl)phthalate. Neither of these were identified as ecoCOPCs. Background criteria have not been established for these compounds. Figure 4.16 shows the distribution of phthalate ester COPCs over the New Property. In Figure 4.16, di-n-butylphthalate is coded as "DINB" and bis(2-ethylhexyl)phthalate is coded as "BIS2". Di-n-butylphthalate was detected in one sediment and five surface soil samples above the laboratory detection limit. The maximum concentration was 420.0 μg/kg from RSI soil sample NPS005. There is no discernible pattern to di-n-butylphthalate contamination in surface soil and sediment samples over the New Property.

Bis(2-ethylhexyl)phthalate was detected above the laboratory detection limit in five sediment samples with a maximum concentration of 120.0J μg/kg from SD23. Two of these samples (SD22 and SD23) were collected south of the Spoils Disposal Area and two (SD16 and SD17) were collected along the main branch of the ephemeral stream.

Other Semi-Volatile Organic Compounds

Two other SVOCs, benzoic acid and carbazole, were identified as human health and ecological COPCs. Background criteria have not been established for these compounds.

Benzoic acid was detected in six RSI samples and three sediment samples with a maximum concentration of 95.0J μg/kg from RSI soil sample AK. Concentrations of the remaining samples ranged from 49.0J to 92.0J μg/kg. Benzoic acid contamination occurs along the northern perimeter road where RSI samples AK, AJ, and AH were collected.

Carbazole was detected in four sediment samples with a maximum concentration of 420.0 μg/kg from sediment sample SD15. Concentrations of the remaining samples (SD18, SD19, and SD21) were 78.0J μg/kg, 41.0J μg/kg, and 85.0J μg/kg, respectively. These four samples were collected from the main branch of the New Property ephemeral stream.

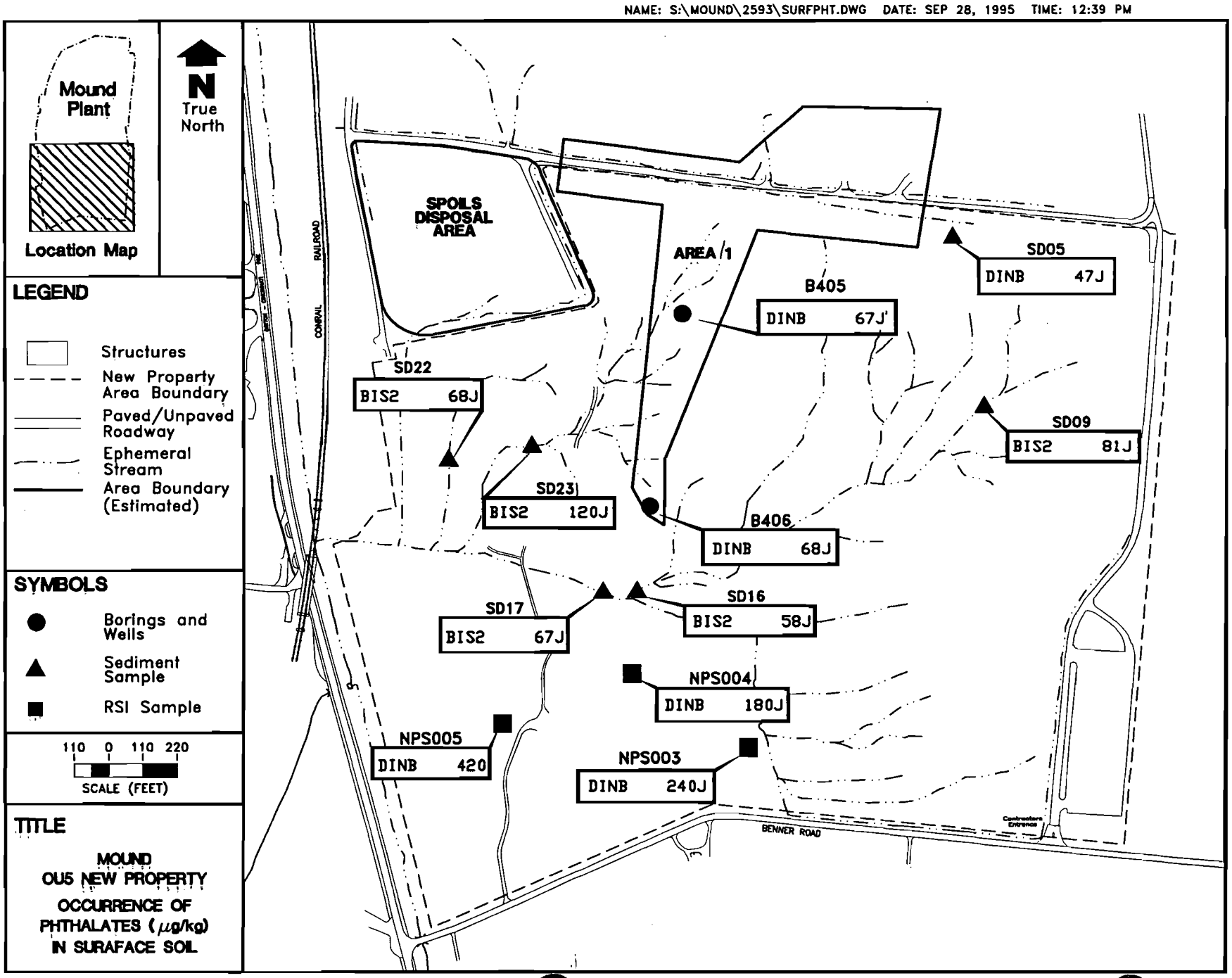


Figure 4.16. Occurrence of Phthalate Ester COPCs in Surface Soil and Sediment Samples (µg/kg)

Non-COPC Semi-Volatile Organic Compounds

Four SVOCs were detected above laboratory detection limits in surface soil and sediment samples but were not identified as COPCs. They include 2-methylnaphthalene, acenapthene, dibenzofuran, and naphthalene. All of these compounds were detected in sediment sample SD15 at concentrations of 110.0J, 120.0J, 250.0J, and 200.0J μg/kg, respectively. In addition, 2-methylnaphthalene was detected in the surface soil sample from boring B401 (63.0J μg/kg), acenapthene was detected in sediment sample SD21 (42.0J μg/kg), and dibenzofuran was detected in sediment sample SD18 (42.0J μg/kg). All samples with detected concentrations were collected along the main branch of the ephemeral stream.

4.3.1.7. Volatile Organic Compounds

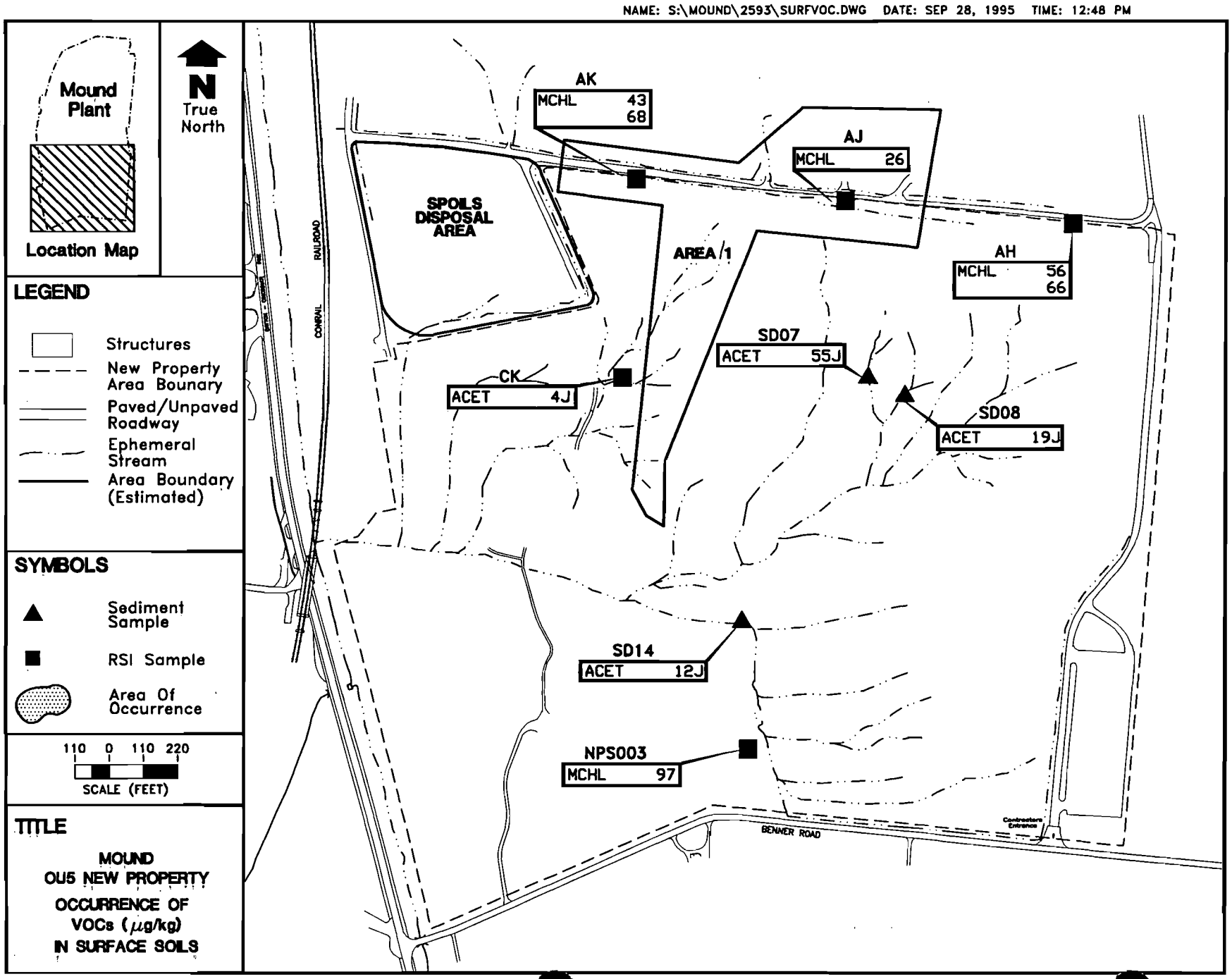
Eight VOCs were detected above laboratory detection limits in surface soil and sediment samples including acetone, 2-butanone, carbon tetrachloride, ethylbenzene, hexane, methylene chloride, toluene, and xylene. Background criteria have not been established for VOCs.

COPC Volatile Organic Compounds

Of the eight VOCs detected above detection limits, acetone and methylene chloride were identified as human health COPCs; none were identified as ecoCOPCs. Figure 4.17 shows the extent of these two contaminants. Acetone is shown as "ACET" and methylene chloride is shown as "MCHL".

Acetone was detected in one surface soil and three sediment samples with a maximum concentration of 55.0J μg/kg from sediment sample SD07. Two of these samples (SD07 and SD08) were collected from the upper reaches of the ephemeral stream in the northeast corner of the property. Methylene chloride was detected in six surface soil samples with a maximum concentration of 97.0 μg/kg from RSI sample NPS003. Five of these six samples (two sampling depths each from RSI samples AH and AK, and one sampling depth from RSI sample AJ) were collected along the northern perimeter road within or near the Area 1 "arm."

Figure 4.17. Occurrence of VOCs (Acetone and Methylene Chloride) in Surface Soil and Sediment Samples (μg/kg)



Non-COPC Volatile Organic Compounds

VOCs that were detected above laboratory detection limits but were not identified as COPCs include 2-butanone, carbon tetrachloride, ethylbenzene, hexane, toluene, and xylene. All of these VOCs were detected only in RSI sample NPS003, except hexane, which was detected in sediment samples SD10 and SD20.

4.3.1.8. Radionuclides

Ten radionuclides were detected above background criteria in surface soil and sediment samples: Pu-238, Pu-239, Pu-240, Ra-226, strontium-90 (Sr-90), tritium, thorium-228 (Th-228), Th-232, uranium-234 (U-234), and uranium-235 (U-235). Of these, Pu-238, Ra-226, Th-228, Th-232, and U-235 were identified as human health COPCs. With the exception of U-235, the same radionuclides were also identified as ecoCOPCs.

Some general observations can be made about radionuclide contamination in New Property surface soil and sediment samples. The first observation is that all of these radionuclide COPCs (with the exception of U-235) were found along the northern perimeter road and especially within the Area 1 "arm." Thorium and Pu-238 contamination in soil samples at and around Building 21 (which is within Area 1) is well documented in the OU9 Site Scoping Report Volume 3, Radiological Site Survey (DOE 1993b). Erosion and transportation of these soils in the drainage channels parallel the northern perimeter road probably account for the contamination noted in this area.

The second observation is that Pu-238 is the most widespread radionuclide COPC in New Property surface soil, detected above background in 48% of the samples. This is followed by Th-228 (19%), Ra-226 (16%), U-235 (13%), and Th-232 (6%).

The following subsections discuss the nature and extent of radionuclide contamination in New Property surface soils.

COPC Radionuclides

Plutonium-238

Pu-238 was detected above the background criterion of 0.13 pCi/g in 22 surface soil and 10 sediment samples with a maximum concentration of 21.87 pCi/g from sediment sample SD23. Concentrations range from 1.0 to 168 times background.

Pu-238 contamination is found in three zones, as shown in Figure 4.18. The first zone is along the northern perimeter road (including the Area 1 "arm") where it was detected in 10 samples. The highest concentration here is 11.23J pCi/g from sediment sample SD03; the remaining concentrations ranged from 1.3 to 86.4 times background. The second zone is south of the Spoils Disposal Area where Pu-238 was detected in eight samples. Five samples, clustered near a remnant of an old abandoned road, accounted for the highest concentrations in this zone and include the maximum site-wide concentration of 21.87 pCi/g (168 times background) from sediment sample SD23. Remaining concentrations ranged from 2.2 to 38.4 times background. The third zone is along the upper reaches of a branch of the ephemeral stream. A sediment sample (SD06), an RSI sample (BJ), and a boring sample (B407) were collected here. Concentrations ranged from 1.2 to 3.5 times background in this zone.

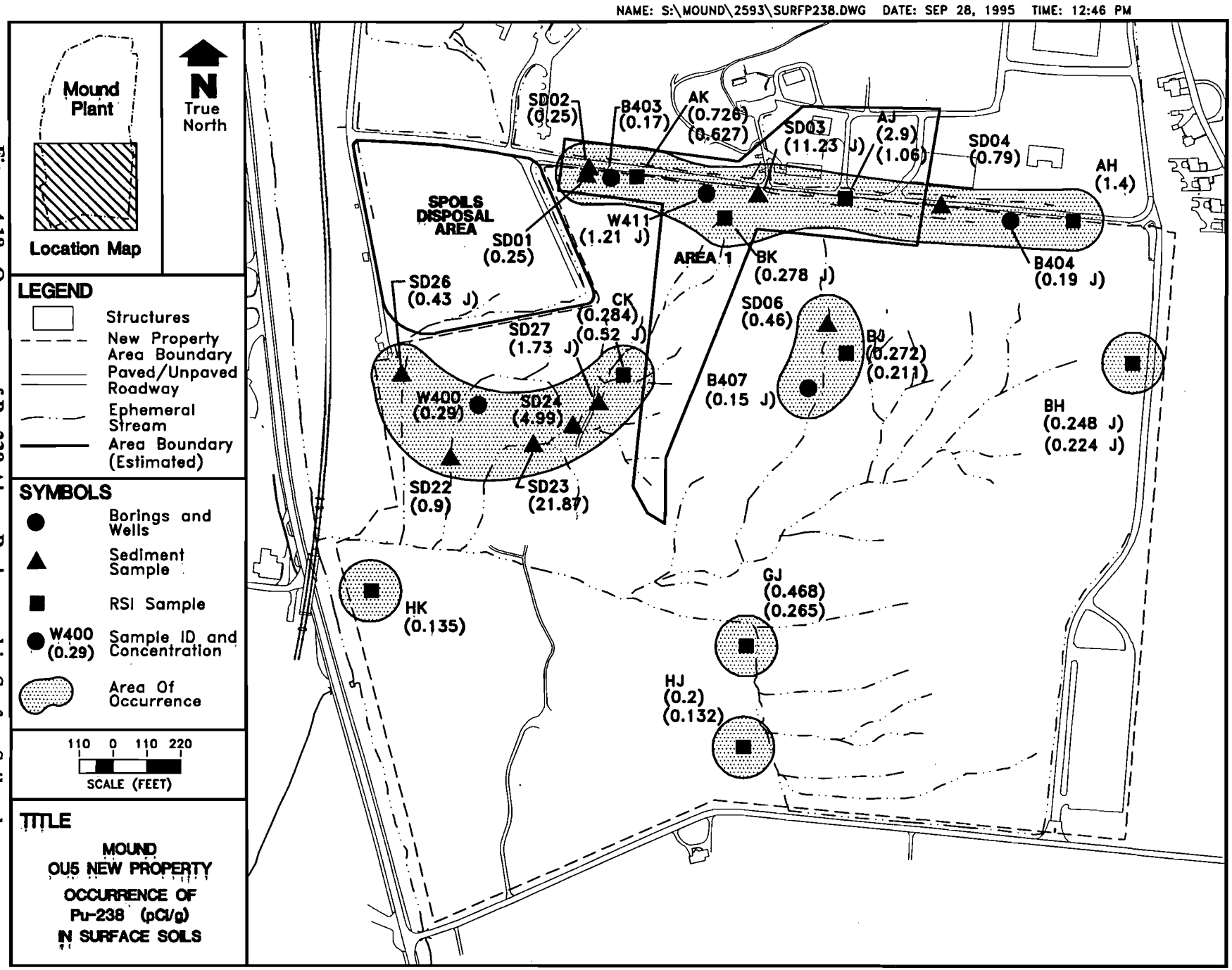
Radium-226

Ra-226 was detected above the background criterion of 2 pCi/g in nine RSI surface soil samples. The maximum concentration was 2.97J pCi/g from sample AH at a depth of 1.5 to 2.0 feet BGS. Concentrations ranged from 1.2 to 1.5 times background. Ra-226 contamination occurs mostly along the northern perimeter road where four RSI samples are widely distributed.

Thorium-228

Th-228 was detected above the background criterion of 1.5 pCi/g in three surface soil and seven sediment samples. The maximum concentration was 3.78 pCi/g from sediment sample SD03. Concentrations ranged from 1.0 to 2.5 times background. The only discernible distribution of Th-228 contamination is along the northern perimeter road within the Area 1 "arm" and in a thin east-west trending zone in the north-central portion of the property. In addition, two samples (SD23 and SD24) located near a remnant

Figure 4.18. Occurrence of Pu-238 Above Background in Surface Soil and Sediment Samples (pCi/g)



of an old abandoned road south of the Spoils Disposal Zone showed concentrations above background. These three zones of Th-228 contamination are shown in Figure 4.19.

Th-228 and Th-232 are in secular equilibrium and, as such, should always be found together in constant proportions. In this RI, the two isotopes were apparently detected together in three soil and sediment samples. Th-228 occurred apparently without Th-232 in six samples. However, the focus of the discussion in this section and the tables provided in Appendix C show only those results above background. Th-232 is present in all samples in which Th-228 was detected above background, but values for Th-232 are below background in six of the samples. The two isotopes occur in the expected proportions in every case, within the limitations of the instruments.

Thorium-230

Th-230 was detected above the background criterion of 1.9 pCi/g in two surface soil and three sediment samples, with a maximum concentration of 2.26 pCi/g from sediment sample SD25. Concentrations ranged from 1.0 to 1.2 times background. Discernible trends of Th-230 contamination exist in two regions: along the northern perimeter road within the Area 1 "arm" (similar to Th-228 and Th-232), and in a thin east-west trending zone in the north-central portion of the property (similar to Th-228) (Figure 4.20).

Thorium-232

Th-232 was detected above the background criterion of 1.4 pCi/g in one surface soil and two sediment samples with a maximum concentration of 2.12J pCi/g from sediment sample SD03. Concentrations ranged from 1.0 to 1.5 times background. There is no discernible trend of Th-232 contamination although two of the samples (sediment sample SD03 and the surface sample from boring B398) are located along the northern perimeter road within the Area 1 "arm" (Figure 4.21).

Uranium-235

U-235 was detected above the background criterion of 0.11 pCi/g in four surface soil and three sediment samples with a maximum concentration of 0.21J pCi/g from well W399. The only discernible trend of U-235 contamination is along the upper reaches of the ephemeral stream in the northeast corner of the

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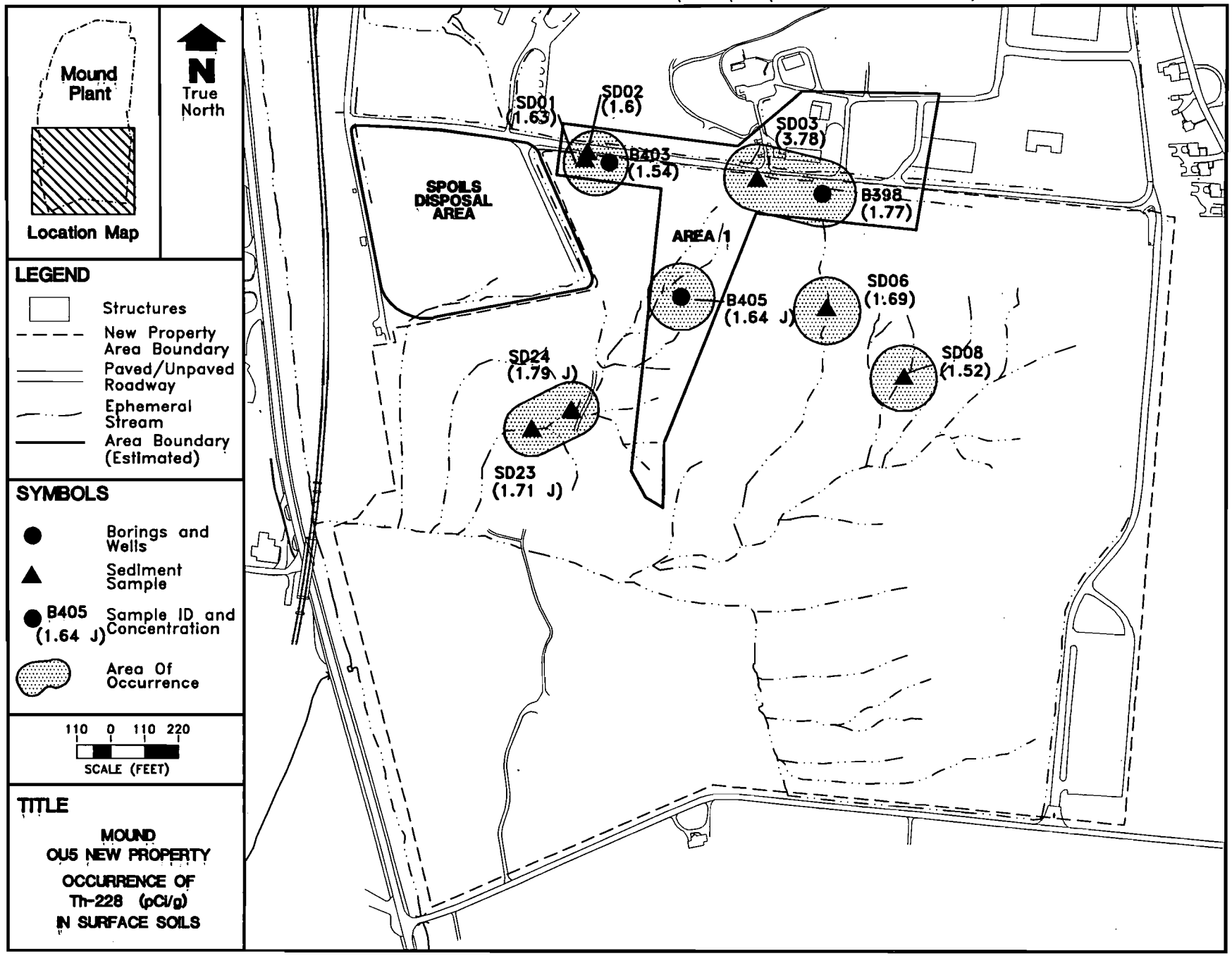

Figure 4.19. Occurrence of Th-228 Above Background in Surface Soil and Sediment Samples (pCi/g)

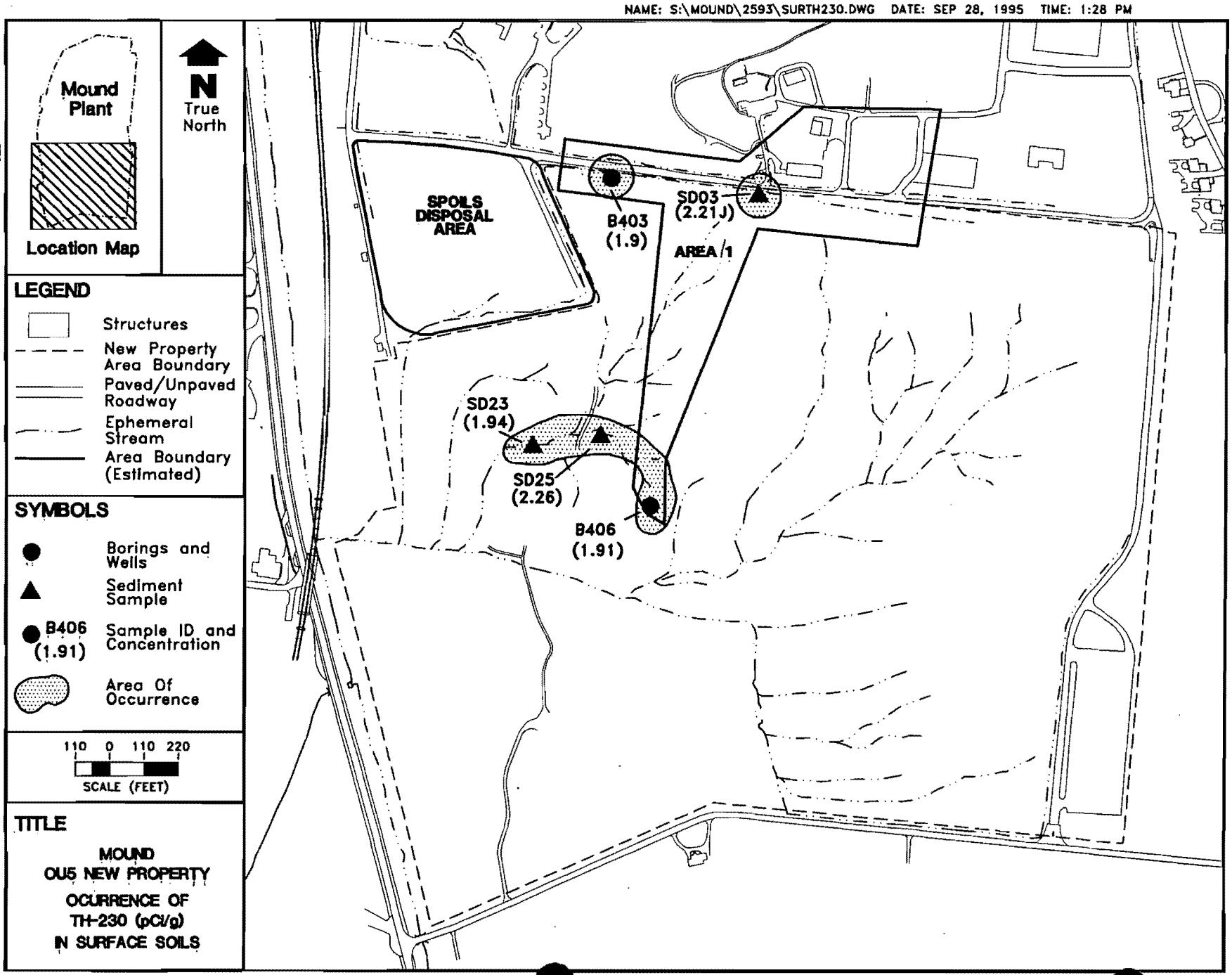

Figure 4.20. Occurrence of Th-230 Above Background in Surface Soil and Sediment Samples (pCi/g)

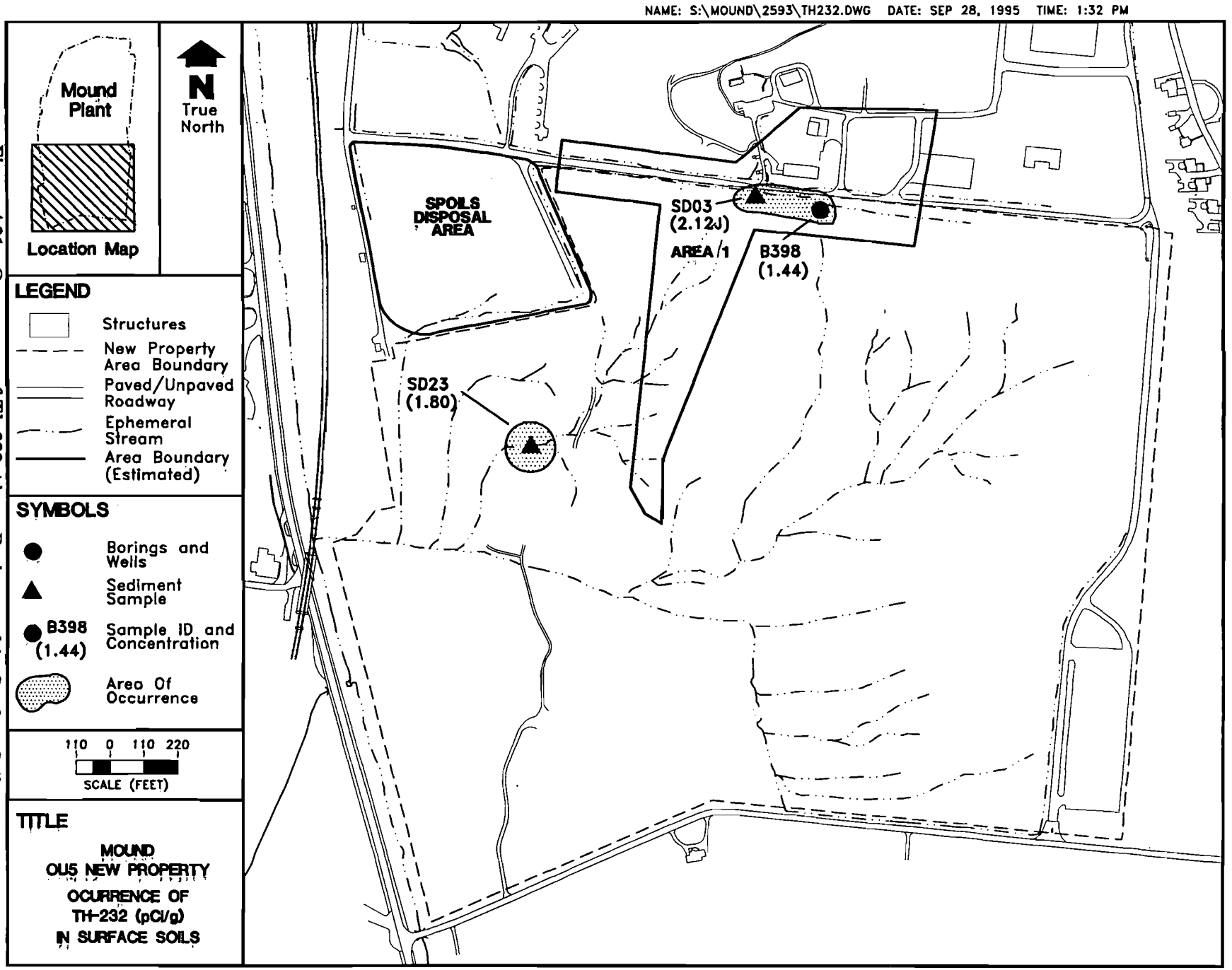

Figure 4.21. Occurrence of Th-232 Above Background in Surface Soil and Sediment Samples (pCi/g)

property. Three samples collected here (sediment samples SD08 and SD09, and the surface sample from well W399) had contamination values above background at 0.17J, 0.12J, and 0.21J pCi/g, respectively. In addition, three samples collected south of the Spoils Disposal Area (sediment sample SD24, and the surface samples from borings B401 and B406) also had values exceeding background but these locations are spaced widely apart and probably do not represent a contiguous contamination zone.

Non-COPC Radionuclides

Radionuclides that are not COPCs but were detected above background criteria include Pu-239, Pu-240, Sr-90, tritium, and U-234. Pu-239 and Pu-240 were detected in sediment sample SD23 at 0.21 pCi/g. Sr-90 was detected in RSI sample NPS005 and boring B405 at 1.58 and 2.77J pCi/g, respectively. Tritium was detected in
sediment samples SD09 and SD17 at 2.60 and 3.00 pCi/g, respectively. U-234 was detected in boring B406 at 1.17J pCi/g.

4.3.2. Nature and Extent of Contamination in Subsurface Soil

Subsurface samples were collected at depths greater than 2.0 feet BGS and include samples from borings and well installations. Eleven subsurface soil samples were collected from the New Property soil borings and monitoring well locations.

Subsurface soils were analyzed for anions, metals, TOC, explosives, pesticides/PCBs, SVOCs, VOCs, and radionuclides. Analytical results indicate that the subsurface soils generally contain low levels of a few contaminants scattered about the New Property. Most of these contaminants are present at levels indistinguishable from background. Except for explosives and possibly radionuclides (identified only in three borings), the contaminants have no apparent relationship to current or past uses of the New Property. Among the eleven samples, antimony (in seven samples), bismuth (in three samples), tetryl (an explosive, in one sample), di-n-butylphthalate (in one sample), bis-2(ethylhexyl)phthalate (in three samples), acetone (in four samples), and U-235 (in one sample) were identified as COPCs. No pesticides, PCBs, or PAHs were detected in the subsurface soils. Anions and TOC were detected in some samples, but are not COPCs. There are no subsurface soil ecoCOPCs because subsurface soil is not an ecological exposure medium. The following text details the findings of the subsurface soil analysis.

4.3.2.1. Anions

Chloride and sulfate are anions detected above background in subsurface soil samples. Neither of these contaminants were identified as COPCs.

Chloride was detected above the background criterion of 107.0 mg/kg in B403. The concentration was 176.0J mg/kg (1.6 times background) at a depth of 4.5 to 7.0 feet BGS. Sulfate was detected above the background criterion of 150.0 mg/kg in six subsurface soil samples. The maximum concentration was 921.0J mg/kg (6.1 times background) from B404 at a depth of 4.0 to 8.0 feet BGS. The remaining samples in which sulfate was detected (W402, B403, B405, B407, and B409) are scattered throughout the New Property. Concentrations in these samples range from 187.0J (1.2 times background) to 480J mg/kg (3.2 times background).

4.3.2.2. Metals

Five metals (antimony, bismuth, lithium, magnesium, and potassium) were detected above background criteria in subsurface soil samples. Of these, antimony and bismuth were identified as COPCs.

<u>COPC Metals</u>

Antimony

Antimony was detected above the background criterion of 0.45 mg/kg in seven subsurface soil samples. The maximum concentration of 2.90J mg/kg was encountered at three locations: W400 (27.0 to 31.0 feet BGS), B403 (4.5 to 7.0 feet BGS), and B404 (4.0 to 8.0 feet BGS). The remaining concentrations ranged from 4.0 to 5.8 times background. There is no discernible pattern to antimony contamination in subsurface soil samples over the New Property.

Bismuth

Bismuth was detected above the background criterion of 39.0 mg/kg in three subsurface soil samples (B401, B406, and B408). The maximum concentration was 69.1 mg/kg (1.8 times background) from

B406 at a depth of 43.0 to 48.5 feet BGS. The three samples were collected from an area along and north of the main branch of the ephemeral stream, as shown in Figure 4.22.

Non-COPC Metals

Lithium, magnesium, and potassium are metals with concentrations exceeding background criteria but were not identified as COPCs. Lithium was detected in two subsurface soil samples with a maximum concentration of 41.40 mg/kg (1.6 times the background value) from B409 at a depth of 9.0 to 13.0 feet. Magnesium was detected in three subsurface soil samples with a maximum concentration of 56.5 mg/kg from B404 at a depth of 4.0 to 8.0 feet BGS. Potassium was detected in two subsurface soil samples with a maximum concentration of 4320.0 mg/kg from B409 at a depth of 9.0 to 13.0 feet.

4.3.2.3. Total Organic Carbon

Total organic carbon was detected above the background criterion of 28,000 mg/kg in three subsurface soil samples from monitoring well W400 (38,067J mg/kg at 27.0 to 31.0 feet BGS), and borings B404 (31,667J mg/kg at 4.0 to 8.0 feet BGS) and B408 (43,600J mg/kg at 37.0 to 42.0 feet BGS). These values are reported as average concentrations because the analytical laboratory performed multiple analyses on each sample. There is no discernible trend of total organic carbon concentrations in subsurface soil samples; the three borings are widely separated within the New Property.

4.3.2.4. Explosives

One explosive, tetryl, was detected above laboratory detection limits in the subsurface soil. No background criteria have been established for explosives in subsurface soils. Tetryl was found at a concentration of 0.29J mg/kg from B407 at a depth of 10.0 to 15.0 feet BGS. It was not identified as a COPC.

4.3.2.5. Pesticides/Polychlorinated Biphenyls

No pesticides/PCBs were detected in subsurface soil samples.

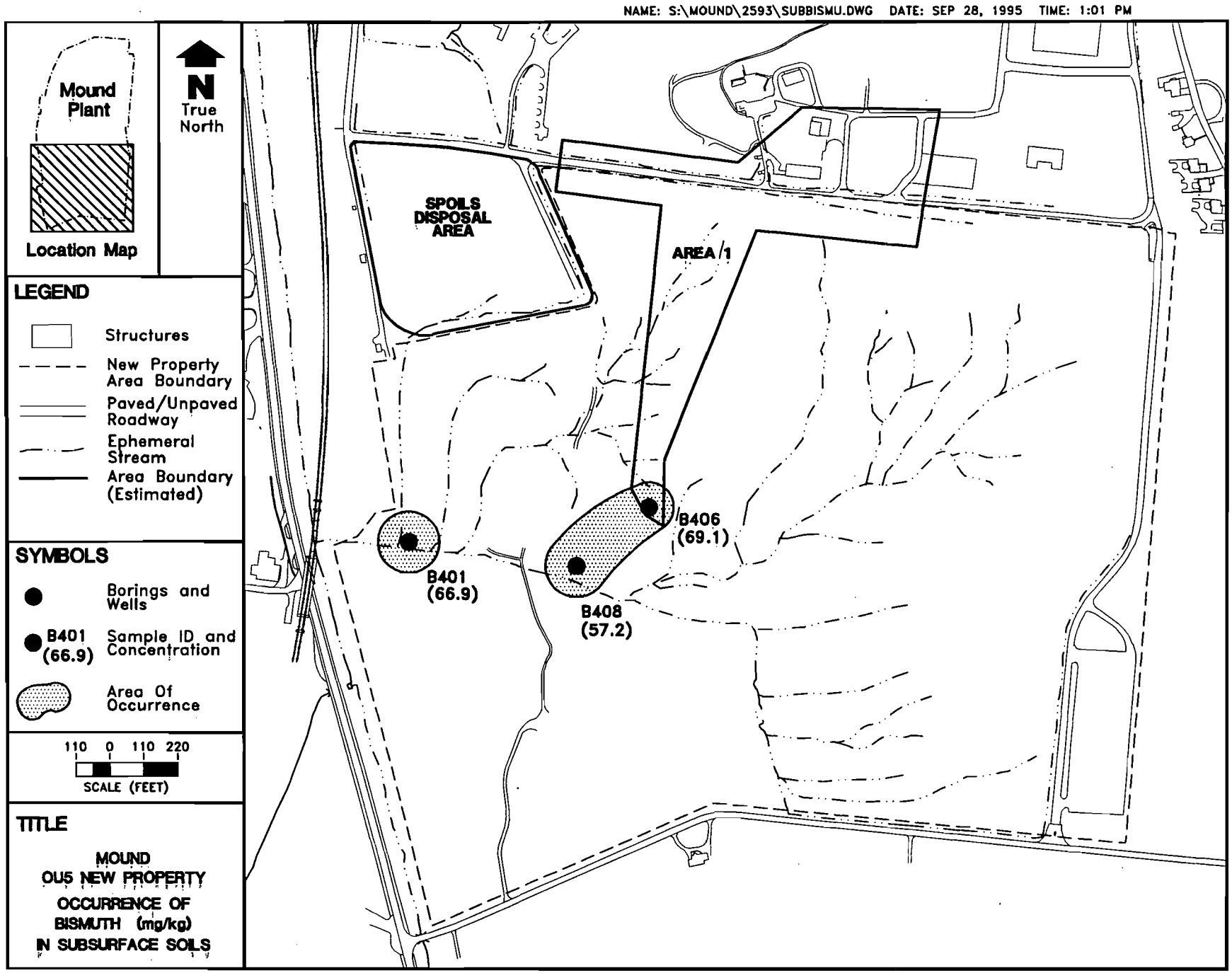

Figure 4.22. Occurrence of Bismuth Above Background in Subsurface Soils (mg/kg)

4.3.2.6. Semi-Volatile Organic Compounds

Three SVOCs, all phthalate esters, (di-n-butylphthalate, bis(2-ethylhexyl)phthalate, and di-n-octylphthalate, were detected above laboratory detection limits in subsurface soil samples. No background criteria have been established for SVOCs. Di-n-butylphthalate and bis(2-ethylhexyl)phthalate were identified as COPCs, whereas di-n-octylphthalate was not identified as a COPC.

Di-n-butylphthalate was found only in B407 at a concentration of 37.0J ug/kg at a depth of 10.0 to 15.0 feet BGS. Bis(2-ethylhexyl)phthalate and di-n-octylphthalate were both found in borings B401, B407, and B408. The sample from B401 at a depth of 24.0 to 30.0 feet BGS yielded the maximum concentrations for these phthalate esters with a value of 340.0J ug/kg for bis(2-ethylhexyl)phthalate and 130.0J ug/kg for di-n-octylphthalate.

4.3.2.7. Volatile Organic Compounds

One VOC, acetone, was detected above laboratory detection limits in subsurface soil samples. No background criteria have been established for VOCs in the subsurface soil. Acetone has been identified as a COPC.

Acetone was detected in four subsurface soil samples with a maximum concentration of 51.0J ug/kg from B409 at a depth of 9.0 to 13.0 feet BGS. The remaining detects were from monitoring well W400 (31.0J ug/kg at 27.0 to 31.0 feet BGS), and borings B405 (33.0J ug/kg at 5.0 to 11.0 feet BGS) and B408 (18.0J ug/kg at 37.0 to 42.0 feet BGS). There is no discernible trend to acetone contamination in subsurface soils over the New Property.

4.3.2.8. Radionuclides

Two radionuclides were detected above background criteria in subsurface soil samples. U-235, identified as a COPC, was detected only in B401 (24.0 to 30.0 feet BGS) at a concentration of 0.18J pCi/g. Sr-90, which is not a COPC, was detected only in B405 at a concentration of 2.77J pCi/g at a depth of 5.0 to 11.0 feet.

4.3.3. Nature and Extent of Contamination in Groundwater and Seeps

Groundwater samples were collected during Phase 1 and Extended Phase field activities from four monitoring wells (W399, W400, W402, and W411) and two borings (B401 and B408) in the New Property (Figure 2.2). Samples from the eight seeps (610, 614, 617, 618, 619, 620, 621, and 623) were collected during the Phase 1 investigation (DOE 1994b) (Figure 2.1). Additional data from the Groundwater Sweeps Program (DOE 1995b) were collected from historical wells 0158, 0319, 0320, 0344, 0353, 0354, and 0356 (Figure 2.3). Monitoring wells were completed in the BVA, bedrock, or in both the BVA and bedrock, as shown in Table IV.4.

All groundwater and seep samples were analyzed by the off-site laboratory for anions, metals, TOC, explosives, pesticides/PCBs, VOCs, SVOCs, and radionuclides. Unfiltered samples were used for all analyses. Laboratory results indicate that contamination in groundwater and seeps in the New Property is scattered and diffuse in most cases. Generally, contaminants present above background do not appear to originate in current or past activities at the New Property. No plumes of contaminated groundwater were identified. In groundwater, 17 metals, one explosive (2,4,6-trinitrotoluene), two VOCs (hexane and 1,2-DCE), and 10 radionuclides (Am-241, Ra-226, Th-228, Th-230, Th-232, tritium, U-234, U-235, U-238, Pu-239, and Pu-240) were identified as COPCs. Most of the COPCs occur at five or fewer sampling locations; some occur at only one location. Eight analytes detected above background or detection limits exceed drinking water standards: aluminum, arsenic, chromium, iron, lead, manganese, thallium, and trichloroethene (TCE). TOC, pesticides, and PCBs were not detected in groundwater at the New Property. In seeps, nine COPCs were identified: copper, (in three of the eight seeps), aluminum and vanadium (in eight of the eight seeps), cobalt (in two of the eight seeps), silver (in four of the eight seeps), PETN (in four of the eight seeps), 1,3-dinitrobenzene, 1,3,5-trinitrobenzene (both in only of one of the eight seeps), PETN (in four of the eight seeps), and trichloroethene (in one seep).

The following subsections discuss in detail the results of the analysis of groundwater and seeps at the New Property. Summary tables of analytical results above background are presented in Appendix B. Where available, the Maximum Contaminant Level (MCL) or Maximum Contaminant Level Goal (MCLG) is compared to the concentrations in New Property samples. A listing of MCLs and MCLGs for drinking water is provided in Table IV.5 to facilitate comparisons with site groundwater contaminants described

Table IV.4. Groundwater Sampling Locations and Depths

Boring/Well ID	Location	Screen Depth (ft)[1]	Screened Interval
W399	Northeast corner, upgradient of New Property	22.8-32.5	Bedrock
W400	Northwest quadrant, downgradient of Area 1	22.3-32.5	Water table
B401	Extreme western boundary	NA	Water table
W402	Northwest quadrant, downgradient of Area 1, in Spoils Disposal Area	20.7-30.9	Water table
B408	Southwest quadrant, near "farm trash area"	NA	Water table
W411	Within Area 1, north-central	27.9-37.7	Bedrock
0158	Southwest corner, near site boundary	28.5-38.5	Water table
0319	Northwest quadrant, immediately east of site boundary	42.5-53	Below water table
0320	Southwest quadrant, west of abandoned road	32-42	Below water table
0344	Northwest quadrant, immediately east of site boundary, near 0319	167-175	Bedrock
0353	Northwest quadrant, east of Spoils Disposal Area	13-18	Bedrock and BVA
0354	Northeast quadrant, east of Area 1 arm	13-23	Bedrock
0356	Southwest quadrant, west of abandoned road, near 0320	172-182	Bedrock and BVA

1 Depths are in feet below ground surface and are rounded to the nearest tenth
BVA Buried Valley Aquifer
NA Not Applicable as these were grab groundwater samples from boreholes.

in this section. Because groundwater and seeps are not ecological exposure media, there are no ecoCOPCs.

The groundwater data were used to evaluate whether there were obvious differences between BVA and bedrock aquifer chemistry beneath the New Property. Geochemical differences would indicate that the two aquifers are not connected; similarities between the two aquifers would suggest hydraulic communication between them. Selected inorganic, organic, and radiological constituents were qualitatively compared among the four wells completed in bedrock and the three completed in the BVA (see Table IV.4 for well placement information). This comparison was inconclusive in identifying chemical differences between the two aquifer systems.

4.3.3.1. Anions

Ammonia, chloride, nitrite, phosphate, and sulfate were detected in either the groundwater or seep samples collected from the New Property. None of these analytes are COPCs. Chloride was present above background in four samples. Chloride concentrations ranged from 357 milligrams per liter (mg/L) in seep 617 to 1026 mg/L in seep 618. Sulfate was present above background in three samples. Sulfate concentrations ranged from 144 mg/L at seep 618 to 399 mg/L at well W399. Ammonia was detected in monitoring wells 0344 and 0353 at concentrations of 0.21 and 0.56 mg/L, respectively. Nitrate was detected in well 0319 (0.02 mg/L), and phosphate was found in the historical wells at concentrations ranging from 0.07 to 0.20 mg/L.

4.3.3.2. Metals

Twenty-six metals were detected above background in New Property groundwater and seeps. Of these, the COPCs in groundwater are aluminum, arsenic, barium, beryllium, bismuth, cadmium, chromium, cobalt, copper, lead, lithium, manganese, mercury, molybdenum, nickel, vanadium, and zinc. Aluminum, cobalt, copper, silver, and vanadium are COPC metals in the seeps.

Occurrences of metals above background in groundwater and seeps do not follow discernible patterns. B408 is the location of the greatest number and frequently the highest concentrations of several metal analytes. Figure 4.23 illustrates the extent of metals occurring above background in New Property groundwater and seeps. The following abbreviations are used in Figure 4.23.

Table IV.5. Water Quality Standards and Health Advisories
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Parameter	MCL[a]		MCLG[b]		Secondary MCL[c]		Office of Drinking Water Health Advisories[e]						Ohio Surface Water Quality Standards[j]
	Proposed (µg/L)	Final (µg/L)	Proposed (µg/L)	Final (µg/L)	Proposed (µg/L)	Final (µg/L)	1-Day Health[d] Advisory	10-Day Health[f] Advisory	Longer Term[g] Health Advisories		DWEL[h] (µg/L)	Lifetime[i] HA (µg/L)	Maximum Outside of Mixing Zone (µg/L except where noted)
							Child (µg/L)	Child (µg/L)	Child (µg/L)	Adult (µg/L)			
Aldrin	-	-	-	-	-	-	0.3	0.3	0.3	0.3	1	-	NS
Aluminum	-	-	-	-	-	50-200	-	-	-	-	-	-	NS
Antimony	-	6	-	6	-	-	15	15	15	15	15	3	650
Arsenic	50	-	-	-	-	-	-	-	-	-	-	-	360
Barium	-	2000	-	2000	-	-	-	-	-	-	2000	2000	NS
Benzene	-	5	-	0	-	-	200	200	-	-	-	-	
Beryllium	-	4	-	4	-	-	30,000	30,000	4,000	20,000	200	-	520-7000[l]
Bis(2-ethylhexyl)phthalate	-	6	-	0	-	-	-	-	-	-	700	-	NS
Cadmium	-	5	-	5	-	-	40	40	5	20	20	5	5.6-32
Carbon Tetrachloride	-	5	-	0	-	-	4,000	200	70	300	30	-	1800
Chromium (total)	-	100	-	100	-	-	1000	1000	200	800	200	100	1800-6700[l]
Copper	-	TT[k]	-	1300	-	1000	-	-	-	-	-	-	18-90[l]
2,4-D	-	70	-	70	-	-	1000	300	100	400	400	70	NS
1,2-Dichloroethane	-	5	-	0	-	-	700	700	700	2600	-	-	NS
cis-1,2-Dichloroethene	-	70	-	70	-	-	700	700	700	2600	-	-	NS
Dieldrin	-	-	-	-	-	-	0.5	0.5	0.5	2	2	-	.005
Diethylphthalate	-	-	-	-	-	-	-	-	-	-	30,000	5,000	2600

Table IV.5. Water Quality Standards and Health Advisories
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Parameter	MCL[a]		MCLG[b]		Secondary MCL[c]		Office of Drinking Water Health Advisories[e]						Ohio Surface Water Quality Standards[j]
	Proposed (µg/L)	Final (µg/L)	Proposed (µg/L)	Final (µg/L)	Proposed (µg/L)	Final (µg/L)	1-Day Health[d] Advisory	10-Day Health[f] Advisory	Longer Term[g] Health Advisories		DWEL[h] (µg/L)	Lifetime[i] HA (µg/L)	Maximum Outside of Mixing Zone (µg/L except where noted)
							Child (µg/L)	Child (µg/L)	Child (µg/L)	Adult (µg/L)			
Endrin	-	2	-	2	-	-	20	20	3	10	10	2	.002
Ethylbenzene	-	700	-	700	-	-	30,000	3000	1000	3000	3000	700	1400
Fluoride	-	4000	-	4000	-	-	-	-	-	-	-	-	NS
Iron	-	-	-	-	-	300	-	-	-	-	-	-	1.0
Lead	-	TT[n]	-	0	-	-	-	-	-	-	-	-	130-1000[l]
Manganese	-	-	200[k]	-	-	50	-	-	-	-	-	-	NS
Mercury (inorganic)	-	2	-	2	-	-	-	-	-	2	10	2	1.1
Methylene chloride	-	5	-	0	-	-	10000	2000	-	-	2000	-	NS
Naphthalene	-	-	-	-	-	-	500	500	400	1000	100	20	NS
Nickel	-	100	-	100	-	-	1000	1000	500	1700	600	100	1600-6300[l]
pH	-	-	-	-	-	6.5-8.5	-	-	-	-	-	-	6.5-9.0
Phenol	-	-	-	-	-	-	6,000	6,000	6,000	20,000	20,000	4,000	5300
Radionuclides													
Beta & photon activity	-	4mrem	-	0mrem	-	-	-	-	-	-	-	-	NS
Gross alpha activity	-	15 pCi/L	-	0 pCi/L	-	-	-	-	-	-	-	-	NS
Selenium	-	50	-	50	-	-	-	-	-	-	-	-	20
Silver	-	-	-	-	-	100	200	200	200	200	200	100	1.6-25[l]

Table IV.5. Water Quality Standards and Health Advisories
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Parameter	MCL[a]		MCLG[b]		Secondary MCL[c]		Office of Drinking Water Health Advisories[e]						Ohio Surface Water Quality Standards[j]
	Proposed (µg/L)	Final (µg/L)	Proposed (µg/L)	Final (µg/L)	Proposed (µg/L)	Final (µg/L)	1-Day Health[d] Advisory	10-Day Health[f] Advisory	Longer Term[g] Health Advisories		DWEL[h] (µg/L)	Lifetime[i] HA (µg/L)	Maximum Outside of Mixing Zone (µg/L except where noted)
							Child (µg/L)	Child (µg/L)	Child (µg/L)	Adult (µg/L)			
Sulfate	-	-	-	-	-	250,000	-	-	-	-	-	-	NS
Thallium	-	2	-	0.5	-	-	7	7	7	20	2	0.4	71
Toluene	-	1000	-	1000	-	-	20000	2000	2000	7000	7000	1000	2400
Trichloroethene	-	5	-	0	-	-	-	-	-	-	300	-	NS
Vanadium	-	-	-	-	-	-	80	80	30	110	110	20	NS
Vinyl chloride	-	2	-	0	-	-	3000	3000	10	50	-	-	5250
Xylenes	-	10,000	-	10,000	-	-	40,000	40,000	40,000	100,000	60,000	10,000	NS
Zinc	-	-	-	-	-	5000	6000	6000	3000	12000	11000	2000	120-450[l]

[a] Maximum Contaminant Levels (MCLs) are enforceable drinking water standards, developed under the Safe Drinking Water Act, that are set as close to MCLGs as feasible (with the use of the best technology and treatment techniques (TT), taking cost into consideration). MCLs are part of National Primary Drinking Water Regulations. MCLs are listed under 40 CFR 141.61 for organic contaminants and 40 CFR 141.62 for inorganic contaminants. (Regulatory limits for copper and lead are based on action levels as listed under 40 cfr 141.80; the copper action level is 1300 µg/L, the lead action level is 15 µg/L).

[b] Maximum Contaminant Level Goals (MCLGs) are nonenforceable health goals, developed under the Safe Drinking Water for drinking water. They are set at levels at which no known or anticipated adverse effects on the health of persons occur and which allow an adequate margin of safety. MCLGs were previously named RMCLs. MCLGs are listed at 40 CFR 141.50 for organic chemicals and 40 CFR 141.51 for inorganic chemicals.

[c] Secondary Maximum Contaminant Levels (SMCLs) are part of the National Secondary Drinking Water Regulations developed under the Safe Drinking Water Act. They are not federally enforceable, but offer guidance to water systems and states on contaminant levels that protect public welfare. They are based on odor, aesthetics, and appearance. They are listed under 40 CFR 143.

Table IV.5. Water Quality Standards and Health Advisories
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[d] Based on ingestion of 1 liter/day by a 10-kg child. One-day exposure.

[e] Drinking water health advisories are informal technical guidance issued by the U.S. EPA Office of Drinking Water (ODW). They are not legally enforceable standards. They are subject to change as new information becomes available. They are based on data describing non carcinogenic endpoints. Lifetime health advisories describe concentrations of drinking water contaminants at which health effects would not be anticipated to occur over a lifetime exposure, accounting for other sources of exposure. No lifetime health advisories are issued for carcinogens. A "NRC" is indicated where health advisories have been issued for the chemical for less than lifetime exposure.

[f] Based on ingestion of 1 liter/day by a 10-kg child. Ten-day exposure.

[g] Linger term advisories based on ingestion of 1 liter/day for a 10-kg child and 2 liters/day for a 70-kg adult. Assumes exposure for approximately 7 years, or 10% of an individual's lifetime.

[h] Drinking Water Equivalent Level (DWEL): The medium specific (i.e., drinking water) lifetime exposure level assuming 100 percent exposure from that medium, at which adverse noncarcinogenic health effects would not be expected to occur. Based on ingestion of 2 liter/day for a 70-kg adult.

[i] Lifetime health advisories assume that other sources besides water contribute to exposure. Where other sources are not known, a 20% drinking water contribution is assumed. Based on ingestion of 2 liters/day for a 70-kg adult.

[j] Based on warm-water habitat use designation for the Lower Mad River (Ohio EPA 1994).

[k] Listed for regulation.

[l] Range represents values for hardness from 100 to 500 mg/L $CaCO_3$ (Ohio EPA 1993).

NS No standard (Ohio EPA 1993).

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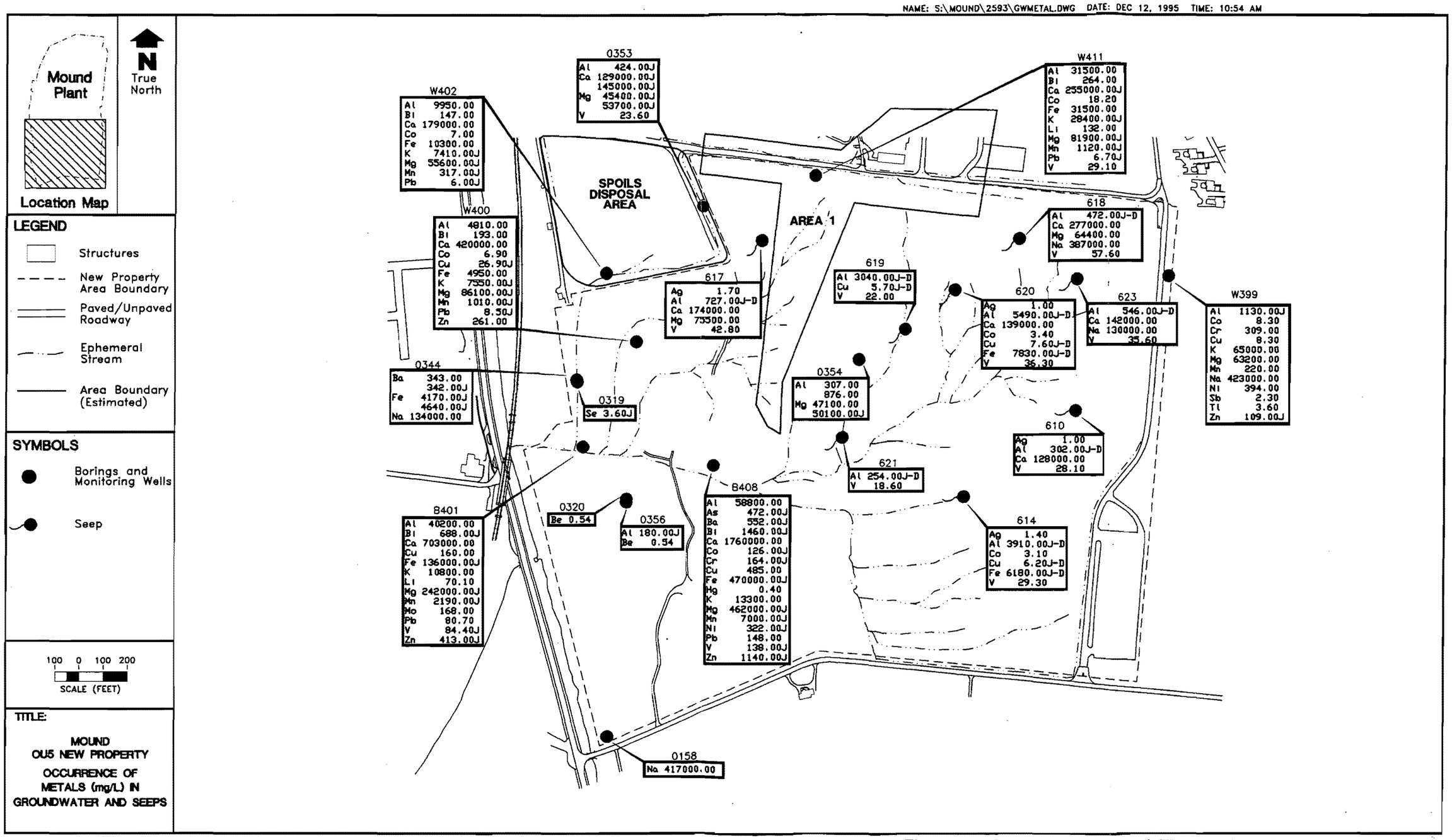


Figure 4.23. Occurrence of Metals in Groundwater and Seeps

Aluminum	Al	Manganese	Mn
Antimony	As	Mercury	Hg
Barium	Ba	Molybdenum	Mo
Bismuth	Bi	Nickel	Ni
Calcium	Ca	Potassium	K
Chromium	Cr	Selenium	Se
Cobalt	Co	Sodium	Na
Copper	Cu	Tin	Sb
Magnesium	Mg	Vanadium	V
		Zinc	Zn

Aluminum was present in groundwater samples from historical wells 0353, 0354, and 0356, and from B401, W402, B408, and W411. The maximum concentration of aluminum in groundwater is 58,800 μg/L at B408. All occurrences exceed the secondary MCL for aluminum (50 to 200 μg/L) and exceed the background criterion of 121.98 μg/L. Aluminum occurs above background in each of the seeps. Its maximum concentration in the seeps is 5,490 μg/L at seep 620. Aluminum is a COPC in seeps and groundwater.

Antimony occurs in W399 at 2.3 μg/L, nearly four times the background criterion of 0.54 μg/L but less than the MCL of 6 μg/L. This occurrence does not correspond to any soil occurrences of antimony. Antimony is not a COPC in either groundwater or seeps.

Arsenic was detected above background only at B408, at 472 μg/L. This concentration exceeds the background criterion 16.8 times and exceeds the proposed MCL for arsenic of 50 μg/L. Arsenic is a COPC in groundwater.

Barium was present at concentrations slightly above the background criterion of 315 μg/L, at B408 and well 0354. The maximum concentration was 552 μg/L at B408, which is below the MCL of 2,000 μg/L. Barium is also a COPC in groundwater.

Beryllium occurs above background in two groundwater sampling locations (wells 0320 and 0356), at a concentration of 0.54 μg/L in both cases. This concentration is well below the MCL of 4 μg/L, but more than twice the background value of 0.24 μg/L. Beryllium is a COPC in groundwater.

Bismuth was detected above background at five of the 15 groundwater sampling locations: W400, B401, W402, B408, and W411. Concentrations exceeded the background criterion of 16.44 μg/L by 8 to 88

times. The highest concentration of bismuth was detected in B408 at 1,460 μg/L. There is no MCL or MCLG for bismuth. There is no apparent relationship between soil and groundwater occurrences of this metal. Bismuth is a COPC in groundwater.

Chromium was detected above the background value of 135.96 μg/L at two of the groundwater sampling locations (W399 and B408), at concentrations of 309 and 164 μg/L, respectively. Both measurements exceed the MCL of 100 μg/L. Chromium is a COPC in groundwater.

Cobalt was detected above the background criterion of 2.16 μg/L in five groundwater and two seep samples: W399, B400, B402, B408, W411, 614, and 620. The highest concentration was detected in B408 at 126 μg/L, about 58 times the background criterion. The other occurrences range from 1.4 to 8 times the background value. Cobalt is a COPC in both groundwater and seeps.

Copper was detected above background in four groundwater sampling locations (W399, W400, B401, B408) and three seeps (614, 619, 620). The highest concentration of copper was 485 μg/L at B408, about 142 times the background value. This concentration is well below the MCLG of 1,300 μg/L for copper. Copper is a COPC in both groundwater and seeps.

Iron was present above background in six groundwater sampling locations (well 0344, W400, B401, W402, B408, and W411) and two seeps (614 and 620). The highest concentration of iron was 470,000 μg/L at B408, 124 times the background value of 3777.95 μg/L. B401 also had a high concentration of iron relative to background (136,000J μg/L). All measurements, including the background value, exceed the secondary MCL of 300 μg/L for iron. Iron is not a COPC in either groundwater or seeps.

The occurrence of lead above background is limited to groundwater. Lead was detected above background in five samples (W400, B401, W402, B408, W411) at concentrations from 6J to 148 μg/L (4.2 to 103 times the background value of 1.44 μg/L). Both background and site occurrences of lead exceed the MCLG of 0 μg/L. Lead is a COPC in groundwater.

Lithium occurs in groundwater from B401 and W411 at 70.1 and 132 μg/L, respectively, with the maximum value at 2.6 times the background concentration. Lithium is a COPC in groundwater.

Manganese occurs above background in six groundwater sampling locations (W399, W400, B401, W402, B408, and W411). Concentrations range from near background (at 214.08 μg/L) to nearly 33 times the background value. All detects above background exceed the proposed MCL of 200 μg/L for manganese. Manganese is a COPC in groundwater.

Mercury was detected above background in one sample (B408). The concentration of 0.40 μg/L is eight times the background value of 0.05 μg/L, but well below the MCL of 2.0 μg/L. Mercury is a COPC in groundwater.

Molybdenum was detected above the background criterion of 6.36 μg/L at B401 at a concentration of 168 μg/L (or 26 times the background criterion). Molybdenum is a COPC in groundwater.

Nickel occurs above the background criterion of 152.46 μg/L in two groundwater samples, at 394.0 μg/L at W399 and 322J μg/L at B408. Both values exceed background by more than two times, and exceed the MCL of 100 μg/L. Nickel is a COPC in groundwater.

Selenium was detected once above the background value of 1.85 μg/L, at 3.60J μg/L in well 0319, far below the MCL of 50 μg/L. Three occurrences of selenium in soil were identified in the vicinity of this well, south of the Spoils Disposal Area (Section 4.4.1). Selenium is not a COPC in either groundwater or seeps.

Silver was detected above background in seeps 610, 614, 617, and 620. The maximum concentration above background was 1.70 μg/L, well below the secondary MCL of 100 μg/L. Silver is a COPC in the seeps.

Thallium occurs only in W399 at 360 μg/L, or about three times greater than the background value. This value exceeds the MCL of 2 μg/L and the MCLG of 0.5 μg/L. Thallium is not a COPC in either groundwater or the seeps.

Vanadium was detected above the background criterion of 18.13 μg/L in all of the eight seeps and four groundwater sampling locations. Concentrations range from slightly above background (22J μg/L at Seep 619) to 7.6 times the background value (138J μg/L at B408). Seep concentrations of vanadium are from 1 to 2.4 times the background value. Soil occurrences of vanadium are all less than twice the background

criterion, and do not correspond to groundwater or seep occurrences of this metal. As previously mentioned, vanadium is a COPC in groundwater and seeps.

Zinc was detected above background in four groundwater sampling locations (W399, B400, B401, and B408). The maximum concentration detected was 1,140J μg/L at B408, approximately eleven times greater than background. This concentration is below the secondary MCL of 5,000 μg/L. Soil and sediment occurrences of zinc do not appear to be related to groundwater or seep occurrences. Zinc is a COPC in groundwater.

4.3.3.3. Total Organic Carbon

Eight monitoring wells and seven of the eight seeps had detects above background of total organic carbon (TOC). Results in groundwater varied from 2.0 to 6.5 μg/L (or 1.1 to 3.6 times background). In the seeps, concentrations ranged from 2.3J to 5.7J μg/L (or 1.2 to 3.2 times background). The highest concentration of TOC measured was 6.5 μg/L at well 0158.

4.3.3.4. Explosives

Three explosives (PETN, 1,3-dinitrobenzene, and 1,3,5-trinitrobenzene) were detected above background in four of the eight seeps, and one explosive (2,4,6-trinitrotoluene) was detected above background in W400. Table IV.6 summarizes the occurrences of explosives in New Property water samples. The three explosives found in seeps are all COPCs; 2,4,6-trinitrotoluene is a COPC in groundwater. The maximum concentration of any explosive is 11J μg/L of PETN at seep 619. There is no apparent pattern in the occurrences of explosives. None of these occurrences correspond to occurrences of explosives in soils.

4.3.3.5. Pesticides/Polychlorinated Biphenyls

Pesticides/PCBs were not detected above background in groundwater or seeps.

4.3.3.6. Semi-Volatile Organic Compounds

SVOCs were not detected above background in either groundwater or seeps.

Table IV.6. Results Summary of Explosives Detected in New Property Water Samples (μg/L)

Sample Location	1,3,5-Trinitrobenzene	1,3-Dinitrobenzene	2,4,6-Trinitrotoluene	PETN
0614	1.80	2.90J	---	2.70J
0618	0.016J	---	---	3.4J
0619	---	0.11J	---	11.00J
0620	---	---	---	1.60J
W400	---	---	0.76J	---

--- not detected
J estimated quantity
μg/L micrograms per liter

4.3.3.7. Volatile Organic Compounds

VOCs detected above background include 1,2-dichloroethene, acrylonitrile, hexane, and trichloroethene (TCE). Of these, 1,2-dicloroethene, TCE, and hexane are COPCs in groundwater, and TCE is a COPC in seeps. With the exception of TCE, these analytes were each detected once above background in groundwater at B401 and W411. TCE was found in W411 and seep 617, at a concentration of 8 μg/L in both cases. These measurements exceed the MCL for drinking water of 5 μg/L. 1,2-Dichloroethene was found at 4 μg/L in W411. Acrylonitrile and hexane were present in B401, at 25J μg/L and 1J μg/L, respectively.

4.3.3.8. Radionuclides

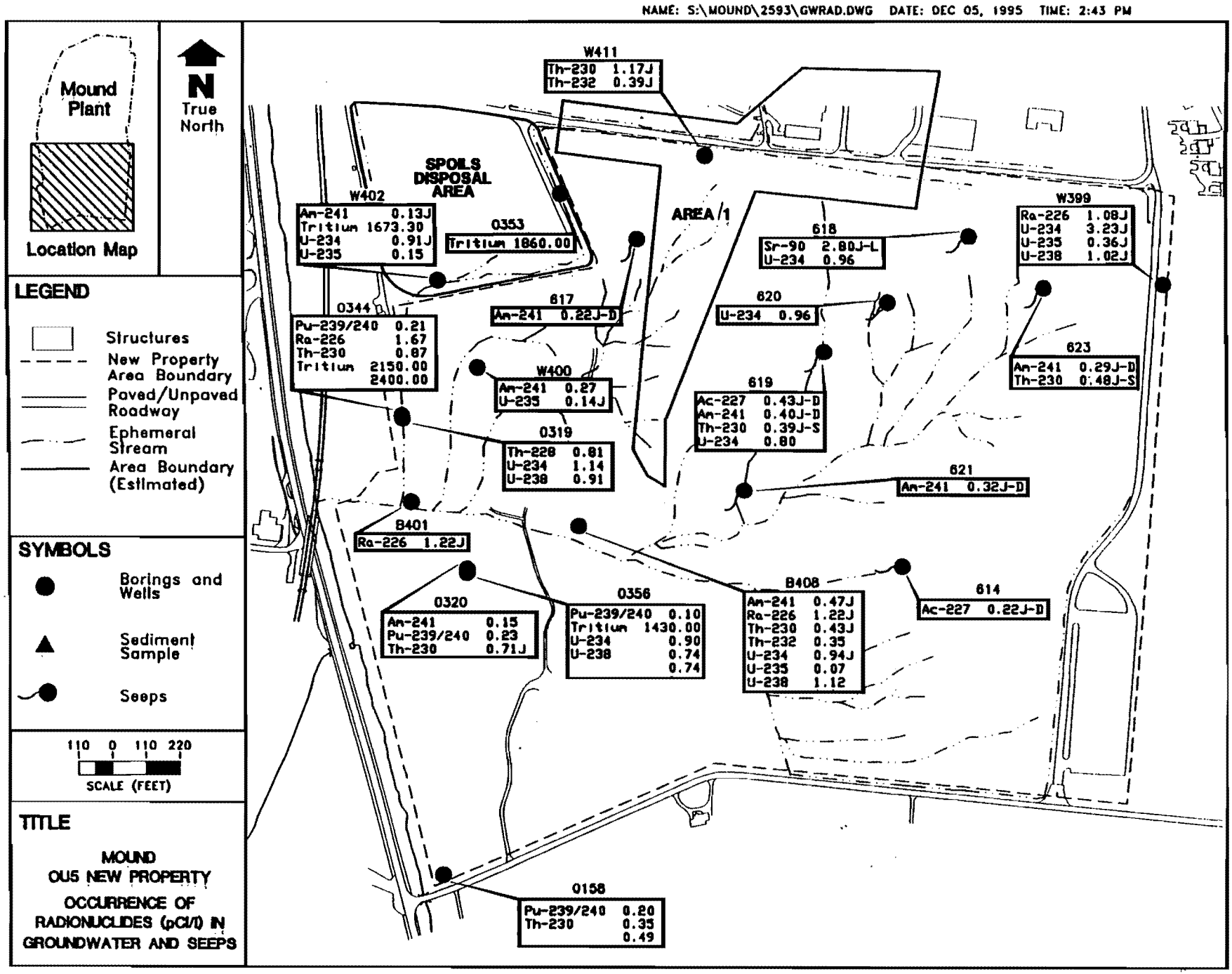
Thirteen radionuclides occur above background criteria in New Property groundwater and/or seeps. Eleven are identified as COPCs in groundwater. Five are identified as COPCs in the seeps.

In groundwater, the following radionuclides were detected above background: Am-241, Pu-239, Pu-240, Ra-226, Th-228, Th-230, Th-232, tritium, U-234, U-235, and U-238. The highest concentration of any radionuclide in groundwater is 0.36J picocuries per liter (pCi/L) of U-235 at W399. This value is approximately 9.5 times higher than the background value of 0.19 pCi/L. Pu-239 and Pu-240 were detected above background at wells 0158, 0320, 0344, and 0356, with the maximum value of 0.23 pCi/L at well 0320 (about four times the background value).

In the seeps, Ac-227, Am-241, Sr-90, Th-230, and U-234 were detected above background levels. Seeps 614, 617, 618, 620, and 621 each had detections of only one radionuclide (Sr-90, U-234, Am-241, or Ac-227) at levels from 1.2 to 2.9 times the background criteria. Seep 610 exhibited no evidence of radionuclides above background. Am-241 and Th-230 were both detected above background in seeps 619 and 623; in addition, Ac-227 was detected at seep 619. Values in these two seeps ranged from approximately one to three times the background criteria.

Figure 4.24 depicts the distribution of radionuclides above background.There is no apparent pattern in the distribution of these analytes in groundwater or seeps at the New Property.

Figure 4.24. Occurence of Radionuclides (pCi/L) in Groundwater and Seeps



4.4. SOURCES OF CONTAMINATION

Historical Mound records show that the New Property has never been used by the Mound Plant for waste disposal or for plant processes. There are no identified landfills or disposal areas in the New Property associated with Mound Plant activities. Thus, any identified sources of contamination are either offsite, or they existed before the Mound Plant purchased the property in 1981. The following subsections discuss possible sources of contamination in surface and subsurface soil, groundwater, and seeps.

4.4.1. Possible Sources of Soil Contamination

Possible sources of soil contamination in the New Property may include:

- Area 1
- the Spoils Disposal Area
- roads surrounding the New Property
- historical farming activity
- offsite air emissions

4.4.1.1. Area 1

As discussed in Section 4.3.1, all of the radionuclide COPCs in soil (with the exception of U-235) were found along the northern perimeter road and especially within the Area 1 "arm." Thorium and Pu-238 contamination in soil samples at and around Building 21 (which is within Area 1) is well documented in the OU9 Site Scoping Report Volume 3, Radiological Site Survey (DOE 1993b). Erosion and transportation of these soils in the drainage channels parallel to the northern perimeter road probably account for the contamination noted in this area.

4.4.1.2. Spoils Disposal Area

Another source of soil contamination may be the Spoils Disposal Area. This area is used by the Mound Plant for the disposal of soil and concrete removed during plant construction. All soils are screened for Pu-238 and Th-232 before disposal in the Spoils Disposal Area. Concentrations must not exceed 25 pCi/g and 2 pCi/g for Pu-238 and Th-232, respectively.

In late 1986 or early 1987, soil contaminated with gasoline from the Building G garage area was disposed of in the Spoils Disposal Area (DOE 1993c).

During this investigation, several metals, PAHs, and radionuclides were detected above background criteria in surface soil and sediment samples in an area downgradient from the Spoils Disposal Area (Section 4.3.1). Also, the soil gas survey conducted during the OU5 New Property Phase 1 investigation (DOE 1994b) showed elevated response to cycloalkanes/alkenes, which are VOCs.

Although radiological contamination below Mound Plant action levels is likely to exist in the Spoils Disposal Area, its potential to migrate onto the New Property and cause risk is low because the primary contaminants (Pu and Th) bind tightly with the soil matrix and are relatively immobile. Migration of these contaminants onto the New Property is unlikely; thus they would not impact future commercial/industrial land use.

4.4.1.3. Roads

Contaminants expected to be found along roads are VOCs, SVOCs, and metals, which are fuel combustion by-products. The New Property is surrounded by roads on all four sides. To the north is the perimeter road, to the east is the contractors entrance road, to the south is Benner Road, and to the west is the Dayton-Cincinnati Pike and the Conrail Railroad. Soil samples collected along the northern perimeter road showed several contaminants including arsenic, vanadium, and PAHs. Also, the soil gas survey conducted during the OU5 New Property Phase 1 investigation (DOE 1994b) showed elevated response to cycloalkanes/alkenes.

4.4.1.4. Historical Farming Activity

As stated in Section 2, the New Property was historically farm land. Aerial photographs show the location of two farm buildings or building clusters. One was located south of the main branch of the ephemeral stream in the southwest portion of the property, known as the "farm trash area." The other is located north of the present contractors' entrance in the east-central part of the property. Gasoline-powered farm equipment and/or fuel storage tanks may have been the source of, or contributed to, SVOC contamination in subsurface soil or groundwater.

The soil gas survey conducted during the OU5 New Property Phase 1 investigation (DOE 1994b) showed elevated response to aromatic hydrocarbons and cycloalkanes/alkenes.

Contaminants found in soil samples collected near the "farm trash area" during the RSI investigation (DOE 1995c) (RSI samples NPS004, NPS005, and NPS006) include phthalates, magnesium, mercury, Sr-90, and Ra-226, but all at levels in the same order of magnitude as background concentrations. In addition, samples were collected from the "farm trash area" during the 1992 OU3 Miscellaneous Sites - Limited Field Investigation (DOE 1992c). No VOCs, SVOCs, or pesticides/PCBs were detected, but one of the sampling locations produced results for 22 metals above laboratory detection limits.

A small area around sediment sample SD09 may be another source of surface soils contamination, particularly metals. Field notes indicate that "glass debris was located in the sampling point. Metal debris was located slightly upstream from this point." This may indicate that there was an historic dumping ground used by former tenants somewhere in the vicinity of SD09 that may be contributing to the metals detected in this sample and in other samples downstream.

4.4.1.5. Offsite Air Emissions

Airborne emissions from the Mound Plant or other offsite power plants and industrial sites may have contributed to contamination at the New Property. The Mound Plant is generally not considered to be a heavy industrial site, so emissions from there may not have contributed significantly. However, until the 1970s, a power plant was located to the northwest of the Mound Plant and there is a coal-fired power plant currently operating to the southwest of the plant. Emissions from either of these could have contributed to contamination at the site, particularly metals.

4.4.2. Sources of Groundwater and Seep Contamination

No discernible plumes of groundwater contamination and no trends in seep contamination were detected in this or previous investigations. Thus, no sources of groundwater or seep contamination can be identified with the available data.

4.5. SUMMARY OF NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination at the New Property can be summarized as follows:

- Generally, the New Property contains low levels of contaminants that are mostly found in the surface soils of the area. The primary contaminants detected above background were metals.

- Some radiological contaminants were detected within the New Property. Pu-238 contamination was detected in surface soil samples collected along the northern perimeter road, just south of Building 21, and in a small area located south of the Spoils Disposal Area. Th-228, Th-230, and Th-232 were also detected in surface soils in these same locations, but to a lesser extent. The average concentrations of radionuclides detected within the New Property were generally at or below background levels. Radiological contaminants were infrequently detected at low concentrations in groundwater and seep samples. The average concentrations of radionuclides detected in the groundwater were at or below background levels.

- Fewer contaminants were detected in subsurface soils than in surface soils, although average concentrations generally increased slightly with depth, as was the case with metals and radionuclides. Average concentrations of SVOCs decreased with depth. This finding indicates that most of the soil contamination at the New Property is distributed within the first two feet BGS. It is also evident that contaminant migration primarily occurs through air and surface water transport mechanisms. Vertical migration through the surface soils to the subsurface soils is a minor transport pathway [i.e., limited to the more mobile (water soluble) contaminants].

- The groundwater within the New Property contains only few contaminants at low concentrations. Contaminants that were detected in the groundwater do not appear to be site related. Consequently, the New Property does not appear to be impacting the quality of the groundwater resources of the area. In addition, very low levels of contaminants were detected in the seeps, indicating that upgradient areas do not contribute measurably to the nature and extent of contamination at the New Property.

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Section 5

5. CONTAMINANT FATE AND TRANSPORT

The purpose of this section is to describe the mechanisms affecting the migration of the COCs detected at the New Property and their fate in environmental media. COCs were selected from the COPCs based on their toxicity, frequency of occurrence, concentrations, migration potentials, and risk. The physical and chemical properties of the COCs and a conceptual model of their most likely migration pathways at the New Property are also presented in this section.

Section 5.1 discusses the fate and transport mechanisms affecting the movement of COCs at the New Property. The potential release mechanisms occurring at the site and the primary transport mechanisms affecting the migration of the COCs in various environmental media are discussed. Graphical and narrative descriptions of the conceptual site model are also presented.

Section 5.2 describes the physical and chemical properties of the environmental media that control the movement and behavior of the COCs at the New Property. The most important chemical and physical properties of the COCs detected at the New Property are also presented.

Section 5.3 describes how the physical and chemical characteristics of the COCs and the environmental media in which they were detected affect their persistence, mobility, and the fate and transport at the New Property.

5.1. FATE AND TRANSPORT MECHANISMS

Contaminant release mechanisms occurring at the New Property include volatilization, wind erosion, soil erosion, and dissolution. Transport mechanisms include wind, surface water runoff, infiltration, and groundwater flow. A representative schematic diagram illustrating the conceptual model of release and transport mechanisms at the New Property is shown in Figure 5.1.

5.1.1. Contaminant Release Mechanisms

The release of contaminants from within the New Property may result from volatilization of VOCs through surface soils and sediments; particulate releases and downwind transport of contaminated soil particles from areas of sparse vegetation; surface water runoff and erosion of contaminated surface soils; and

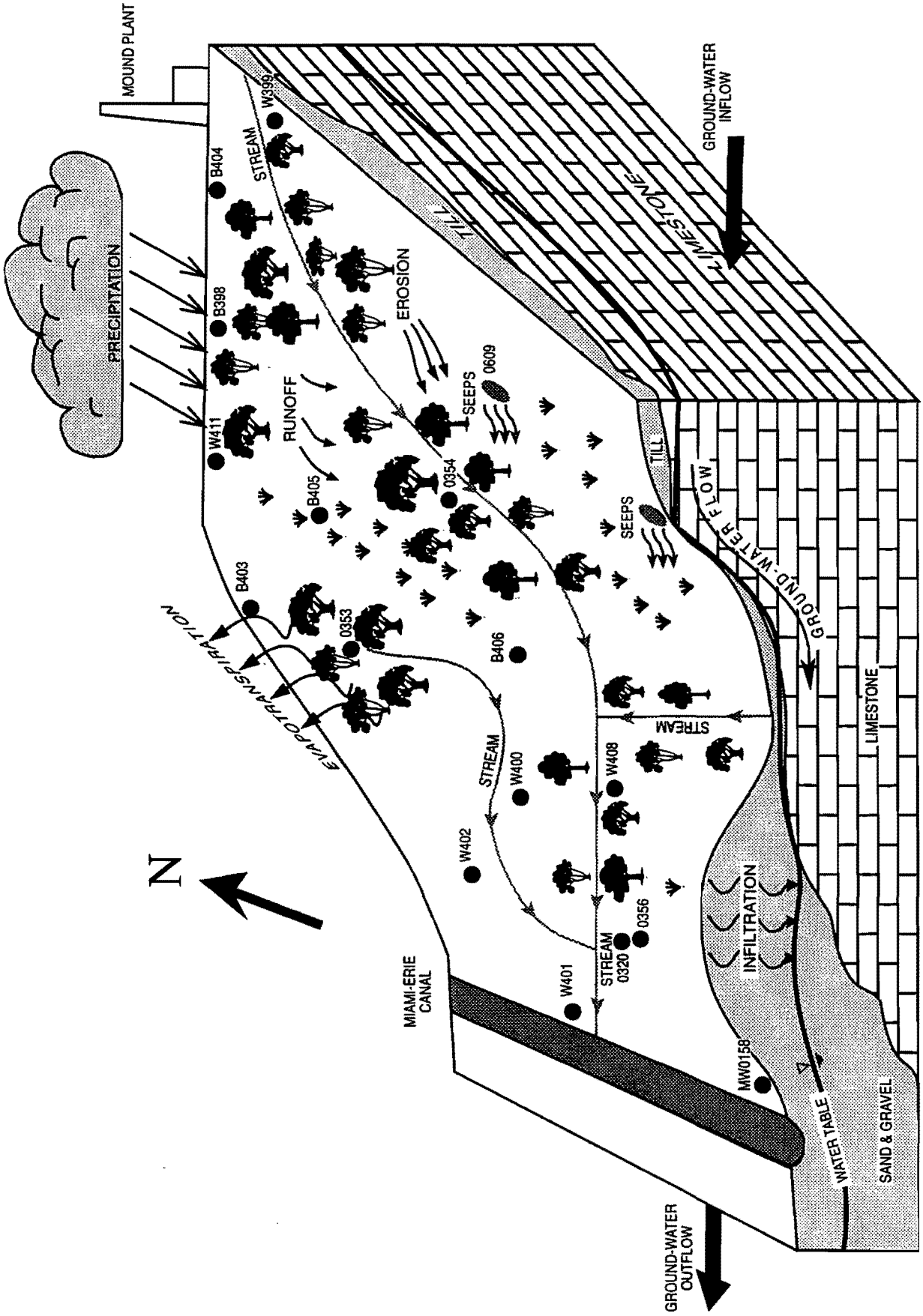

Figure 5.1. Conceptual Site Model of Release and Transport Mechanisms

dissolution from soils via the infiltration and percolation of surface waters. Contaminants present at the surface and in the soils at the New Property may also be released through mechanical means during periods of heavy precipitation. Contaminants released in this manner are either transported via surface water through the ephemeral network or percolate through the vadose soils to the saturated zone.

5.1.1.1. Volatilization

VOCs have relatively high vapor pressures, high Henry's Law constants, moderate water solubility, and generally low organic carbon partition coefficients (K_{OC}). These compounds volatilize from groundwater or soil particles into the aerated pore spaces in the soil or directly to the atmosphere, especially when the soil is disturbed (e.g., excavated). The potential for VOCs to volatilize to the atmosphere may be limited where there is abundant vegetative cover. VOCs (acetone and methylene chloride) were detected in the surface soils at the New Property. However, it is not likely that volatilization is a significant release mechanism because of the dense vegetation covering most of the New Property. Small quantities of these compounds may be released to the atmosphere in areas that are sparsely vegetated or locations where the soil has been disturbed (e.g., animal burrows).

5.1.1.2. Wind Erosion

Contaminants adsorbed to surface soils within the New Property may be released to the atmosphere as particles transported by surface winds resulting in airborne contaminated dust. Soil particles containing SVOCs (primarily PAHs), radionuclides, and metals may be eroded from areas containing little vegetative cover. These contaminants were found in surface soil samples (at low concentrations) throughout the New Property. However, because most of the New Property is heavily vegetated, wind erosion is probably not a significant release mechanism at the site.

5.1.1.3. Soil Erosion

Soil erosion is probably the dominant release mechanism at the New Property. Surface water runoff from precipitation is likely to carry dissolved contaminants as well as contaminated soils and sediments. Soil erosion is most notable in the ephemeral network that drains the New Property and may be responsible for the release and subsequent redeposition of the PAHs, pesticides, and radionuclides that were detected in the surface soils. Contaminated soils and sediments appear to be collecting in the ephemeral network

during heavy precipitation and are subsequently transported down the main branch of the ephemeral stream which eventually discharges into the Great Miami River.

5.1.1.4. Infiltration and Dissolution

Precipitation returns to the atmosphere through evapotranspiration, infiltrates the surface soil and percolates through the vadose soil to the water table, or flows into the ephemeral streams where it may either infiltrate or ultimately discharge to the Great Miami River. Water soluble compounds in the soil can be released via dissolution and eventually percolate to the groundwater. This is probably a significant release mechanism at the New Property because VOCs, radionuclides, and water soluble metals were found in the surface and subsurface soils.

5.1.2. Transport Mechanisms

The primary transport mechanisms affecting the migration of contaminants onto, within, and away from the New Property include wind, surface water runoff, precipitation percolating through vadose soils, and groundwater flow. Contaminants released from the Spoils Disposal Area, Area 1, the Operational Area (e.g., stack emissions), and offsite industrial areas are the most likely sources of the contamination detected at the New Property. These contaminants are subsequently transported by means of all of the transport mechanisms listed above.

5.1.2.1. Wind Transport

Vapors and particulates entering the atmosphere by means of wind erosion or stack emissions are widely dispersed across the New Property and offsite. Although wind is not a primary transport mechanism for contaminants at the New Property, it is a significant means of transport for contaminants onto the New Property from offsite sources. Airborne contaminants from the Spoils Disposal Area (e.g., dust), stack emissions from the Operational Area, and from offsite sources such as power plants and industrial sites, may have contributed to contamination at the New Property through wind transport. This mechanism may be responsible for the distribution of PAHs and metals found in New Property surface soils.

5.1.2.2. Surface Runoff and Erosion

Movement of contaminated sediment to the ephemeral streams via surface runoff and erosion appears to be an important transport mechanism at the New Property. Movement of runoff water and eroded sediment to the ephemeral streams accounts for occurrences of similar contaminants, such as PAHs and radionuclides, in the streams and the surface soils "downstream" from Area 1 and the Spoils Disposal Area. Surface erosion is the most effective mechanism for transporting the less soluble compounds like PAHs and radionuclides, resulting in their occurrence "downstream" from areas of known contamination. Surface runoff is also an effective transport mechanism for water soluble compounds such as metals.

During times of heavy precipitation, surface water moves through the ephemeral streams of the New Property carrying potentially contaminated water and sediment offsite. Occurrence of this transport mechanism was evident in the contaminated sediments detected in the main ephemeral stream, which receives runoff from the network of minor ephemeral streams on the New Property.

5.1.2.3. Infiltration and Groundwater Flow

Movement of contaminants from surface and subsurface soils to the groundwater via dissolution by infiltrating and percolating water appears to be a minor transport mechanism at the New Property. Water percolating through the contaminated surface soils may have dissolved some of the contaminants and carried them downward to the underlying groundwater. These contaminants may have been adsorbed once again on soils at a greater depth. This mechanism probably accounts for the distribution of several contaminants detected in the vadose zone. It may also account for some of the groundwater contamination detected at the New Property.

Migration of dissolved and suspended contaminants via groundwater flow is a significant transport mechanism at the New Property. The groundwater at the New Property generally moves to the southwest under small hydraulic gradients (Section 3.3.2.2). Therefore the contaminants, both soluble and suspended, such as VOCs, SVOCs, metals and radionuclides migrate with the groundwater offsite. The groundwater may also have been infiltrated with contaminants before it migrated to the New Property.

5.2. PHYSICAL AND CHEMICAL CHARACTERISTICS OF ENVIRONMENTAL MEDIA AND CONTAMINANTS OF CONCERN

The physical and chemical characteristics that affect the fate and transport of contaminants through the environmental media, as well as the interactions between the different media, are discussed in this section. Emphasis is placed upon those characteristics and processes most likely to influence the movement of the COCs identified for the New Property (Section 6). The general information on chemical characteristics is summarized from published sources (EPA 1979; Dragun 1988; Knox et al. 1993).

Environmental media under consideration are surface soils and groundwater. None of the COCs identified in the risk assessment were found above background criteria or detection limits in subsurface soils or seeps.

5.2.1. Surface Soil Characteristics

The most important physical characteristic that controls the movement of water and contaminants through soils is its permeability, both in the surface and subsurface soils. The chemical characteristics most likely to influence contaminant movement are cation exchange capacity (CEC) and organic carbon content.

Factors that affect the relative amount of precipitation that infiltrates or runs off the surface include surface soil type and permeability. The mean annual precipitation for Montgomery County is 40 inches per year. Approximately 6 inches per year of this rainfall are available for groundwater recharge (Schairbaum and Frost 1988).

Five soil samples from the New Property were analyzed for geotechnical parameters, including coefficient of permeability (a dimensionless value). Table V.1 shows the locations, depths, soil types, and permeabilities for these samples.

Coefficients of permeability of these samples range from 1.1×10^{-6} to 9.1×10^{-9}. These average values are within the range of expected permeabilities for glacial materials. Based on these measurements, surface water would be expected to percolate and infiltrate slowly through surface soils, and ultimately to the water table. Measured permeability coefficients suggest that most of the precipitation results in surface water runoff and soil transportation by erosion throughout much of the New Property.

Table V.1. Results of Geotechnical Analyses of Soil Samples

Location	Depth (ft BGS)	Soil Type	Coefficient of Permeability
B405	0-2	MH	2.9×10^{-8}
B406	6-24	CL/ML	9.1×10^{-9}
B407	0-0.5	ML	1.7×10^{-9}
B408	0-2	CL	1.1×10^{-6}
B408	17-34	SM	9.3×10^{-7}

ft BGS feet below ground surface
CL clay
MH inorganic silts with medium plasticity
ML inorganic silts with slight plasticity
SM silty sand

The CEC of a soil is a measure of its capacity to immobilize positively-charged ions, such as metals and radionuclides, by exchange of those ions onto the surfaces of soil particles. Cation exchange specifically refers to the exchange between cations balancing the charge on the soil particle and the cations moving through a soil. The capacity of a soil to adsorb ions is greatly influenced by the surface area of the soil particles, because ions are exchanged on the exposed mineral surfaces. Clay particles have a large amount of surface area compared to sand grains, and can exchange cations within their layered structures to a greater or lesser degree depending on the clay minerals present. The CEC of a typical clay-rich soil may be 2 to 30 times higher than the CEC of a typical sandy soil (Dragun 1988). Therefore, a soil with a high clay content (and a correspondingly high CEC value) can be expected to attenuate (slow down) dissolved ions during transport more readily than a clay-free soil, unless the clay fraction is dominated by low-CEC clay minerals.

CEC was measured in eight soil borings during the OU5 New Property Extended Phase investigation (DOE 1995a). Values ranged from 2.44 to 30.32 milliequivalents per 100 grams (meq/100 g), with an average of 16.34 meq/100 g. CEC was also measured in well 0344 in the uppermost outwash deposits (6.6 and 9.9 meq/100 g), the till (5.8 and 8.6 meq/100 g), and the unconsolidated materials beneath the till (8.6 to 22.5 meq/100 g). These CEC values are generally low; therefore, most dissolved metals and radionuclides would infiltrate and percolate through vadose soils with negligible CEC attenuation. Thus, some metals and radionuclides would be expected to be found in subsurface soil samples at the New

Property. This was found to be true as discussed in Section 4.3.2. However, fewer metals and radionuclides were detected in subsurface soils than in surface soils which may indicate that some CEC attenuation occurs. Also, the average concentrations of most metals and radionuclides in subsurface soils is greater than in surface soils.

The amount of naturally occurring organic carbon present in a soil affects the adsorption of organic compounds in that soil. The greater the organic carbon content in the soil, the more likely it is that organic compounds migrating through the soil will become adsorbed by the carbon in the soil and the less likely they will migrate long distances through it. Although the presence of organic material in soil tends to increase the attenuation of organic compounds, it may reduce the attenuation of radionuclides.

Values of TOC measured in samples collected during the OU5 New Property Extended Phase investigation (DOE 1995a) ranged from 4015J mg/kg in B409 to 40,225J mg/kg in B408. These values are high; therefore, most organic compounds percolating through soil will be appreciably attenuated. Thus, in the soils present at the New Property, organic compounds would be expected to be found at higher concentrations in soils at or near the surface with concentrations decreasing with depth. This was generally the case, although the average concentration of acetone in subsurface soils (20.2 μg/kg) was greater than in surface soils (8.43 μg/kg).

5.2.2. Groundwater Characteristics

Based on subsurface data from the New Property, the principal medium of transport of chemicals is groundwater movement in the subsurface unconsolidated glacial deposits and in the bedrock fractured carapace. The factors affecting the transport of chemicals through the groundwater include the orientation and steepness of the groundwater gradients, the pH of the groundwater, and the oxidation/reduction (redox) potential of the groundwater.

5.2.2.1. Hydraulic Gradients, Groundwater Flow Directions, and Velocities

The horizontal and vertical gradients have been determined for the hydrogeologic systems beneath the New Property based on groundwater elevations in monitoring wells, as discussed in Section 3.3. The gradients define the direction and rate of groundwater flow in the BVA and fractured bedrock and therefore affect the direction and rate of migration of chemicals traveling within groundwater.

Groundwater flow at the New Property is predominantly southward along the trend of the BVA, with an essentially horizontal gradient in the western half of the New Property. Horizontal groundwater flow velocity in the BVA underlying the New Property can be calculated using the equation:

$$\bar{v} = -\frac{K}{n_e}\frac{dh}{dl},$$

where: $\bar{v}$ = *average linear velocity*,
K = *hydraulic conductivity*,
n_e = *effective porosity* (%),
dh/dl = *horizontal hydraulic gradient*,

Horizontal groundwater flow in the BVA is estimated to be about 0.5 feet/day (200 feet/year), based on an average hydraulic conductivity of 680 feet/day, an average gradient of 0.0002 feet/feet (DOE 1994f), and an estimated effective porosity of 25%.

The Great Miami River is recognized as a boundary to shallow groundwater flow from the New Property, and is generally considered to be a source of groundwater recharge. Horizontal gradients at the New Property are not influenced by pumping in the nearby production wells that penetrate the BVA.

Groundwater flow in the bedrock fractured carapace is controlled by the orientation and degree of interconnection of fractures. Both vertical and horizontal fractures are present in the fracture zone, as described in Section 3.3.2.2 of this report. Permeability is greatest in the upper, unsaturated zone of interconnecting fractures. Permeability diminishes with depth below the bedrock surface as fracture density decreases. The bottom of the fracture zone is a no-flow boundary. Hydraulic conductivity has been measured from 0.09 to 1.02 feet per day in the fractured carapace. The degree of communication between the two aquifers beneath the New Property is unknown. However, as mentioned in Section 4.3.3, the geochemical data suggest that they are not isolated from one another.

5.2.2.2. Redox Potential and pH

The mobility of a chemical in groundwater is determined by both the properties of the chemical and the chemistry of the groundwater. The pH and redox potential of groundwater are important factors in the fate and transport of chemicals because they control the ability of groundwater to dissolve and mobilize metals and other chemicals.

The pH of groundwater at the New Property, measured in the field during the OU5 New Property Extended Phase groundwater sampling (Section 4), ranged from 7.38 to 8.50 in six samples, with an average value of 7.75, indicating neutral to slightly basic conditions that would not enhance the potential for migration of metals. Soil pH was recorded at well 0344 at depths from 18 to 65 feet BGS. Readings vary from 6.2 to 7.8 in this boring (slightly acidic to slightly basic).

The redox potential is a numerical index of the intensity of oxidizing or reducing conditions in groundwater, and is useful in predicting which chemical reactions involving electron transfer are likely to occur in groundwater. The redox potential was measured in the field during the OU5 New Property Extended Phase investigation (DOE 1995a), and ranged from -3.6 to 213.6 millivolts in five sampling locations. Based upon these measurements, it is difficult to characterize the entire New Property as either reducing or oxidizing. Conditions are likely to vary laterally as well as with depth.

The dissolved iron concentration in the groundwater is an indicator of the redox conditions in the aquifer at the New Property. Iron occurs in the groundwater in one of two oxidation states; as reduced soluble ferrous iron (Fe^{2+}) or as oxidized relatively insoluble ferric iron (Fe^{3+}). In groundwater analyses, the dissolved iron concentration reflects the reduced soluble ferrous iron content of the water, whereas the total concentration includes the soluble as well as the insoluble ferric iron. If the bulk of the iron is in the dissolved form, reducing conditions prevail. If most of the iron is in the insoluble form, oxidizing conditions exist. Total and dissolved iron data are available for monitoring wells 0320, 0344, 0353, and 0356. A comparison of total to dissolved iron in these wells reveals no uniform set of conditions for the entire New Property; rather, groundwater varies from oxidizing to reducing. Oxidizing conditions were indicated from measurements at monitoring wells 0320, 0353, and 0356. At well 0344, reduced soluble and oxidized insoluble iron concentrations were nearly the same.

5.2.3. Physical and Chemical Characteristics of COCs

5.2.3.1. Arsenic

Arsenic is a ubiquitous metal found in low concentrations in the Earth's crust. It is insoluble in water in its pure form, but forms soluble compounds that are mobile in aqueous environments in reactions with air, water, minerals, and organic matter. Arsenic is not volatile under conditions observed at the New Property.

Arsenic in surface water cycles between solution and adsorption to sediment particles through a complex chemistry involving many types of reactions. In sediment, it undergoes bacterial metabolism to form methylarsines, which are soluble in water and highly volatile (Agency for Toxic Substances and Disease Registry (ATSDR) 1987). Therefore, arsenic does not bioaccumulate in microorganisms, but is present at low levels in fish tissue, when water and food contaminated with arsenic is consumed. However, laboratory studies indicate that arsenic levels in tissues do not increase as trophic levels increase (EPA 1979).

5.2.3.2. Beryllium

Beryllium is a relatively rare element in the Earth's crust and atmosphere. It is one of the lightest elements, and forms stable compounds with anions. The water solubility of beryllium is low in the pH range of most natural waters. It is probable, therefore, that beryllium will occur as insoluble particles or will be absorbed onto mineral surfaces, rather than stay in solution. The fate of beryllium in the environment is most likely adsorption to mineral surfaces or complexing into soluble compounds. It is not known to bioaccumulate or magnify in the food chain.

5.2.3.3. Chromium

Chromium is naturally occurring in low concentrations and is an essential nutrient. Trivalent chromium (Cr^{3+}) is the most common chromium ion occurring in nature, and also the most stable valence under the redox conditions found in naturally occurring waters and soils. Hexavalent chromium (Cr^{6+}) is the most toxic form, and is a strong oxidizing agent in the presence of organic matter. Both are soluble in water. Trivalent chromium will precipitate when in solution at a pH greater than 5 to form insoluble oxides or hydroxides. Hexavalent chromium tends to form chromates in water, which are soluble and highly mobile in aquatic systems. Redox conditions strongly control the solubility of chromium. Both are only weakly adsorbed to inorganic solids such as clay minerals. Organic matter also has little influence on mobility. Volatilization and photolysis are not probable fates for chromium.

5.2.3.4. Manganese

Manganese is a common element in the Earth's crust and plays an important role in redox reactions in soils. Insoluble manganese oxides are ubiquitous in well-aerated soils with pH greater than 5, as coatings

on grain surfaces, or as nodules. In reducing conditions, manganese is readily leached from the soil. Manganese has a complicated chemistry with iron, chromium, reduced sulfur, and organic compounds in the environment, and plays a primary role in biological processes. Its environmental fate is dependent upon the geochemical conditions in soils and water. Manganese may be mobile in reducing environments, and immobile where higher pH conditions cause it to precipitate as oxides.

5.2.3.5. Nickel

Nickel occurs naturally in trace amounts in geological materials. It is refined for use in alloys, and is commonly used in plating. Nickel is a highly mobile metal that will form soluble compounds with many naturally occurring aqueous chemicals. Nickel may be removed from solution by sorption to hydrous iron or manganese oxides (although soil analyses at the New Property indicate that manganese oxides are not abundant in the soils). Organic matter such as humic acids in water tend to increase nickel's solubility; thus, precipitation of nickel compounds is probably an unlikely fate under natural conditions. However, if extreme reducing conditions prevail, insoluble nickel sulfides will form. Nickel is bioaccumulated, but this is not considered a significant environmental fate. Volatilization and photolysis are also unlikely fates for nickel.

5.2.3.6. Benzo(a)pyrene

PAHs such as benzo(a)pyrene are common residues of human activity that result from the combustion of organic matter. Principle sources of PAHs include vehicle emissions, fires, and coal-fired power plants. Benzo(a) pyrene is preferentially adsorbed to organic materials present in soils, as indicated by its very low vapor pressure (5.6×10^{-9} millimeters of mercury) and very low water solubility (0.0012 mg/L). Volatilization is probably not a significant fate. Ground and surface water transport of benzo(a)pyrene is unlikely in light of the compound's capacity to bind to soil and sediment organic matter. It is likely to be mobile only if eroded particles contaminated with the compound are transported by overland flow to streams or by wind. Biodegradation of PAHs has been documented, and is probably the eventual fate of benzo(a) pyrene. Its half-life in aerobic soil conditions, such as in surface soils at the New Property, is two months to 1.5 years (Howard et al. 1991).

5.2.3.7. Americium-241

Americium-241 has essentially the same mobility characteristics in the environment as uranium (Benedict et al. 1980). Although these heavy isotopes are insoluble in water in their pure forms, they react with organisms, humic acids, and other organic matter in soils and sediment to form soluble compounds. These compounds are potentially mobile in groundwater and surface water.

5.3. FATE AND TRANSPORT OF COCs

This section provides a summary of the potential environmental fate of site-specific COCs. The discussion highlights the factors that are relevant to the New Property on the basis of the physical setting. These factors include mobility in groundwater, degradation potential, persistence in soils and water, and potential for biological uptake.

The analytes identified as human health COCs in groundwater by the risk assessment (Section 6) are arsenic, beryllium, chromium, manganese, nickel, and Am-241. In soils, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)fluoranthene, and indeno(1,2,3-cd)pyrene (all PAHs) were identified as COCs. There were no ecoCOCs identified. The fate and transport characteristics of these analytes are discussed below.

5.3.1. Metals

Various metals are reported in New Property soil, sediment, and groundwater. However, metals are COCs only in groundwater. These trace metals are naturally occurring and may enter the environment through the weathering and erosion of geologic materials. In addition, there are anthropogenic sources (caused by humans) of metals that may disperse them widely throughout the region. For example, pesticide application, incineration of refuse, and fossil fuel combustion all release trace metals.

5.3.1.1. Arsenic

Arsenic is detected generally at background levels in the surface and subsurface soils at the New Property, but is present in high concentrations above background in groundwater at B408. The occurrence of arsenic in groundwater, and its presence at only low levels within soils, suggest arsenic is predominant

present in a soluble form. There is no evidence that the source of the occurrence at B408 is upgradient, however. B408 is the locus of many of the maximum detects of metals in New Property groundwater, although soil from this location does not exhibit correspondingly high concentrations. Groundwater downgradient does not appear to be influenced by arsenic in B408. These data suggest that there is little transport of arsenic occurring in groundwater.

5.3.1.2. Beryllium

Beryllium was detected above background levels in monitoring wells 0320 and 0356. The occurrence of beryllium in these wells does not appear to be related to past or current activities at the New Property, because beryllium occurs at no other groundwater or surface water location and is not present above background in soil or sediment. Beryllium may become immobilized by adsorption to subsurface soils or may be diluted by groundwater.

5.3.1.3. Chromium

Chromium was detected in two groundwater samples in the New Property. Concentrations were 309 μg/L at W399, and 164J μg/L at B408. These two results do not appear to be related. Although not a COC in soil, chromium was detected in soils at B409, AH, AK, and CJ, and in sediment samples SD01, SD04, and SD26, at concentrations slightly above background. The maximum concentration in soil was 29.6 mg/kg. Chromium was not speciated in the laboratory analyses, so the relative proportions of hexavalent to trivalent species in groundwater and soils are unknown. However, both species are likely to dissolve in groundwater and remain mobile.

5.3.1.4. Manganese

Manganese is reported at a concentration of 7,000J μg/L, about 33 times the background criterion in groundwater, in B408, and at concentrations from one to ten times background in five other wells. The distribution of these results does not indicate that there is a manganese-contaminated groundwater plume migrating across the site. Manganese was not detected in surface and subsurface soils at concentrations above background, indicating that conditions in the subsurface do not promote manganese precipitating from solution. It is likely, therefore, that manganese in groundwater will continue to migrate and be subject to dilution over time.

5.3.1.5. Nickel

Nickel is reported in water samples from monitoring well W399 and borehole B408. The highest concentration was detected at W399, at 394 μg/L (31.5 feet BGS). The concentration at B408 was 322 μg/L (37.1 feet BGS). Both of these results are greater than twice the background criterion for nickel (152.46 μg/L). Nickel was detected only once above background in soil, at location AH (41.90 mg/kg). There were no detects above background in the seeps or in subsurface soils. These findings suggest the source of nickel is not on the surface of the New Property and that nickel is unlikely to precipitate from solution in subsurface conditions. Nickel's likely fate at the New Property is to continue to migrate in groundwater and be diluted over time.

5.3.2. Organic Compounds

Four PAH compounds (benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)fluoranthene, and indeno(1,2,3-cd)pyrene are identified as human health COCs in Section 6. Benzo(a)pyrene is discussed in this section as a representative compound because more is known about its environmental behavior than any other PAH.

5.3.2.1. Benzo(a)pyrene

Benzo(a)pyrene is present in surface soils at W399, B401, W402, B404, and in sediment samples from SD04, SD09, SD14, SD15, SD17, SD18, SD19, SD21, and SD26. Concentrations range from 42J to 2500 μg/kg, with the maximum value detected at SD15. It was not detected above background in the subsurface soils. The distribution of these detections indicates no clear pattern. However, seven of the 13 soil occurrences are located along the main ephemeral stream network that flows westward across the southern half of the New Property. No single source of the compound is evident from the distribution, however. The likely fate of benzo(a)pyrene in the surface soils of the New Property is microbial breakdown into more elementary compounds. Specifically, microbes convert benzo(a)pyrene through a series of processes (such as substitution, hydrolysis, and epoxidation) to dihydroxy epoxides. It is these dihydroxy epoxides that are believed to be the actual carcinogens formed by metabolism of PAHs (Morrison et al. 1983).

5.3.3. Radionuclides

Am-241 is present in groundwater at monitoring wells 0320, W400, W402, and soil boring B408, as well as seeps 617, 619, 621, and 623. Concentrations range from 0.15 to 0.47J pCi/L. The maximum value was detected at B408. Am-241 was not detected in soils or sediments. The occurrences in groundwater are south-southwest of the Area 1 arm, except for W402, due west of the arm. In seeps, there is no apparent pattern of distribution for Am-241. The likely fate of this element is continued transport in groundwater and surface water.

Section 6

6. BASELINE RISK ASSESSMENT

6.1. HUMAN HEALTH BASELINE RISK ASSESSMENT

6.1.1. Introduction

6.1.1.1. Objective of the Baseline Human Health Risk Assessment

The baseline human health risk assessment evaluates current and future risks to human health from exposures to contaminants present at, or released from the New Property (the site). The focus of the risk assessment is to provide information necessary to justify action (or no action) at the New Property by sufficiently characterizing the contaminants, potential exposures and the potentially exposed population to determine what risks need to be mitigated. The human health risk assessment is a quantitative process that evaluates the potential noncancer and cancer health effects from long-term, low-level exposures to site-related contaminants. The results of the risk assessment are used, together with Applicable or Relevant and Appropriate Requirements (ARARs), to determine the need for site remediation and, if remediation is warranted, to support the selection of appropriate remedial alternatives.

6.1.1.2. Site Background

The New Property is located immediately south of the OU5 Operational Area. Section 1.2 of this report provides a more detailed description and history of the New Property.

6.1.1.3. Methodology and Organization of the Section

Methods used to characterize risk at the New Property are consistent with EPA methods for human health risk assessment as contained in the following guidance documents:

- Risk Assessment Guidance for Superfund (RAGS): Human Health Evaluation Manual, Part A (EPA 1989a)
- Exposure Factors Handbook (EPA 1989b)

- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (EPA 1991a)
- Dermal Exposure Assessment: Principles and Applications (EPA 1992b)
- Guidelines for Exposure Assessment (EPA 1992c)
- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment (EPA 1992d)
- Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure, Preliminary Review Draft (EPA 1993b).

Other pertinent guidance documents are referenced throughout the text. The baseline human health risk assessment is organized in accordance with RAGS (EPA 1989a), which specifies four steps:

- Data Compilation and Evaluation (Section 6.1.2)
- Exposure Assessment (Section 6.1.3)
- Toxicity Assessment (Section 6.1.4)
- Risk Characterization (Section 6.1.5)

In addition to the above, the risk assessment will qualitatively discuss uncertainty associated with the risk estimates (Section 6.1.6) and will conclude with a summary of the results (Section 6.1.7).

6.1.2. Data Compilation and Evaluation

The first step in the risk assessment process is to gather and evaluate pertinent data on contaminants present in environmental media at the New Property. This section of the risk assessment focuses on the following elements: (1) overview of sample collection and analyses program and data quality assessment as it relates to the human health risk assessment, (2) comparison of site-related contaminant concentrations to background concentrations, and 3) data aggregation and selection of COPCs.

6.1.2.1. Environmental Media Considered and Data Availability

Field investigations conducted for the New Property RI are detailed in Section 2.1 of this report. That section discusses sampling methods, sample locations, and the parameters for which the samples were analyzed.

Environmental media that were evaluated include soil/sediment, seeps generated from groundwater along the northeastern boundary of the property and groundwater. Generally, samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, common anions, TOC, and radionuclides (see Table II.4).

6.1.2.2. Data Quality Assessment

Environmental data used in the human health risk assessment have been obtained from the OU5 New Property Phase 1 Field Report (DOE 1994b), the OU5 New Property Extended Phase 1 Field Report (DOE 1995a), the OU9 Regional Soils Investigation Report (DOE 1995c), and the OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995b). Samples were collected, analyzed, and have undergone QA/QC evaluation and data validation in accordance with the methods outlined in the OU9 QAPjP (DOE 1993e) and the OU5 QAPjP (DOE 1993d).

6.1.2.3. Background Data Evaluation

Background data are important in evaluating the nature and extent of site-related contamination. Background data collected from areas that are not believed to be influenced by the site are compared to onsite samples to determine if onsite concentrations are higher than background levels. Sections 4.1 and 4.2 of this document outline the background data and the statistical methodology used to conduct the background comparison.

The background data set includes soil and groundwater data. Background soil data were obtained from the OU9 Background Soils Investigation: Soil Chemistry Report (DOE 1994i). This report presents the results of sampling and analysis of background soil locations for soils within one mile of the Mound Plant. Soils were analyzed for metals, pesticides, PCBs, and radionuclides. No other organic compounds were included in the analysis for the background soil study. The background groundwater data were obtained from the OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995b). The methods

used to conduct the background evaluation, background concentration data, and sampling locations are provided in Sections 4.1 and 4.2 of this report.

For the comparison to background data, concentrations of onsite inorganic, pesticide, and radionuclide analytes were compared to the 95% UTL concentrations of the same analytes in background for soils and groundwater. The 95% UTL concentrations for soils were obtained from OU9 Background Soils Investigation: Soil Chemistry Report (DOE 1994i). For groundwater, the 95% UTL concentrations were determined using the same methodology as the soils and were obtained from OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995b). In the background data set, non-detected analytes were included in the data set at a concentration equal to one half of the detection limit. The data set was then evaluated for distribution (normal, lognormal, or nonparametric). Based on the distribution, the 95% UTL concentrations were calculated for each analyte in each medium.

Inorganic, pesticide, and radionuclide compounds which did not exceed the background criteria were screened out of the New Property data set and were not considered further in the evaluation of COPCs. All detected organic analytes (except pesticides, as noted above) were included for evaluation of COPCs. The results of the background data evaluation including the analytes detected above the background criteria are discussed in Section 4.3.

6.1.2.4. Data Aggregation

Data aggregation refers to the manner in which sample data are combined in order to calculate summary statistics and estimated risk. For the New Property, all data have been aggregated as a single exposure unit. An exposure unit is a geographic area over which a receptor is likely to average his or her exposure (both spatially and temporally) and is defined based on observed or assumed patterns of behavior and nature and extent of contamination. The New Property was evaluated as a single exposure unit because potential human receptors would be expected to traverse the entire property in a random manner.

6.1.2.5. Contaminants of Potential Concern

According to RAGS (EPA 1989a), COPCs are "contaminants that are potentially site-related and whose data are of sufficient quality for use in the quantitative risk assessment." RAGS (EPA 1989a) states that contaminants can be eliminated from consideration if (a) detected infrequently, (b) only found in one

media or in low concentration, and (c) there is no reason to believe the chemicals are actually present (i.e., may be sampling artifacts). For the New Property, the organic COPCs (excluding pesticides) include all compounds detected in more than 5% of the samples and with concentrations greater than five times the CRDL. For inorganics, pesticides, and radionuclides, the COPCs include all analytes that are detected above the 95% UTL background concentration and detected in more than 5% of the samples.

RAGS specifies that further reduction in the number of contaminants is optional. Further reduction of inorganic analytes was performed based on the classification of the compound as an essential nutrient. According to RAGS (EPA 1989a):

> "Contaminants that are (1) essential human nutrients, (2) present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and (3) toxic only at very high doses (i.e., much higher than those that could be associated with contact at the site) need not be considered further in the quantitative risk assessment."

Calcium, iron, magnesium, potassium, and sodium are considered essential nutrients to humans. These compounds were detected onsite at levels slightly elevated above background and are toxic only at very high doses. Concentrations of these compounds in onsite media would not be expected to result in intakes associated with a toxic response. Therefore, these compounds were eliminated as COPCs for the site. A list of the COPCs by medium is presented in Table VI-1.1.

6.1.3. Exposure Assessment

This section evaluates the potential for human exposure to contaminants at the site. The exposure assessment estimates the type and magnitude of exposures to COPCs identified for the site. The results of the exposure assessment are combined with contaminant-specific toxicity information to characterize potential risks to human health. The exposure assessment consists of the following principal components:

- Overview and characterization of exposure setting,
- Identification and characterization of exposure pathways,

Table VI-1.1.
Contaminants of Potential Concern in Soil, Groundwater, and Seeps
Page 1 of 3

Soil COPCs		
Inorganics	**Organics**	**Radionuclides**
Antimony	Acenaphthylene	Plutonium-238
Arsenic	Acetone	Radium-226
Bismuth	Anthracene	Thorium-228
Cadmium	Benzo(a)anthracene	Thorium-230
Cerium	Benzo(a)pyrene	Thorium-232
Lead	Benzo(b)fluoranthene	Uranium-235
Manganese	Benzo(g,h,i)perylene	
Mercury	Benzo(k)fluoranthene	
Neodymium	Benzoic Acid	
Selenium	Carbazole	
Thallium	alpha-Chlordane ([a])	
Tin	Chrysene	
Vanadium	Di-n-butylphthalate	
Zinc	Dibenzo(a,h)anthracene	
	bis(2-Ethylhexyl)phthalate	
	Fluoranthene	
	Fluorene	
	Indeno(1,2,3-cd)pyrene	
	Methylene Chloride	
	Phenanthrene	
	Pyrene	

Table VI-1.1.
Contaminants of Potential Concern in Soil, Groundwater, and Seeps
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Groundwater COPCs		
Inorganics	**Organics**	**Radionuclides**
Aluminum	Hexane	Americium-241
Arsenic	2,4,6-Trinitrotoluene	Plutonium-239/240
Bismuth	1,2-Dichloroethene	Radium-226
Barium	Trichloroethene	Thorium-228
Beryllium		Thorium-230
Cadmium		Thorium-232
Chromium		Tritium
Cobalt		Uranium-234
Copper		Uranium-235
Lead		Uranium-238
Lithium		
Manganese		
Mercury		
Molybdenum		
Nickel		
Vandium		
Zinc		

Table VI-1.1.
Contaminants of Potential Concern in Soil, Groundwater, and Seeps
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Seep (surface water) COPCs		
Inorganics	**Organics**	**Radionuclides**
Aluminum	1,3-Dintrobenzene	Actinium-227 ([b])
Cobalt	PETN	Americium-241 ([b])
Copper	Trichloroethene	Strontium-90 ([b])
Silver	1,3,5-Trinitrobenzene	Thorium-230 ([b])
Vandium		Uranium-238 ([b])

a alpha-Chlordane is a COPC for exposures to surface soil (zero to two feet below ground surface), but is not a COPC for exposures to subsurface soil (two to 15 feet below ground surface).

b Radionuclides met the criteria for COPCs; however, risk from radionuclides in seep surface water was not evaluated for the reasons discussed in Section 6.1.3.4.

- Derivation of exposure point concentrations, and
- Discussion of all exposure intake assumptions and exposure quantification.

In accordance with EPA guidance (EPA 1993b), the risk assessment has been conducted using a reasonable maximum exposure (RME) estimate (i.e., a high-end conservative estimate). EPA defines the RME estimate as "the maximum exposure that is reasonably expected to occur at a site" (EPA 1989a). RME estimates have been developed for environmental concentrations, as well as for input variables used in the exposure assessment equations to estimate chronic intake or dose.

6.1.3.1. Overview and Characterization of Exposure Setting

Conceptual Site Model

The conceptual site model identifies the sources and types of environmental release and links these with receptors and activity patterns to determine the important pathways of human exposure (EPA 1989a). Figure 6.1.1 is a graphical depiction of the conceptual site model for human exposure pathways. It summarizes the exposure pathways that have been evaluated in the human health risk assessment under both current and future land use scenarios.

Land Use Scenarios

At the New Property, land use scenarios are based on the known current use and the anticipated future use of the property. Under current land use, a trespassing scenario with an adolescent receptor was evaluated. The New Property is currently fenced to restrict access. However, due to its location and surrounding land use (residential housing to the east), it is reasonable to assume that accessibility is possible and trespassing does occur.

A future residential scenario has not been evaluated at the New Property due to preliminary plans currently underway to develop the land for commercial/industrial use. The future land use scenario assumes that the New Property will be developed for commercial or industrial purposes and would involve a full-time adult employee population onsite. In addition, the future use scenario includes an evaluation of a construction/excavation adult worker employed to develop the New Property for commercial and/or

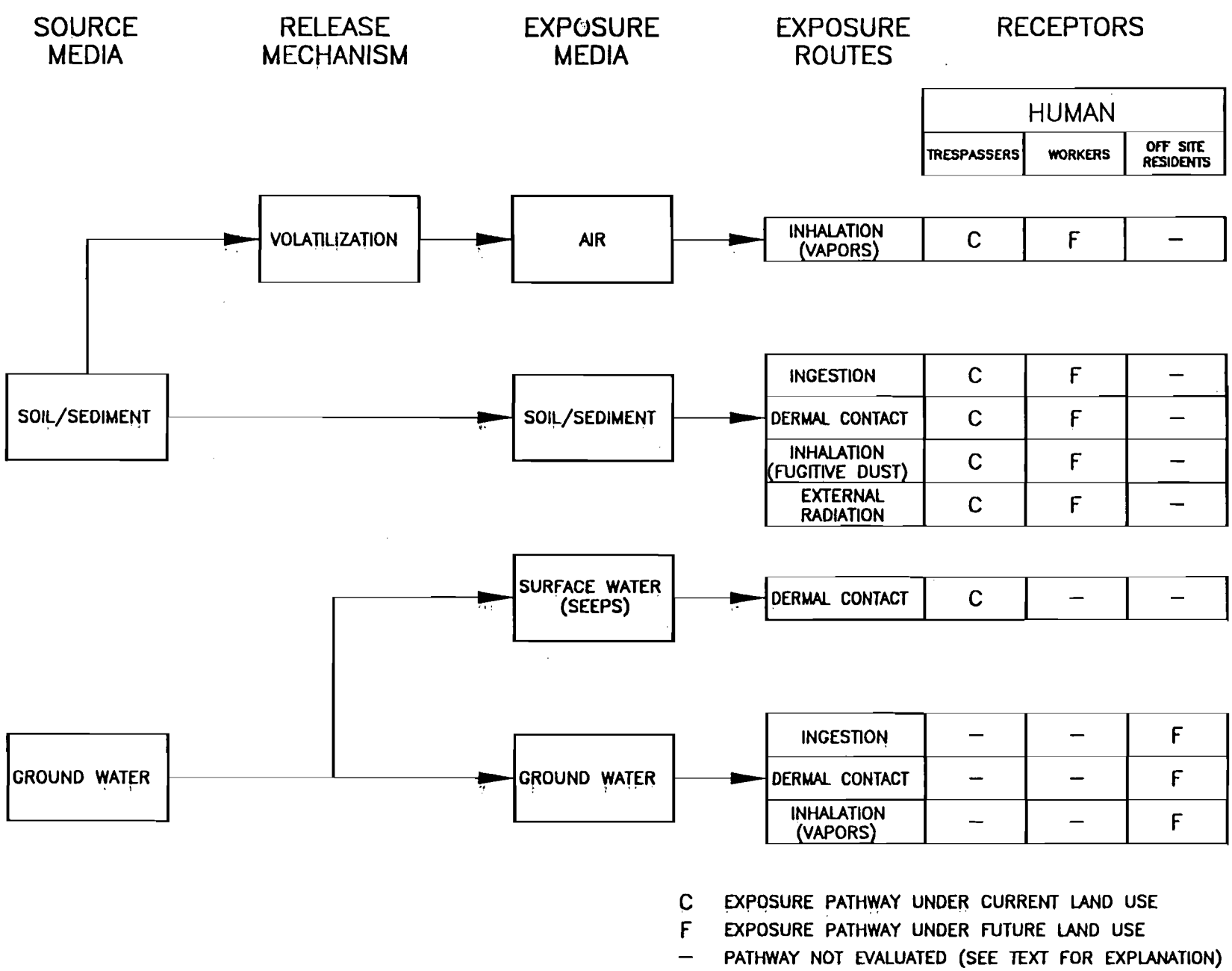

Figure 6.1.1. Conceptual Site Model for Human Exposure Pathways

industrial use. However, under the future use scenario, residential use of groundwater migrating off the site boundaries has been evaluated for both children and adult receptors. The groundwater concentrations used in this risk assessment are current site groundwater concentrations not groundwater concentrations obtained from modeling data to offsite locations.

Potential Populations of Concern

Under current land use, adolescent trespassers are the receptor group at potential risk of exposure to contaminants onsite. This group includes a 50 kilogram (kg) adolescent receptor (from 10 to 18 years in age). The adolescent receptor was chosen instead of a 15 kg child to more realistically reflect the age of individuals who would be expected to trespass onsite on a regular basis. Younger children would not be expected to be unattended for long periods of time and, due to the fence around the New Property, would not be able to readily gain access to the site.

Under future land use, the receptor groups at potential risk of exposure are adult commercial/industrial workers and adult construction/excavation workers involved in development of the New Property. Commercial/industrial workers would be expected to be onsite during a typical work week (five days a week for 8 hours a day). Construction/excavation workers would be onsite during construction activities only.

6.1.3.2. Exposure Pathways

Exposure Pathways Under Current Land Use

As mentioned previously, the receptor groups of concern under current land use are adolescent trespassers. These receptors may be exposed to contaminants in various media as follows:

- Soils/Sediments - through ingestion, dermal contact, external radiation (radionuclides) and inhalation (suspended soil particulates or volatilization), and
- Seeps - through dermal contact.

Soils and sediments have been grouped together due to the nature of the sediments at the New Property. Future commercial/industrial or construction/excavation workers are unlikely to come into contact with seeps while onsite. The drainage ditches which traverse the New Property have intermittent flow only during heavy rain events and are dry the majority of the time. A trespasser onsite would be expected to come into contact with sediments in these shallow ditches with the same frequency as they would for site soils. Therefore, the exposure assumptions for soils and sediments are the same and these media have been evaluated together.

Seeps that occur intermittently along the northeast corner of the property have been sampled and analyzed. Future commercial/industrial or construction/excavation workers are unlikely to come into contact with seeps while onsite. Based on best professional judgement, it was determined that it would be unlikely for construction workers be exposed to seeps on a chronic (or even subchronic) basis because (1) the seeps areas have intermittent flow and are usually dry, (2) most of the seeps areas are located on slopes which are areas that would not be suitable for construction activities, and (3) construction workers using heavy equipment would not come into direct contact with the seeps. Trespassers may come in contact with the seeps while onsite. The frequency of these exposure periods is low. Therefore, the seep data is utilized in characterizing only the dermal contact risk under a current land use scenario for an adolescent trespasser.

The groundwater pathway is not evaluated under current land use because onsite groundwater is not currently used as a source of drinking water.

Foodchain exposures are not considered in the BRA. There are no produce, dairy, or beef exposures under current land use at the New Property. No hunting is permitted on the New Property; therefore, the ingestion of game has not been evaluated.

Exposure Pathways Under Future Land Use

The receptor groups of concern under future land use are commercial/industrial workers and construction/excavation workers (adults only). These receptors may be exposed to contaminants in soils/sediments through ingestion, dermal contact, external radiation (radionuclides) and inhalation (suspended soil particulates and volatilization). Additionally, there are no plans to install groundwater

wells for use for consumption of groundwater on New Property, thus eliminating the likelihood of worker contact with groundwater.

In addition, under the future land use scenario, offsite exposure to groundwater is included. In this scenario, it is assumed that groundwater from beneath the New Property has migrated to an offsite residential receptor directly downgradient from the New Property. Under this assumption, exposure could occur through the dermal contact, inhalation, and ingestion pathways.

Surface water was not evaluated under a future scenario due to flow present in the drainage ditches only during heavy rain events and the elimination of the drainage ditches during the conversion of the property to commercial and/or industrial use.

6.1.3.3. Exposure Point Concentrations

Exposure point concentrations are the concentrations of contaminants available to human receptors at the point of contact. Exposure point concentrations for the risk estimates are developed from appropriate sample data, which were aggregated as discussed in Section 6.1.2.4. These concentrations have been calculated in accordance with EPA guidance (EPA 1992e and 1993b).

The data were first tested to determine if they were normally or lognormally distributed. If the data were found to be normally distributed, the exposure point concentration for the RME estimate was calculated as the 95% upper confidence limit (UCL) on the arithmetic mean of the data, using the student's t-statistic. If the data were found to be lognormally distributed, the RME estimate was calculated as the 95% UCL using the H-statistic (EPA 1992c).

If the 95% UCL exceeded the maximum value observed at the site the maximum value was used as the RME exposure point concentration (whether the data were normally or lognormally distributed). "Not detected" results were treated as one-half the limit of detection and included in the calculations of the mean and UCL values. Blind field duplicates were collected to assess variability in the sampling process. They are used in the data quality assessment, but were not included in the calculation of the exposure point concentrations.

Soils/Sediments

The soil sample data have been divided into different depths for analysis. Risk assessment generally focuses upon two soil depths: surface soils and subsurface soils. Surface and subsurface soils are evaluated separately because receptors are generally more likely to contact soils at the surface. Contaminants in subsurface soils would pose a higher risk if these soils were excavated and redistributed at the surface (e.g., during a construction project). Another reason surface soils were evaluated separately from subsurface soils is because the bulk of the contamination was primarily detected in one soil layer. In addition, averaging the surface and subsurface soil samples would under-represent exposures at the surface. If they are comparable, such averaging would have little or no effect on the exposure point concentrations.

Under the current land use scenario, only surface soil data (zero to approximately two feet below the ground surface) were used to evaluate current exposures since trespassers would not come into contact with soils at depth. Under the future land use scenario, only surface soil data were evaluated for exposures to the industrial/commercial worker because workers would not come into contact with soils deeper than two feet. However, surface (0 to 2 feet) and subsurface soils (2 to approximately 15 feet below the ground surface) were evaluated for exposures associated with the construction/excavation worker scenario since excavation of subsurface soils would occur during development of the site.

The exposure point concentrations used in the human health risk assessment are included in the data presentation tables for Appendix E. Also included in these tables are summary statistics for each contaminant in each medium. These statistics include frequency of detection, minimum and maximum concentrations, minimum and maximum detection limits, the mean concentration and the 95% UCL on the arithmetic mean.

6.1.3.4. Human Intake Assumptions and Exposure Quantification

This section presents the exposure equations and assumptions used in deriving contaminant-specific intake estimates for the populations and exposure pathways evaluated in the risk assessment. The use of the intake equations presented in this section is in accordance with methods presented by EPA in RAGS (EPA 1989a) and Dermal Exposure Assessment: Principles and Applications (EPA 1992b). Exposure

assumptions have been developed to represent high-end RMEs. The exposure assumptions and corresponding guidance or rationale used in this assessment are presented in Tables VI-1.2 and VI-1.3.

There is a fundamental difference between exposures to chemical contaminants as compared to radionuclide contaminants. For chemicals, exposure generally refers to the intake (e.g., inhalation, ingestion, dermal exposure) of the chemical, expressed in units of milligrams per kilogram per day (mg/kg-day). For radionuclides, exposure can occur in two ways, internal and external. Internal exposure is similar to a chemical exposure (e.g. ingestion, inhalation), however, the exposure is in units of radioactivity rather than units of mass. External exposures can result from gamma or x-ray emitting radionuclides penetrating through the body and depositing in the tissue. This exposure is expressed as an absorbed dose. Dose is equal to the energy imparted to a unit mass of tissue.

The approach to exposure assessment for chemical contaminants largely applies to radionuclide contaminants. However, there are differences in the methods as follows:

- In addition to the ingestion, inhalation and direct contact pathways considered for chemical contaminants, external exposure to penetrating radiation is also evaluated for radionuclides;

- Radioactive daughters that contribute significantly to the radiation exposure are also evaluated in the radionuclide exposure assessment; and

- Equations for estimating intake to radionuclide contaminants do not require use of body weight and averaging time.

Oral and inhalation intakes are expressed as the amount of chemical at the exchange boundary (e.g., skin, lungs, intestine) that is available for absorption. These intakes are not equivalent to the absorbed dose (the amount of chemical actually absorbed into the blood stream). Dermal doses are estimates of absorbed dose, however, and this discrepancy is a source of uncertainty when comparing or combining dermal doses with intakes from other exposure routes. All chemicals are assumed not to transform or degrade over the period of exposure.

Table VI-1.2.
Mound New Property Human Health Risk Assessment
Exposure Assumptions For Current Land Use

Exposure Pathway	Parameter	Units	Adolescent Trespasser	Reference
General				
	Body weight	kg	50	a
	Exposure Duration	years	8	b
	Averaging time - noncancer	days	2920	c
	Averaging time - cancer	days	25550	c
Soil/Sediment Ingestion				
	Ingestion rate	mg/day	100	d
	Exposure frequency	days/year	52	e
	Units conversion	kg/mg	1.00E-06	-
Soil/Sediment Dermal Contact				
	Skin surface area available	cm^2/day	4600	f
	Soil-to-skin adherence factor	mg/cm^2	1	f
	Dermal Absorption factor	none	chemical-specific	g
	Exposure frequency	days/year	52	e
	Units conversion	kg/mg	1.00E-06	-
Soil/Sediment External Radiation				
	Exposure frequency	days/year	52	e
	Exposure time	hrs/hrs	4/24	h
	Gamma sheilding factor	none	0	g
Soils/Sediment Fugitive Dust Inhalation				
	Inhalation rate	m^3/hour	0.833	d
	Particulate emission factor	m^3/kg	4.63E+09	j
	Exposure frequency	days/year	52	e
	Exposure time	hrs/day	4	g
Surface Water (Seeps) Dermal Contact				
	Skin surface area available	cm^2/day	4600	f
	Permeability Coefficient	cm/hour	chemical-specific	f
	Event Frequency	events/day	1	k
	Exposure frequency	days/year	10	l
	Units conversion	L/cm^3	1.00E-03	-
Air Inhalation of Vapors				
	Inhalation rate	m^3/day	20	d
	Exposure frequency	days/year	52	e

a - EPA, 1989b, Exposure Factors Handbook, value for adolescents ages 10 - 18 years
b - Exposure during ages 10 -18 years
c - Averaging time (noncancer) = exposure duration x exposure frequency, averaging time (cancer) = 70 yrs x 365 d/yr
d - EPA, 1991a, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03
e - Assumes exposure occurs 2 days/week, 26 weeks/yr (warm weather months)
f - EPA, 1992b, Dermal Exposure Assessment; for skin surface area available during soil, sediment and surface water dermal contact, assumes 25% of total body surface area is exposed; permeability coefficients are from EPA, 1992f.
g - Guidance provided by OEPA
h - Assumes exposure occurs 4 hrs/day
i - Assumes open space, no reduction from shielding
j - EPA, 1991b, default value from Human Health Evaluation Manual, Part B
k - Assumes exposure to seeps occurs 1 hour/day
l - Assumes exposure to intermittent seeps occurs 10 days/yr
- = No reference

Table VI-1.3.
Mound New Property Human Health Risk Assessment
Exposure Assumptions For Future Land Use
Page 1 of 2

Exposure Pathway	Parameter	Units	Commercial/Industrial Worker	Reference	Excavation Worker	Reference	Off-site Resident(a)	Reference
General								
	Body weight	kg	70	b	70	b	70/15	b
	Exposure Duration	years	25	b	0.5	c	30/6	b
	Exposure frequency	days/year	250	b	250	b	350	b
	Averaging time - noncancer	days	9125	d	183	d	10950/2190	d
	Averaging time - cancer	days	25550	d	25550	d	25550	d
Soil/Sediment Ingestion	Ingestion rate	mg/day	50	b	480	b	NA	-
	Units conversion	kg/mg	1.00E-06	-	1.00E-06	-	NA	-
Soil/Sediment Dermal Contact	Skin surface area available	cm^2/day	5800	e	5800	e	NA	-
	Soil-to-skin adherence factor	mg/cm^2	1	e	1	e	NA	-
	Dermal Absorption factor	none	chemical-specific	f	chemical-specific	f	NA	-
	Units conversion	kg/mg	1.00E-06	-	1.00E-06	-	NA	-
Soil/Sediment External Radiation	Exposure time	hrs/hrs	8/24	g	8/24	g	NA	-
	Gamma Shielding factor	none	0	h	0	h	NA	-
Soils/Sediment Inhalation of Fugitive Dust	Inhalation rate	m^3/hr	0.833	b	0.833	b	NA	-
	Particulate emission factor	m^3/kg	4.63E+09	i	4.63E+09	i	NA	-
	Exposure time	hrs/day	8	g	8	g		
Surface Water (Seeps) Dermal Contact	Skin surface area available	cm^2/day	NA	-	NA	-	NA	-
	Permeability Coefficient	cm/hour	NA	e	NA	e	NA	-
	Event Frequency	events/day	NA	-	NA	-	NA	-
	Units conversion	L/cm^3	NA	-	NA	-	NA	-
Air Inhalation Vapors	Inhalation rate	m^3/day	20	b	20	b	NA	-
	Fraction of day exposed	none	0.33	g	0.33	g	NA	-
Groundwater Ingestion	Ingestion rate	L/day	NA	-	NA	-	2/1	b/i

Table VI-1.3.
Mound New Property Human Health Risk Assessment
Exposure Assumptions For Future Land Use
Page 2 of 2

Exposure Pathway	Parameter	Units	Commercial/Industrial Worker	Reference	Excavation Worker	Reference	Off-site Resident(a)	Reference
Groundwater								
Dermal Contact	Skin surface area available	cm^2/day	NA	-	NA	-	20000/7600	e
(Showering)	Permeability Coefficient	cm/hour	NA	e	NA	e	chemical-specific	-
	Event Frequency	events/day	NA	-	NA	-	1	e
	Units conversion	L/cm^3	NA	-	NA	-	1.00E-03	-
Groundwater								
Inhalation Airborne Chemicals	Inhalation rate	m^3/day	NA	-	NA	-	15	b
(Showering)	Exposure time	hour/day	NA	-	NA	-	0.25	e

NA - Not Applicable
a - Parameters provided for adult and child (adult/child)
b - EPA, 1991a, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03
c - Assumes a 6-month excavation project
d - Averaging time (noncancer) = exposure duration x exposure frequency, averaging time (cancer) = 70 yrs x 365 days/yr
e - EPA, 1992b, Dermal Exposure Assessment; for skin surface area available during soil, sediment and surface water dermal contact, assumes 25% of total body surface area is exposed; permeability coeeficients are from EPA, 1992f
f - Guidance provided by OEPA
g - Assumes 8 hour work day
h - Assumes open space, no reduction from shielding
i - EPA, 1991b, default value from Human Health Evaluation Manual, Part B
- = No reference

Exposure to Soils/Sediments

Soil/sediment ingestion exposures have been evaluated for trespassers under current land use and workers under the future land use scenario. Intake estimates for the chemical contaminants in the soil/sediment ingestion pathway are estimated by means of the following equation:

$$Intake\ (mg/kg\text{-}day) = \frac{C_{SO} \times IR \times FI \times EF \times ED \times CF}{BW \times AT}$$

where:

C_{SO}	=	Contaminant concentration in soil/sediment (mg/kg)
IR	=	Ingestion rate (mg/day)
FI	=	Fraction ingested from contaminated source (1.0) (unitless)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
CF	=	Conversion factor (10^{-6} kg/mg)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

Radionuclide intake estimates for the soil/sediment ingestion pathway are estimated by means of the following equation:

$$Intake\ (pCi) = C_{SO} \times IR \times FI \times EF \times ED \times CF$$

where:

C_{SO}	=	Radiological activity in soil/sediment (pCi/g)
IR	=	Ingestion rate (mg/day)
FI	=	Fraction ingested from contaminated source (1.0) (unitless)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
CF	=	Conversion factor (10^{-3} g/mg)

Dermal exposure is assumed to occur simultaneously with incidental ingestion exposure. Soil/sediment dermal exposures have been evaluated for trespassers and workers under current and future land use.

Absorbed dose estimates for chemical contaminants in the dermal pathway are calculated by means of the following equation:

$$\textit{Absorbed Dose (mg/kg-day)} = \frac{C_{SO} \times SA \times AF \times ABS \times EF \times ED \times CF}{BW \times AT}$$

where:

C_{SO}	=	Chemical concentration in soil/sediment (mg/kg)
SA	=	Skin surface area available for contact (cm^2/day)
AF	=	Soil to skin adherence factor (1) (mg/cm^2)
ABS	=	Dermal absorption factor (unitless)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
CF	=	Conversion factor (10^{-6} kg/mg)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

Exposure to external radiation from radionuclides in soils/sediments was calculated using the following equation:

$$\textit{Absorbed Dose (pCi/g of soil/yr)} = C_{SO} \times ED \times Te \times (1-Se)$$

where:

C_{SO}	=	Radionuclide activity in soil/sediment (pCi/g)
ED	=	Exposure duration (years)
Te	=	Gamma exposure time factor (unitless)
Se	=	Sheilding factor (unitless)

Unlike inhalation, ingestion, and dermal exposure, the external radiation exposure term is defined as an equivalent radionuclide concentration in soil/sediment that an onsite receptor would be exposed to for a particular exposure duration. This exposure term is adjusted for exposure time and shielding. For the New Property human health risk assessment, it was assumed that there is no shielding to external radiation. In addition, the receptor is assumed to be exposed to external radiation at every moment during the exposure duration period. These assumptions provide for a conservative estimate of external radiation exposure.

Intake of soil/sediment (fugitive dust) via inhalation has been evaluated for trespassers (current land use), and commercial/industrial and construction/excavation workers (future land use). The intake equation for chemical contaminants is as follows:

$$Intake\ (mg/kg\text{-}day) = \frac{C_{SO} \times IR \times ET \times EF \times ED}{PEF \times BW \times AT}$$

where:

C_{SO}	=	Contaminant concentration in soil/sediment (mg/kg)
IR	=	Inhalation rate (m^3/hr)
ET	=	Exposure time (hrs/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
PEF	=	Particulate emission factor (4.63×10^9 m^3/kg, EPA default value)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

The intake equation for inhalation of radionuclide contaminants in fugitive dust is as follows:

$$Intake\ (pCi) = \frac{C_{SO} \times IR \times ET \times EF \times ED}{PEF}$$

where:

C_{SO}	=	Radiological activity in soil/sediment (pCi/g)
IR	=	Inhalation rate (m^3/hr)
ET	=	Exposure time (hrs/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
PEF	=	Particulate emission factor (4.63×10^6 m^3/kg, EPA default value)

In the above equations, a particulate emission factor (PEF) is used. This factor relates the concentration of the contaminant in soil/sediment to the concentration of respirable particles in the air from fugitive dust emissions. These emissions result from wind erosion. The default value of 4.63×10^9 m^3/kg was taken from RAGS, Volume I, Part B (EPA 1991b) and represents a surface with unlimited erosion potential.

The intake for chemicals based on inhalation of soil particulates for an excavation worker under the future land use scenario was calculated as follows:

$$Intake\ (mg/kg\text{-}day) = \frac{C_{SO} \times DL \times IR \times ET \times EF \times ED}{BW \times AT}$$

where:

C_{SO}	=	Contaminant concentration in soil/sediment (mg/kg)
DL	=	Dust loading factor (4×10^{-7} kg soil/m^3)
IR	=	Inhalation rate (m^3/hr)
ET	=	Exposure time (hrs/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

The intake for radionuclides based on inhalation of soil particulates for an excavation worker under the future land use scenario was calculated as follows:

$$Intake\ (pCi) = C_{SO} \times DL \times IR \times ET \times EF \times ED$$

where:

C_{SO}	=	Radiological activity in soil/sediment (pCi/g)
DL	=	Dust loading factor (4×10^{-4} g soil/m^3)
IR	=	Inhalation rate (m^3/hr)
ET	=	Exposure time (hrs/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)

The above equations utilize a dust loading factor based on typical construction site activity (DOE 1983). Use of this factor assumes greater dust generation from construction/traffic associated with soil excavation activities.

Volatilization of chemical contaminants from soils/sediments may result in exposures via inhalation for trespassers and workers under both current and future land use scenarios. The intake equation is as follows:

$$Intake\ (mg/kg\text{-}day) = \frac{C_{SO} \times IR \times ET \times EF \times ED}{VF \times BW \times AT}$$

where:

C_{SO}	=	Contaminant concentration in soil/sediment (mg/kg)
IR	=	Inhalation rate (m^3/hr)
ET	=	Exposure time (hrs/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
VF	=	Volatilization factor (chemical-specific)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

In the above equation, a volatilization factor (VF) is used. The VF relates the concentration of the contaminant in soil/sediment to the concentration of the volatilized contaminant in the air. Use of the VF in the above equation assumes that the contaminant concentration in the soil/sediment is homogeneous from the soil surface to the depth of concern and that the contaminated material is not covered by contaminant-free material. These assumptions result in a conservative estimate for volatile exposures. The VF was established as part of the Hwang and Falco model cited in and utilized in RAGS, Volume I, Part B (EPA 1991b). Due to varying soil types on the New Property, default values presented in RAGS, Volume I, Part B (EPA 1991b) were used to calculate VFs for volatile compounds.

Radioactive decay of Ra-226 results in emissions of inert, gaseous isotopes of radon (i.e., Radon-222). Ra-226 was detected in soil/sediment onsite and may result in exposures to radon via inhalation for trespassers and workers under both current and future land use scenarios. The intake equation for inhalation of radon produced by radioactive decay of Ra-226 is as follows:

$$Intake\ (pCi) = \frac{C_{SO} \times IR \times ET \times EF \times ED}{VF}$$

where:

C_{SO}	=	Radiological activity of Ra-226 in soil/sediment (pCi/g)
IR	=	Inhalation rate (m^3/hr)
ET	=	Exposure time (hrs/day)
EF	=	Exposure frequency (days/year)

ED	=	Exposure duration (years)
VF	=	Volatilization factor (8 m^3/kg default value for Ra-226)

This pathway was evaluated due to the presence of Ra-226 in soil/sediment. RAGS, Volume I, Part B (EPA 1991b) recommends using the default VF of 8 m^3/kg when calculating the intake of radon isotopes produced by radioactive decay of Ra-226.

Exposure to Seeps

Only dermal contact exposure to seeps has been considered as a likely exposure pathway at the site. Dermal contact with chemical contaminants present in seeps is calculated according to the following equation:

$$\textit{Dermal Absorbed Dose (mg/kg-day)} = \frac{DA_{event} \times SA \times EV \times ED \times EF}{BW \times AT}$$

where:

DA_{event}	=	Absorbed dose per event in water (mg/cm^2-event)
SA	=	Skin surface area available for contact (cm^2)
EV	=	Event frequency (events/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

For inorganics, DA_{event} (mg/cm^2-event) is calculated as follows:

$$DA_{event} = K_p \, C_w \, t_{event}$$

where:

Da_{event}	=	Dose absorbed per unit area per event (mg/cm^2-event)
K_p	=	Permeability coefficient from water (cm/hour)

C_w	=	Concentration of chemical in water mg/cm^3) (Note: mg/cm^3= 10^{-3} X mg/L)
t_{event}	=	Duration of event (hour/event)

For organics, DA_{event} (mg/cm^2-event) is calculated as follows:

$$If\ t_{event} < t*\ then:\ DA_{event} = 2\ K_p\ C_w \sqrt{\frac{6\ \tau\ t_{event}}{\pi}}$$

$$If\ t_{event} > t*,\ then:\ DA_{event} = K_p\ C_w \left[\frac{t_{event}}{1 + B} + 2\ \tau \left(\frac{1 + 3B}{1 + B}\right) \right]$$

where:

Da_{event}	=	Dose absorbed per unit area per event (mg/cm^2-event)
K_p	=	Permeability coefficient from water (cm/hour)
C_w	=	Concentration of chemical in water (mg/cm^3) (Note: mg/cm^3= 10^{-3} X mg/L)
t_{event}	=	Duration of event (hour/event)
B	=	Chemical-specific constant reflecting the partitioning properties (dimensionless)
t^*	=	Chemical-specific time to reach steady-state (hour)
τ	=	Lag time (hour)
π	=	Constant (3.14159)

Values and equations for K_p, t^*, τ, and B can be found in Chapter 5 of Dermal Exposure Assessment: Principles and Applications (EPA 1992b).

Penetrating radiation from radionuclides in seep water was not evaluated because of the types of radionuclides detected in seeps and their low concentrations.

Exposure to Groundwater

Under the future use scenario, adults and children are assumed to be exposed to unfiltered groundwater which has migrated offsite. Intake estimates for groundwater ingestion for chemical contaminants are calculated as follows:

$$Intake\ (mg/kg\text{-}day) = \frac{C_{GW}\ x\ IR\ x\ EF\ x\ ED}{BW\ x\ AT}$$

where:

C_{GW}	=	Contaminant concentration in groundwater (mg/L)
IR	=	Ingestion rate (L/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

Intake estimates for groundwater ingestion for radionuclide contaminants are calculated as follows:

$$Intake\ (pCi) = C_{GW}\ x\ IR\ x\ EF\ x\ ED$$

where:

C_{GW}	=	Radiological activity in groundwater (pCi/L)
IR	=	Ingestion rate (L/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)

Dermal exposure to groundwater has also been evaluated for the residential scenario. The equation for dermal exposure is as follows:

$$Dermal\ Absorbed\ Dose\ (mg/kg\text{-}day) = \frac{DA_{event}\ x\ SA\ x\ EV\ x\ ED\ x\ EF}{BW\ x\ AT}$$

where:

DA_{event}	=	Absorbed dose per event in water (mg/cm^2-event)
SA	=	Skin surface area available for contact (cm^2)
EV	=	Event frequency (events/day)
EF	=	Exposure frequency (days/year)

ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

For inorganics, DA_{event} (mg/cm^2-event) is calculated as follows:

$$DA_{event} = K_p \, C_w \, t_{event}$$

where:

Da_{event}	=	Dose absorbed per unit area per event (mg/cm^2-event)
K_p	=	Permeability coefficient from water (cm/hour)
C_w	=	Concentration of chemical in water (mg/cm^3) (Note: mg/cm^3= 10^{-3} X mg/L)
t_{event}	=	Duration of event (hour/event)

For organics, DA_{event} (mg/cm^2-event) is calculated as follows:

$$\textit{If } t_{event} < t* \textit{ then: } DA_{event} = 2 \, K_p \, C_w \sqrt{\frac{6 \, \tau \, t_{event}}{\pi}}$$

$$\textit{If } t_{event} > t*, \textit{ then: } DA_{event} = K_p \, C_w \left[\frac{t_{event}}{1 + B} + 2 \, \tau \left(\frac{1 + 3B}{1 + B} \right) \right]$$

where:

Da_{event}	=	Dose absorbed per unit area per event (mg/cm^2-event)
K_p	=	Permeability coefficient from water (cm/hour)
C_w	=	Concentration of chemical in water (mg/cm^3) (Note: mg/cm^3= 10^{-3} X mg/L)
t_{event}	=	Duration of event (hour/event)
B	=	Chemical-specific constant reflecting the partitioning properties (dimensionless)
t^*	=	Chemical-specific time to reach steady-state (hour)
τ	=	Lag time (hour)
π	=	Constant (3.14159)

Values and equations for K_p, t^*, τ, and B can be found in Chapter 5 of Dermal Exposure Assessment: Principles and Applications (EPA 1992b).

Inhalation of volatiles present in groundwater is also evaluated for general water use in a household. Intake estimates for inhalation of groundwater are calculated as follows:

$$Intake\ (mg/kg\text{-}day) = \frac{C_{GW} \times K \times IR \times ET \times EF \times ED}{BW \times AT}$$

where:

C_{GW}	=	Contaminant concentration in groundwater (mg/L)
K	=	Volatilization factor (unitless) (Andelman 1990)
IR	=	Inhalation rate (m^3/hour)
ET	=	Exposure time (hours/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time for noncancer or cancer effects (days)

Exposure from indoor inhalation of volatiles is assumed to be relevant only for chemicals that easily volatilize. Therefore, the inhalation of volatiles pathway is applicable only to a chemical with a Henry's law constant of greater than 1×10^{-5} atmospheres per mole per cubic meter and a molecular weight of less than 200 grams per mole. In the above equation a default volatilization constant (K) of 0.005 x 1000 L/m^3 is used to define the relationship between the concentration of a contaminant in household water and the average concentration of the volatilized contaminant in air. The K constant was derived from the Andelman model cited in RAGS, Volume I, Part B (EPA 1991b).

Penetrating radiation from radionuclides in groundwater was not evaluated because of the types of radionuclides detected in groundwater and their low concentrations.

6.1.4. Toxicity Assessment

The objectives of the toxicity assessment are to evaluate the toxicity of the compounds under investigation, and to identify and select toxicological values for use in evaluating the significance of the exposure. The EPA recommends evaluating two general toxicological endpoints; cancer and noncancer.

In assessing the potential for noncancer health effects, EPA assumes that there is a threshold below which there are no adverse toxic effects. EPA derives and publishes reference doses (RfDs) and reference concentrations (RfCs) for use in evaluating adverse noncarcinogenic effects. These are estimates (with uncertainty spanning one to three orders of magnitude) of daily human exposures, including sensitive subpopulations, that may go without appreciable deleterious effects during a lifetime (EPA 1989a). EPA derives RfDs and RfCs based on estimates of the no-observable-adverse-effect level (NOAEL) or lowest-observable-adverse-effect level (LOAEL) in humans or test animals.

Carcinogenesis, however, is generally thought to be a phenomenon for which the presumption of threshold effects is inappropriate (EPA 1989a). For example, an extremely low level of exposure to a carcinogen may result in chromosomal or enzyme changes leading to cellular proliferation associated with cancer. EPA does not therefore estimate an effects threshold for this class of chemicals. EPA uses a two-part evaluation in which the subject chemical is first assigned a weight-of-evidence classification (Table VI-1.4), and then a cancer potency (slope factor) is calculated. The slope factor is a plausible upper-bound estimate of the slope of the dose-response curve. In risk assessment, the cancer slope (potency) factor is used to estimate the excess lifetime probability of a carcinogenic effect occurring in exposed receptors. The units of the cancer slope factor are in units of inverse dose, or $(mg/kg/day)^{-1}$.

For the assessment of human health risk of exposure to chemicals at the New Property, the following toxicity values are of principal importance:

- RfDs for oral exposure - acceptable intake values for chronic exposure (noncarcinogenic effects),
- RfCs for inhalation exposure - acceptable intake values for chronic exposure (noncarcinogenic effects),
- Carcinogenic slope factors for oral exposure, and
- Carcinogenic slope factors for the inhalation route.

The primary sources of information for these data are the EPA Integrated Risk Information System (IRIS) data base (EPA 1994a). IRIS is a computer-housed catalog of EPA risk assessment and risk management information for chemical substances. Data in the IRIS system are regularly reviewed and updated monthly. If toxicity measures are not available on IRIS, EPA recommends use of the EPA Office of

Table VI-1.4. Toxicity Values for Ingestion and Inhalation Pathways

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	NONCARCINOGENS				CARCINOGENS*							
	Oral Route		Inhalation Route		Oral Route		Inhalation Route		EPA Weight-of-Evidence	Slope Factor Ingestion Pathway	Slope Factor Inhalation Pathway	Slope Factor Ground Surface
COMPOUND	RfD[a] (mg/kg/day)	Source	RfD[b] (mg/kg/day)	Source	Slope Factor $(mg/kg/day)^{-1}$	Source	Slope Factor $(mg/kg/day)^{-1}$	Source	Classification	(Risk/pCi)	(Risk/pCi)	(Risk/yr per pCi/g)
INORGANICS												
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	4.00E-04	c	--	--	--	--	--	--	--	--	--	--
Arsenic	3.00E-04	c	--	--	1.50E+00	e	5.00E+01	d	[A]	--	--	--
Bismuth	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium (food)	1.00E-03	c	--	--	--	--	--	--	[B1]	--	--	--
Cadmium (water)	5.00E-04	c	--	--	--	--	--	--	[B1]	--	--	--
Cerium	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (VI)	5.00E-03	c	--	--	--	--	4.10E+01	d	[A]	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--
Copper	3.70E-02	d,j	--	--	--	--	--	--	[D]	--	--	--
Lead	--	f	--	--	--	--	--	--	[B2]	--	--	--
Manganese (food)	1.40E-01	c	1.43E-05	c	--	--	--	--	[D]	--	--	--
Manganese (water)	5.00E-03	c	1.43E-05	c	--	--	--	--	[D]	--	--	--
Mercury	3.00E-04	d	8.57E-05	d	--	--	--	--	[D]	--	--	--
Molybdenum	5.00E-03	c	--	--	--	--	--	--	--	--	--	--
Neodymium	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	2.00E-02	c,i	--	--	--	--	--	--	--	--	--	--
Selenium	5.00E-03	c	--	--	--	--	--	--	[D]	--	--	--
Silver	5.00E-03	c	--	--	--	--	--	--	[D]	--	--	--
Tin	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	8.00E-05	c	--	--	--	--	--	--	[D]	--	--	--
Vanadium	7.00E-03	d	--	--	--	--	--	--	--	--	--	--
Zinc	3.00E-01	c,i	--	--	--	--	--	--	[D]	--	--	--
ORGANICS												
Acenaphthylene	3.00E-02	g	--	--	--	--	--	--	[D]	--	--	--
Acetone	1.00E-01	c	--	--	--	--	--	--	[D]	--	--	--
Anthracene	3.00E-01	c	--	--	--	--	--	--	[D]	--	--	--
Benzo(a)anthracene	3.00E-02	g	--	--	7.30E-01	h	--	--	[B2]	--	--	--
Benzo(a)pyrene	3.00E-02	g	--	--	7.30E+00	c	--	--	[B2]	--	--	--
Benzo(b)fluoranthene	3.00E-02	g	--	--	7.30E-01	h	--	--	[B2]	--	--	--
Benzo(g,h,i)perylene	3.00E-02	g	--	--	--	--	--	--	[D]	--	--	--
Benzo(k)fluoranthene	3.00E-02	g	--	--	7.30E-02	h	--	--	[B2]	--	--	--
Benzoic Acid	4.00E+00	c	--	--	--	--	--	--	[D]	--	--	--
Bis(2-ethylhexyl)phthalate	2.00E-02	c	--	--	1.40E-02	c	--	--	[B2]	--	--	--
Butyl benzyl phthalate	2.00E-01	c	--	--	--	--	--	--	[C]	--	--	--
Carbazole	--	--	--	--	2.00E-02	c	--	--	[B2]	--	--	--
alpha-Chlordane	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	3.00E-02	g	--	--	7.30E-03	h	--	--	[B2]	--	--	--

Table VI-1.4. (continued) Toxicity Values for Ingestion and Inhalation Pathways

(Page 2 of 3)

	NONCARCINOGENS				CARCINOGENS*							
	Oral Route		Inhalation Route		Oral Route		Inhalation Route		EPA Weight-of-Evidence	Slope Factor Ingestion Pathway	Slope Factor Inhalation Pathway	Slope Factor Ground Surface
COMPOUND	RfD[a] (mg/kg/day)	Source	RfD[b] (mg/kg/day)	Source	Slope Factor $(mg/kg/day)^{-1}$	Source	Slope Factor $(mg/kg/day)^{-1}$	Source	Classification	(Risk/pCi)	(Risk/pCi)	(Risk/yr per pCi/g)
Dibenzo(a,h)anthracene	3.00E-02	g	--	--	7.30E+00	h	--	--	[B2]	--	--	--
1,2-Dichloroethene	9.00E-03	d	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	1.00E-01	c	--	--	--	--	--	--	[D]	--	--	--
Fluoranthene	4.00E-02	c	--	--	--	--	--	--	[D]	--	--	--
Fluorene	4.00E-02	c	--	--	--	--	--	--	[D]	--	--	--
Hexane	6.00E-02	d	5.71E-02	c	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	3.00E-02	g	--	--	7.30E-01	h	--	--	[B2]	--	--	--
Methylene Chloride	6.00E-02	c	8.57E-01	d	7.50E-03	c	--	--	[B2]	--	--	--
Phenanthrene	3.00E-02	g	--	--	--	--	--	--	[D]	--	--	--
Pyrene	3.00E-02	c	--	--	--	--	--	--	[D]	--	--	--
Trichloroethene	--	--	--	--	1.10E-02	k	6.0E-03	k	--	--	--	--
EXPLOSIVES												
1,3-Dinitrobenzene	1.00E-04	c	--	--	--	--	--	--	--	--	--	--
PETN	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trinitrobenzene	5.00E-05	c	--	--	--	--	--	--	--	--	--	--
2,4,6-Trinitrotoluene	5.00E-04	c	--	--	3.00E-02	c	--	--	[C]	--	--	--
RADIONUCLIDES												
Americium 241	--	--	--	--	--	--	--	--	--	2.40E-10	3.20E-08	4.90E-09
Radium 226	--	--	--	--	--	--	--	--	--	1.20E-10	3.00E-09	1.20E-08
Radon 222+D	--	--	--	--	--	--	--	--	--	1.70E-12	7.70E-12	5.90E-06
Plutonium 238	--	--	--	--	--	--	--	--	--	2.20E-10	3.90E-08	2.80E-11
Plutonium 239/240	--	--	--	--	--	--	--	--	--	2.30E-10	3.80E-08	1.70E-11/2.70E-11
Thorium 228	--	--	--	--	--	--	--	--	--	1.10E-11	7.70E-08	5.50E-10
Thorium 232	--	--	--	--	--	--	--	--	--	1.20E-11	2.80E-08	2.60E-11
Tritium	--	--	--	--	--	--	--	--	--	7.15E-14	--	--
Uranium 234	--	--	--	--	--	--	--	--	--	1.60E-11	2.60E-08	3.00E-11
Uranium 235	--	--	--	--	--	--	--	--	--	1.60E-11	2.50E-08	2.40E-07
Uranium 238	--	--	--	--	--	--	--	--	--	1.60E-11	2.40E-08	2.10E-11

Table VI-1.4. (continued). Toxicity Values for Ingestion and Inhalation Pathways (Page 3 of 3)

* Radionuclide slope factors are from HEAST, March 1994.

a. RfD: Reference dose. RfC: Reference concentration.

b. Inhalation RfCs have been converted to inhalation RfDs by multiplying by $20m^3$/day and dividing by 70 kg.

c. EPA IRIS Data Base (December 1994).

d. USEPA ORD Health Effects Assessment Summary Tables (HEAST) FY 1994 Annual (March 1994).

e. The oral unit risk for arsenic has been proposed by EPA. The oral slope factor was calculated from the unit risk by assuming an ingestion of 2 liters of water per day by a 70 kg adult.

f. EPA has not developed a reference dose for lead. EPA recommends use of the lead biokinetic model to estimate blood lead levels for the purposes of risk assessment.

g. In the absence of toxicity data, the RfDs for pyrene have been adopted for this compound.

h. The cancer slope factor for this compound has been estimated by multiplying the cancer slope factor for benzo(a)pyrene by a relative potency value (see table below).

i. Values are for metals in the form of soluble salts.

j. The EPA Office of Drinking Water MCL of 1.3 mg/L has been converted to intake estimate of 3.7E-02 mg/kg-day by assuming ingestion of 2 liters of water/day by a 70 kg adult.

k. The EPA Superfund Technical Support Center provided the information in the *Risk Assessment Issue Paper for: Carcinogenicity Information for Trichloroethilene (TCE) (CASRN 79-01-6)*

RELATIVE POTENCY OF PAHs

PAH	Relative Potency (a)
Benzo(a)pyrene	1.00E+00
Benzo(a)anthracene	1.00E-01
Benzo(b)fluoranthene	1.00E-01
Benzo(k)fluoranthene	1.00E-02
Chrysene	1.00E-03
Dibenzo(a,h)anthracene	1.00E+00
Indeno(1,2,3-cd)pyrene	1.00E-01

a. EPA 1993b. *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons.* EPA/600/R-93/089.

Research and Development (ORD) Health Effects Assessment Summary Tables (HEAST) (EPA 1994b) as the second current source of information.

The toxicity values for ingestion and inhalation pathways used in the human health risk assessment are presented in Table VI-1.4. Priority is given to the values obtained from the IRIS data base as they have been verified by the EPA RfD/RfC Work Group or the Carcinogen Risk Assessment Verification Endeavor (CRAVE) Work Group.

Toxicity Values for Evaluating the Dermal Pathway

Toxicity values are available only for the oral and inhalation pathways. In addition, the majority of these toxicity values are based on intake (i.e., administered dose) rather than an absorbed dose. Because the intake equation for the dermal contact pathway calculates absorbed dose (by incorporating a dermal absorption factor or a permeability coefficient), it is necessary to convert the administered dose toxicity value to an absorbed dose toxicity value in order to calculate risk. In RAGS, Part A (EPA 1989a), EPA states:

> "The output of the exposure assessment for dermal exposure is expressed as the amount of substance absorbed per kg body weight per day. It therefore may be necessary to derive an absorbed-dose toxicity value from an administered-dose toxicity value to compare with the exposure estimate".

The adjustment of the oral administered-dose toxicity values requires sufficient data from the principal laboratory studies on oral absorption efficiency (i.e., gastrointestinal absorption factors) in the species of which the toxicity measures are based. Once these data have been identified, the adjustment of the toxicity value involves multiplying the administered dose toxicity value (i.e., the RfD or slope factor) by the gastrointestinal absorption factor.

The gastrointestinal absorption factors used in this assessment were obtained from the Agency for Toxic Substances and Disease Registry's (ATSDR) toxicological profiles and from other literature sources. A list of the toxicity values used to evaluate the dermal pathway, gastrointestinal absorption factors, dermal permeability coefficients, and dermal absorption factors used in this risk assessment is included in Table VI-1.5.

Table VI-1.5. Toxicity Values Used in Evaluation of Dermal Exposure Pathways

(Page 1 of 2)

COMPOUND	NONCARCINOGENS Dermal Route Chronic RfD [a] (mg/kg/day)	CARCINOGENS Dermal Route Slope Factor [b] $(mg/kg/day)^{-1}$	Gastrointestinal Absorption Factor (unitless)	Source	Dermal Absorption Factor (unitless)	Source	Dermal Permeability Coefficient (cm/hour)	Source
INORGANICS								
Aluminum	--	--	0.10	c	0.01	f	1.0E-03	g
Antimony	8.0E-06	--	0.02	c	0.01	f	1.0E-03	g
Arsenic	1.2E-04	3.7E+00	0.41	c	0.01	f	1.0E-03	g
Bismuth	--	--	--	--	--	--	--	--
Cadmium (food)	1.0E-05	--	0.01	c	0.01	e	--	--
Cadmium (water)	5.00E-04	--	1.00	d	--	--	1.0E-03	g
Cerium	--	--	--	--	--	--	--	--
Chromium (VI)	1.0E-04	--	0.02	c	0.01	f	1.0E-03	g
Cobalt	--	--	0.08	c	0.01	f	1.0E-03	g
Copper	1.1E-02	--	0.30	c	0.01	f	1.0E-03	g
Lead	--	--	0.15	c	0.01	f	1.0E-03	g
Manganese (food)	1.4E-01	--	1.00	d	0.01	f	--	--
Manganese (water)	2.0E-04	--	0.04	c	--	--	1.0E-03	g
Mercury	3.0E-08	--	0.0001	c	0.01	f	1.0E-03	g
Molybdenum	1.9E-03	--	0.38	c	0.01	f	1.0E-03	g
Neodymium	--	--	--	--	--	--	--	--
Nickel	5.4E-03	--	0.27	c	0.01	f	1.0E-03	g
Selenium	2.2E-03	--	0.44	c	0.01	f	1.0E-03	g
Silver	9.0E-04	--	0.18	c	0.01	f	1.0E-03	g
Tin	--	--	--	--	--	--	--	--
Thallium	1.2E-05	--	0.15	c	0.01	f	1.0E-03	g
Vanadium	7.0E-05	--	0.01	c	0.01	f	1.0E-03	g
Zinc	6.0E-02	--	0.20	c	0.01	f	1.0E-03	g
ORGANICS								
Acenaphthylene	9.3E-03	--	0.31	c	0.1	f	1.9E-03	i
Acetone	8.3E-02	--	0.83	c	0.25	f	1.9E-03	i
Anthracene	2.3E-01	--	0.76	c	0.1	f	1.9E-03	i
Benzo(a)anthracene	3.0E-02	7.3E-01	1.00	d	0.1	f	8.1E-01	h
Benzo(a)pyrene	9.3E-03	2.4E+01	0.31	c	0.1	f	1.2E+00	h
Benzo(b)fluoranthene	9.3E-03	2.4E+00	0.31	c	0.1	f	1.2E+00	h
Benzo(g,h,i)perylene	9.3E-03	--	0.31	c	0.1	f	1.9E-03	i
Benzo(k)fluoranthene	9.3E-03	2.4E-01	0.31	c	0.1	f	1.9E-03	i
Benzoic Acid	4.0E+00	--	1.00	c	0.1	f	7.3E-03	h
Bis(2-ethylhexyl)phthalate	3.8E-03	7.4E-02	0.19	c	0.1	f	3.3E-02	h
Butyl benzyl phthalate	2.0E-01	--	1.00	d	0.1	f	5.9E-02	i
Carbazole	--	2.0E-02	1.00	d	0.1	f	--	--
alpha-Chlordane	--	--	1.00	d	0.1	f	4.6E-02	h
Chrysene	9.3E-03	2.4E-02	0.31	c	0.1	f	8.1E-01	h

Table VI-1.5. (continued) Toxicity Values Used in Evaluation of Dermal Exposure Pathways

(Page 2 of 2)

COMPOUND	NONCARCINOGENS Dermal Route Chronic RfD [a] (mg/kg/day)	CARCINOGENS Dermal Route Slope Factor [b] $(mg/kg/day)^{-1}$	Gastrointestinal Absorption Factor (unitless)	Source	Dermal Absorption Factor (unitless)	Source	Dermal Permeability Coefficient (cm/hour)	Source
Dibenzo(a,h)anthracene	3.0E-02	7.3E+00	1.00	d	0.1	f	2.7E+00	h
1,2-Dichloroethene	9.00E-03	--	1.00	d	0.25	f	1.0E-02	h
Di-n-butyl phthalate	1.0E-01	--	1.00	c	0.1	f	3.3E-02	h
Fluoranthene	1.2E-02	--	0.31	c	0.1	f	3.6E-01	h
Fluorene	4.0E-02	--	1.00	d	0.1	f	1.6E-01	i
Hexane	6.0E-02	--	1.00	d	0.25	f	3.3E-01	i
Indeno(1,2,3-cd)pyrene	9.3E-03	2.4E+00	0.31	c	0.1	f	1.9E+00	h
Methylene Chloride	5.7E-02	7.9E-03	0.95	c	0.1	f	4.5E-03	h
Phenanthrene	2.2E-02	--	0.73	c	0.1	f	2.7E-01	h
Pyrene	9.3E-03	--	0.31	c	0.25	f	3.2E-01	i
Trichloroethene	--	7.3E-02	0.15	c	0.25	f	1.6E-02	h
EXPLOSIVES								
1,3-Dinitrobenzene	1.0E-04	--	1.00	d	0.1	f	2.1E-03	i
PETN	--	--	--	--	--	--	--	--
1,3,5-Trinitrobenzene	5.0E-05	--	1.00	d	0.1	f	5.8E-04	i
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02	1.00	d	0.1	f	3.1E-03	i

a. The chronic RfD for the dermal route was calculated by multiplying the chronic oral RfD by the gastrointestinal absorption factor.

b. The slope factor for the dermal route was calculated by dividing the oral slope factor by the gastrointestinal absorption factor.

c. These gastrointestinal absortpion factors have been compiled by the Biomedical and Environmental Information Analysis Section (BEIAS) of the Health and Safety Research Division of Oak Ridge National Laboratory (ORNL) for use at all DOE-OR/ERD sites.

d. A default gastrointestinal absorption factor of 1 was assumed if no other information could be located.

e. EPA 1992b, *Dermal Exposure Assessment: Principles and Applications*, Table 6-3.

f. Ohio EPA suggested values for inorganics (0.01), semi-volatile organics (0.1), and volatile organics (0.25)

g. The default permeability coefficient recommended in EPA 1992b was used for these metals in the absence of chemical specific coefficients.

h. Chemical specific permeability coefficients were taken from Table 5-7 of EPA 1992b.

i. The permeability coefficients for these compounds were calculated from the $K_{o/w}$ and MW using the Potts and Guy equation in EPA 1992b.

Chromium

Chromium speciation was not conducted at the New Property. Therefore, the risk assessment has assumed that all chromium is present in its hexavalent form. This is a conservative assumption as hexavalent chromium is a carcinogen by inhalation (whereas the trivalent form is not) and has a more stringent (i.e., lower) RfD than trivalent chromium.

Lead

Health effects associated with low-level lead exposures include reproductive effects, neurological effects, and learning disorders. At the present time, toxicologic studies indicate that there may be no threshold of exposure below which adverse effects do not occur. Given the uncertainty surrounding an acceptable exposure below which there would be no adverse effects for lead, EPA has withdrawn the RfD for lead. Therefore, risks from lead exposure cannot be quantified using an RfD.

EPA has developed the integrated exposure uptake biokinetic (IEUBK) model for lead, LEAD 0.99d (EPA 1994c), to estimate blood lead levels in children ages 0.5 to seven years (6 to 84 months) based upon uptake originating from five environmental media (air, drinking water, soil/dust, food, and paint). It is not applicable to adults. The IEUBK model predicts as its output a probability distribution around a geometric mean blood lead concentration from which the 95th percentile of the children's blood lead concentration can be determined. In general, EPA considers acceptable exposures as those that correspond to a blood lead level of 10 ug/dL or less in 95 percent of exposed children. The IEUBK model and a soil screening level developed using this model were used to estimate risks from lead.

The soil lead exposure point concentrations at the site may be compared to recent EPA soil screening guidelines for lead (EPA 1994d). The RME concentrations for lead in surface soil/sediment and surface/subsurface soil are 28.6 mg/kg and 27.1 mg/kg, respectively. Both of these values are below the 48.0 mg/kg background concentration for lead. In addition, the soil lead guidance establishes a screening level of 400 mg/kg for total lead under residential land use. The screening level is based upon the IEUBK model for lead in children, LEAD 0.99d (EPA 1994c). Lead concentrations that are above this level may help determine when and to what extent investigation is required. Under this guidance, lead soil levels below 400 mg/kg indicates that further investigation may not be required. As indicated above, the exposure concentrations for lead in soil/sediments at the New Property are well below the recommended

screening concentration of 400 mg/kg. In addition, children are not a receptor population for soil/sediment on the New Property. Therefore, soil lead concentrations on the New Property site are not believed to result in significant risk to current or potential future receptors.

Lead was detected in groundwater above background and the RME concentration for lead in groundwater was calculated to be 27.3 ug/L. Because the future off-site resident scenario assumes that on-site groundwater may migrate to off-site wells, risks to future off-site residential children from lead in groundwater were evaluated using the IEUBK model, LEAD 0.99d (EPA 1994c). Input data and the model output are presented in Figure 6.1.2 at the end of Appendix E. The RME concentration of lead in groundwater (27.3 ug/L) was used as the drinking water concentration. The background concentration of lead in soil, 48.0 mg/kg, was used as soil/dust concentration because off-site exposures to lead would correspond more closely with the background concentration rather than the on-site soil lead concentration. In addition, the background concentration is greater than the RME concentration; therefore, using the background concentration will generate a higher and more conservative estimate of blood lead levels. Default values were used for lead concentrations in air, food, maternal blood, and other sources and for all exposure parameters associated with lead uptake.

As shown in Figure 6.1.2, blood lead levels in children are predicted to be 10 ug/dL or less in 98.13% of children. This result fulfills EPA's criteria of acceptable lead exposure; therefore, human health risks from lead are not considered further.

Polycyclic Aromatic Hydrocarbons

Many PAHs do not have published RfDs for noncancer effects and only benzo(a)pyrene (BAP) has a slope factor for carcinogenic effects. EPA has provided interim guidance for the evaluation of some PAHs that are known to cause cancer (EPA 1993c). In this interim guidance, EPA recommends using relative potency values for seven PAHs. These values are related to the slope factor of BAP and are based on well-conducted studies that found complete carcinogenesis after repeated exposure to mouse skin as the endpoint.

These relative potency values have been incorporated into the risk assessment and are listed in the table of toxicity values included in Table VI-1.4. EPA specifies that the guidance provided "...should be applied only to assessment of carcinogenic hazard from oral exposure to PAHs " and that there is

"...currently no inhalation unit risk for BAP that has been found acceptable by the CRAVE" (EPA 1993c). Therefore, inhalation exposure to carcinogenic PAHs has not been evaluated quantitatively in the risk assessment. Slope factors for dermal exposure are derived from oral slope factors and are presented in Table VI-1.5.

For noncarcinogenic assessment of PAHs that do not have EPA-approved RfDs, the RfD for pyrene was used as a surrogate.

Radium-226

Radioactive decay of Ra-226 produces inert, gaseous isotopes of radon (i.e. Radon-222). Inhalation of these isotopes can pose cancer risks. Therefore, cancer risks from inhaling Radon-222 were calculated using the following inhalation slope factor for Radon-222 (plus progeny): 7.7×10^{-12} risk/pCi.

Tentatively Identified Compounds

Over 900 tentatively identified compounds (TICs) were detected at the New Property. The great uncertainty regarding the identification and quantification of TICs makes any conclusions regarding them highly uncertain. Due to the low frequency of detection and concentration of any specific TIC no further quantitative estimate of exposure risks from TICs is warranted. However, given that most estimated concentrations of TICs are relatively low, it is assumed that the risks from TICs would be only a minor contribution to the total exposure risks at the New Property.

6.1.5. Risk Characterization

This section presents the risk characterization for the New Property. Section 6.1.5.1 presents an overview of risk characterization methods used in this assessment. Section 6.1.5.2 presents the results of risk characterization for the New Property.

6.1.5.1. Risk Characterization Methods

Risk characterization integrates the exposure and toxicity assessments by comparing estimates of intake or dose with appropriate toxicity values. This in turn provides an indication of the potential for adverse

effects to exposed receptors. The objective of the baseline risk characterization is to determine if exposure to contaminants associated with the site pose risks that exceed EPA target levels for human health effects. The results of the risk assessment may thus support the determination of need for site remediation.

General EPA Methods for Risk Assessment

This risk characterization presents a separate evaluation of noncarcinogenic and carcinogenic effects. The assessment distinguishes cancer from noncancer effects because organisms typically respond differently following exposure to carcinogenic or noncarcinogenic agents.

The cancer risks are estimates of the excess (incremental) lifetime cancer risk (ELCR) for an individual that are attributable to long term exposure to site-related chemicals. The terms *excess* and *incremental* imply the estimated risk does not include the risk associated with background; however, the exposure concentration for COPCs is derived using concentrations detected at the New Property which include any portion of the chemical concentration that is naturally occurring (i.e., background).

The procedure for calculating risk associated with exposure to carcinogenic compounds has been established by EPA (EPA 1989a). A nonthreshold, dose-response model is used to calculate a cancer slope (potency) factor (which mathematically is the slope of the dose-response curve) for each chemical.

To derive an estimate of risk, the cancer slope factor is then multiplied by the estimated chronic daily dose experienced by the exposed individual:

$$\text{Risk} = \text{CDI} \times \text{CSF}$$

where:

Risk	=	High end estimate of the excess lifetime cancer risk to an individual (unitless probability)
CDI	=	Chronic daily intake (or absorbed dose) averaged over a 70-year period (mg/kg body weight/day)
CSF	=	95% upper-bound estimate of the slope of the dose-response curve (mg/kg body weight/day)$^{-1}$.

This equation assumes that the dose-response relationship is linear in the low-dose portion of the multistage model dose-response curve. A linearized multistage dose response model is most commonly used by EPA in deriving the slope estimates. Given this assumption, the slope factor is a constant and risk is directly proportional to intake. In evaluating risk of exposure to more than one carcinogen, the risk measure for each compound may be summed (in the absence of information on antagonistic or synergistic effects) to provide an overall estimate of total carcinogenic risk (EPA 1989a).

$$Risk_T = \sum_{i=1}^{n} Risk_i$$

where:

$Risk_T$	=	The combined excess lifetime cancer risk across chemical carcinogens
$Risk_i$	=	The risk estimate for the ith chemical of n chemicals under evaluation.

This is conducted for each source of environmental release, associated exposure pathway, and receptor group at risk of exposure.

The traditionally accepted practice of evaluating exposure to noncarcinogenic compounds has been to experimentally determine a NOAEL and to divide this by a safety factor to establish an acceptable daily intake or RfD. The estimated daily intake is compared to the RfD to determine if the estimated intake exceeds the acceptable intake:

$$HQ = \frac{Dose}{RfD}$$

where:

HQ	=	Hazard Quotient: potential for adverse noncarcinogenic effects
Dose	=	Average daily dose (intake) for subchronic or chronic exposure (mg/kg body weight/day)
RfD	=	Acceptable intake for subchronic or chronic exposure (mg/kg body weight/day).

Dose and the RfD are expressed in the same units and are based upon common exposure periods (i.e., chronic, subchronic, or shorter-term). Guidelines for evaluating exposure to mixtures of noncarcinogens is presented by EPA (1989a). Essentially, this involves summing the HQs (ratio of daily dose/RfD) for all chemicals under evaluation to obtain the Hazard Index (HI).

EPA guidelines for interpreting noncarcinogenic and carcinogenic effects have been adopted in the BRA. EPA has established target risk levels for use in determining the need for site remediation. For noncarcinogenic effects, EPA has set the target HQ at one. If the HQ is > 1, there is the potential for adverse health effects at the given exposure/dose level. For multiple noncarcinogens, the HQs for all of the chemicals under evaluation are summed resulting in the HI. If the HI is > 1, the potential also exists for adverse health effects resulting from exposure to mixtures of chemicals. In cases where the HQ for individual substances is below 1 yet several HQs sum to greater than 1, EPA recommends segregating the compounds into groups with like or common toxicological effects and re-evaluating the potential for the various adverse health effects. In cases where HQs for individual substances are greater than 1, this step is not necessary or useful.

For carcinogenic effects, the target cancer risk range has been set at 1×10^{-4} to 1×10^{-6}. Cancer risks less than 10^{-6} are not typically considered a concern. EPA guidance is not as definitive concerning risks falling within the target risk range. In a memorandum entitled "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" (EPA 1991c), EPA Assistant Administrator Don R. Clay states, "Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted..." although "...a risk manager may also decide that a baseline risk level less than 10^{-4} is unacceptable due to site specific reasons."

In the risk characterization, COCs are identified. In order to be conservative, the COCs in the human health risk assessment are defined as individual chemicals which contribute to a pathway that exceeds a 10^{-4} risk or an HI of 1. In addition, individual chemicals posing cancer risks within the 1×10^{-4} to 1×10^{-6} target risk range are considered COCs. COCs may either independently exceed an EPA target or combine to exceed the target. In addition, consideration is given to background risks in the selection of COCs. If background risks for an individual chemical are estimated to be indistinguishable from onsite risks, then the chemical is not identified as a COC for the New Property.

6.1.5.2. Risk Characterization Results

The following subsections present the risk characterization results for the New Property. Table VI-1.6 presents a summary of the quantitative results of the risk assessment for all scenarios and pathways. Letter designators interpreting the estimates in light of EPA targets are included in the table. In the

Table VI-1.6. Summary of Total Risk
All Scenarios and Pathways
Mound New Property

Scenario and Receptor	Media	Pathway	Noncarcinogen Risk HI		Carcinogenic Risk ELCR	
Current Scenario Trespasser	Soil/Sediment	Ingestion	1.34E-02	B	6.11E-07	B
		Dermal	4.37E-01	B	2.19E-06	W
		Inhalation of Dust	1.31E-04	B	1.63E-10	B
		Inhalation of Vapors/Radon	2.53E-07	B	1.65E-09	B
		External Radiation	0.00E+00	B	4.11E-08	B
	Seeps	Dermal	4.33E-03	B	0.00E+00	B
		TOTAL	5E-01	B	3E-06	W
Future Scenario Commercial/ Industrial Worker	Soil/Sediment	Ingestion	2.30E-02	B	3.33E-06	W
		Dermal	1.89E+00	E	2.97E-05	W
		Inhalation of Dust	8.97E-04	B	4.10E-09	B
		Inhalation of Vapors/Radon	1.52E-06	B	4.95E-08	B
		External Radiation	0.00E+00	B	2.57E-07	B
		TOTAL	2E+00	E	3E-05	W
Future Scenario Construction/ Excavation Worker	Soil/Sediment	Ingestion	2.15E-01	B	6.20E-07	B
		Dermal	1.86E+00	E	5.74E-07	B
		Inhalation of Dust	1.58E+00	E	1.48E-07	B
		Inhalation of Vapors/Radon	1.43E-06	B	9.59E-10	B
		External Radiation	0.00E+00	B	4.95E-09	B
		TOTAL	4E+00	E	1E-06	B
Future Scenario Off-site Residential Adult	Groundwater	Ingestion	4.73E+01	E	1.36E-03	E
		Dermal	2.40E+00	E	6.65E-06	W
		Inhalation	3.60E-04	B	0.00E+00	B
		TOTAL	5E+01	E	1E-03	E
Future Scenario Off-site Residential Child	Groundwater	Ingestion	1.10E+02	E	6.36E-04	E
		Dermal	4.25E+00	E	2.36E-06	W
		Inhalation	1.68E-03	B	0.00E+00	B
		TOTAL	1E+02	E	6E-04	E

HI = Hazard Index
ELCR = Excess lifetime cancer risk
E = Exceeds EPA target risk levels (HI > 1 or ELCR >1.0E-04)
W = Within EPA target risk range (ELCR between 1.0E-06 and 1.0E-04)
B = Below EPA target risk levels (HI ≤ 1 or ELCR ≤ 1.0E-06)
Note: ELCR values of 0.00E+00 indicate that cancer toxicity criteria were not available for contaminants evaluated in the pathway.

summary table, risk estimates that are at or below the noncancer HI of 1 and the cancer target risk level of $1.0E^{-6}$ are indicated with a "B." "E" designates risk exceeding the EPA target cancer risk range (10^{-4}) or the noncancer HI of 1. Cancer risk estimates within the EPA target cancer risk range (ELCR between $1.0E^{-6}$ and $1.0E^{-4}$) are designated with a "W." Cancer risk estimates of zero indicate that cancer toxicity criteria are not available for any contaminants evaluated in the pathway.

Table VI-1.7 presents risk estimates for all scenarios and pathways from exposure to background concentrations of COPCs. The 95% UTL for background concentrations of soil and groundwater constituents was used as the exposure concentration for estimating background risks from each COPC. Since risk estimates in Tables VI-1.6 and VI-1.7 were calculated using the same procedures and exposure assumptions, the tables may be compared to determine the relative risk from COPCs at the New Property (Table VI-1.6) to risks from COPCs at background concentrations (Table VI-1.7). It should be noted that background concentrations represent the concentrations of COPCs in soils and groundwater in the areas surrounding the Mound Plant, and for some COPCs, background concentrations may be higher than New Property RME concentrations. This can result in risks associated with background being higher than onsite risks.

Risk estimates for individual COPCs for all scenarios and pathways are presented in Appendix E. In this Appendix, Tables VI-1.8 through VI-1.32 present risk estimates based on RME concentrations of COPCs at the New Property. Tables VI-1.33 through VI-1.57 present risk estimates based on background concentrations of COPCs.

EPA recommends that risk estimates be reported to one significant figure. Risk estimates are rounded to one significant figure in the last step when reporting total site risk estimates (Tables VI-1.6 and VI-1.7). In the text, scientific notation is used when needed to avoid overstating the precision of the estimates.

Current Land Use Risk

One receptor class, an adolescent trespasser, is evaluated under the current land use scenario. A summary of risk estimates for exposure to soil/sediment and seeps is provided in Table VI-1.6. A summary of background risk estimates is provided in Table VI-1.7. For the trespasser, the total risk from all pathways and media at the New Property is below or within EPA targets. In addition, the noncarcinogen risk from exposure to background concentrations of COPCs is indistinguishable from the risk from exposure to

Table VI-1.7. Summary of Background Risk
All Scenarios and Pathways
Mound New Property

Scenario and Receptor	Media	Pathway	Noncarcinogen Risk HI		Carcinogenic Risk ELCR	
Current Scenario Trespasser	Soil/Sediment	Ingestion	1.49E-02	B	5.04E-07	B
		Dermal	7.53E-01	B	5.50E-07	B
		Inhalation of Dust	2.00E-04	B	1.67E-10	B
		Inhalation of Vapors/Radon	0.00E+00	B	2.66E-09	B
		External Radiation	0.00E+00	B	6.97E-08	B
	Seeps	Dermal	4.75E-01	B	0.00E+00	B
		TOTAL	1E+00	B	1E-06	B
Future Scenario Commercial/ Industrial Worker	Soil/Sediment	Ingestion	2.56E-02	B	2.73E-06	W
		Dermal	3.26E+00	E	7.44E-06	W
		Inhalation of Dust	1.38E-03	B	4.15E-09	B
		Inhalation of Vapors/Radon	0.00E+00	B	7.99E-08	B
		External Radiation	0.00E+00	B	4.36E-07	B
		TOTAL	3E+00	E	1E-05	W
Future Scenario Construction/ Excavation Worker	Soil/Sediment	Ingestion	2.45E-01	B	5.25E-07	B
		Dermal	3.25E+00	E	1.49E-07	B
		Inhalation of Dust	2.54E+00	E	1.54E-07	B
		Inhalation of Vapors/Radon	0.00E+00	B	1.60E-09	B
		External Radiation	0.00E+00	B	8.72E-09	B
		TOTAL	6E+00	E	8E-07	B
Future Scenario Off-site Residential Adult	Groundwater	Ingestion	3.51E+01	E	1.73E-03	E
		Dermal	1.60E+00	E	8.42E-06	W
		Inhalation	0.00E+00	B	0.00E+00	B
		TOTAL	4E+01	E	2E-03	E
Future Scenario Off-site Residential Child	Groundwater	Ingestion	8.20E+01	E	8.05E-04	E
		Dermal	2.84E+00	E	2.99E-06	W
		Inhalation	0.00E+00	B	0.00E+00	B
		TOTAL	8E+01	E	8E-04	E

HI = Hazard Index
ELCR = Excess lifetime cancer risk
E = Exceeds EPA target risk levels (HI > 1 or ELCR >1.0E-04)
W = Within EPA target risk range (ELCR between 1.0E-06 and 1.0E-04)
B = Below EPA target risk levels (HI ≤ 1 or ELCR ≤ 1.0E-06)
Note: ELCR values of 0.00E+00 indicate that cancer toxicity criteria were not available for contaminants evaluated in the pathway.

COPC concentrations at the New Property. The cancer risk from exposure to background concentrations of COPCs (1×10^{-6}) is the same order of magnitude as the cancer risk from exposure to COPC concentrations at the New Property (3×10^{-6}). Media-specific risks for the trespasser are discussed below. More detailed risk estimates for all COPCs are provided in Appendix E.

Soils/Sediments

All of the risk estimates for soil/sediment exposures under current land use at the New Property are below or within EPA targets. Noncancer risks for all pathways are below the EPA target HI of 1. Cancer risks for all pathways are below the EPA target range of 1×10^{-6} to 1×10^{-4} except dermal contact which is within the target range at 2×10^{-6}.

Tables VI-1.8 through VI-1.13 in Appendix E present risk estimates for all COPCs and all pathways. Benzo(a)pyrene contributes the greatest cancer risk (1×10^{-6}) to the dermal contact pathway and is selected as a COC. No COPCs in soil/sediment have risk estimates for individual COPCs which exceed 10^{-4} cancer risk or an HI of 1. Risk estimates for background concentrations of COPCs are provided in Appendix E, Tables VI-1.33 through VI-1.38. Pathway noncancer risk estimates for background concentrations of COPCs were indistinguishable from pathway noncancer risk estimates for COPC concentrations at the New Property. Pathway cancer risk estimates were slightly greater for New Property COPC concentrations compared to background concentrations.

Seeps

Only dermal exposure to seeps is considered in the current land use scenario. Both the cancer and noncancer risk estimates for dermal exposure to seeps at the New Property are below or within EPA targets. Table VI-1.14 in Appendix E contains the risk estimates for individual COPCs in seeps. Table VI-1.39 in Appendix E contains the risk estimates for exposure to background concentrations of seep COPCs. Groundwater background concentrations of COPCs are used to calculate these risk estimates because background concentrations of seep constituents are unavailable and the source of the seeps is groundwater. The noncancer risk from background is estimated to be indistinguishable from the noncancer risk from onsite concentrations. Cancer risk toxicity criteria for the seep COPCs are not available; consequently, cancer risk estimates are not calculated for any seep COPCs. No COCs were identified in

seeps because no COPCs contributed greater than 10^{-4} cancer risk, cancer risks within the risk range, or HI of 1 for dermal exposures.

Future Land Use Risk

A summary of risk estimates for receptors under future land use scenarios is provided in Table VI-1.6. Background risk estimates for future land use receptors are summarized in Table VI-1.7. Exposures to soil/sediment are evaluated for future commercial/industrial workers and construction/excavation workers. In addition, only exposures to groundwater were evaluated for future offsite residents (adults and children). Media-specific risks for these receptors are discussed below. More detailed risk estimates for all COPCs are provided in Appendix E.

Soil/Sediment

For future commercial/industrial workers, the total noncancer risk from all soil/sediment pathways (ingestion, dermal contact, inhalation, and external radiation) is estimated to be an HI of 2 which is greater than the EPA target HI of 1. However, the noncarcinogen risk from exposure to background concentrations of COPCs is estimated to be an HI of 3 which is indistinguishable from the risk from exposure to COPC concentrations at the New Property. In both cases, the noncancer risk is driven by the dermal contact pathway which is the only pathway where the HI is greater than 1. The cancer risk at the New Property is estimated to be within the EPA target range. In addition, the cancer risk from exposure to background concentrations of COPCs (1×10^{-5}) is the same order of magnitude as the cancer risk from exposure to COPC concentrations at the New Property (3×10^{-5}).

Tables VI-1.15 through VI-1.20 in Appendix E present risk estimates for all COPCs and all pathways for future commercial/industrial workers at the New Property. Risk estimates for background concentrations of COPCs are provided in Appendix E, Tables VI-1.40 through VI-1.45. No COPCs have cancer risk estimates in excess of 1×10^{-4} by any pathway. Arsenic poses cancer risks within the target range for the ingestion and dermal contact pathway; however, the background risks from arsenic are estimated to be indistinguishable from onsite risks. As a result, arsenic is not identified as a COC for the New Property. Benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene pose cancer risks within the target range by the dermal contact pathway. Therefore, all four chemicals are identified as COCs. The HQ for dermal exposure to mercury is estimated to be 2 which exceeds the EPA target

of HQ of 1; however, the HQ for dermal exposure to the background concentration of mercury is estimated to be 3. As a result, mercury is not identified as a COC. No other COPCs have HQs greater than 1 by any exposure pathway.

For future construction/excavation workers, noncancer risk from all soil/sediment pathways is estimated to be an HI of 4 which is greater than the EPA target HI of 1. However, the noncarcinogen risk from exposure to background concentrations of COPCs is estimated to be an HI of 6 which is indistinguishable from the risk from exposure to COPC concentrations at the New Property. In both cases, the noncancer risk is driven by the dermal contact and inhalation of fugitive dust pathways which are the only pathways where the HI is greater than 1. The total cancer risk at the New Property is estimated to be 1×10^{-6} which is equal to the lower end of the EPA target range. The background cancer risk is slightly less at 8×10^{-7}.

Tables VI-1.21 through VI-1.26 in Appendix E present risk estimates for all COPCs and all pathways for future construction/excavation workers at the New Property. Risk estimates for background concentrations of COPCs are provided in Appendix E, Tables VI-1.46 through VI-1.51. No carcinogenic COCs were identified in soil/sediment because no risk estimates for individual COPCs exceeded 10^{-4} cancer risk and none were within the target risk range. The HQ for dermal exposure to mercury is estimated to be 2 which exceeds the EPA target of HQ of 1; however, the HQ for dermal exposure to the background concentration of mercury is estimated to be 3. As a result, mercury is not identified as a COC. The HQ for inhalation of manganese in fugitive dust is estimated to be 2 which exceeds the EPA target of HQ of 1; however, the HQ for inhalation of the background concentration of manganese is estimated to be 3. As a result, manganese is not identified as a site-related COC. No other COPCs have HQs greater than 1 by any exposure pathway; therefore, no COCs in soil/sediment are identified for future construction/excavation workers.

Groundwater

For future offsite resident adults, noncancer risk from RME concentrations of COPCs by all groundwater pathways is estimated to be an HI of 50 which is greater than the EPA target HI of 1. The noncancer risk from exposure to background concentrations of COPCs is estimated to be an HI of five which also exceeds the EPA target. In both cases, the noncancer risk is driven by the direct ingestion and dermal contact pathways which have HI values greater than 1.

For future offsite resident adults the total cancer risk from RME concentrations of COPCs by all pathways is estimated to be 1×10^{-3}, but the total cancer risk from exposure to background concentrations of COPCs is estimated to be 5×10^{-4}. Cancer risks from both RME and background concentrations exceed the EPA target range. In both cases, the cancer risk from the direct ingestion pathway exceeds the EPA target range and the risk from dermal contact is within the target range. Cancer risk for the inhalation pathway of the volatile compounds detected in groundwater was below the target range for both exposure and background concentrations.

For future offsite resident children, noncancer risk from RME concentrations of COPCs by all groundwater pathways is estimated to be an HI of 100 which is greater than the EPA target of HI of 1. However, the noncancer risk from exposure to background concentrations of COPCs is estimated to be an HI of 10 which also exceeds the EPA target. In both cases, the noncancer risk is driven by the direct ingestion and dermal exposure pathways which have HI values greater than 1. The total cancer risk from exposure to RME concentrations of COPCs is estimated to be 6×10^{-4}, but the cancer risk from background concentrations is estimated to be 2×10^{-4}. Cancer risks from both RME and background concentrations exceed the EPA target range. In both cases, the cancer risk from the direct ingestion pathway exceeds the EPA target range and the risk from dermal contact is within the target range. As explained above, cancer risk for the inhalation of volatile compounds pathway was below the target range.

Tables VI-1.27 through VI-1.32 in Appendix E present risk estimates for all COPCs and all pathways for future offsite residents using groundwater as a household water supply. Risk estimates for background concentrations of COPCs are provided in Appendix E, Tables VI-1.52 through VI-1.57. For both adults and children, the noncancer risk from ingestion of water is driven by arsenic, chromium, and manganese, all of which have HI values greater than 1 for exposure to RME concentrations. Nickel also has an HI value greater than 1 for children. The HI values for ingestion of arsenic, chromium, manganese, and nickel at RME concentrations exceed the HI values for ingestion of background concentrations. As a result arsenic, chromium, manganese, and nickel are listed as COCs for the ingestion pathway. The HI value for dermal contact with manganese exceeds 1 and is greater than the HI for the background concentration. Consequently, it is listed a COC for the dermal contact pathway also. No other COPCs have HIs greater than EPA target for any exposure pathway.

Arsenic is the only COPC with a cancer risk value greater than 1×10^{-4} for the ingestion pathway and within the target range for the dermal pathway. The background concentration for arsenic result in a

cancer risk values for children and adults that are above the target range for the ingestion pathway and within the target range for the dermal pathway. The estimated risk for arsenic in site groundwater samples is twice the risk found in the background samples, therefore, arsenic is a COC for groundwater for both ingestion and dermal pathways. Beryllium and Am-241 are COPCs with a cancer risk value within the cancer target range for the ingestion pathway . Background cancer risk for beryllium is within the target range at approximately half the risk of the site samples. Am-241 background risk values are below the target range. Consequently, beryllium and Am-241 are COCs at the New Property. The adult cancer risk from ingestion of both Ra-226 and tritium in groundwater is estimated to be 2×10^{-6} which is within the target risk range. These values are equal to the estimated background risk (2×10^{-6}) for both Ra-226 and tritium; therefore, Ra-226 and tritium are not listed as COCs. No other COPCs have cancer risks greater than EPA target for any exposure pathway evaluated.

6.1.6. Uncertainty in the Risk Assessment

In the following section, an evaluation is presented of the sources of uncertainty in the baseline human health risk assessment for the New Property and the relative influence of these sources on the results of the evaluation. Uncertainty is inherent in the selection of key input parameters and in every step of the risk assessment process. Risk assessment of waste sites must not be viewed as yielding single value, invariant results. Rather, the results of risk assessment are estimates that span a range of possible values, and which may be understood only in light of the assumptions and methods used in the evaluation.

The results of the risk assessment are presented in terms of the potential for adverse effects based upon a number of conservative assumptions. The tendency to be conservative is an effort to error toward protecting health. Uncertainty can be found at all phases in the risk assessment: in the analytical data, the exposure assessment, the toxicity information, and the risk characterization.

6.1.6.1. Uncertainty in the Analytical Data

Uncertainty will always surround estimates of environmental concentrations at waste sites. The objective is to understand, minimize, and quantify this uncertainty in the risk assessment. Given the objective of protecting human health and the environment, it is prudent to design the sampling program to minimize the error where we accept the hypothesis that there is no significant difference between background and site concentrations.

The great uncertainty regarding the identification and quantification of TICs makes any conclusions regarding them highly uncertain. Given that most estimated concentrations of TICs are relatively low, it is assumed that the risks from TICs would be only a minor contribution to the total exposure risks at the New Property.

6.1.6.2. Uncertainty in Exposure Assessment

Exposure assessment may introduce considerable uncertainty in the risk assessment process. Uncertainty in all elements of the exposure assessment are brought together and compounded in the estimate of intake or dose. The professional judgment of the risk assessor becomes particularly important, and the risk assessor must examine and interpret a diversity of information, including: the nature, extent, and magnitude of contamination; transport of chemicals in the environment; identification of exposure routes; identification of receptor groups currently at risk and potentially at risk in the future; and activity patterns of receptors and receptor groups.

Different types of uncertainty have been identified in the exposure assessment: (1) Scenario Uncertainty: missing or incomplete information needed to define the exposure scenario or pathway; (2) Model Uncertainty: inability to quantify all assumptions in model variables; and (3) Parameter Uncertainty: inadequate information to quantify an exposure variable or parameter.

Scenario uncertainty arises when pathways were not included in, or were eliminated from, the assessment. In this risk assessment, a future industrial/commercial land use scenario was assumed in which workers (adults) would be exposed to soils/sediments. A future residential land use scenario was not assumed due to the anticipated use of the property. Although based on reasonable judgment, these assumptions are uncertain as it is impossible to know what will happen in the future.

Risks associated with human exposure to groundwater are highly uncertain. Uncertainty arises from the use of onsite concentrations of COPCs to estimate risks to future offsite residents. The actual offsite concentrations to which future receptors would be exposed would be much lower due to dilution during the migration of any groundwater COPCs offsite.

Many of the exposure parameters used in the risk assessment are default values recommended by EPA. These default parameters, which are generally conservative, do not necessarily reflect actual behavior and

have been used in the absence of site-specific information. In addition, assumptions regarding the future land uses are speculative. In attempting to predict future exposures, assumptions must be made concerning contaminant fate and transport, future site activities, and receptor behavior. In particular, it was assumed that contaminant concentrations will be the same in the future as at present, and that the contaminants themselves are immobile. The uncertainty associated with the exposure assumptions used in the risk assessment is low to moderate, and most likely overestimates the actual risks.

Each of these parameters is commonly treated as a single point estimate. None of these parameters, however, is truly a single value. Instead, a range of values or distribution would more accurately represent these parameters. Defining a range of values for any given parameter is actually a measure of variability in the risk assessment. Quantitative uncertainty analysis allows one to measure this variability, but is difficult because of the quantity and quality of data available, or the commitment of time and resources.

6.1.6.3. Uncertainties Related to Toxicity Information

Although EPA provides toxicity values that are point estimates, a significant amount of uncertainty may surround these point estimates. Identification of the sources of this uncertainty enables the risk assessor to establish the degree of confidence associated with the toxicity measures.

Uncertainty is inherent within the toxicity assessment and is primarily due to differences in study design, species, sex, routes of exposure, or dose-response relationships. A major source of uncertainty involves using toxicity values based on experimental studies that substantially differ from typical human exposure scenarios. The derivation of the toxicity values must take into account such differences as 1) using dose-response information from animal studies to predict effects in humans, 2) using dose-response information from high-dose studies to predict adverse health effects from low doses, 3) using data from short-term studies to predict chronic effects, and 4) extrapolating from specific populations to general populations.

The cancer slope factors in particular are based on studies that may differ greatly from realistic situations. Experimental cancer bioassays typically expose animals to very high levels of chemicals (i.e., the maximum tolerated dose) for their entire lifetime. After the appropriate studies have been identified, the slope factor is calculated as the upper 95th percent confidence limit of the slope of the dose-response curve. This introduces conservativism into the risk assessment.

The derivation of reference doses generally involves the use of animal studies. Uncertainty factors ranging from 1 to 10,000 are incorporated into the reference dose to provide an extra level of public health protection. The factors used depend on the type of study from which the value has been derived (e.g., animal or human, chronic or acute). The scientific basis for this practice is somewhat uncertain. In general, high uncertainty factors are meant to bias the results conservatively so that exposures at the reference dose level will not result in adverse health effects.

Oral administered dose toxicity values have been converted to absorbed dose toxicity values for use in evaluating the dermal contact pathway. This is considered a more accurate approach than using unadjusted oral toxicity values for the dermal pathway. Uncertainty is introduced in the use of the gastrointestinal absorption factors. Limited information is available on the gastrointestinal absorption of some analytes and many have no information at all. In addition, no adjustments have been made for the medium of exposure (e.g., when the medium of exposure in the site differs from the medium of exposure assumed by the toxicity value). The uncertainty associated with using the absorbed dose toxicity values for the dermal pathway is moderate and the bias unknown.

There are many chemicals for which no toxicity value exists and for which little information is available. Therefore, a quantitative risk estimate cannot be calculated for these chemicals. For example, many chemicals are not evaluated for the inhalation pathway because of limited inhalation-based toxicological information. The lack of toxicity information for some chemicals contributes to the underestimation of risks.

Cancer and noncancer risks are summed in the risk characterization process (separately for carcinogens and noncarcinogens) to estimate potential risks associated with the simultaneous exposure to multiple chemicals. In the case of carcinogens, this gives carcinogens with a class B or class C weight-of-evidence the same weight as carcinogens with a class A weight-of-evidence. It also equally weights slope factors derived from animal data with those derived from human data. Uncertainties in the combined risks are also compounded because RfDs and cancer slope factors do not have equal accuracy or levels of confidence and are not based on the same severity of effect.

Toxicity values are not available for most of the PAHs. However, values have been assigned to several carcinogenic PAHs based upon relative potency values (which relate the carcinogenicity of each PAH to the carcinogenicity of BAP). This approach, although currently under review by EPA, is based on

scientific studies, and is thought to be more realistic than the alternative method of assuming that all carcinogenic PAHs have a potency factor equal to that of BAP.

Arsenic is a Class A human carcinogen, which is the most certain carcinogen classification. The oral unit risk (and resulting cancer slope factor) was based on studies of human *dermal* cancers occurring in populations *ingesting* drinking water with high levels of arsenic. EPA recommends that risk managers recognize the large uncertainties associated with the cancer slope factor for arsenic. This is reflected in the following quote:

> . . . in reaching risk management decisions in a specific situation, risk managers must recognize and consider the quantities and uncertainties of risk estimates. The uncertainties associated with ingested inorganic arsenic are such that estimates could be modified *downwards* as much as an order of magnitude, relative to risk estimates associated with most other carcinogens. (EPA 1994a)

6.1.6.4. Uncertainties in Risk Characterization

Uncertainties in any phase of the risk analysis are reflected in the risk estimates. Some uncertainty is associated with the summation of risks and HQs for multiple chemical contaminants. As stated in RAGS (EPA 1989a), "The assumption of dose additivity ignores possible synergisms or antagonisms among chemicals, and assumes similarity in mechanisms of action and metabolism." However, summing risks and HQs for multiple substances in this risk assessment provides a conservative estimate.

In Table VI-1.39 of Appendix E, a summary is provided of the principal sources of uncertainty in the baseline human health risk assessment. In keeping with EPA guidance (EPA 1989a), the table is a qualitative (order of magnitude) assessment incorporating simple relative influences of principal sources of uncertainty on the overall results of risk assessment.

6.1.7. Summary of the Baseline Human Health Risk Assessment

The BRA was conducted for both current and future land use at the New Property. The reported noncancer (HQs and HIs) and cancer risks (ELCRs) for human health were derived using EPA-approved methods. The conclusions of the BRA are summarized in Table VI-1.58 and in the following points:

Table VI-1.58. Summary of Human Health Risks

CONTAMINANTS	COC?	PATHWAY	SCENARIO	SITE RISK		BACKGROUND RISK	
				Noncancer[1]	Cancer[2]	Noncancer	Cancer
SOIL/SEDIMENT							
Benzo(a)pyrene	Yes	dermal	current trespasser	NA	1.22E-6	NA	NA
			future industrial	NA	1.65E-5	NA	NA
Benzo(b)fluoranthene	Yes	dermal	future industrial	NA	2.37E-6	NA	NA
Dibenzo(a,h)anthracene	Yes	dermal	future industrial	NA	1.92E-6	NA	NA
Indeno(1,2,3-cd)pyrene	Yes	dermal	future industrial	NA	1.13E-6	NA	NA
Arsenic	No[3]	dermal	future industrial	NA	6.81E-6	NA	7.44E-6
		ingestion		NA	2.41E-6	NA	2.63E-6
Mercury	No[3]	dermal	future industrial	1.54	NA	2.84	NA
			future excavation	1.51	NA	2.83	NA
Manganese	No[3]	inhalation	future excavation	1.58	NA	2.54	NA
GROUNDWATER							
Beryllium	Yes	ingestion	future adult	NA	2.73E-5	NA	1.21E-5
			future child	NA	1.27E-5	NA	5.65E-6
Chromium	Yes	ingestion	future adult	1.69	NA	NA	NA
			future child	3.95	NA	1.74	NA
Manganese	Yes	ingestion	future adult	38.4	NA	1.17	NA
			future child	89.5	NA	2.74	NA
		dermal	future adult	2.76	NA	NA	NA
			future child	4.25	NA	NA	NA
Nickel	Yes	ingestion	future child	1.26	NA	NA	NA
Arsenic	Yes	ingestion	future adult	6.05	1.17E-3	2.57	4.96E-4
			future child	14.1	5.45E-4	6.00	2.32E-4
		dermal	future adult	NA	9.55E-6	NA	4.06E-6
			future child	NA	2.95E-6	NA	1.25E-6
Americium-241	Yes	ingestion	future adult	NA	2.37E-6	NA	NA
Radium-226	No[3]	ingestion	future adult	NA	2.22E-6	NA	2.57E-6
Tritium	No[3]	ingestion	future adult	NA	2.01E-6	NA	2.07E-6

(1) Noncarcinogen Hazard Quotient (HQ) effects. Per EPA guidance, noncarcenogenic risk is present if HQ exceeds 1.0.
(2) Excess lifetime cancer risk. Per EPA guidance, cancer risk is present if excess lifetime cancer risk exceeds 1.0E-6.
(3) Contaminant exceeded EPA risk levels for cancer (1.0E-6) and/or noncancer (1.0) but risk associated with contaminant at site is indistinguishable from risk associated with contaminant in background.
Note: The greatest cancer risk associated with plutonium-238 is 1.00E-7 (ingestion - future industrial). The greatest cancer risk associated with thorium is 3.40E-8 (inhalation - future excavation).
NA Not applicable because HQ <1 or cancer risk <1.0E-6 or not calculated

- Benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene are COCs in soil/sediment for future commercial/industrial workers because the cancer risks from dermal exposure to these chemicals are estimated to be within the EPA target risk range. In addition, benzo(a)pyrene in soil/sediment is a COC for current adolescent trespassers because the cancer risk from dermal contact with this compound is estimated to be 1×10^{-6}. No soil/sediment cancer risks exceed the EPA target ELCR of 1×10^{-4} for any of the receptors evaluated. Noncancer risks from dermal exposure to mercury in soil/sediment risks exceed the EPA target HI of 1 for future commercial/industrial workers and future construction/excavation workers. In addition, noncancer risk from inhalation of manganese in fugitive dust exceeds the EPA target HI of 1 for construction/excavation workers. However, risks calculated from the background concentrations of mercury and manganese are indistinguishable from the risk from the RME concentrations at the New Property. As a result, mercury and manganese are not identified as COCs for soil/sediment. Arsenic poses cancer risks within the target range for the ingestion and dermal contact pathway; however, the background risks from arsenic are not distinguishable from onsite risks. As a result, arsenic is not identified as a COC for soil/sediment.

- No radionuclides in soil/sediment at the New Property are identified as COCs for human health because estimated risks do not exceed EPA targets.

- No COCs for human health are identified in seeps at the New Property because risks from dermal exposure to constituents in seeps do not exceed EPA targets for human health.

- Chromium, manganese, and nickel in groundwater are COCs for human health because the noncancer risks exceed the EPA target HI of 1. In addition, the noncancer and cancer risks from arsenic exceeds EPA targets; consequently, arsenic is listed as a COC. Beryllium is also a COC because the cancer risk exceeds the EPA target.

- Am-241 has an estimated cancer risk within the EPA target range for adults under the groundwater ingestion pathway; therefore, it is listed as a COC.

- The estimated cancer risks for Ra-226 and tritium (both 2 x 10^{-6}) are indistinguishable from the background risk; therefore, Ra-226 and tritium are not considered COCs.

6.2. BASELINE ECOLOGICAL RISK ASSESSMENT

6.2.1. Introduction

Ecological risk assessment (ERA) defines the likelihood of harmful effects on plants and animals and on their habitats as a result of exposure to chemical contaminants. A baseline ERA (BERA) for the New Property is required by CERCLA, as amended by the SARA, to evaluate the risk to plants, animals, and the environment from current and future exposure to contamination at the site.

The regulatory guidance for the BERA is contained in EPA's Risk Assessment Guidance for Superfund, Vol. II, Environmental Evaluation Manual, Interim Final (EPA 1989c) and subsequent documents (EPA 1991d, 1992g). Further discussion of the scientific basis for assessing ecological effects is found in Ecological Assessments of Hazardous Waste Sites: A Field and Laboratory Reference Document (EPA 1989d). Other guidance is provided in the Framework for Ecological Risk Assessment (EPA 1992h).

These documents do not provide a detailed step-by-step approach to ERAs. Instead, they discuss an overall approach to considering ecological effects and identifying sources of information necessary to perform ERAs. Thus, professional knowledge and experience are important in ERAs to compensate for this lack of specific guidance and established methods.

6.2.2. Scope and Objectives

The scope of the BERA is to characterize the risk to plant and animal populations and habitats at the New Property. It assesses the risk to ecological (rather than human) receptors, including both terrestrial plants and animals. Unlike the human health risk assessment, which focuses on individuals, the BERA focuses on populations or groups of interbreeding individuals of a species. In the ERA process, individuals are addressed only if they are protected under the Endangered Species Act (DOI 1973).

The objective of the BERA is to assess the risk of harmful effects on ecological receptors from exposure to chemical contamination. These contaminants are called ecological contaminants of potential concern

(ecoCOPCs). When it has been demonstrated that these ecoCOPCs cause risk, they are called ecological contaminants of concern (ecoCOCs). The BERA examines both the direct and indirect effects of New Property ecoCOPCs on the ecological receptors.

The exposure unit evaluated in the BERA was limited to surface soil (zero to two feet). Subsurface soils and groundwater were not evaluated because plants and animals are unlikely to be exposed to these media. In addition, surface water was not evaluated because this media is present on the New Property only as seasonal drainages and seeps. The ephemeral nature of the seeps was judged to not provide permanent habitat (cover and food) and no ecological risk assessment was needed. The emphasis of the BERA is inorganic and organic chemicals. There are dietary and other toxicological limits for many of the site contaminants. Radionuclides were not evaluated. The available toxic effects data for radionuclides are based on experimental exposures. These experimental exposures or doses for radionuclides are much higher than those likely caused by concentrations at the site.

To assess the potential for a contaminant to pose a hazard at the New Property, the surface soil exposure unit was qualitatively screened. In addition, quantitative estimates of exposure to ecological receptors were calculated for the most important pathways involving surface soil.

Benchmark concentrations of ecoCOPCs obtained from published literature serve as toxicity thresholds (concentrations below which there are no unacceptable adverse effects). The ratio of the exposure concentration to the toxicity threshold concentration results in a risk quotient. A risk quotient is calculated for each ecoCOPC and for each receptor. Each risk quotient is compared to the assessment endpoints, pre-established ecological goals expressed as ratios, to determine whether site remediation is required to protect the ecological receptors. The effects of uncertainties in the measured, estimated, and calculated concentrations on the final characterization of risk at the New Property are discussed qualitatively.

The overall objectives of the BERA for the New Property are to define and evaluate the current and future baseline risks of harmful effects on plants and animals exposed to ecoCOPCs. Further, the baseline risks can aid in the assessment of the residual risks associated with various possible remedial activities.

Completion of the following objectives meets the overall objectives of the BERA for the New Property:

- characterize habitats at the New Property (Section 6.2.4.1);
- evaluate likelihood of threatened and endangered species being present at New Property (Section 6.2.4.1);
- define spatial boundaries of the New Property exposure unit (Section 6.2.4.2);
- identify ecological receptors potentially exposed to contaminants (Section 6.2.4.2);
- choose assessment and measurement endpoints (Section 6.2.4.3);
- identify ecoCOPCs (Section 6.2.4.4);
- estimate exposure of ecological receptors to ecoCOPCs (Section 6.2.5);
- identify toxicity thresholds of ecoCOPCs (Section 6.2.6);
- compare exposure concentrations and toxicity thresholds, and estimate risk of harmful effects on ecological receptors exposed via contaminated pathways (Section 6.2.7);
- evaluate uncertainty about these risk estimates (Section 6.2.8); and
- interpret and summarize findings (Sections 6.2.9).

6.2.3. Procedural Framework

This section describes two complementary procedures for conducting BERAs: (1) EPA Region V guidance (EPA 1992g), consisting of five steps, and (2) U.S. EPA framework (EPA 1992h), consisting of 4 steps. Although the BERA for the New Property is consistent with both procedures, the discussion of the BERA in this RI report is organized according to the U.S. EPA framework.

6.2.3.1. EPA Region V Guidance

The BERA for the New Property follows a five-step process developed by EPA Region V (EPA 1992g). These interrelated steps are:

- site characterization,
- preliminary screening,
- determination of need for further study,
- performance of additional studies (if needed), and
- ecological risk assessment.

This BERA is consistent with the EPA Region V process, however, the format used to project this information is in accordance with the U.S. EPA four-step process.

6.2.3.2. U.S. EPA's Framework

According to the Framework for Ecological Risk Assessment (EPA 1992h), the ERA process consists of three interrelated phases: problem formulation, analysis (comprised of exposure assessment and ecological effects assessment), and risk characterization. In performing the BERA for New Property, these three phases were completed by performing four interrelated steps:

- problem formulation,
- exposure assessment,
- effects assessment, and
- risk characterization.

Problem Formulation

Problem formulation establishes the goals and focus of the BERA and provides a preliminary characterization of chemical stressors (chemicals that restrict growth and reproduction or otherwise disturb the balance of ecological populations and systems) present in the various habitats at the site. The problem formulation step also includes a preliminary characterization of the components, especially the receptor species, in the ecosystem likely to be at risk. It also includes the selection of assessment and measurement endpoints as a basis for developing a conceptual model of stressors, components, and effects (Section 6.2.4).

Exposure Assessment

Exposure assessment evaluates the interactions of the chemical stressors. It also describes the ecological receptors and defines the route, magnitude, frequency, duration, trend, and spatial pattern of the exposure of each receptor population or habitat to a chemical or physical stressor (Section 6.2.5).

Effects Assessment

Effects assessment evaluates the ecological response to chemical and physical stressors in terms of the selected assessment and measurement endpoints. The effects assessment results in a profile of the ecological response of populations and habitats to the chemical concentrations or doses and to other types and units of stress to which they are exposed. Data from both field observations and controlled laboratory studies are used to assess ecological effects (Section 6.2.6).

Risk Characterization

Risk characterization integrates the effects of exposure and of the response to stressors on receptor populations or habitats using risk quotients (ratios of exposure to effect). The resulting data are used to define the risk from contamination at the New Property, in contrast to background (naturally occurring) risk, and to assess the potential for population and ecosystem recovery (Section 6.2.7).

The New Property BERA is organized by these four U.S. EPA steps, which in turn, incorporate the five EPA Region V steps.

6.2.3.3. Organization of Document

The BERA is presented and organized by the four interrelated steps of the EPA framework (Sections 6.2.4 through 6.2.7). The reliability of these steps and the data used is evaluated in a separate uncertainty section (Section 6.2.8). The major findings and methods for the New Property BERA are summarized in Section 6.2.9.

6.2.4. Problem Formulation

The first step of the U.S. EPA approach to the BERA process, problem formulation, includes:

- determination of the scope of the assessment; and
- formulation of a conceptual model of the site based on existing information and reasonable assumptions (EPA Region V Step 1) including habitats and populations, any threatened and endangered species, and selection of ecological receptors (Sections 6.2.4.1

and 6.2.4.2); selection of assessment and measurement endpoints for the BERA (Section 6.2.4.3), and identification of the hazards, i.e., ecoCOPCs (Section 6.2.4.4).

The conceptual model of the New Property was developed for the BERA using the available site-specific information and professional judgement. The conceptual model, which illustrates the pathways by which ecological receptors are exposed to hazards at the New Property is shown Figure 6.2.1, and is described in Section 6.2.5.

6.2.4.1. Description of Habitats and Populations

The following description of habitats and populations at the New Property is a summary of information contained in the OU9 Ecological Characterization Report (DOE 1994c). This report presented the results of ecological surveys conducted at the Mound Plant and surrounding areas from the spring of 1992 through the fall of 1993. Methodology used to characterize habitats and populations is described in the DOE report (1994c). The purpose of this section is to describe habitats and populations that are present at the New Property and identify important receptors living in the area. A full description of the ecological surveys conducted at the Mound Plant and results regarding plants and animals is included in the OU9 Ecological Characterization Report (DOE 1994c).

Terrestrial Habitats and Populations

In the OU9 Ecological Characterization Report (DOE 1994c), terrestrial habitats on the New Property were classified into the following five categories: subxeric (relatively dry) grasslands, mesic (wet) grasslands, early successional scrub/shrub, south-facing slope forests, and riparian forests (forests near surface water bodies). In addition, a portion of the eastern boundary of the New Property is covered by a maintained lawn, and a gravel lot is located in the southeast corner. Figure 6.2.2 is a map showing the locations of habitat types that have been identified on the New Property.

Detailed discussion of the plant communities present in each habitat is presented in the OU9 Ecological Characterization Report (DOE 1994c); consequently, only dominant and noteworthy plant species are discussed in the following habitat descriptions. Scientific nomenclature for these plant species is presented in Table VI-2.1. Dominant plants are those species that contributed at least one percent of the total cover

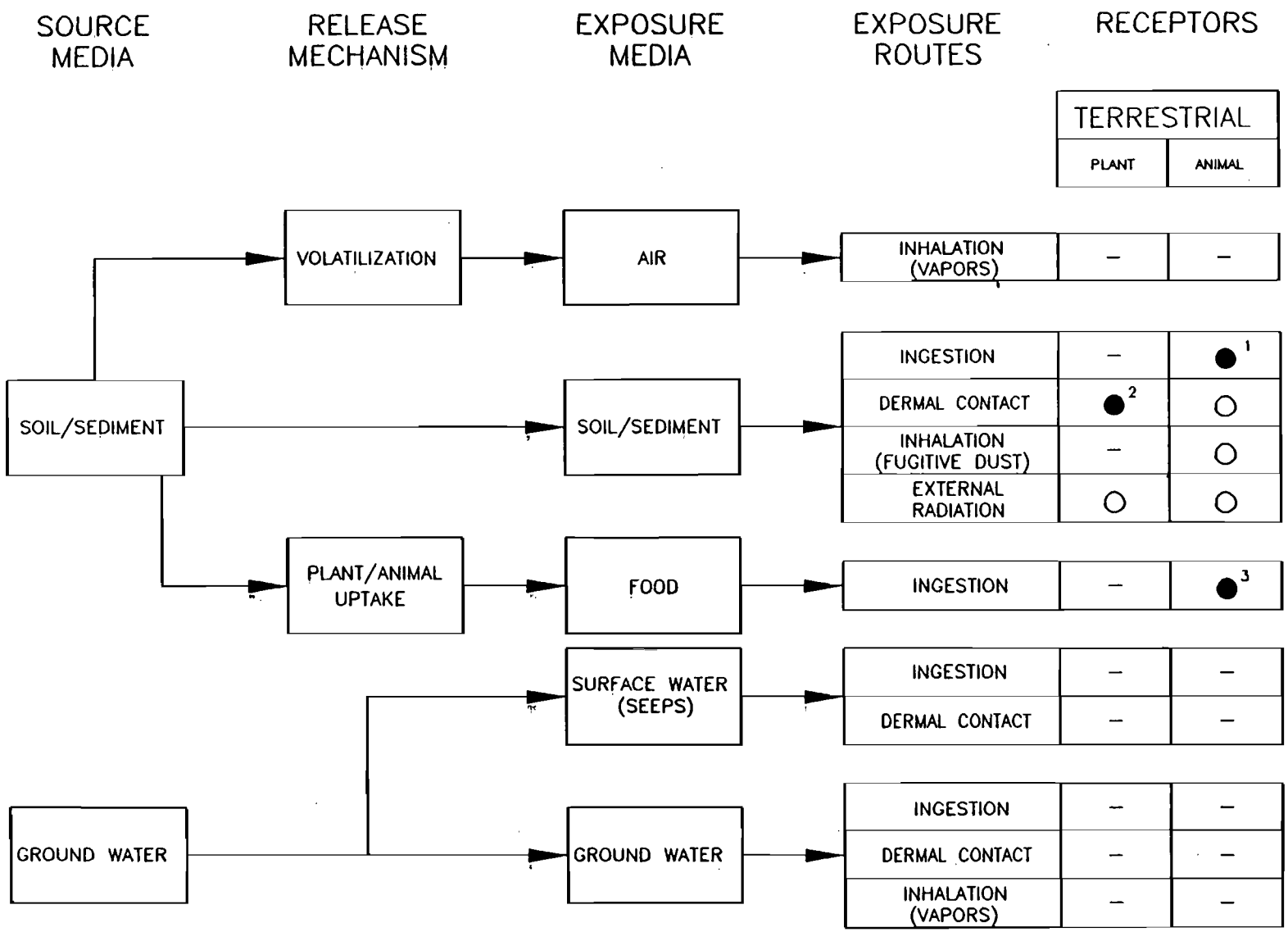

Figure 6.2.1. Conceptual Model for Ecological (Nonhuman) Exposure Pathways

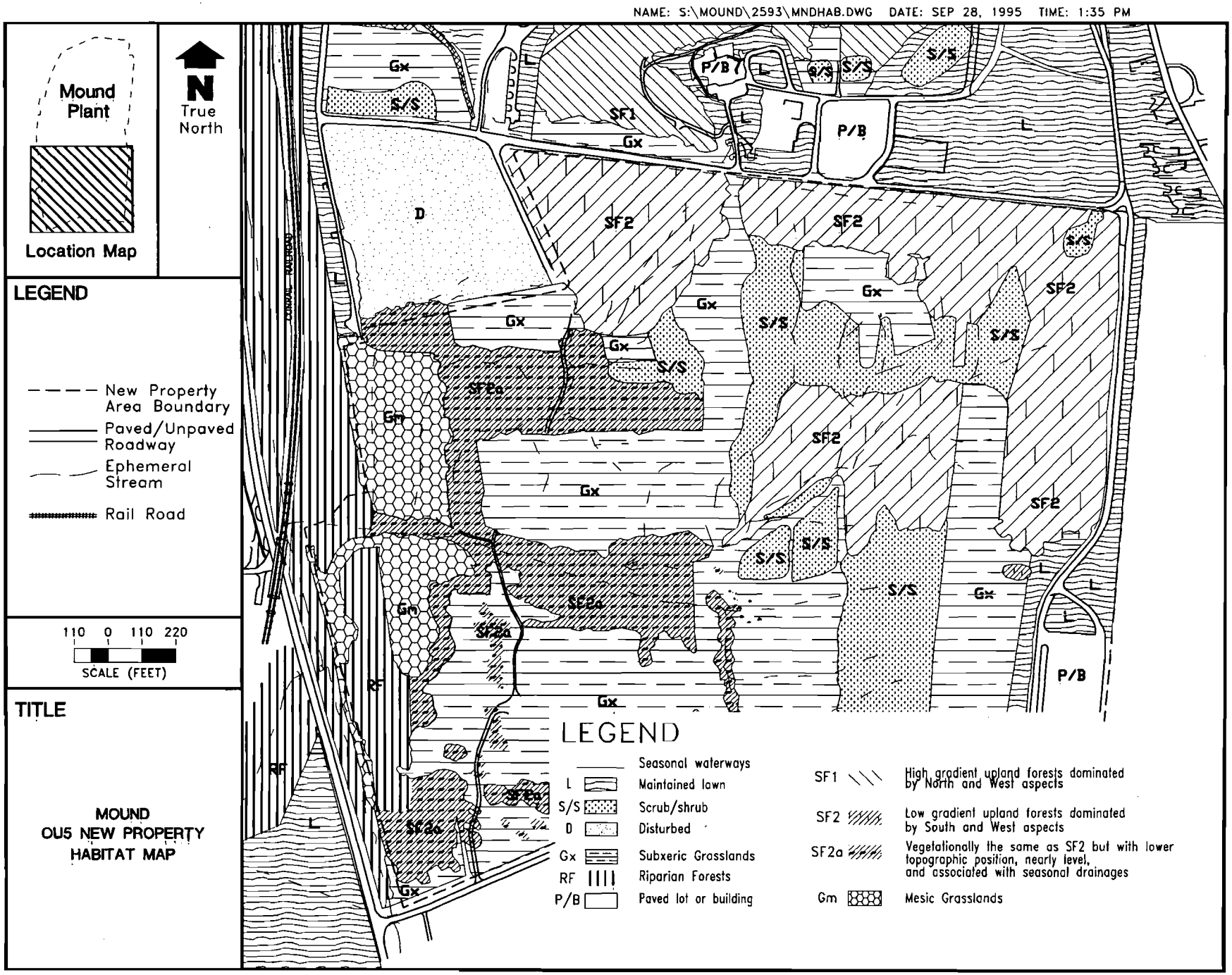

Figure 6.2.2. Habitat Map for New Property (DOE 1994c)

Table VI-2.1.
Dominant and Noteworthy Plant Species at the New Property[a]
Page 1 of 2

Common Name	Scientific Name	Habitats[b]
Amblystegium moss	*Amblystegium sp.*	Gx
American elm	*Ulmus americana*	SF, RF
Amur honeysuckle	*Lonicera maackii*	S/S, SF, RF
Bedstraw	*Galium aparine*	RF
Black cherry	*Prunus serotina*	RF
Black medic	*Medicago lupulina*	Gx, S/S
Black locust	*Robina pseudoacacia*	S/S
Blue ash	*Fraxinus quadrangulata*	SF
Boxelder	*Acer negundo*	Gm, S/S, RF
Canada blue grass	*Poa compressa*	Gx
Canada goldenrod	*Solidago canadensis*	Gx, Gm, S/S
Canada thistle	*Cirsium arvense*	Gm, S/S
Chickory	*Cichorium intybus*	Gx
Common brome grass	*Bromus commutatus*	Gm, S/S
Common chickweed	*Stellaria media*	RF
Downy aster	*Aster pilosus*	S/S
Dudley's path rush[c]	*Juncus tenius*	Gx
English plantain	*Plantago lanceolata*	Gx
Field bindweed	*Convolvulus arvensis*	Gm, S/S
Field garlic	*Allium vineale*	SF
Fox sedge[c]	*Carex vulpinoidea*	Gx
Frank's sedge	*Carex frankii*	Gx
Frost grape	*Vitis vulpina*	S/S, SF, RF
Garlic mustard	*Alliaria petiolata*	SF, RF
Green bulrush[c]	*Scipus atrovirens*	Gx
Hackberry	*Celtis occidentalis*	SF, RF
Head-bearing sedge	*Carex cephalophora*	Gx, Gm
Honeylocust	*Gleditsia triacanthos*	RF
Indian hemp	*Apocynum cannibinum*	Gm

Table VI-2.1.
Dominant and Noteworthy Plant Species at the New Property[a]
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Common Name	Scientific Name	Habitats[b]
Inland rush[d]	*Juncus interior*	Gx
Japanese brome grass	*Bromus japonicus*	Gm
Johnson grass	*Sorghum halepense*	Gm
Kentucky blue grass	*Poa pratensis*	Gx, Gm, S/S
Lined bulrush[c]	*Scirpus pendulus*	Gx
Meadow fescue	*Festuca arundinacea*	Gx, Gm, S/S
Poison hemlock	*Conium maculatum*	Gm
Poison ivy	*Toxicodendron radicans*	SF, RF
Queen Anne's lace	*Daucus carota*	Gx, S/S
Rough dropseed	*Sporobolus asper*	Gx
Soft hawthorne	*Crataegus mollis*	S/S, SF
Spotted knapweed	*Centaurea maculosa*	Gx
Sterile brome grass	*Bromus sterilus*	Gm
Tall ironweed	*Vernonia gigantea*	Gx, Gm
Tall thoroughwort	*Eupatorium altissium*	Gm
Teasel	*Dipsacus fullonum*	S/S
Torrey's rush	*Juncus torreyi*	Gx
White ash	*Fraxinus americana*	SF
White mulberry	*Morus alba*	RF
White snakeroot	*Eupatorium rugosum*	RF
White sweet clover	*Melilotus alba*	Gx
Wild potato vine	*Ipomea pandurata*	Gm
Yellow foxtail	*Setaria glauca*	Gx
Yellow sorrell	*Oxalis dillenii*	Gm
Yellow sweet clover	*Melilotus officinalis*	S/S

[a] Dominant plants occupied 1% average cover in at least one habitat during one or more sampling periods (DOE 1994c).
[b] Only those habitats where species were dominant or noteworthy are listed.
[c] These plants were not dominants; however, they were present at unique seep habitats in the subxeric grasslands.
[d] Inland rush was not a dominant; however, it was the only state endangered plant species located at the Mound Plant.

Gx Subxeric grasslands
Gm Mesic grasslands
S/S Early successional scrub/shrub
SF South-facing slop forests
RF Riparian forests

in at least one sampling period during the ecological survey (DOE 1994c). A checklist of the vascular plant species of the entire Miami Valley is located in the FEIS for the Mound Plant (DOE 1979).

Maintained Lawn and Gravel Lots

The maintained lawn and gravel lots are not natural habitats and do not support native communities. The gravel lot is located in southeast corner of the New Property. Entrance to the lot is via the Contractors' Entrance on Benner Road. The maintained lawn is present on the east side of the New Property surrounding and extending north of the gravel lot. These areas are continually disturbed by human activity which restricts the natural development of plant and animal communities.

Subxeric Grasslands

The subxeric grassland habitat covers 20.7 ha of the Mound Plant property and is the largest habitat in the New Property. It is found in areas between 780 and 850 ft elevation. These grasslands were formerly upland pastures and occur in well drained and seasonally droughty areas. There are tile drains near some seep areas which enhance this dry characteristic. Soils are moderately to severely eroded silty clay loams of the Fairmount and Milton series (DOE 1994c).

These subxeric grasslands were abandoned recently, so no woody overstory, middlestory, or understory had developed at the time they were surveyed (DOE 1994c). In addition, the grasslands are mowed periodically which hinders the establishment of woody species and keeps the area in an early successional stage. As a result of this disturbance and other natural factors influencing invasion and establishment of plant species, vegetation observed in this area was primarily herbaceous (non-woody) (DOE 1994c).

In the OU9 Ecological Characterization Report (DOE 1994c), 111 plant species were identified as inhabiting the subxeric grasslands of which 73 were herbaceous species. Of these 73 species, 30 were non-native (41%). In addition, approximately 47% of the average groundcover was composed of grass species. Drought resistant sod formers such as meadow fescue, Kentucky blue grass, Canada blue grass, and rough dropseed were the most prominent species observed during the ecological survey (DOE 1994c). The remaining ground area was occupied mainly by grass litter and to a far lesser extent by various shade-intolerant herbs including the following dominant species: yellow foxtail, Canada goldenrod, spotted

knapweed, tall ironweed, chickory, Torrey's rush, head-bearing sedge, Queen Anne's lace, English plantain, Amblystegium moss, black medic, and white sweet-clover.

In addition to dry grasslands, a small, unique habitat type was observed near small seeps scattered within the grassland area; however, these seeps areas dried up during periods of low rainfall. Though limited in areal extent, these areas provided unique habitat for sedges and rushes that require full sunlight for survival. The following species were observed in these areas: green bulrush, lined bulrush, head-bearing sedge, fox sedge, Frank's sedge, Dudley's path rush, and Torrey's rush. In addition, a single specimen of inland rush was located at one of these seep areas. This species was the only state endangered plant discovered at Mound during the plant surveys reported in the OU9 Ecological Characterization Report (DOE 1994c).

Mesic Grasslands

Mesic grasslands are limited to the western boundary of the New Property and occupy approximately 10 percent of the New Property land cover (2.7 ha). The mesic grasslands in the New Property are located on moist and fertile Ross soils of the Great Miami River's historic floodplain (DOE 1994c). These grasslands resemble subxeric grasslands in appearance, but a considerably different herbaceous community has developed in these areas due primarily to the greater soil moisture. The elevation of these areas ranges from 700 to 710 feet.

The following data are based only on June and July 1992 sampling because the grasslands were inadvertently mowed in August 1992 (DOE 1994c). A total of 136 plant species were identified in the mesic grasslands during the ecological survey of which 49 were herbaceous species (DOE 1994c). Of these 49 species, nearly half were non-native. Herbaceous plants were far more prevalent than woody plants, and grasses occupied the greatest area. The following plants were dominant during at least one sampling period: Canada goldenrod, Canada thistle, common brome grass, field bindweed, head-bearing sedge, Indian hemp, Japanese brome grass, Johnson grass, Kentucky blue grass, meadow fescue, poison hemlock, sterile brome grass, tall ironweed, tall thoroughwort, wild potato vine, and yellow sorrell. Early in the season, Canada thistle, common brome grass, and Kentucky blue grass were the most prevalent. By the end of July, Johnson grass, a non-native perennial, became the most prevalent species.

Few trees and shrubs were present in the grasslands and accounted for only six percent of species observed. In July 1992, boxelder seedlings were located in 70% of the 1 m^2 plots sampled in July 1992 indicating that this tree species may become established in the near future. The most likely seed source for the boxelder is a nearly pure stand of mature trees in the adjacent riparian forest (DOE 1994c).

Early Successional Scrub/Shrub

Approximately 8.6 ha of scrub/shrub habitat is located in the central and eastern portion of the New Property. The OU9 Ecological Characterization Report (DOE 1994c) described the scrub/shrub communities as previously disturbed areas that have been abandoned for a sufficiently long period of time to allow invasion and establishment of small trees and shrubs. Due to the relatively open canopy in these communities, the understory areas receive a greater amount of sunlight compared to closed-canopy forests which has allowed a diverse herbaceous community to develop. Scrub/shrub habitats in the New Property are present on abandoned farm land in relatively dry areas. The primary soils in these areas are moderately to severely eroded Milton, Fairmont, and Ritchey silty clay loams (DOE 1994c).

A total of 114 plant species were identified in the scrub/shrub community. The overstory was composed primarily of 10 year old black locust trees that occurred at an average density of 50 stems/ha. The middlestory was dominated by juvenile Amur honeysuckle averaging six years old. Amur honeysuckle also dominated the woody species community in the understory constituting nearly 100% of the density and approximately 97% of the average cover. Boxelder, frost grape, and soft hawthorne were present in open sod-dominated areas.

The herbaceous community was composed of over 30 species with early successional members of the grass, aster, and pea families dominating. The following plants were dominant during at least one sampling period: black medic, Canada goldenrod, Canada thistle, common brome grass, downy aster, field bindweed, Kentucky blue grass, meadow fescue, Queen Anne's lace, teasel, and yellow sweet clover. Kentucky blue grass and meadow fescue were the most prevalent grasses.

South-Facing Slope Forests

The south-facing slope forests are located on the south side of SM/PP Hill and across flats in the northern part of the New Property. These forests occupy approximately 17.2 ha of the Mound Plant property with

the majority of the forest located on the New Property. Due to the southern orientation, this area receives substantial amount of sunlight. Soils in this area are slightly eroded Fairmont and Milton silty clay loams (DOE 1994c), and the elevation ranges from approximately 750 to 860 feet.

The OU9 Ecological Characterization Report (1994c) described the south-facing slope forests as being comprised of young, mixed deciduous trees with Amur honeysuckle dominating the middle and understories. A total of 43 plant species were inventoried in this community. Tree age was fairly consistent averaging 37 years, but several older trees were observed throughout the forest. This suggested that the forest originated as an abandoned pasture which contained several pasture trees. The forest canopy averaged 16 m high and combined averaged stand density for all species was 1,750 stems/ha.

The structure of the forest consists of an overstory (trees which compose the canopy), middlestory (trees and shrubs with heights below the canopy height), and the understory (plants which grow near the ground surface). The overstory was dominated by American elm and white ash. Many dead elm trees were located in these stands with nearly all showing characteristics of Dutch elm disease. Amur honeysuckle, hackberry, and soft hawthorne were present in the stands. The middlestory was dominated by Amur honeysuckle and blue ash.

The woody understory was composed primarily of dense layer of Amur honeysuckle. Blue ash, frost grape, hackberry, poison ivy, and white ash seedlings were present also. Only two herbaceous species, field garlic and garlic mustard, were identified in the understory areas during the ecological survey (DOE 1994c) and only garlic mustard occupied greater than one percent of the plot area.

Riparian Forests

The riparian forests are limited to the western edge of the New Property near the Miami-Erie Canal which lies west of the New Property boundary. This forest type occupies 11.1 ha of the Mound Plant property and is located within the historic 100-year flood plain of the Great Miami River. Soils are alluvial Ross silt loams partially intruded with fill material. These soils are well drained, but display high moisture and nutrient availability and offer a deep rooting zone during the growing season (DOE 1994c). Elevations in this area range from 700 to 720 feet.

The OU9 Ecological Characterization Report (DOE 1994c) described the trees in the riparian forests as younger (averaging only 22 years) than those in the south-facing slope forests. A total of 105 plant species were identified in this community. Typical riparian species such as boxelder were present and Amur honeysuckle dominated the middle and understories. The forest canopy averaged 15 m high and combined averaged stand density for all species was 2,100 stems/ha.

The overstory was dominated by American elm and boxelder. Similar to the south-facing slope forests, a large number of dead elm trees were present in the riparian forests. In addition, hackberry, honeylocust, and white mulberry were present in the riparian forest overstory.

The middlestory and woody understory were dominated by two species, Amur honeysuckle and boxelder. American elm, black cherry, frost grape, hackberry, and poison ivy also were present in the woody understory.

The herbaceous layer was more developed in the riparian forest compared to the south-facing forests. The OU9 Ecological Characterization Report (DOE 1994c) cited more favorable moisture regimes and reduced competition from honeysuckle as factors influencing this difference. The following herbaceous species were dominants in at least one sampling period: bedstraw, common chickweed, garlic mustard, and white snakeroot. All of these species are shade-tolerant and moisture-loving.

Terrestrial Animal Populations

Birds, mammals, reptiles, and amphibians at the Mound Plant were characterized during the ecological survey (DOE 1994c). In some cases, specific information for animal populations on the New Property could not be extracted from the DOE report (1994c). Consequently, the following discussion is specific to the New Property where possible, and provides general information about animal populations at the Mound Plant elsewhere. A full description of the sampling methodology utilized during the survey was presented in the OU9 Ecological Characterization Report (DOE 1994c). The purpose of this section is to briefly describe the terrestrial animal populations that are present at the New Property which will aid the selection of receptor species to be evaluated in the risk assessment. A complete discussion of the terrestrial animal populations at the Mound Plant and Montgomery County is included in the OU9 Ecological Characterization Report (DOE 1994c). In addition, a checklist for the animal species of the Miami Valley can be found in the FEIS for the Mound Plant (DOE 1979).

Bird species at the Mound Plant were characterized by transect sampling, nocturnal surveys, and random encounters (DOE 1994c). A total of 81 species were observed on the Mound Plant of which 11 were known to be nesting onsite and an additional 22 were suspected of nesting onsite. A list of all bird species observed at the Mound Plant is presented in Table VI-2.2. The ten most common birds in decreasing order of abundance were: American robin, European starling, northern cardinal, American goldfinch, Carolina chickadee, house finch, mourning dove, red-winged blackbird, song sparrow, and common grackle. The American kestrel was the most abundant of five raptor species observed at the site and was suspected of nesting onsite. No federal threatened or endangered bird species were observed at the Mound Plant; however, several dark-eyed juncos, a state endangered bird, were observed on the New Property. Seasonal distribution and abundance of bird species can be found in the OU9 Ecological Characterization Report (DOE 1994c). The Mound Plant habitats inhabited by each species is presented in Table VI-2.2.

Small mammals at the Mound Plant were sampled by trapping along selected transects and in small and large grids (DOE 1994c). Large mammals were surveyed with spotlight searches at night. A total of 16 mammal species were identified using these sampling techniques (see Table VI-2.3). White-tailed deer was the most common large mammal encountered, and eastern chipmunk and *Peromyscus* mice were the most frequently trapped small mammals. None of the species encountered are listed as federal or state threatened or endangered species. The New Property contains suitable habitat for all mammalian species encountered during the survey.

Reptiles and amphibians (herptiles) were sampled using roving searches, drift fences, and quadrant searches. A total of ten herptile species were collected at the Mound Plant (see Table VI-2.4), and the following four species were found on the New Property: American toad, blue racer, rat snake, and bullfrog. Although not encountered on the New Property during the survey, there is suitable habitat for the following species which were encountered elsewhere at Mound: eastern box turtle, blue racer, and queen snake. The rat snake was the most commonly encountered reptile. The red-backed salamander was the most frequently trapped amphibian at the Mound Plant, but it was not found on the New Property. The ecological report (DOE 1994c) stated that herptiles at the Mound Plant were less than expected in the number of species and the number of individuals encountered. None of the species encountered are listed as federal or state threatened or endangered species.

Table VI-2.2.
Bird Species at Mound Plant, Montgomery County, Ohio[a]
Page 1 of 3

Common Name	Scientific Name	Habitats
Red-winged blackbird	*Agelaius phoeniceus*	Gx/Gm, SF, S/S, RF, I/OW
Eastern bluebird	*Sialia sialis*	NI
Indigo bunting	*Passerina cyanea*	Gx/Gm, SF, S/S, RF, I/OW
Northern cardinal	*Cardinalis cardinalis*	Gx/Gm, SF, S/S, RF, I/OW
Gray catbird	*Dumetella carolinensis*	Gx/Gm, SF, S/S, RF
Black-capped chickadee	*Parus atricapillus*	Gx/Gm, SF, S/S
Carolina chickadee	*Parus carolinensis*	Gx/Gm, SF, S/S, RF
Double-crested cormorant	*Phalacrocorax auritas*	SF
Brown-headed cowbird	*Molothrus ater*	Gx/Gm, SF, I/OW
Brown creeper	*Certhia americana*	SF
American crow	*Corvus brachyrhynchos*	Gx/Gm, SF, S/S, RF, I/OW
Yellow-billed cuckoo	*Coccyzus americanus*	SF
Mourning dove	*Zenaida macroura*	Gx/Gm, SF, S/S, RF, I/OW
Rock dove	*Columbia livia*	SF, S/S, RF, I/OW
House finch	*Carpodacus mexicanus*	Gx/Gm, SF, S/S, RF, I/OW
Northern flicker	*Colaptes auratus*	Gx/Gm, SF, S/S, RF, I/OW
Empidonax flycatcher	*Empidonax sp.*	RF
Blue-gray gnatcatcher	*Polioptila caerulea*	Gx/Gm, SF
American goldfinch	*Carduelis tristis*	Gx/Gm, SF, S/S, RF, I/OW
Canada goose	*Branta canadensis*	Gx/Gm, SF, S/S, RF, I/OW
Common grackle	*Quiscalus quiscula*	Gx/Gm, SF, S/S, RF, I/OW
Cooper's hawk	*Accipiter striatus*	SF
Red-tailed hawk	*Buteo jamaicensis*	SF, S/S
Rough-legged hawk	*Buteo lagopus*	SF
Sharp-shinned hawk	*Accipiter striatus*	Gx/Gm, SF
Great blue heron	*Ardea herodias*	Gx/Gm, S/S, I/OW
Green-backed heron	*Butorides striatus*	Gx/Gm, RF, I/OW
Ruby-throated hummingbird	*Archilochus colubris*	S/S
Blue jay	*Cyanocitta cristata*	Gx/Gm, SF, S/S, RF, I/OW

Table VI-2.2.
Bird Species at Mound Plant, Montgomery County, Ohio[a]
Page 2 of 3

Common Name	Scientific Name	Habitats
Dark-eyed junco	*Junco hyemalis*	Gx/Gm, SF, S/S
American kestrel	*Falco sparverius*	Gx/Gm, S/S, I/OW
Killdeer	*Charadrius vociferus*	S/S, RF, I/OW
Eastern kingbird	*Tyrannus tyrannus*	SF, I/OW
Belted kingfisher	*Ceryle alcyon*	Gx/Gm, S/S, RF, I/OW
Golden-crowned kinglet	*Regulus satrapa*	Gx/Gm, SF, S/S
Ruby-crowned kinglet	*Regulus calendula*	SF, S/S, RF
Mallard	*Anas platyrhynchos*	Gx/Gm, SF, RF, I/OW
Purple martin	*Progne subis*	Gx/Gm, SF
Eastern meadowlark	*Sturnella magna*	Gx/Gm, SF, S/S, I/OW
Northern mockingbird	*Mimus polyglottos*	Gx/Gm, SF, S/S
Common nighthawk	*Chrodeiles minor*	NI
Northern oriole	*Icterus galbula*	Gx/Gm, SF, RF
Eastern phoebe	*Sayornis phoebe*	NI
American redstart	*Setophaga ruticilla*	S/S
American robin	*Turdus migratorius*	Gx/Gm, SF, S/S, RF, I/OW
Barred owl	*Strix varia*	NS
Great horned owl	*Bubo virginianus*	NS
Eastern screech owl	*Otus asio*	NS
Spotted sandpiper	*Actitis macularia*	I/OW
Chipping sparrow	*Spizella passerina*	Gx/Gm, SF, S/S, RF
Field sparrow	*Spizella pusilla*	Gx/Gm, SF, S/S
House sparrow	*Passer domesticus*	Gx/Gm, SF, RF
Song sparrow	*Melospiza melodia*	Gx/Gm, SF, S/S, RF, I/OW
Swamp sparrow	*Melospiza georgina*	S/S
White-throated sparrow	*Zonotrichia albicollis*	Gx/Gm, S/S, RF, I/OW
European starling	*Sturnus vulgaris*	Gx/Gm, SF, S/S, RF, I/OW
Barn swallow	*Hirundo rustica*	S/S, RF
Northern rough-winged swallow	*Stelgidopteryx serripennis*	Gx/Gm, SF, S/S, RF, I/OW

Table VI-2.2.
Bird Species at Mound Plant, Montgomery County, Ohio[a]
Page 3 of 3

Common Name	Scientific Name	Habitats
Tree swallow	*Tachycineta bicolor*	SF
Chimney swift	*Chaetura pelagica*	Gx/Gm, SF, S/S, RF, I/OW
Brown thrasher	*Toxostoma rufum*	Gx/Gm, SF
Tufted titmouse	*Parus bicolor*	SF, S/S, RF
Rufous-sided towee	*Piplio erythropthalmus*	Gx/Gm, SF, S/S, RF
Wild turkey	*Meleagras gallopavo*	BR
Red-eyed vireo	*Vireo olivaceus*	Gx/Gm, SF, S/S
Warbling vireo	*Vireo gilvus*	RF
Turkey vulture	*Cathartes aura*	SF, S/S
Bay-breasted warbler	*Dendroica castanea*	Gx/Gm
Black-throated green warbler	*Dendroica virens*	SF
Chestnut-sided warbler	*Dendroica pensylvanica*	SF
Tennessee warbler	*Vermivora perigrina*	NI
Yellow warbler	*Dendroica petechia*	Gx/Gm, I/OW
Yellow-rumped warbler	*Dendroica coronata*	Gx/Gm, S/S
Cedar waxwing	*Bombycilla cedrorum*	Gx/Gm, SF, S/S, RF
American woodcock	*Scolopax minor*	SF
Downy woodpecker	*Picoides pubescens*	Gx/Gm, SF, S/S, RF, I/OW
Hairy woodpecker	*Picoides villosus*	Gx/Gm, S/S, I/OW
Red-bellied woodpecker	*Melanerpes carolinus*	SF
Eastern wood-peewee	*Contopus virens*	SF
Carolina wren	*Thryothorus ludovicianus*	Gx/Gm, SF, S/S, RF
House wren	*Troglodytes aedon*	Gx/Gm, SF, S/S, RF
Common yellowthroat	*Geothylpis trichas*	Gx/Gm, SF

[a] Information obtained from DOE (1994c)
BR a female turkey with three or four poults was observed crossing Benner Road
Gx/Gm xeric and mesic grasslands
I/OW industrial or open water habitat
NI no habitat information was provided in the DOE (1994d) report
NS night surveys were used to identify owl species, habitat information not available
RF riparian forests
SF south-facing forests
S/S early succesional scrub/shrub

Table VI-2.3.
Mammal Species at Mound Plant, Montgomery County, Ohio (DOE 1994c)

Common Name	Scientific Name
Oppossum	*Didelphis virginiana*
Short-tailed shrew	*Blarina brevicauda*
Eastern cottontail	*Sylvilagus floridanus*
Eastern chipmunk	*Tamias striatus*
Groundhog (Woodchuck)	*Marmota monax*
Eastern Gray squirrel	*Sciurus carolinensis*
Eastern Fox squirrel	*Sciurus niger*
Prairie Deer mouse	*Peromyscus maniculatus*
White-footed mouse	*Peromyscus leucopus*
Meadow vole	*Microtus pennsylvanicus*
House mouse	*Mus musculus*
Meadow jumping mouse	*Zapus hudsonius*
Gray fox	*Urocyon cineroargenteus*
Raccoon	*Procyon lotor*
Striped skunk	*Mephitis mephitis*
White-tailed deer	*Odocoileus virginianus*
Muskrat	*Ondatra zibethicus*

Table VI-2.4.
Reptile and Amphibian Species at Mound Plant, Montgomery County, Ohio (DOE 1994c)

Common Name	Scientific Name
Red-backed salamander	*Plethodon cinereus*
American toad	*Bufo americanus*
Bullfrog	*Rana catesbeiana*
Snapping turtle	*Chelydra serpentina*
Eastern box turtle	*Terrapene carolina*
Blue racer	*Coluber constrictor*
Rat snake	*Elaphe obsoleta*
Northern water snake	*Nerodia sipedon*
Queen snake	*Regina septemvittata*
Brown snake	*Storeria dekayi*

Aquatic Habitats and Populations

No ponds or perennial streams are present on the New Property; however, intermittent streams (seasonal drainages) and seeps are found throughout the area. Two of the streams, the east fork and Benner branch, were sampled for benthic macroinvertebrates using Surber samplers and qualitative methods during the ecological report (DOE 1994c). Seasonal differences in the benthic communities were noted. Insects adapted to living in erosional situations dominated in the spring, while species associated with depositional situations dominated in the fall. The OU9 Ecological Characterization Report (DOE 1994c) related that these differences were associated with the changing habitat in the streams over the season with stream flow and erosion occurring primarily in the spring and standing isolated pools in the fall. Due to their intermittent nature, it is unlikely that these drainages support any fish populations, and they were not sampled for fish during the ecological survey. A detailed discussion of the aquatic habitats and communities at the Mound Plant is included in the OU9 Ecological Characterization Report (DOE 1994c).

In January 1992, a preliminary assessment of wetlands at and near the Mound Plant was conducted using remote sensing techniques and the results were presented in the Preliminary Floodplain/Wetlands Assessment Report for 10 CFR 1022 (DOE 1992f). This report indicated that no wetlands are present on the New Property. Field investigation of wetlands onsite was conducted in September 1992 which included eleven potential wetland areas located on the New Property. Offsite wetlands were investigated in May and September 1993. The results of these investigations were presented in the OU9 Hydrogeological Investigation: Wetlands Determination Report (DOE 1994e). In this report, it was determined that none of the eleven areas on the New Property met all wetlands criteria. As a result, none of the areas were designated as wetlands.

Threatened and Endangered Species

The FEIS for the Mound Plant (DOE 1979) concluded that the presence of state or federal threatened or endangered species was unlikely; however, this conclusion was made without field reconnaissance and before the New Property was acquired. As a result, the presence of endangered or threatened species was investigated during the ecological survey (DOE 1994c). Field investigation during the ecology survey discovered that two state endangered species were present at the Mound Plant and both of these species were present on the New Property. One specimen of inland rush (*Juncus interior*), a prairie plant, was discovered near a small seep in the subxeric grasslands. Ohio is at the extreme eastern edge of this

species range. Because only a single individual was discovered on the site, it was concluded in the OU9 Ecological Characterization Report (DOE 1994c) that a viable breeding population of inland rush is not present at Mound, and the presence of the single individual should not interfere with any activities at the site. As a result, inland rush is not considered further in this BERA.

The second state endangered species sighted at Mound was the dark-eyed junco (*Junco hyemalis*). This bird species is a common winter visitor in Ohio. It is the presence of breeding populations in the extreme northeastern portion of Ohio that is responsible for the state endangered listing. Several individuals were observed on the New Property foraging in the grasslands, scrub/shrub, and forests; however, no known breeding populations occur in southern Ohio (DOE 1994c). As a result, dark-eyed junco is not considered further.

No federal threatened or endangered species were observed at the Mound Plant during the ecological survey (DOE 1994c).

Sensitive Habitats

The OU9 Ecological Characterization Report (DOE 1994c) concluded that, "...the habitats and species composition of the Mound Plant is neither unique nor even of local importance." This conclusion was based on a comparison of the results of the Mound Plant ecological survey to casual observations of offsite areas. The New Property and the Mound Plant in general contain habitats with diverse plant and animal communities; however, these habitats and communities do not differ substantially from nearby offsite habitats. It should be noted that nearby habitats include numerous state and local conservancy land holdings such as Germantown Reserve, Possum Creek Reserve, Spring Valley Wildlife Area, and Sugarcreek Reserve.

6.2.4.2. Selection of Exposure Units and Receptor Species

The BERA exposure unit is defined as an area where ecological receptors are likely to gather food, seek shelter, reproduce, and move around, and as a result of these activities, be potentially exposed to site contaminants. Thus, the exposure unit for the New Property BERA was defined, in part, on the basis of (1) observed and assumed patterns of behavior of the receptors, and (2) the spatial area of habitats relative

to the home range and foraging areas of the receptors. The spatial boundaries of the ecological exposure unit are the same as the unit defined for the New Property human health risk assessment.

The ecological receptors for the BERA were selected from plant and animal species found in terrestrial habitats at the New Property (Tables VI-2.1 to VI-2.4). Five criteria were used to select the ecological receptors:

- presence at the New Property,
- representation of major biological pathways and trophic groups (species that share similar feeding habitats) in the terrestrial habitats present at the New Property,
- potential sensitivity to contaminants,
- availability of toxicity data, and
- rare, threatened, or endangered status.

For the terrestrial habitats at the New Property, the ecological receptors are honeysuckle (forbs), black locust (trees), meadow vole, short-tailed shrew, raccoon, woodcock, deer, fox, and hawk. Risks are quantitatively estimated for all but the woodcock and deer. The risks to these two receptors are discussed relative to the other receptors using knowledge of their likely exposure and relative sensitivity to contamination.

6.2.4.3. Ecological Assessment and Measurement Endpoints

The protection of ecological resources, such as the species of plants and animals and habitats described in Section 6.2.4.1, is mandated by a variety of legislation and government agency policies [e.g., CERCLA, NEPA]. Statements of key aspects of ecological protection are presented as policy goals (goals established by legislation or agency policy). One such policy goal was defined for the New Property BERA. To determine whether this goal is met at the New Property, assessment and measurement endpoints are formulated to define the specific ecological values to be protected.

Assessment endpoints are societal values expressed as ratios that, if they exceed 1.0 or unity, suggest the need for further examination. The ratios compare an exposure concentration (estimated from a measured concentration in a medium) and an effects concentration (the toxicity threshold below which there are no

adverse effects). A *measurement endpoint* means the measurement or concentrations (of a chemical and of a toxicity threshold) that are used to define and develop the assessment endpoint.

The policy goals and endpoints used for the New Property BERA were developed in accordance with current legislation and with guidance provided by EPA (1992h). The policy goal and endpoints for the New Property BERA are for no harmful effects from soil contaminants to terrestrial indicator plant and animal species. More specifically:

Assessment Endpoint (1): The ratio of (1) concentrations of ecoCOPCs in surface soil (≤ 2 ft), to (2) phytotoxicity thresholds for terrestrial plants, should be ≤1.

Measurement Endpoint: Measured concentrations of ecoCOPCs in surface soil and literature values for phytotoxicity thresholds of ecological receptors for ecoCOPCs.

Assessment Endpoint (2): The ratio of (1) concentrations of ecoCOPCs in surface soil (≤ 2 ft), adjusted for exposure to (2) dietary limits for protection of terrestrial animals, should be ≤1.

Measurement Endpoint: Measured concentrations of ecoCOPCs in surface soil and literature values for dietary limits of ecological receptors for ecoCOPCs.

The assessment endpoints for the New Property BERA are stated quantitatively in terms of toxicity or risk quotients (Barnthouse et al. 1986). A risk quotient is the ratio of (1) the measured or predicted concentration of an ecoCOPC to which receptors are exposed in an environmental medium, to (2) the measured concentration of an ecoCOPC that adversely affects an organism (benchmark or toxicity threshold). If the measured concentration is equal to or less than the concentration producing an adverse effect (i.e., the ratio of the two, or the risk quotient, is less than or equal to 1), the risk is considered acceptable (protective of the ecological receptor). Assessment endpoints can then be simply stated as, "the risk quotient for ecological receptors exposed to ecoCOPCs in an environmental medium should be less than or equal to 1.0." Any risk quotient greater than 1 indicates that the ecoCOPC qualifies for further investigation of the actual likelihood of harm. The measured concentrations of New Property ecoCOPCs are provided in Section 4 of this report and are discussed in Section 6.2.5. The threshold concentrations [the NOAEL or LOAEL] are discussed in Section 6.2.6.

Endpoints stated in terms of specific ecological receptor or exposure classes (groups of species exposed by similar pathways) often require data on the processes that increase or decrease the exposure concentration below or above the measured environmental concentration. Thus, some risk quotients incorporate exposure factors (e.g., dietary soil fractions and bioaccumulation factors). A risk quotient adjusted for exposure is termed an *exposure quotient* (XQ). This BERA uses the more general terms, risk quotient and XQ. Exposure factors for New Property ecological receptors are discussed in Section 6.2.5.

Ratios for assessment endpoints 1 and 2 were calculated for ecoCOPCs in soils. Calculation and evaluation of the XQs for the ecological receptors are discussed in Section 6.2.7.

6.2.4.4. Ecological Contaminants of Potential Concern

EcoCOPCs are those substances detected at New Property that have the potential to pose a hazard to the plants and animals. The potential exposure medium for the New Property RI is surface soil (0 to 2 ft), including soil found in dry, small stream beds.

According to EPA (1991d), factors determining whether a contaminant should qualify as an ecoCOPC include environmental concentration, frequency of occurrence, background levels, bioavailability, physical and chemical properties (e.g., solubility), potential for bioaccumulation, toxicity, and effects. Contaminants at the New Property site were first identified from a comparison of site and background concentrations. Background concentrations for organic compounds were only available for some pesticides. The background concentrations of all other organic compounds are assumed to be zero. All contaminants detected above background were then screened as ecoCOPCs on the basis of their toxicity and potential for bioaccumulation.

Toxicity threshold values for screening contaminants at New Property to identify ecoCOPCs were obtained from published sources (e.g., Opresko et al. 1994) and toxicological data bases [e.g., Hazardous Substances Data Bank (HSDB) (NLM 1992)].

Published toxicity data were used in the following order of preference:

- concentrations showing no effect [e.g., NOAEL]; and
- chronic toxicity concentrations [e.g., LOAEL].

The first choices for soil toxicity thresholds were conservative estimates of safe soil concentrations derived from Opresko et al. (1994) for the New Property ecological receptors. When these values were available, they were used to set thresholds for the appropriate media, regardless of other, perhaps conflicting, data. In all cases, the appropriateness of study methods, chemical species, and test organisms relative to the New Property was considered when setting toxicity threshold values.

The soil toxicity threshold was the lowest protective soil concentration among the New Property ecological receptors for each contaminant. Soil screening levels were calculated using dietary limits (mg contaminant/kg diet) published in Opresko et al. (1994) or dietary limits calculated using the formulas in Opresko et al. (1994) and oral toxicity data obtained from electronic data bases. Dietary limits were calculated for acenaphthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, and pyrene from NOAELs published in IRIS (EPA 1992i), HSDB (NLM 1992) and Registry of Toxic Effects of Chemical Substances (NIOSH 1992). To calculate soil screening levels from dietary limits, the lowest dietary limit is divided by the highest bioaccumulation factor (BAF), with units [(mg contaminant/kg dietary item)/(mg contaminant/kg soil)]. This assumes that receptors obtain 100% of their diet from the site, and the absorption efficiency is 1.0 for tissue (100% is absorbed from all biotic tissue ingested). The BAF is the highest value for terrestrial organisms reported or a default value when no value was reported (Table VI-2.5). These assumptions result in conservative soil screening levels for all ecological receptors; the lowest of these among the different receptors is the soil toxicity threshold. The toxicity thresholds for New Property contaminants are given in Table VI-2.5.

Contaminants are screened according to the following:

(1) If the mean concentration at the site does not exceed the toxicity threshold, then the contaminant does not qualify as an ecoCOPC.

(2) If the mean concentration at the site exceeds the toxicity threshold or if no threshold is available, then the contaminant is an ecoCOPC.

Using the thresholds and screening rules described above, 30 of the 44 contaminants or groups of contaminants (inorganics and organics above background) qualify as ecoCOPCs in soil. The 14 contaminants in soil excluded from further consideration as ecoCOPCs are lead, manganese, acetone, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, chlordane, chrysene, di-n-butylphthalate, dibenzo(a,h)anthracene, fluoranthene, fluorene, methylene chloride, pyrene, and uranium-235 based on its

Table VI-2.5. Screening of Soil Contaminants at New Property

CONTAMINANT	Mean Soil Concentration (mg/kg)	Mean Background* (mg/kg)	Lowest Dietary Limit# (mg/kg)	Highest Bioaccumulation Factor+	Soil Screening Level (mg/kg)++	Above Screening Level
INORGANICS						
Antimony	1.02	ND	0.24	10	0.02	yes
Arsenic	7.3	5.33	0.24	0.1	2.41	yes
Bismuth	24.9	15.9	nd	--	no screening level	yes
Cadmium	0.246	0.429	0.37	11	0.03	yes
Cerium	40.2	ND	nd	--	no screening level	yes
Lead	21.4	20.4	2.34	0.015	155.70	no
Manganese	760	659	379	0.02	18900.00	no
Mercury	0.0698	0.0316	0.008	13	0.0006	yes
Neodymium	21.6	ND	nd	--	no screening level	yes
Selenium	0.563	0.203	0.14	0.75	0.19	yes
Thallium	0.445	0.15	0.032	10	0.0032	yes
Tin	6.3	5.31	nd	--	no screening level	yes
Vanadium	18.9	16.9	0.82	0.13	6.30	yes
Zinc	83.5	68.1	3.6	5	0.71	yes
ORGANICS						
Acenaphthylene	0.2	ND	nd	--	no screening level	yes
Acetone	0.00843	ND	43	0.05	860.00	no
Anthracene	0.206	ND	nd	--	no screening level	yes
Benzo(a)anthracene	0.273	ND	nd	--	no screening level	yes
Benzo(a)pyrene	0.27	ND	1.9	1.5	1.28	no
Benzo(b)fluoranthene	0.341	ND	nd	--	no screening level	yes
Benzo(g,h,i)perylene	0.2	ND	nd	--	no screening level	yes
Benzo(k)fluoranthene	0.502	ND	nd	--	no screening level	yes
Benzoic Acid	0.761	ND	nd	--	no screening level	yes
Bis(2-ethylhexyl)phthalate	0.194	ND	0.7	0.19	3.76	no
Carbazole	0.203	ND	nd	--	no screening level	yes
Chlordane	0.000891	ND	1.03	1.6	0.10	no
Chrysene	0.259	ND	855a	0.76	1125.00	no
Di-n-butylphthalate	0.192	ND	0.07	0.24	0.29	no
Dibenzo(a,h)anthracene	0.197	ND	860a	4.8	179.00	no
Fluoranthene	0.336	ND	23.8a	0.13	182.70	no
Fluorene	0.201	ND	23.8a	0.05	475.00	no
Indeno(1,2,3-cd)pyrene	0.214	ND	nd	--	no screening level	yes
Methylene chloride	0.0146	ND	25.2	0.05	503.70	no
Phenanthrene	0.297	ND	nd	--	no screening level	yes
Pyrene	0.29	ND	14.3a	0.3	47.70	no
IONS						
Chloride	89.9	48.2	nd	--	no screening level	yes
Fluoride	6.51	3.35	5.3	10	0.53	yes
Nitrate-Nitrite-N	443	6.64	nd	--	no screening level	yes
Sulfate	275	62.1	nd	--	no screening level	yes
RADIONUCLIDES						
Pu-238	0.841	0.0591	nd	--	no screening level	yes
Ra-226	1.07	1.17	nd	--	no screening level	yes
Th-228	1.23	0.959	nd	--	no screening level	yes
Th-330	1.4	1.9	nd	--	no screening level	yes
Th-232	0.905	0.933	nd	--	no screening level	yes
U-235	0.0488	0.0646	5.7	100	0.06	no

ND - not detected
nd - no data
* values presented for information purposes only
# unless otherwise denoted, lowest dietary levels in Opresko et al. (1994) for New Property receptors
a Calculated from toxicity data in EPA (1992i), NLM (1992) and NIOSH (1992) using Opresko et al. (1994) methods
+ BERA for Loring Air Force Base, Draft (HAZWRAP 1994);
defaults are 10 (inorganics, ions) and 100 (organics, radionuclides)
++ Dietary limit/ highest reported bioaccumulation factor

effects as a chemical. Table VI-2.5 includes each contaminant reported in soil at the New Property exposure unit and whether it qualifies as an ecoCOPC.

6.2.5. Exposure Assessment

Step 2 of U.S. EPA's ERA process, as it applies to the New Property BERA, is discussed in this section. The exposure assessment describes the contaminant sources and exposure media at New Property. It also examines the route, magnitude, frequency, duration, trend, and spatial pattern of exposure of each receptor population and habitat to a chemical or physical stressor.

Exposure assessment includes (1) quantification of the release, migration, and fate of contaminants; (2) characterization of ecological receptors being exposed; and (3) quantification of concentrations at the point of contact with the exposed organisms. The release, migration, and fate of contaminants determine the concentrations of ecoCOPCs in the exposure media. The concentrations in exposure media are measured or estimated. For example, the concentrations in soil at the New Property are measured. The concentrations in prey are estimated from these measured concentrations.

Each receptor is characterized by different routes of exposure. These differences are captured in exposure factors, which are used to adjust the measured concentration of ecoCOPCs in the exposure media as the chemical moves along its pathway to the receptor. Sufficient data exist (1) to identify the source media leading to potential exposure of ecological receptors, (2) quantify the concentration of ecoCOPCs in exposure media, and (3) derive exposure factors for a diversity of ecological receptors.

6.2.5.1. Qualitative Evaluation of Exposure Pathways

The potential exposure pathways (contaminant sources, release mechanisms, exposure media, exposure routes, and receptors) at the New Property are diagrammed in Figure 6.2.1. The contaminant source, exposure media, receptors, and the routes by which they are exposed to ecoCOPCs are described below.

Contaminant Sources

Contaminant sources at New Property include surface and subsurface soil at the terrestrial exposure unit. The origin, nature, and extent of the contaminants in these media are discussed in Sections 2 and 4.

Exposure Media

Soil (surface and sub-surface), surface water, groundwater, and air, as well as contaminated plants and animals that are ingested by other receptors, are all *potential* exposure media. After further evaluation, however, only surface soil and biota (living organisms such as plants and animals) were retained as exposure media for the BERA.

Subsurface soil (2 feet and deeper) exhibits much less animal, microbial, and plant activity than does surface soil (0 to 2 feet from ground surface) (Suter et al. 1993a). Subsurface soil was judged to be of much lower exposure and was not considered quantitatively. Surface water consists of ephemeral seeps and surface flow after rain storms. The ephemeral areas were judged to provide insufficient cover and food to organisms. Therefore, surface water risks were not evaluated quantitatively. Groundwater is not considered an exposure medium because ecological receptors are unlikely to come into contact with it while it is below the ground surface. Air is not considered an exposure medium because only two volatile organics, acetone and methylene chloride, were detected at low concentrations at the New Property (Table VI-2.5). It was assumed that these chemical concentrations were so low as not to merit further analysis. No data were available for contaminant body burdens so this precluded the use of direct measurements for plants and animals.

Exposure Routes

Potential exposure routes for the exposure media evaluated at the New Property are those for soil, biota, and surface water at seeps. Animals may be exposed to surface water at seeps by dermal contact and ingestion. Animals may be exposed by ingestion of contaminated biota. Animals may come into contact with soil by means of incidental ingestion, dermal contact, inhalation of dust, and external radiation with radioactive materials. Plants are potentially exposed by external radiation and dermal contact (root uptake) from soil.

Ingestion of soil and biota by animals are the only two potential exposure routes evaluated quantitatively in the BERA. The exposure of animals to contaminants in soil by dermal contact and inhalation are likely to be a small fraction of the total exposure compared to exposure to contaminants in soil by incidental ingestion and the indirect exposure by ingestion of contaminated plants and animals. Furthermore, the available toxicity data is almost exclusively for ingestion (e.g., Opresko et al. 1994). Likewise, external

radiation is unlikely to be a primary route of exposure for animals moving across the site, and there is no evidence that low concentrations of radioactive materials in soil are detrimental to ecological populations (Whicker and Schultz 1982). Finally, animals are potentially exposed only intermittently to surface water at seeps on the New Property, during periods of wet weather. Exposure to potentially contaminated surface water at seeps during only a fraction of the year makes risks to animals from dermal contact and ingestion of surface water at seeps unlikely.

Therefore, no additional quantitative evaluation of exposure to surface water at seeps is included in the BERA.

The exposure pathways that are most likely to put ecological receptors at risk and that are evaluated quantitatively using site measurements and published exposure parameters and toxicity data are (1) direct contact of plants with soil, and (2) incidental ingestion of soil and (3) ingestion of plant and animal matter by animals.

6.2.5.2. Ecological Receptors and Their Exposure

The potential exposures of ecological receptors to contaminants in surface soil and plants and animals ingested by other receptors are evaluated. The two primary receptor categories (terrestrial plants and animals) are subcategorized by *exposure classes*. Exposure classes group together those species whose feeding habits and physiology are similar. For example, terrestrial animals are subcategorized into small mammals, mammalian herbivores (plant consumers), mammalian predators (animal consumers), and bird predators. Each exposure class for the New Property has one or more species of ecological receptors (e.g., meadow vole and short-tailed shrew in the case of small mammals).

Risks are assessed for almost all of the ecological receptors. The risk to bird predators is greater than the risk to bird herbivores for two reasons: (1) the potential for bioconcentration is greater in animals than in plants, and (2) bird predators are likely to be more sensitive to ecoCOPCs than bird herbivores.

The terrestrial exposure classes and their ecological receptors for the New Property are:

- plants;
  - trees (black locust);

- forbs (honeysuckle);

- small mammals;
  - ground-dwelling herbivore (meadow vole);
  - subterranean carnivore (short-tailed shrew);
- mammalian herbivores;
  - temporary browser at site (deer);
- mammalian predators;
  - permanent resident (raccoon);
  - temporary forager (fox); and
- bird predators;
  - with soil-dwelling prey (woodcock);
  - with terrestrial prey (red-tail hawk).

Plants

Trees and forbs are exposed to ecoCOPCs primarily by direct contact with soil. It is assumed that they are exposed to the full soil concentration. In the risk characterization for the New Property BERA (Section 6.2.7), the measured soil concentrations were compared directly with the toxic threshold (the lowest soil concentrations reported in the published literature as producing a toxic effect on test plants of the same exposure class).

Small Mammals

Ground-dwelling herbivorous small mammals (e.g., meadow vole) are exposed primarily through incidental ingestion of contaminated surface soil and ingestion of plant material. Exposure by dermal contact with soil is assumed to be negligible for small mammals at the New Property. Exposure for these receptors is the sum of what is absorbed from ingested soil and plant matter. Small mammals are assumed to obtain everything they ingest from the exposure unit.

Small mammal predators (e.g., short-tailed shrew) are primarily exposed by ingestion of potentially contaminated prey (e.g., earthworms, insect larvae, slugs) as well as ingestion of soil. This class of receptors may also be exposed to soil contaminants by direct contact and inhalation of volatile and semi-volatile organic compounds and particulates. For the New Property, the exposure for this class of

receptors is the sum of what is absorbed from the soil and from the plants and animals they ingest. The fraction of their diet that is soil includes soil from the intestinal tracts of their prey. All prey are assumed to be obtained from the exposure unit. The estimated exposure for this class does not include exposure by direct contact or inhalation. Conservative values for soil ingestion and dietary composition are used for shrews. For example, it was assumed that shrews ingest 30% soil and 70% earthworms for their total diet. Both ingestion values are conservative because shrews likely eat fewer earthworms (EPA 1993d) and, thus, less soil. Also, shrews likely eat other less contaminated organisms (e.g., surface-dwelling invertebrates) as part of their diet.

Mammalian Herbivores

Large herbivores like deer are exposed primarily to ecoCOPCs that are in plant material. Exposure by direct contact with soil is assumed to be negligible for deer at the New Property. Deer are assumed to obtain about 40 percent of their diet from the exposure unit. Therefore, the risk to deer are not quantitatively evaluated. The risk estimates for the vole are expected to be greater than those for the deer.

Mammalian Predators

Mammalian predators are exposed primarily to ecoCOPCs that have accumulated in their prey. As is the case with the raccoon and fox, some terrestrial predators also may incidentally consume soil. The predator is assumed to eat only terrestrial prey contaminated from ecoCOPCs in soil.

Bird Predators

Bird predators are exposed primarily to ecoCOPCs that have accumulated in their prey. For bird predators feeding on primarily soil-dwelling food (e.g., woodcock) and terrestrial prey (e.g., red-tail hawk), the ecoCOPCs in their prey are assumed to come from exposure to soil. The concentrations of ecoCOPCs in the prey of bird predators were calculated by multiplying the soil concentration by the appropriate bioaccumulation factor. The resulting value would accurately represent ecoCOPC concentrations in the prey if (1) most of the prey of bird predators were not themselves predators and ecoCOPCs concentrations did not become magnified in vegetation or (2) the ecoCOPCs did not become magnified in carnivorous prey organisms above the concentration levels in herbivorous prey. The risk to the woodcock are not

calculated but are estimated from the calculated risks to other receptors and the relative magnitude of their dietary limits and exposures.

The exposures of these receptor classes to ecoCOPCs are estimated from the measured concentrations in the exposure media, adjusted by exposure factors (Table VI-2.6). These are described below.

6.2.5.3. Quantification of Exposure

The concentrations of ecoCOPCs in soil to which ecological receptors at the New Property are potentially exposed were quantified for the BERA. The measured mean and RME concentrations of ecoCOPCs in soil were used to estimate exposure to the New Property ecological receptors. Details on the number and location of samples, sampling methods, and analytical methods are provided in Sections 3 and 4 of this report. The measured ecoCOPC concentration data for soil at the terrestrial exposure unit are summarized in Tables VI-2.7 and VI-2.8. These measured concentrations are adjusted by *exposure factors* to estimate the exposure to ecological receptors.

Exposure Factors

Exposure factors (EFs) for the New Property terrestrial ecological receptors exposed to ecoCOPCs in a single medium are calculated using the following equation:

$$\mathbf{EF = DI \times [(SI \times AE_S) + (PI \times AE_T \times BV) + (TI \times AE_T \times BAF)]} \quad \textbf{Eq. 6.2-1}$$

where:

- DI = the fraction of the total ingested substances that comes from a specific exposure unit;
- SI = the fraction ingested that is abiotic (e.g., soil);
- AE_S = the fraction of the ecoCOPC in soil that is absorbed by receptor;
- PI = the fraction ingested that is plant material;
- AE_T = the fraction of the ecoCOPC in tissue that is absorbed by the receptor;
- BV = bioaccumulation factor for plants (unitless);
- TI = fraction ingested that is terrestrial prey; and
- BAF = bioaccumulation factor for terrestrial prey (unitless).

Table VI-2.6. Exposure Parameters and Factors for Terrestrial Ecological Receptors at New Property

Receptor	Exposure Parameters				Exposure Factor
	DI	SI	PI	TI	
Forbs	—	—	—	—	1
Trees	—	—	—	—	1
Meadow vole	1	0.02	0.98	—	(0.02 x 0.1) + (0.98 x BV)
Shrew	1	0.3	—	0.7	(0.3 x 0.1) + (0.7 x BAF)
Raccoon	1	0.09	—	0.91	(0.09 x 0.1) + (0.9 x BAF)
Fox	0.1	0.03	—	0.97	0.1[(0.03 x 0.1) + (0.97 x BAF)]
Hawk	0.1	—	—	1	0.1[BAF]

DI fraction of ingesta from exposure unit
SI fraction of ingesta that is soil or sediment
PI fraction of ingesta that is plant matter
TI fraction of ingesta that is living terrestrial animal matter
BV biouptake factor for terrestrial vegetation
BAF bioaccumulation factor for terrestrial prey
— not applicable

Table VI-2.7. Risk Quotients for Inorganic EcoCOPCs in Surface Soil at Mound New Property*: Mean Exposure

	Mean	Forb		Tree		Vole		Shrew		Raccoon		Fox		Hawk	
EcoCOPC	Conc. (mg/kg)	Threshold (mg/kg)	XQ	Threshold (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ
INORGANICS															
Antimony	1.02	5.0	2.0E-1	5.0	2.0E-1	1.0	2.1E-1	0.3	2.5E-1	0.4	1.3E-1	0.2	2.2E-2	ND	ND
Arsenic	7.3	11.2	6.5E-1	10.0	7.3E-1	1.0	3.1E-1	0.3	2.1E+0	0.4	1.2E+0	0.2	2.0E-1	6.1	7.9E-3
Bismuth	24.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.246	2.5	9.8E-2	5.0	4.9E-2	1.5	1.8E-2	0.4	4.7E+0	0.7	3.7E+0	0.4	7.2E-1	1.8	1.5E-1
Cerium	40.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	0.0698	0.3	2.3E-1	0.3	2.3E-1	0.1	1.1E-1	0.0	2.1E+1	0.0	1.7E+1	0.0	3.1E+0	ND	ND
Neodymium	21.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.563	12.9	4.4E-2	1.0	5.6E-1	0.6	6.7E-3	0.2	2.0E+0	0.3	1.5E+0	0.1	2.9E-1	0.6	7.2E-2
Thallium	0.445	1.0	4.5E-1	1.0	4.5E-1	0.1	2.0E-2	0.0	8.9E+1	0.1	6.9E+1	0.0	1.3E+1	ND	ND
Tin	6.3	50.0	1.3E-1	50.0	1.3E-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	18.9	2.5	7.6E+0	2.5	7.6E+0	3.3	1.8E-2	0.9	2.5E+0	1.5	1.6E+0	0.8	3.0E-1	14.3	1.7E-2
Zinc	83.5	25.0	3.3E+0	20.0	4.2E+0	2791.3	8.9E-3	754.1	3.9E-1	1238.9	3.1E-1	688.8	5.9E-2	3.6	1.2E+1

* Risk quotients not calculated for organic, ion and radionuclide ecoCOPCs for lack of toxicity thresholds
ND - no data
XQ - exposure quotient calculated as (mean concentration of ecoCOPC X exposure factor/toxicity threshold concentration)
EcoCOPC - ecological contaminant of potential concern

Table VI-2.8. Risk Quotients for Inorganic EcoCOPCs in Surface Soil at Mound New Property*: UCL95 Exposure

	UCL 95	Forb		Tree		Vole		Shrew		Raccoon		Fox		Hawk	
EcoCOPC	Conc. (mg/kg)	Threshold (mg/kg)	XQ	Threshold (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ
INORGANICS															
Antimony	1.28	5.0	2.6E-1	5.0	2.6E-1	1.0	2.6E-1	0.3	3.2E-1	0.4	1.6E-1	0.2	2.8E-2	ND	ND
Arsenic	7.87	11.2	7.0E-1	10.0	7.9E-1	1.0	3.3E-1	0.3	2.3E+0	0.4	1.3E+0	0.2	2.2E-1	6.1	8.5E-3
Bismuth	28.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.392	2.5	1.6E-1	5.0	7.8E-2	1.5	2.9E-2	0.4	7.6E+0	0.7	6.0E+0	0.4	1.1E+0	1.8	2.4E-1
Cerium	47.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	0.0813	0.3	2.7E-1	0.3	2.7E-1	0.1	1.3E-1	0.0	2.5E+1	0.0	1.9E+1	0.0	3.7E+0	ND	ND
Neodymium	28.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.652	12.9	5.1E-2	1.0	6.5E-1	0.6	7.7E-3	0.2	2.3E+0	0.3	1.8E+0	0.1	3.4E-1	0.6	8.3E-2
Thallium	0.532	1.0	5.3E-1	1.0	5.3E-1	0.1	2.4E-2	0.0	1.1E+2	0.1	8.3E+1	0.0	1.6E+1	ND	ND
Tin	9.09	50.0	1.8E-1	50.0	1.8E-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	21.3	2.5	8.5E+0	2.5	8.5E+0	3.3	2.0E-2	0.9	2.9E+0	1.5	1.8E+0	0.8	3.4E-1	14.3	1.9E-2
Zinc	122	25.0	4.9E+0	20.0	6.1E+0	2791.3	1.3E-2	754.1	5.7E-1	1238.9	4.5E-1	688.8	8.6E-2	3.6	1.7E+1

* Risk quotients not calculated for organic, ion, and radionuclide ecoCOPCs for lack of toxicity thresholds
UCL 95 - 95th upper confidence level about the mean
ND - no data
XQ - exposure quotient calculated as (UCL95 concentration of ecoCOPC X exposure factor/toxicity threshold concentration)
EcoCOPC - ecological contaminant of potential concern

Only the appropriate exposure parameters that contribute to a receptor's exposure should be used to derive the EF using Eq. 6.2-1.

The values used for the exposure parameters DI, SI, PI, and TI in the New Property BERA are shown in Table VI-2.6. The absorption efficiency for soil (AE_s) is assumed to be 0.1 and for tissue (AE_t) it is assumed to be 1.0. These values were chosen to estimate the relative availability of contaminants in abiotic and biotic media. Bioaccumulation factors, BV and BAF, depend on the ecoCOPC and prey item. The BVs and BAFs used to estimate exposure are given in Table VI-2.9. When more than one value was available from published reports, the highest value was chosen from among the BVs or BAFs. When no value was available for an ecoCOPC, the default BV was 0.5 and the default BAF was 10.0. These were chosen as conservative default values based on values reported for other ecoCOPCs.

For the New Property BERA, the EF combining the exposures from ingestion of soil and from ingestion of terrestrial plants and animals is multiplied by the concentration of the ecoCOPC in soil. Each resulting exposure concentration is individually compared to the appropriate toxicity threshold. They are not combined to estimate total exposure (and risk) over multiple pathways.

Terrestrial plants are assumed to be exposed to surface soil (zero to two feet) only. The EFs for these exposure classes are 1.0 because they are exposed to the full concentration in the soil.

The EF for terrestrial herbivorous small mammals depends on the assumed fraction of incidental soil ingestion, the fraction of ecoCOPC in soil that is absorbed (absorption efficiency), and the bioaccumulation factor for terrestrial plants (BV). Exposure is calculated for only one receptor species, the meadow vole. The dietary soil fraction used for the meadow vole (0.02) is that reported by EPA (1993d). The absorption efficiency is 0.1 for soil and 1.0 for plant tissue. The bioaccumulation factors for terrestrial plants (BVs) are given in Table VI-2.9.

Regarding shrews, the fraction of ingested material that is soil is a maximum (conservative) estimate based on published reports. It is reported that up to 41% of shrew diet is earthworms (EPA 1993d) and it is professional judgement that less than 75% of earthworms ingested by shrews is soil.

Table VI-2.9. Bioaccumulation Factors for Inorganic EcoCOPCs Used to Calculate Risk Quotients

CONTAMINANT	Maximum BV*	Ref.	Maximum BAF+	Ref.
INORGANICS				
Antimony	0.2	a	0.05	c
Arsenic	0.04	a	0.066	d
Bismuth	0.5		10	
Cadmium	0.11	b	11	e
Cerium	0.5		10	
Mercury	0.18	b	13	c
Neodymium	0.5		10	
Selenium	0.005	b	0.76	d
Thallium	0.004	a	10	
Tin	0.5		10	
Vanadium	0.0011	b	0.13	c
Zinc	0.3	b	5	c

* Biouptake factor for vegetation; default is 0.5

\+ Bioaccumulation factor for animal prey; default is 10.0

a Baes et al. (1984)

b Calculated from values reported in Baes et al. (1984) multiplied by 0.2 to represent 80% water composition of plants, as reported by HAZWRAP (1994).

c Value derived from biotransfer factors presented in Baes et al. (1984) for uptake into cattle, converted to BAF by multiplying by food ingestion rate of 50 kg/day wet weight, as reported by HAZWRAP (1994).

d Average of values for industrial soils (Beyer and Cromartie 1987) multiplied by 0.2 to represent 80% water content of earthworms, as reported by HAZWRAP (1994).

e BCF for earthworms from Dierexsens et al. (1985), as reported by HAZWRAP (1994).

The EF for small mammal predators is the fraction of soil ingested (assumed to be 0.3) times the absorption efficiency for soil plus the product of the bioaccumulation factor for the ecoCOPC and the fraction of diet that is animal matter (0.7) times the absorption efficiency for animal tissue (1.0). The BAFs used for the New Property ecoCOPCs are given in Table VI-2.9.

The EF for terrestrial predators includes the fraction of diet that comes from the exposure unit (DI), the fraction of diet that is soil, the absorption efficiencies for soil (0.1) and tissue (1.0), the bioaccumulation factor for the prey, and the fraction of diet of that prey type. For raccoons, the fraction of diet from the exposure unit is assumed to be 1.0, whereas the fractions for fox and red-tail hawk are taken to be 0.1. These estimates are considered to be conservative, given the large foraging areas for these predators. Raccoons are the only terrestrial predators that consume soil. The dietary soil fractions used for raccoons (0.09) for the New Property BERA are those reported by EPA (1993d). The fraction of food that is prey for the raccoons is assumed to be 0.91 with only terrestrial prey being ingested. The bioaccumulation factors are given in Table VI-2.9.

6.2.6. Effects Assessment

The third step in U.S. EPA's framework for conducting ERAs, as it applies to the New Property BERA, is discussed in this section. The purpose of the effects assessment is to evaluate the response to chemical and physical stressors in terms of the selected assessment and measurement endpoints. Depending on the parameters of exposure, this effects assessment results in a profile of the response of receptor populations and habitats to stressors at concentrations or doses (or other units of stress) to which they are exposed.

6.2.6.1. Chemical Toxicity

Chemicals in the ecosystem may be directly toxic to plants and animals. They may also be indirectly harmful by reducing an organism's ability to survive and reproduce by decreasing reproductive rates, reducing the viability of offspring, causing alterations in behavior patterns, or increasing susceptibility to disease or predators. These distinct effects are characterized by different dose responses and may result from different exposure pathways. The toxicity thresholds used for animals in the New Property BERA are based on concentrations that have been observed to cause a 20% or less reduction in population size. That is, chemical concentrations above these toxicity thresholds are considered excessive.

Chronic (long-term) toxicity resulting from chemical contaminants is the primary concern at the New Property. Volatile organics, unless they are at very high concentrations or are being released continuously, are unlikely to remain at high concentrations due to volatilization and transport offsite. Thus, the likelihood of acute (short-term) exposures from volatile organics is low. Although metals and semivolatile organic contaminants can occur in high concentrations in soil, most organisms do not ingest large amounts of soil and, thus, are unlikely to be exposed to concentrations above acute toxicity thresholds. Vegetation at the New Property showed no indication of acute toxicity.

Plants grown in soil containing metals, however, can accumulate higher-than-background levels of some metals, resulting in chronic toxicity. Bioaccumulation is generally most significant in the roots of plants; however, several metals can be translocated to parts of the plants above the ground. Some metals (e.g., selenium) accumulate in animal tissues and can have subtle deleterious effects on animals over long exposure times. Many organic contaminants (e.g., PCBs and pesticides) are extremely lipophilic (attracted to fat) and can biomagnify in organisms. No investigations into chronic effects on local plants and animals as a result of exposure to soils, surface water, sediment, or ingestion of plants and animals have been conducted at the New Property.

Toxicity of soil contaminants varies, depending on the receptor species and on the attending physical and chemical factors such as pH, the presence of complexing agents, or interaction with other chemicals at the site. Plants can be adversely affected by soil contaminants in numerous ways, including seed production, seed germination, growth rate, and plant mass. Suter, Will, and Evans (1993b) catalogue published data on the effects of contaminants on different species of plants grown under various conditions. Opresko et al. (1994) published compiled data about effects on animals.

6.2.6.2. Toxicity Thresholds

Site-specific toxicological studies using New Property populations have not been conducted to determine whether the concentrations of ecoCOPCs at the site are toxic. Therefore, this effects assessment uses toxicity data obtained from compiled databases [e.g., RTECS (NIOSH 1992), Suter et al. 1993b and Opresko et al. 1994]. Information on test concentrations, modes of exposure, and effects on similar species from published toxicity studies was used to establish toxicity thresholds for screening (Table VI-2.5) and

for risk calculations (Tables VI-2.7 - VI-2.8). Examples of the kinds of toxicological data that are used to assess effects of site contaminants on ecological receptors are:

- NOAEL (the concentration of a contaminant that causes no observed adverse effect on a test species) and
- LOAEL (the lowest concentration of a contaminant that causes an observed adverse effect on a test species).

Ecological effects data are available for many ecoCOPCs at the New Property. These data encompass effects from exposure to ingested matter, including soil and food, for animals, and dermal contact with soil for plants. Data are available for ecological receptors in all exposure classes for the exposure unit at the New Property. These data are used in the screening of contaminants to identify inorganic and organic ecoCOPCs in the soil. Risks are calculated using the toxicity thresholds for ecoCOPCs in the soil (Section 6.2.7).

6.2.7. Risk Characterization

The fourth step in the U.S. EPA ERA process, risk characterization, is discussed in this section. Risk characterization integrates exposure and stressor response on receptor organisms used in the assessment and measurement endpoints, summarizes risk or the likelihood of harm to plants and animals, and interprets the ecological significance of these findings.

Risk characterization compares exposures to effects to determine the risk or likelihood of harm to plants and animals. An evaluation of the ecological assessment endpoints, using XQs for ecoCOPCs at New Property, forms the quantitative basis of this risk characterization. The use of XQs to calculate the risks to ecological receptors is supported by available guidance (EPA 1989c).

XQs compare the estimated exposure concentrations to toxicity threshold concentrations. Exposure concentrations are derived from measured environmental concentrations (mean and RME) by multiplying the measured concentration by an exposure factor. As explained earlier, the exposure factor incorporates likely adjustments to the measured environmental concentration (e.g., fraction of ingestion diet that comes from contaminated soil for small mammals) (Eq. 6.2-1). That is,

$$XQ = \frac{\textit{Environmental Concentration} \times \textit{Exposure Factor}}{\textit{Toxicity Threshold Concentration}}$$

For several ecoCOPCs, an XQ could not be calculated because insufficient data were available to establish a toxicity threshold. These ecoCOPCs are carried through the risk characterization as ecoCOPCs of uncertain risk to ecological receptors.

As expressed in the ecological assessment endpoints for the New Property (Sect. 6.2.4.3), an XQ greater than unity (1.0) indicates that there is a potential for harmful ecological effects and that the ecoCOPC qualifies for further investigation into its potential to pose a hazard. Moreover, the risk of potential hazardous effects increases with the magnitude of the ratio. An XQ threshold of 1.0 assumes that the toxicity threshold and exposure concentrations are accurate. In reality, the range of values around 1.0 within which XQs may or may not indicate the existence of risk increases with the uncertainty of the estimated exposure and toxicity threshold concentrations.

6.2.7.1. Current Baseline Risk to Ecological Receptors

Risks to ecological receptors under current conditions are estimated by calculating XQs for all terrestrial exposure classes, as represented by their ecological receptors. Tables VI-2.7 and VI-2.8 report the XQs for all ecoCOPCs. Those ecoCOPCs with XQs >1.0 are the focus of further evaluation. In addition, baseline risks are calculated for current concentrations of these ecoCOPCs in background samples (Tables VI-2.10 and VI-2.11).

Recalling that no organic contaminant with a screening threshold qualified as an ecoCOPC (Table VI-2.5), it is justified to conclude that there is no risk to ecological receptors from organic ecoCOPCs in surface soil at the New Property, and they will not be discussed further.

Based on the 95% UCL (or RME) concentrations of ecoCOPCs in New Property surface soil, seven inorganic ecoCOPCs have XQs greater than 1.0. These are arsenic, cadmium, mercury, selenium, thallium, vanadium, and zinc. Several receptors have XQs for these ecoCOPCs that exceed 1.0: trees and forbs, shrews, raccoons, foxes, and hawks.

All COPCs with XQs greater than 1.0 exhibit a potential for harmful ecological effects and merit further investigation. The following paragraphs of analyses show that the ecoCOPCs at the New Property with XQs greater than 1.0 are unlikely to pose a risk to ecological receptors and do not qualify as ecoCOCs.

Table VI-2.10. Risk Quotients for Inorganic EcoCOPCs in Surface Soil at Background Site: UCL95 Exposure

	UCL 95	Forb		Tree		Vole		Shrew		Raccoon		Fox		Hawk	
EcoCOPC	Conc. (mg/kg)	Threshold (mg/kg)	XQ	Threshold (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ	Diet Limit (mg/kg)	XQ
INORGANICS															
Arsenic	5.63	11.2	5.0E-1	10.0	5.6E-1	1.0	2.4E-1	0.3	1.6E+0	0.4	9.0E-1	0.2	1.6E-1	6.1	6.1E-3
Bismuth	16.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.509	2.5	2.0E-1	5.0	1.0E-1	1.5	3.8E-2	0.4	9.8E+0	0.7	7.7E+0	0.4	1.5E+0	1.8	3.1E-1
Mercury	0.0346	0.3	1.2E-1	0.3	1.2E-1	0.1	5.5E-2	0.0	1.1E+1	0.0	8.3E+0	0.0	1.6E+0	ND	ND
Selenium	0.241	12.9	1.9E-2	1.0	2.4E-1	0.6	2.9E-3	0.2	8.6E-1	0.3	6.5E-1	0.1	1.2E-1	0.6	3.1E-2
Thallium	0.164	1.0	1.6E-1	1.0	1.6E-1	0.1	7.4E-3	0.0	3.3E+1	0.1	2.6E+1	0.0	5.0E+0	ND	ND
Tin	6.19	50.0	1.2E-1	50.0	1.2E-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	17.7	2.5	7.1E+0	2.5	7.1E+0	3.3	1.6E-2	0.9	2.4E+0	1.5	1.5E+0	0.8	2.8E-1	14.3	1.6E-2
Zinc	82.4	25.0	3.3E+0	20.0	4.1E+0	2791.3	8.7E-3	754.1	3.9E-1	1238.9	3.0E-1	688.8	5.8E-2	3.6	1.2E+1

UCL 95 - 95th upper confidence level about the mean
ND - no data
XQ - exposure quotient calculated as (UCL95 concentration of ecoCOPC X exposure factor/toxicity threshold concentration)
EcoCOPC - ecological contaminant of potential concern

Table VI.2-11. Comparison of UCL 95 Site and Background XQs Exceeding Unity

	UCL 95	UCL 95	Forb			Tree			Shrew			Raccoon			Fox			Hawk		
EcoCOPC	Conc. (mg/kg)	Bkgd (mg/kg)	Site XQ	Bkgd XQ	Diff Factor	Site XQ	Bkgd XQ	Diff Factor	Site XQ	Bkgd XQ	Diff Factor	Site XQ	Bkgd XQ	Diff Factor	Site XQ	Bkgd XQ	Diff Factor	Site XQ	Bkgd XQ	Diff Factor
INORGANICS																				
Arsenic	7.87	5.63							2.3E+0	1.6E+0	1.4	1.3E+0	9.0E-1	1.4						
Cadmium	0.392	0.509							7.6E+0	9.8E+0	0.8	6.0E+0	7.7E+0	0.8	1.1E+0	1.5E+0	0.8			
Mercury	0.0813	0.0346							2.5E+1	1.1E+1	2.3	1.9E+1	8.3E+0	2.3	3.7E+0	1.6E+0	2.3			
Selenium	0.652	0.241							2.3E+0	8.6E-1	2.7	1.8E+0	6.5E-1	2.7						
Thallium	0.532	0.164							1.1E+2	3.3E+1	3.2	8.3E+1	2.6E+1	3.2	1.6E+1	5.0E+0	3.2			
Vanadium	21.3	17.7	8.5E+0	7.1E+0	1.2	8.5E+0	7.1E+0	1.2	2.9E+0	2.4E+0	1.2	1.8E+0	1.5E+0	1.2						
Zinc	122	82.4	4.9E+0	3.3E+0	1.5	6.1E+0	4.1E+0	1.5										1.7E+1	1.2E+1	1.5

XQ - exposure quotient calculated as (UCL95 concentration of ecoCOPC x exposure factor/toxicity threshold concentration)
EcoCOPC - ecological contaminant of potential concern
Diff Factor - difference factor calculated as Site XQ/Bkgd XQ

Most of these ecoCOPCs have XQs that are based on observed or estimated NOAELs (Opresko et al. 1994). Some risk quotients are calculated using reported LOAELs, which are 10 or more times higher than estimated NOAELs. Thus, their XQs (based on LOAELs) would be less than unity for the ecoCOPCs with XQs (based on NOAELs) < 10. Except for thallium with an XQ of 110 and mercury with an XQ of 25, the ecoCOPCs at New Property do not pose a risk within these limits of uncertainty as shown below.

Upon further examination of the exposure assumptions and toxicity data for thallium, it also does not qualify as an ecoCOC at the New Property. In the toxicity study on which the NOAEL was based, the thallium was administered dissolved in drinking water. Thus, the NOAEL most likely overestimates the availability of thallium in New Property soil. The 10% absorption incorporated in the exposure factor corrects only for differences between availability in soil and solid food, and does not correct sufficiently for differences between exposure to thallium in soil and that in drinking water. Furthermore, the concentration used in the toxicity study that caused the observed effect (reduced sperm motility) in the laboratory rats after 60 days exposure was 100 times higher than the estimated NOAEL. Given the conservatism of this estimate, it is likely that thallium does not pose a risk to ecological receptors exposed to thallium at the measured concentrations in surface soil at New Property.

Similarly, the XQs above 10 for mercury result from a conservative toxicity threshold. The threshold is a NOAEL estimated at 0.01 of the observed LOAEL (Opresko et al. 1994). The observed LOAEL caused kidney and immune impairment, which would not necessarily reduce survival of animal populations under natural conditions. Moreover, the mercury administered in the laboratory experiment was a very soluable form of mercury (mercuric chloride), which likely overestimates the exposure of ecological receptors to mercury in soils (likely mercuric sulfide at the site with a much lower solubility) at the site.

Although XQs were not calculated for the white-tailed deer and the woodcock, these receptors are also not likely to be at risk from the ecoCOPCs. There is unlikely to be risk to the white-tailed deer because their exposure to surface soil at New Property is expected to be only a fraction (0.4) of the exposure of the meadow vole, which showed no risk. And although the dietary limits of the white-tailed deer are less than the dietary limits of the vole, they are not more than 40% lower (Opresko et al. 1994). Likewise, the published dietary limits of the American woodcock are larger than those of the short-tailed shrew for all ecoCOPCs except mercury, thallium, and zinc (Opresko et al. 1994). The dietary limit of the woodcock that is reported for mercury is for methylmercury dicyandiamide, which is unlikely to occur

in soils at the site. There is no reported dietary limit of the woodcock for thallium. The reported dietary limit of the woodcock for zinc (carbonate) is lower than the dietary limit of the shrew for zinc (oxide) by a factor of 112. This difference may be due to the difference in the form of contaminant to which receptors were exposed. Whenever there are reported toxicity data of a comparably soluble form of metal for small mammals and birds in Opresko et al. (1994), the dietary limit is higher for birds. Also, the acceptable effects threshold of the shrew for zinc is most likely somewhat higher than the dietary limit based on the observed NOAEL, but the effects threshold for the woodcock is at least a factor of 10 higher than those reported (Opresko et al. 1994).

6.2.7.2. Future Baseline Risk to Ecological Receptors

The general lack of risks to plants and animals at the New Property can be considered to be true for long-term risks. The available toxicity data for trees indicate that vegetation would be expected to eventually colonize deforested areas if the natural successional process is allowed to proceed. The lack of toxicity thresholds for a few of the organic ecoCOPCs contributes to the uncertainty of any assessment of the risk to future vegetation at the exposure units without trees. Some organic ecoCOPCs would be expected to decrease in concentration through natural degradation processes, although the types of breakdown products could increase. The highest XQs were those for vanadium and zinc, which are unlikely to be as available in natural soils as in phytotoxicity experiments.

6.2.7.3. Comparison to Background Risk

Background samples for soil were collected at various locations outside the New Property boundaries. The risk to ecological receptors exposed to background concentrations of those ecoCOPCs posing the greatest risk at the New Property exposure unit (Table VI-2.8) is presented in Table VI-2.10. Also, risk quotients are shown for ecoCOPCs at the New Property exposure unit that exceed those for the background samples (Table VI-2.11). The risk from arsenic, mercury, selenium, and zinc at the New Property exceeds the background risk for these ecoCOPCs. The risk from cadmium in New Property surface soil is less than that in background soil. The greatest difference between the New Property and background was the 3.2 times greater concentration of thallium in New Property surface soil. However, as described in Section 6.2.7.1, these contaminants do not pose an unacceptable risk to receptors at the New Property.

The largest ratio belongs to thallium for predators. The ratio is 3.2 for shrews, raccoons, and foxes. The XQ is 110 compared to 33 for background for shrews; this is a risk above background of 77 (110 -33 = 77). The XQ is 83 (site) compared to 26 (background) for raccoons; this site-specific risk is shown as an XQ of 57. It is 16 (site) compared to 5 (background) for foxes; this difference is 11. Because of these high quotients and high ratios, it can be concluded that thallium is an ecoCOC except for its dismissal as above described. The only other ecoCOC is mercury. The site XQ is 25 and 11 for background for shrews; this is a risk difference of 14. It is 19 (site) compared to 8 (background) for raccoons; this difference is 11. Mercury is eliminated also on the basis of overly conservative effects data as stated above.

6.2.7.4. Summary of Risk Characterization

The current and future risks to ecological receptors at the New Property exposure unit have been characterized by evaluating ecological assessment endpoints using risk quotients. Risk quotients are calculated for different receptors for every ecoCOPC for which a toxicity threshold concentration was available from published information. Each risk quotient compares two concentrations: (1) the estimated ecoCOPC concentration (mean and RME) in soil to which a given receptor is exposed and (2) the toxicity threshold concentration for the ecoCOPC and receptor. The toxicity threshold concentration is the concentration expected to cause no harm to the receptor, minimal harm with no ecological significance, or minimal harm to a community of organisms (i.e., assemblage of species) exposed to the ecoCOPC in the appropriate medium. Thus, the toxicity threshold is a safe, or protective, concentration.

According to the assessment endpoints defined for the New Property BERA (Section 6.2.2.3), all ecoCOPCs with a risk quotient exceeding 1.0 are potential ecoCOCs. EcoCOPCs for which no exposure quotients were calculated (because threshold concentrations are unavailable) are also potential ecoCOCs and should be examined in relation to those with risk quotients. In general, it is assumed that contaminants with risk quotients are representative of their respective group (e.g., SVOCs) and that those without risk quotients are no more or no less toxic than those with quotients. Therefore, the New Property BERA focuses on those ecoCOPCs for which risk quotients were actually calculated.

One or more contaminants at the New Property exposure unit has exposure quotients greater than 1.0. Numerous others do not have exposure quotients. The risk quotients for all receptors and ecoCOPCs in

soil are given in Table VI-2.7 and VI-2.8. Heavy metals in soil are potential ecoCOCs for plants and carnivorous mammals, shrews, raccoon, fox, and in one case, predatory birds.

Ecological risk quotients for most ecoCOPCs at the New Property exposure unit exceed 1.0 by less than one order of magnitude. Like the hazard index from human health risk assessment, the ecological risk quotients greater than 1.0 indicate that there is some probability that an effect greater than that associated with the toxicity threshold concentration will occur. This is true when there is no uncertainty about the exposure and toxicity concentrations. Because uncertainty is associated with these concentrations, the higher the quotient, the less likely it is that the true risk quotient is less than 1.0. However, none of these ecoCOPCs have high enough quotients to represent a true risk. Uncertainties in the estimated exposure concentrations and the toxicity threshold concentrations are discussed in Section 6.2.8. EcoCOPCs are reevaluated in Section 6.2.9, following the discussion of uncertainties, to focus attention on the ecoCOPCs that likely cause any ecological risk with the greatest certainty.

The risks to ecological receptors from ecoCOPCs in soil at the New Property exposure unit and in the respective background soil were compared. In soil, the ecoCOPCs that are in excess of background in one or more exposure units are arsenic, mercury, selenium, thallium, vanadium, and zinc (Table VI-2.10). The difference factors between New Property and background range is from 0.8 cadmium to 3.2 for thallium (Table VI-2.11).

6.2.8. Uncertainties

Uncertainties in the New Property BERA are discussed in this section by the four interrelated steps of the U.S. EPA approach to ERA: problem formulation, exposure assessment, effects assessment, and risk characterization.

6.2.8.1. Uncertainties in Problem Formulation

Environmental concentrations of contaminants at the New Property site, which are used to calculate XQs and to characterize ecological risk, are based on a limited number of nonrandomly located samples. Given that the assumed distributions of the data are correct, there is a degree of uncertainty about the actual spatial distribution of contaminants, that is, whether a sampling location chosen at random would have a contaminant concentration above or below a given value. If the data do not fit the assumed distribution,

the number of ecoCOPCs and their exposure concentrations could be overestimated or underestimated, depending on how the actual data distribution differs from the assumed data distribution. Because the estimated UCL_{95} of the mean concentrations or maximum detected concentration was used as the RME concentration to calculate XQs, the estimates of risk from ecoCOPCs were conservative. Using UCL_{95} or maximum concentrations decreases the likelihood of underestimating the risk posed by each ecoCOPC and increases the likelihood of overestimating the risk.

The distribution and abundance of organisms comprising the ecological receptors at the New Property site was not quantified by field studies. The lack of quantitative data introduces uncertainties concerning whether, and to what extent, the risk characterization based on the selected receptor species underestimates or overestimates the risk to organisms that were not used in the risk computations but that are found at the New Property. Onsite reconnaissance established the nature and quality of habitat and confirm the presence of vegetation types and of active, visible animal species. Observations made during this reconnaissance justify assumptions about the presence of unobserved organisms that are essential to normal ecosystem functioning, such as soil-dwelling worms and arthropods, herbivorous insects, and aquatic benthic invertebrates. It is possible that one (or more) unobserved species of organism at the New Property is more sensitive than those ecological receptors for which toxicity data were available for use in setting toxicity thresholds. It does not necessarily follow that these unevaluated organisms are at significantly greater risk of harmful ecological effects than that estimated in this BERA, because exposure concentrations for ecological receptors could be greater than those for more sensitive receptors and they could be overestimated generally.

The contaminant screen likely overestimated the number of ecoCOPCs at the New Property. Also, the thresholds for toxicity, mobility, persistence, and bioaccumulation are conservative, and the screening rules are designed to include as ecoCOPCs any contaminant that could possibly bioaccumulate above toxic levels at the site or move offsite and pose a hazard to more sensitive receptors there. The dietary limits and phytotoxicity thresholds of some ecoCOPCs, especially thallium, vanadium, and zinc are likely to be too low by one or two orders of magnitude. For example, the experimental conditions under which test plants and animals were exposed to thallium and vanadium were unrepresentative of natural conditions at the New Property (Suter et al. 1993b; Opresko et al. 1994). Further, the effects endpoint in the test of thallium toxicity, sperm motility (Suter et al. 1993b), may not result in observable harmful effects in natural conditions.

6.2.8.2. Uncertainties in Exposure Assessment

The movement of contaminants from the New Property contaminant source media to ecological receptors was not measured for this BERA. This introduces uncertainties about the actual modes and pathways of exposure and the actual exposure concentrations of these contaminants to the ecological receptors. Exposure concentrations can differ from the measured environmental concentrations as a result of physical and chemical processes during transport from source to receptor and as a result of biomagnification through the food web. These processes were not evaluated quantitatively in this BERA. Although bioaccumulation was estimated for those receptors ingesting food for which toxicity thresholds were available, it is possible that exposure to top predators is underestimated because the biomagnification of certain contaminants in their prey was overlooked. It is more likely that exposure to many ecoCOPCs, especially inorganics such as thallium are overestimated by the default bioaccumulation factors of 10 and 100.

There is little uncertainty that the modes and pathways used to characterize the exposure to ecological receptors at the New Property are most important for the relatively large and active species in terrestrial habitats. Soil-dwelling terrestrial animals may be exposed to contaminants in soil by way of inhalation following volatilization, but gaseous concentrations in soil interstices, cavities, and burrows were not available for the New Property. Therefore, the exposure to burrowing organisms at the site from contaminated soil and soil interstitial water may be underestimated if gas concentrations are larger than soil concentrations, which is unlikely. The estimate of risk will also be underestimated if toxicity thresholds are lower for inhalation than they are for ingestion. Conservative exposure estimates were used for adsorption of ecoCOPCs from soil (0.1) and absorption from tissue (1.0). The fraction of diet obtained from each exposure unit was set at 1.0 (100%) for most small species and 0.1 (10%) for hawks.

Overestimating exposure by using conservative exposure concentrations balances the underestimation of exposure that results from neglecting exposure modes and pathways of lesser importance.

Estimates of exposure concentrations are likely overestimated by one or more orders of magnitude because of conservative exposure factors. Sources of conservatism in the exposure factors include (1) using the highest published bioaccumulation factor, irrespective of species and environmental conditions, (2) assuming high incidental soil ingestion rates for shrews, and (3) constraining all but the largest predators to obtaining all their diet from the exposure unit in which they are located. In particular, it should be

noted that, while the largest bioaccumulation factors may overestimate bioaccumulation at the New Property by one to two orders of magnitude for some ecoCOPCs, very high bioaccumulation as well as biomagnification are well documented for other contaminants, although not necessarily those detected at the New Property.

Finally, the exposure of plants and animals to contaminants below detection limits is not considered in the BERA. Also, the exposure of ecological receptors to tentatively identified compounds is not considered.

6.2.8.3. Uncertainties in Effects Assessment

There is little doubt that, for some New Property organisms, the ecoCOPCs singly have harmful effects at concentrations above the toxicity threshold concentrations used to characterize the risks. Toxicity thresholds were based on concentrations reported to have no or little effect on the test organism or were estimated conservatively from published toxicity data. Dietary limits used as threshold levels for soils were derived from NOAELs or LOAELs using safety factors of 1, 10, and 100 (Opresko et al. 1994). These thresholds would underestimate the risks only to organisms at New Property that are considerably more sensitive than the study organisms. They are more likely to overestimate the risk to organisms that are equally or less sensitive than the study organisms. There remains the possibility that some thresholds were set at levels at or above which some harm would occur to organisms at the New Property.

The calculated risks to the ecological receptors at the New Property are the risks of individual contaminants. The risks from exposure to multiple contaminants depend on contaminant interactions; effects could be greater or lesser than those from a single chemical. This BERA provides findings for ecoCOPC-specific risk estimates. An evaluation of risk from chemical mixtures cannot be conducted without additional data and evaluation of alternative models of contaminant interaction.

Additional uncertainty exists as to the pertinence of organismal toxicity for characterizing the risk to populations and ecosystems. It is possible that populations may compensate for the loss of large numbers of juveniles or adults with increased survival or birth-rates, and habitats or ecosystems may possess functionally redundant species that are less sensitive to contaminants. The uncertainty as to whether ecosystems at the New Property possess these buffering mechanisms justifies a conservative approach to risk assessment based on organismal toxicity thresholds (i.e., NOAELs).

6.2.8.4. Uncertainties in Risk Characterization

The uncertainties described above ultimately produce uncertainty in the quantification of current and future risks to plants and animals at the New Property. There are four additional areas of uncertainty in the risk characterization: offsite risk, cumulative risk, future risk, and background risk.

Offsite Risk

The risks to offsite receptors cannot be characterized without benefit of contaminant tracer studies and offsite plant and animal and habitat surveys. Offsite receptors can be exposed to contaminants via physical and organismal transport processes, but evaluating the magnitude of this exposure would require additional studies. It is unlikely that offsite receptors would have lower toxicity thresholds for contaminants than the thresholds used for onsite receptors. Also, there is little reason to expect that contaminants migrating offsite would be concentrated above measured concentrations at the New Property site unless a contaminant bioconcentrates in organisms that move extensively on and off the site. In general, the risk to most offsite receptors is likely to be overestimated rather than underestimated by the risk estimate for onsite receptors.

Cumulative Risk

The BERA estimates the risk to populations of ecological receptors from individual contaminants. Generally, the methods used are sufficiently conservative that individual risks are overestimated. Nevertheless, cumulative risk is possible when several living plants and animals are affected simultaneously. Harmful effects in ecosystems (including effects on individual organisms) may cascade throughout the system and have indirect effects on the ability of a population to persist in the area even though individual organisms are not sensitive to the given contaminants in isolation. Therefore, the ecological risk characterization for the New Property site may underestimate actual risks to plants and animals from cumulative risks.

Future Risk

A third area of uncertainty in the ecological risk characterization is the future risk to the plants and animals from contamination at the New Property site. The BERA characterizes the current risk based on

chronic exposure to measured concentrations of toxicants with the potential to persist in the environment for extended periods of time. Risk quotients for trees estimate the risk to plant species that would be natural parts of future successional stages at these areas. Nevertheless, possible mechanisms exist that could significantly increase (e.g., erosion, leaching to surface or groundwater) or decrease (e.g., enhanced microbial degradation) the risk to future plants and animals at the site.

Background Risk

Another source of uncertainty is ecological risk relative to background conditions. Although only inorganics with concentrations above background were examined in the ecoCOPC screening, some ecoCOPCs are above background only by a statistically insignificant amount, such that concentrations at the exposure unit are actually less than the background concentration. For example, mean concentrations (0.509 mg/kg) of cadmium in background soils are similar to mean concentrations (0.392 mg/kg) at the site. The conservative approach to comparing site concentrations to background likely overestimates the risk from ecoCOPCs whose source is not associated with a given exposure unit.

Summary

The most important uncertainties in the New Property BERA are those surrounding the estimates of the contaminant concentrations to which ecological receptors are actually exposed (exposure concentrations) and the concentrations that present an acceptable level of risk of harmful effects (toxicity thresholds). These uncertainties arise from multiple sources, especially from the lack of site-specific data on contaminant transport and transformation processes, organismal toxicity, animal behavior and diet, population dynamics, and the response of plant and animal populations to stressors in their environments. Despite these uncertainties, the available site-concentration data and published exposure and effects information allow risks to be characterized for the exposure unit.

6.2.9. Summary and Conclusions of the Baseline Ecological Risk Assessment

A BERA was performed in accordance with written and other guidance from the Ohio EPA, EPA Region V, and U.S. EPA. This guidance recognizes step-by-step procedures. For example, EPA Region V uses a five-step process, and U.S. EPA uses a framework of four interrelated steps. Despite differences in the guidance from different organizations, all guidance adheres to an ERA process that

includes problem formulation, followed by exposure assessment and effects assessment and culminating in risk characterization with attention to uncertainties and summarization.

Risk quotients were calculated for the New Property exposure unit, and the associated risk was characterized with sufficient confidence to support a decision that the ecological receptors at the exposure units are or are not at risk of possible harmful effects from site contamination.

The New Property covers approximately 0.2 square miles of natural and human-made habitats. Forests occupy about 60% of the total area. Grassy and shrub areas occupy most of the remainder. The appearance of the abundant vegetation and animal life suggest no immediate endangerment. Of the many observed plant and animal species, 8 terrestrial species were selected as ecological receptors. The species are honeysuckle (forbs), black locust (trees), raccoons, woodcocks, voles, shrews, deer, and hawks. The contaminant screening based on conservative toxicity thresholds and exposure assumptions identified 30 ecoCOPCs for New Property soil.

The protection of ecological resources, such as the species and habitats described above, from harmful effects arising from exposure to ecoCOPCs are presented as assessment and measurement endpoints. Assessment endpoints are technical attributes of ecological systems based on societal values. The end points are stated in terms of ratios; ratios that exceed unity (1.0) suggest the need for further examination. Measurement endpoints are the measurements used to provide data to the assessment endpoints. These ratios or quotients compare (1) the environmental concentration of a contaminant in a medium adjusted where necessary by exposure factors to (2) a dietary, toxicological, or other protective threshold.. The likelihood of harm to plants and animals is expressed by a ratio; any number greater than unity means harm is possible, and the greater the number is above unity, the greater the likelihood of harm or risk.

Once exposure was adjusted to account for dilutions, concentrations, and other logical exposure factors, risk quotients were calculated for the above ecoCOPCs. Risk quotients ranged from 10^{+2} to 10^{-3}, depending on receptor, contaminant, medium, and exposure unit. Only a few ecoCOPCs showed risk quotients greater than 1.0, thus qualifying as possible ecoCOCs: arsenic, cadmium, mercury, selenium, thallium, vanadium, and zinc. Of these, mercury and thallium also exceed the risk quotient of 10 and, therefore, qualify as much more likely ecoCOCs in soil. Following a discussion of the appropriateness of ecotoxicological effects data, background risk, and uncertainty about the methods and data used to compute risk quotients, mercury and thallium are eliminated as ecoCOCs at the New Property. For

example, when background risks are subtracted from site baseline risks, the adjusted ecological risk gets smaller for each COPC. Further, when the overly conservative ecotoxicological effects data for each COPC are presented and discussed, the likelihood greatly diminishes of any real ecological COCs in the soil at the New Property.

In summary, no contaminants are ecoCOCs in soil because (1) they are not present at the New Property at concentrations greatly exceeding background and other exposure units; (2) they are unlikely to bioaccumulate in prey (such as insects) at high levels which, in turn, expose their predators; and/or (3) their published toxicity thresholds (dietary limits, and effects levels) indicate no harmful effects on organisms at observed concentrations.

Section 7

7. SUMMARY AND CONCLUSIONS

The RI at the New Property was performed to characterize the nature and extent of contamination and its potential for migration; to evaluate risk to human health and the environment; and to assess the need for site remediation. The investigation was conducted in accordance with EPA guidance and the approved OU5 RI/FS Work Plan (DOE 1993a).

The specific objectives of this RI were met and are summarized below:

- Identify the presence, nature, and extent of contamination in groundwater, seeps, soils, and sediment.
- Identify contaminants and establish their concentration ranges with respect to background levels or ARARs.
- Identify site geologic features that affect the fate and transport of contaminants.
- Provide groundwater data and hydrogeologic parameters to assess groundwater flow directions and rates that will affect the fate and transport of contaminants.
- Provide chemical and radiological data on the quality of groundwater, seeps, soil, and sediment that will support a BRA.
- Perform the BRA.
- Provide data for the FS alternatives screening and provide data necessary to assess the need for site remediation.

7.1. SUMMARY

This section summarizes the nature and extent of contamination, fate and transport mechanisms, and baseline human health and ecological risk assessment results.

7.1.1. Nature and Extent of Contamination

The nature and extent of contamination was determined from one round of soil (surface and subsurface), sediment, seep, and groundwater sampling during this investigation and two rounds of groundwater sampling from previously installed wells.

A total of 32 surface soil samples (0-2 feet BGS), 11 subsurface soil samples (greater than 2 feet BGS), 27 sediment samples, eight seep samples, and six groundwater samples were collected during this RI and sent to the analytical laboratories. These samples, supplemented with 14 groundwater samples collected from existing monitoring wells, comprise the analytical data set used in the BRA.

The nature and extent of contamination at the New Property can be summarized as follows:

- Generally, the New Property contains low levels of contaminants that are mostly found in surface soils. The primary contaminants detected above background were metals, SVOCs (mostly PAHs), and radionuclides.

- Some radiological contaminants were detected at the New Property. Pu-238 contamination was detected in surface soil samples collected along the northern perimeter road south of Building 21, and in a small area south of the Spoils Disposal Area. Th-228, Th-230, and Th-232 were also detected in surface soil samples above background levels in these same areas but to a lesser extent. Radiological contaminants were infrequently detected at low concentrations in groundwater and seep samples. At least one radionuclide was detected in each groundwater sample.

- Metals in surface soil were found in two zones. The first zone is along the northern perimeter road and the second zone is south (downgradient) of the Spoils Disposal Area.

- PAHs in surface soils were found in four zones. These zones included the northern perimeter road, the main branch of the ephemeral stream, the upper reaches of the ephemeral stream, and an area south of the Spoils Disposal Area.

- Of the four PAH COCs in surface soils (benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene), benzo(b)fluoranthene was the most widely distributed and was found in each of the four PAH contamination zones. The other three PAHs were mostly found along the main branch of the ephemeral stream.

- Fewer contaminants were detected in subsurface soils than in surface soils. Average concentrations of metals and radionuclides generally increased with depth. Average concentrations of SVOCs generally decreased with depth.

- The groundwater within the New Property contains only few contaminants at low concentrations. No plumes were identified; rather, contaminants in groundwater were single point occurrences and sparsely scattered over the New Property.

7.1.2. Fate and Transport

Contaminant release mechanisms at the New Property include volatilization, wind erosion, soil erosion, and dissolution. Transport mechanisms include wind, surface water runoff, infiltration, and groundwater flow.

7.1.2.1. Release Mechanisms

Soil erosion is likely the predominant release mechanism at the New Property, most notable in the ephemeral stream drainage. This mechanism may be responsible for the release and redeposition of the PAHs, pesticides, and radionuclides that were detected in the surface soils. Infiltration and dissolution are minor release mechanisms that may be responsible for the distribution of VOCs, radionuclides, and water soluble metals in surface and subsurface soil.

Volatilization and wind erosion are not significant release mechanisms, due partly to the heavy vegetation covering the New Property.

7.1.2.2. Transport Mechanisms

Movement of contaminated sediment to the ephemeral streams via surface water runoff and erosion appears to be the primary transport mechanism at the New Property. This mechanism contributes to the distribution of PAHs and radionuclides "downstream" from the Spoils Disposal Area and the Area 1 "arm." Surface runoff also effectively transports water soluble metals. Migration of dissolved and suspended contaminants via groundwater flow is another significant transport mechanism. It is likely that VOCs, SVOCs, metals, and radionuclides will eventually migrate offsite with the groundwater.

Wind transport, though not a significant transport mechanism of contaminants at the New Property, probably accounts for much of the contamination distributed onsite from offsite sources. Infiltration appears to be a minor transport mechanism, but may be responsible for some of the contaminants found in vadose soils and in the groundwater.

7.1.3. Risk Assessment

Human health and ecological risks were assessed. The BRA can be summarized as follows:

- No ecoCOCs were identified in the ecological BRA.

- Few contaminants were identified as human health COCs in any medium. Four PAH COCs were identified in soil, and five metals and one radionuclide were identified as COCs in groundwater.

- Groundwater COCs include arsenic, beryllium, chromium, manganese, nickel, and Am-241, which pose human health risks to future offsite residential adults and children. However, no groundwater plumes or discernible trends of these contaminants were noted.

- Human health risks for Ra-226 and tritium in groundwater exceed the EPA target cancer risk level. However, this risk is indistinguishable from the background risk from Ra-226 and tritium; therefore, neither radionuclide is considered a COC.

- Benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3,-cd)pyrene are PAH COCs detected in surface soils that pose human health cancer risks within the EPA risk range of 1.0×10^{-6} to 1.0×10^{-4}.

- Human health risks for arsenic, mercury, and manganese in soils exceeded EPA risk levels for cancer (arsenic) and noncancer (mercury and manganese) but risks posed by these contaminants at the New Property are less than risks posed by background. Thus, arsenic, mercury, and manganese are not identified as COCs in soils.

Table VII.1 summarizes human health risks associated with contaminants found in New Property media.

7.2. CONCLUSIONS

Conclusions of this RI Report are:

- Radionuclides were detected in soils and groundwater at the New Property; however, concentrations were low and occurrences were infrequent. Radionuclides, including plutonium, thorium, and tritium, are not significant contaminants at the New Property because they do not pose significant risk to human health or the environment.

- With the exception of isolated high concentrations of metals in the "farm trash area," contaminants that were detected in groundwater and seeps do not have apparent sources within the New Property. Groundwater occurrences of contamination do not have apparent relationships to soil occurrences of the same contaminants. Consequently, the New Property does not appear to be impacting the quality of the groundwater resources in the area.

- Metals and PAHs are ubiquitous in soils and no relation can be drawn between their occurrence at the New Property and operations at the Mound Plant. Although past Mound Plant activities may have contributed to metals and PAH contamination at the site, offsite sources may also be contributing to the occurrence of these compounds at the New Property.

Table VII.1. Summary of Human Health Risks

CONTAMINANTS	COC?	PATHWAY	SCENARIO	SITE RISK		BACKGROUND RISK	
				Noncancer[1]	Cancer[2]	Noncancer	Cancer
SOIL/SEDIMENT							
Benzo(a)pyrene	Yes	dermal	current trespasser	NA	1.22E-6	NA	NA
			future industrial	NA	1.65E-5	NA	NA
Benzo(b)fluoranthene	Yes	dermal	future industrial	NA	2.37E-6	NA	NA
Dibenzo(a,h)anthracene	Yes	dermal	future industrial	NA	1.92E-6	NA	NA
Indeno(1,2,3-cd)pyrene	Yes	dermal	future industrial	NA	1.13E-6	NA	NA
Arsenic	No[3]	dermal	future industrial	NA	6.81E-6	NA	7.44E-6
		ingestion		NA	2.41E-6	NA	2.63E-6
Mercury	No[3]	dermal	future industrial	1.54	NA	2.84	NA
			future excavation	1.51	NA	2.83	NA
Manganese	No[3]	inhalation	future excavation	1.58	NA	2.54	NA
GROUNDWATER							
Beryllium	Yes	ingestion	future adult	NA	2.73E-5	NA	1.21E-5
			future child	NA	1.27E-5	NA	5.65E-6
Chromium	Yes	ingestion	future adult	1.69	NA	NA	NA
			future child	3.95	NA	1.74	NA
Manganese	Yes	ingestion	future adult	38.4	NA	1.17	NA
			future child	89.5	NA	2.74	NA
		dermal	future adult	2.76	NA	NA	NA
			future child	4.25	NA	NA	NA
Nickel	Yes	ingestion	future child	1.26	NA	NA	NA
Arsenic	Yes	ingestion	future adult	6.05	1.17E-3	2.57	4.96E-4
			future child	14.1	5.45E-4	6.00	2.32E-4
		dermal	future adult	NA	9.55E-6	NA	4.06E-6
			future child	NA	2.95E-6	NA	1.25E-6
Americium-241	Yes	ingestion	future adult	NA	2.37E-6	NA	NA
Radium-226	No[3]	ingestion	future adult	NA	2.22E-6	NA	2.57E-6
Tritium	No[3]	ingestion	future adult	NA	2.01E-6	NA	2.07E-6

(1) Noncarcinogen Hazard Quotient (HQ) effects. Per EPA guidance, noncarcenogenic risk is present if HQ exceeds 1.0.
(2) Excess lifetime cancer risk. Per EPA guidance, cancer risk is present if excess lifetime cancer risk exceeds 1.0E-6.
(3) Contaminant exceeded EPA risk levels for cancer (1.0E-6) and/or noncancer (1.0) but risk associated with contaminant at site is indistinguishable from risk associated with contaminant in background.
Note: The greatest cancer risk associated with plutonium-238 is 1.00E-7 (ingestion - future industrial). The greatest cancer risk associated with thorium is 3.40E-8 (inhalation - future excavation).
NA Not applicable because HQ <1 or cancer risk <1.0E-6 or not calculated

In some cases, New Property risks appear to be higher than the background risks; in others, background risks appear to be higher. The results are so similar that they do not represent real differences, within the ability to measure and calculate risks. This difference between background and the New Property risks is not sufficiently large to require remediation at the New Property.

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Section 8

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Plate 1

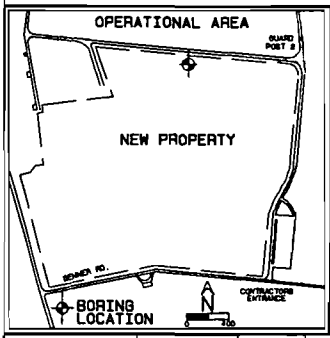
Appendix A

APPENDIX A
BOREHOLE PROFILES AND WELL CONSTRUCTION DIAGRAMS

GTGS PATTERNS FOR BORING LOGS

	GW Well graded gravels, gravel-sand mixtures, little or no fines
	GP Poorly graded gravels, gravel-sand mixtures, little or no fines
	GM Silty gravels, gravel-sand-silt mixtures
	GC Clayey geavels, gravel-sand-clay mixtures
	SW Well graded sands, gravelly sands, little or no fines
	SP Poorly graded sands, gravelly sands, little or no fines
	SM Silty sands, sand-silt mixtures
	SC Clayey sands, sand-clay mixtures
	ML Inorganic silts and very fine sands, silty or clayey fine sands or clayey silts with slight plasticity
	CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	CH Inorganic clays of high plasticity, fat clays
	OH Organic clays of medium to high plasticity organic silts
	PT Peat, humus, swamp soils with high organic content
	SHALE
	Interbedded shale and limestone bedrock
	No recovery or not recorded

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B398	Page 1 of 1



Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Cable Tool
Drilling Dates: 6/21, 6/22, 6/23/94
Logged By: Susan Abston
Total Depth (ft BGS): 33.02

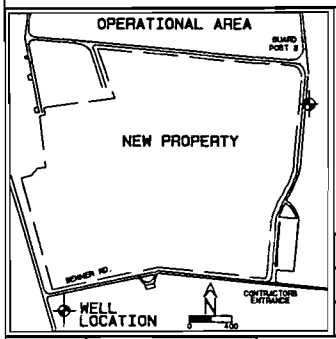
COORDINATES

State Plane; Northing:	596313.6630
Easting:	1496515.3100
Mound Plant; South:	3867.0687
West:	3569.1371
Ground Surface Elevation (ft MSL):	864.02

GROUNDWATER	DEPTH (ft BGS)	COMMENTS
▼	29.02	Encountered during drilling on 6/22/94.
▽	29.62	Measured 6/23/94, not suitable for well placement.
▽		

BLOW COUNTS	RECOVERY (ft)	F.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES: Geotech.	SAMPLES: Water	SAMPLES: Soil	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
		0				B39801		CL	0-1.5 CLAY, some silt, trace gravel; organic material; 5YR3/2 greyish brown.
		0	4						1.5-33.02 Interbedded shale and limestone bedrock.
		0	8						
		0							
		0	12						
NA	NA	0	16						
		NR	20						
			24						
			28 ▼ ▽						
			32						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	WELL LOG W399	Page 1 of 1



Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: Cable Tool
Drilling Fluid: Water
Drilling Completed: 6/14/94
Well Installed: 6/15/94
Logged By: Susan Abston
Total Depth (ft BGS): 34.0

COORDINATES
State Plane; Northing: 595949.8530
Easting: 1497616.6500
Mound Plant; South: 4653.3514
West: 2716.454
Ground Surface Elevation (ft MSL): 887.54
Top of Casing Elevation (ft MSL): 889.67

GROUNDWATER	DATE	DEPTH (ft BGS)	COMMENTS
▼	6/14/94	31.7	Encountered during drilling
▽	6/15/94	5.3	Measured prior to well installation.

DEPTH (ft BGS)	SAMPLES: Water	SAMPLES: Soil	WELL CONSTRUCTION	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
0	B39901		steel protective casing with locking cap (2.30 ft AGS); concrete pad		CL	0-3.8 CLAY, some silt, trace gravel; firm; dry; organic material; 10YR3/3 dark brown.
4 ▽			cement bentonite grout			3.8-34.0 Interbedded shale and limestone bedrock.
8			2" stainless steel riser			
12			(14.10 ft BGS)			
16			3/8" bentonite pellet seal			
20			(21.30 ft BGS)			
			(22.80 ft BGS)			
24			2", 0.01 slotted stainless steel screen			
28			Global #5 sand pack			
▼ 32	W39901		(32.80 ft BGS) stainless steel cap (33.90 ft BGS) 6" borehole diameter			

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	WELL LOG W400	Page 1 of 1

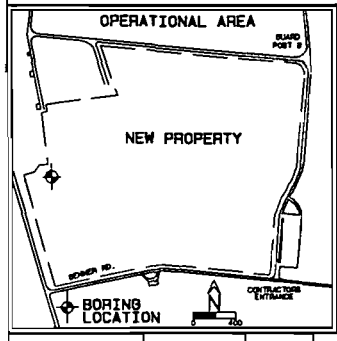
Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: Cable Tool
Drilling Fluid: Water
Drilling Completed: 6/28/94
Well Installed: 6/28/94
Logged By: Susan Abston
Total Depth (ft BGS): 34.0

COORDINATES	
State Plane; Northing:	595678.0580
Easting:	1495392.6100
Mound Plant; South:	3982.1137
West:	4854.1326
Ground Surface Elevation (ft MSL):	705.27
Top of Casing Elevation (ft MSL):	707.21

GROUNDWATER	DATE	DEPTH (ft BGS)	COMMENTS
▼	6/28/94	22.87	Encountered during drilling.
▽			

DEPTH (ft BGS)	SAMPLES Water	SAMPLES Soil	WELL CONSTRUCTION	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
			steel protective casing with locking cap (2.50 ft AGS); concrete pad			
0	B40001				CL	0-10.0 CLAY, some silt; rootlets; angular limestone fragments; 10YR5/6 brown.
4			cement bentonite grout			
8			2" stainless steel riser			
12					GW	10.0-23.0 GRAVEL, some fine sand; well graded; angular to subrounded granules and pebbles; 10YR5/4 yellowish brown.
			(14.20 ft BGS); 3/8" bentonite pellet seal; (18.00 ft BGS)			
16						
20			Global #5 sand pack			
			(22.51 ft BGS)			
24					SP	23.0-29.0 SAND; fine; well sorted; trace cobbles. F.I.D.=5.0ppm
			2", 0.01 slotted stainless steel screen			
28	W40001	B40002	Global #5 sand pack		GW	29.0-34.0 SAND and GRAVEL; fine sand, angular to subrounded granules and pebbles; 10YR5/4 yellowish brown.
32			(32.50 ft BGS); stainless steel cap; (34.00 ft BGS); 6" borehole diameter			

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B401	Page 1 of 1



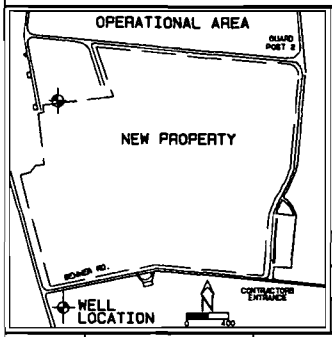
Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Hollow-Stem Auger
Drilling Dates: 6/14/94
Logged By: Mike Klidzejs
Total Depth (ft BGS): 30.0

COORDINATES
State Plane; Northing: 595241.4060
Easting: 1495173.3400
Mound Plant; South: 4289.1848
West: 5234.2000
Ground Surface Elevation (ft MSL): 703.68

GROUNDWATER	DEPTH (ft BGS)	COMMENTS
▼	22.9	Encountered during drilling. Sample collected.
▽		
▽		

BLOW COUNTS	RECOVERY (ft)	F.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES: Geotech.	SAMPLES: Water	SAMPLES: Soil	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
3 1 1 3	0.8	0				B40101		PT	0-4.0 SILT, trace gravel; organic material; moist; 2.5YR2.5/0 gray.
NR	0.8	0							
7 8 10 12	2.0	0	4					OH	4.0-8.0 CLAY, some silt, trace sand and gravel; rootlets; 7.5YR3/2 dark brown.
6 7 7 12	1.6	0							
3 6 4 10	1.2	0	8					CL	8.0-10.0 CLAY, some silt and gravel; subround to rounded granules and pebbles; 5YR4/2 dark reddish gray.
29 14 27 21	0.1	0							10.0-12.0 No recovery.
7 9 12 19	1.6	0	12					GM	12.0-14.0 CLAY, SILT and GRAVEL; angular to subrounded granules and pebbles; 5YR7/1 light gray.
14 23 26 22	1.0	0						GW	14.0-16.0 GRAVEL, some silt and sand; angular granules and pebbles; 5YR7/1 light gray.
8 22 19 31	1.6	0	16					GW	16.0-22.0 GRAVEL, some silt and sand; angular granules and pebbles; moist; 10YR6/2 pale brown.
34 31 28 42	1.8	0							
11 18 24 25	1.1	0	20						
14 19 10 12	1.2	0	▼					GW	22.0-23.5 GRAVEL, some silt and sand; angular pebbles and cobbles; moist; 10YR7/1 light gray.
			24					SM	23.5-24.0 SAND; well sorted; saturated.
21 24 50 4	NR	0			W40101	B40102		GW	24.0-26.0 SILT, SAND and GRAVEL; subangular to subrounded granules and pebbles; saturated; 10YR5/3 brown
15 20 35 4	2.0	0						GW	
80 45 33 31	2.0	0	28						26.0-30.0 GRAVEL, some silt and sand; subangular to subrounded granules, pebbles, and cobbles; poorly sorted; saturated.
			32						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	WELL LOG W402	Page 1 of 1



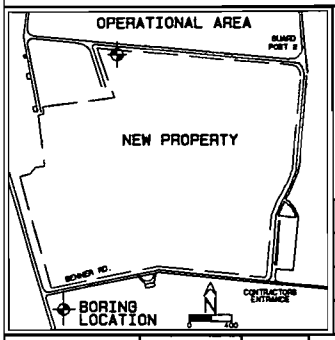
Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: Cable Tool
Drilling Fluid: Water
Drilling Completed: 6/30/94
Well Installed: 6/30/94, 7/16/94
Logged By: Susan Abston
Total Depth (ft BGS): 32.6

COORDINATES
State Plane; Northing: 595963.0000
Easting: 1495267.6500
Mound Plant; South: 3671.0002
West: 4850.2214
Ground Surface Elevation (ft MSL): 704.56
Top of Casing Elevation (ft MSL): 706.08

GROUNDWATER	DATE	DEPTH (ft BGS)	COMMENTS
▼	6/30/94	22.09	Encountered during drilling.
▽	7/20/94	21.67	Sample collected.

DEPTH (ft BGS)	SAMPLES: Water	SAMPLES: Soil	WELL CONSTRUCTION	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
0	B40201		steel protective casing with locking cap (2.30 ft AGS); concrete pad		CL	0-5.5 CLAY, some silt, trace gravel; 7.5YR4/2 brown.
4			cement bentonite grout		GC	F.I.D.=4.0ppm 5.5-12.0 CLAY, GRAVEL and SAND; subangular to rounded granules and pebbles; 7.5YR5/3 brown.
8			2" stainless steel riser			
12					SW	12.0-23.5 SAND and GRAVEL; poorly sorted.
16			(15.30 ft BGS); 3/8" bentonite pellet seal			
20			(19.13 ft BGS); (20.74 ft BGS)			
24	W40201, W40211	B40202	2", 0.01 slotted stainless steel screen		SP	23.5-26.6 SAND; fine; well sorted; saturated; 5YR4/4 brown.
28			Global #5 sand pack		SM GW	26.6-27.0 SAND, some silt and clay; fine sand; well sorted; 5YR4/1 brownish grey. 27.0-32.6 SAND and GRAVEL; fine to coarse sand; poorly sorted.
32			(31.01 ft BGS); stainless steel cap (32.60 ft BGS); 6" borehole diameter			

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B403	Page 1 of 1



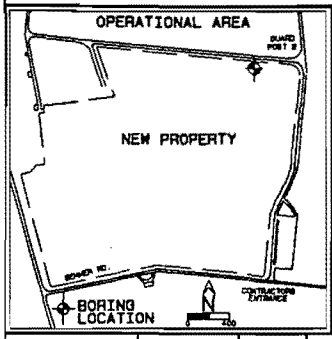
Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Hollow-Stem Auger
Drilling Dates: 6/29/94
Logged By: Mike Klidzejs
Total Depth (ft BGS): 7.5

COORDINATES
State Plane; Northing: 596415.4439
Easting: 1495826.6401
Mound Plant; South: 3489.887
West: 4154.252
Ground Surface Elevation (ft MSL): 798.75

GROUNDWATER	DEPTH (ft BGS)	COMMENTS
▼		None encountered.
▽		
▽		

BLOW COUNTS	RECOVERY (ft)	P.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES: Geotech.	SAMPLES: Water	SAMPLES: Soil	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
8 12 8 12	1.2	0			B40301 B40311			ML CL CL	0-0.5 SILT and CLAY; organic material; 5Y3/1 very dark gray. 0.5-1.2 CLAY, some silt, trace gravel; stiff; mottled; 5Y3/2 dark olive gray and 5Y5/4 olive.
7 11 12 40	1.6	0							
8 11 16 19	0.9	0	4			B40302			1.2-7.5 CLAY, some gravel; stiff; 5Y6/4 pale olive.
28 50/5	0.3	0							
			8						
			12						
			16						
			20						
			24						
			28						
			32						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B404	Page 1 of 1



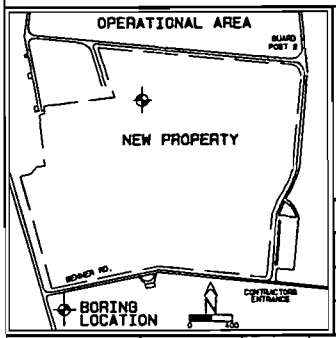
Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Hollow-Stem Auger
Drilling Dates: 6/29/94
Logged By: Mike Klidzejs
Total Depth (ft BGS): 8.8

COORDINATES
State Plane; Northing: 596275.6400
Easting: 1497120.7100
Mound Plant; South: 4151.7881
West: 3033.5161
Ground Surface Elevation (ft MSL): 877.99

GROUNDWATER	DEPTH (ft BGS)	COMMENTS
		None encountered.

BLOW COUNTS	RECOVERY (ft)	F.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES Geotech.	SAMPLES Water	SAMPLES Soil	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
3 6 6 8	1.9	0				B40401		OH	0-0.7 SILT and CLAY; organic material; 10YR4/3 brown.
7 7 9 22	1.7	0						CL	0.7-4.0 CLAY, some silt; stiff; organic material; 10YR5/6 yellowish brown.
10 19 12 25	2.0	0	4	B40421		B40402		CL	4.0-5.2 CLAY, some silt and gravel; stiff; 10YR4/3 brown.
6 8 7 9	1.9	0				B40412		SM	5.2-6.0 SILT and SAND, some gravel; poorly sorted; 10YR4/4 dark yellowish brown.
8 50/5	0.9	0	8					OH	6.0-8.8 CLAY, some silt, sand and gravel; 10YR4/4 dark yellowish brown.
			12						
			16						
			20						
			24						
			28						
			32						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B405	Page 1 of 1



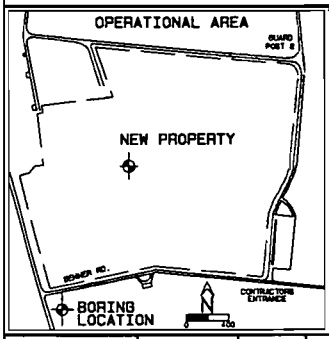
Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Hollow-Stem Auger
Drilling Dates: 6/22/94
Logged By: Mike Klidzejs
Total Depth (ft BGS): 11.3

COORDINATES
State Plane; Northing: 595980.8650
Easting: 1496057.7100
Mound Plant; South: 3981.1068
West: 4123.3460
Ground Surface Elevation (ft MSL): 771.50

GROUNDWATER	DEPTH (ft BGS)	COMMENTS
		None encountered.

BLOW COUNTS	RECOVERY (ft)	P.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES Geotech.	SAMPLES Water	SAMPLES Soil	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
NA	NA	0		B40521		B40501		OH	0-0.5 CLAY, some silt, trace gravel; organic material; 10YR3/2 very dark grayish brown.
55 18 16 17	2.0	0						OH	0-2.0 Shelby tube sample and bucket sample collected.
11 10 11 12	1.8	0	4					CL	2.0-4.0 CLAY, some silt, trace gravel; organic material; 10YR3/2 very dark grayish brown.
9 13 13 15	1.6	0							4.0-10.6 CLAY, some silt, trace gravel; 10YR6/6 brownish yellow.
9 10 13 15	NR	0	8			B40502			
11 19 55 50	1.3	0						CL	10.6-11.3 CLAY, some silt; hard; 5Y5/1 gray.
			12						
			16						
			20						
			24						
			28						
			32						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B406	Page 1 of 2



Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Hollow-Stem Auger
Drilling Dates: 6/22, 6/23, 6/27/94
Logged By: Mike Klidzejs
Total Depth (ft BGS): 63.0

COORDINATES
State Plane; Northing: 595353.4240
Easting: 1495951.9400
Mound Plant; South: 4508.8136
West: 4478.8668
Ground Surface Elevation (ft MSL): 733.36

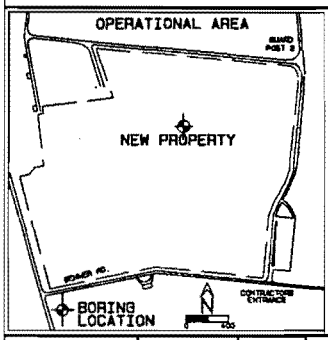
GROUNDWATER	DEPTH (ft BGS)	COMMENTS
		None encountered.

BLOW COUNTS	RECOVERY (ft)	P.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES Geotech.	SAMPLES Water	SAMPLES Soil	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
3 6 10 11	1.6	0				B40601		OH SM	0-0.5 CLAY, some silt; organic material; 10YR3/2 very dark grayish brown.
8 10 11 13	1.4	0							0.5-4.0 SILT, some clay and gravel; poorly sorted; 10YR6/4 light yellowish brown.
8 10 10 16	1.8	0	4					CL	4.0-6.0 CLAY; moist; sticky; 10YR4/2 dark grayish brown.
6 7 8 10	1.8	0						CL	6.0-10.0 CLAY, trace coarse sand; moist; sticky; 10YR4/2 dark grayish brown. (6.0-24.0 Geotechnical bucket sample B40621 collected.)
7 10 14 15	1.9	0	8						
NA	1.9	0							10.0-12.0 Shelby tube sample B40621 collected.
8 10 13 15	1.9	0	12					CL	12.0-14.0 CLAY, trace coarse sand; moist; sticky; 10YR6/3 pale brown.
14 18 24 33	0.4	0		B40621					14.0-16.0 No sample collected.
9 23 16 17	2.1	0	16					CL	16.0-22.0 CLAY, trace coarse sand; moist; sticky; 2.5Y3/2 very dark grayish brown.
9 17 13 17	1.6	0							
7 14 39 80	1.3	0	20						
NA	0	0							22.0-24.0 No sample collected.
8 11 24 35	0.9	0	24					GM	24.0-30.0 SAND, SILT and GRAVEL; moist.
50/6	0.2	0							
46 31 50/5	0.6	0	28						
14 21 37 46	0.8	0						GW	30.0-40.0 SAND and GRAVEL; subangular to subround; moist; 2.5Y5/4 light olive brown.
43 45 50/5	1.2	0	32	B40622					
38 49 45 42	1.4	0							

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B408	Page 2 of 2

BLOW COUNTS	RECOVERY (ft)	P.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES: Geotech.	SAMPLES: Water	SAMPLES: Soil	LITHOLOGY	USCS	
38 49 45 42	1.4	0						GW	
17 19 21 26	1.4	0							
37 68 49 46	1.2	0	39						
NA	0	0							40.0-43.0 No sample collected.
			43						
59 43 45 48	1.8	0						GW	43.0-51.0 SAND and GRAVEL; poorly sorted.
90 98 99 95	1.0	0				B40602			
			47						
65 100 88	1.4	0							
100/3	0.3	0							
			51						
50/0	0	0							51.0-55.4 No recovery.
50/0	0	0							
			55						
27 52 50/1	0.9	0							55.4-63.0 Interbedded shale and limestone bedrock.
100/6	0.4	0							
			59						
NA	NA	0							
			63						
			67						
			71						
			75						
			79						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B407	Page 1 of 1

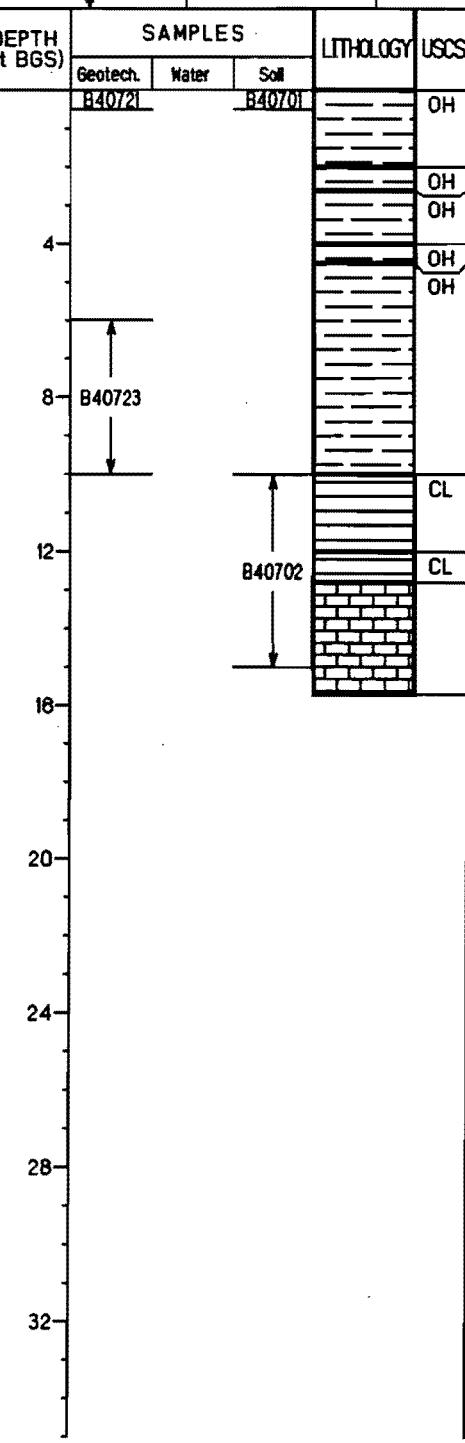


Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Hollow-Stem Auger
Drilling Dates: 6/21/94
Logged By: Mike Klidzejs
Total Depth (ft BGS): 15.7

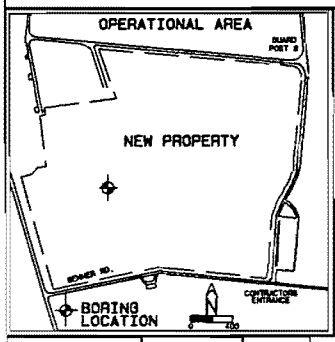
COORDINATES
State Plane; Northing: 595733.8856
Easting: 1496463.4383
Mound Plant; South: 4373.6346
West: 3855.8835
Ground Surface Elevation (ft MSL): 790.36

GROUNDWATER	DEPTH (ft BGS)	COMMENTS
		None encountered.

BLOW COUNTS	RECOVERY (ft)	F.I.D. (ppm)	DESCRIPTION / COMMENTS
NA	2.0	0	0-2.0 CLAY and SILT, trace gravel; organic material; 2.5Y2.5/1 black.
14 8 11 13	1.5	0	2.0-2.6 CLAY; organic material; moist; 2.5Y3/2 very dark grayish brown.
10 21 20 21	1.1	0	2.6-4.0 CLAY, some silt and gravel; moist; 2.5Y6/1 gray.
8 13 22 29	1.5	0	4.0-4.5 CLAY; moist; 2.5Y3/2 very dark grayish brown.
7 15 25 22	1.4	0	4.5-10.0 CLAY, some silt and gravel; 2.5Y6/2 light brownish gray.
50/4	0.5	0	10.0-12.0 SILT, some clay; laminated; 5Y5/2 grayish brown.
15 50/5	1.2	0	12.0-12.8 SILT, some clay, trace gravel; dry; 5Y6/3 light yellowish brown.
41 50/1	0.6	0	12.8-15.7 Interbedded shale and limestone bedrock.



MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B408	Page 1 of 2



Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Hollow-Stem Auger
Drilling Dates: 6/16/94
Logged By: Mike Klidzejs
Total Depth (ft BGS): 42.0

COORDINATES
State Plane; Northing: 595164.0740
Easting: 1495717.6300
Mound Plant; South: 4584.4576
West: 4770.470
Ground Surface Elevation (ft MSL): 714.67

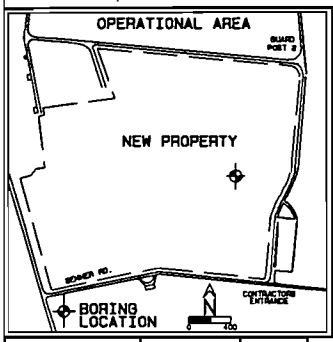
GROUNDWATER	DEPTH (ft BGS)	COMMENTS
▼	34.04	Measured prior to sample collection.
▽		
▽		

BLOW COUNTS	RECOVERY (ft)	F.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES: Geotech.	SAMPLES: Water	SAMPLES: Soil	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
NA	NA	0		B40821		B40801 B40811		SM	0-0.5 SILT, trace sand and gravel; dry; organic material; 10YR5/3 brown.
3 3 5 6	1.2	0						SM	0-2.0 Shelby tube sample collected.
3 4 56	1.1	0	4					SC	2.0-4.0 SILT; organic material; 10YR3/2 very dark grayish brown.
3 2 2 2	0.7	0							4.0-7.8 SILT, some clay; moist; 10YR3/2
3 6 4 5	0.9	0	8					GM	7.8-14.0 CLAY, some silt and sand, trace gravel; poorly sorted; subangular to subrounded granules and pebbles; 2.5YR7/2 light gray.
22 35 16 13	0.9	0							
15 13 12 16	1.4	0	12						
15 37 28 35	NR	0						GM	14.0-16.0 SILT and SAND, some gravel; poorly sorted; 10YR5/3 brown.
NA	0.6	0	16						16.0-18.0 Shelby tube sample B40822 collected. (17.0-34.0 Geotechnical bucket sample B40822 collected.)
21 26 21 22	1.4	0						GM	18.0-36.0 SAND, SILT and GRAVEL; poorly sorted; moist; 10YR7/1 light gray.
29 23 22 22	1.2	0	20						
16 12 18 21	1.3	0							
20 26 38 44	1.4	0	24	B40822					
18 21 23 33	1.4	0							
14 23 50	0.4	0	28						
21 37 36 23	NR	0							
41 30 30 24	1.3	0	32						
33 52 29 21	1.4	0	▼						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B408	Page 2 of 2

BLOW COUNTS	RECOVERY (ft)	F.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES Geotech.	SAMPLES Water	SAMPLES Soil	LITHOLOGY	USCS	
33 52 29 21	1.4	0						GM	
NA	NA	0							36.0–37.0 No recovery.
21 28 33 22	1.8	0			W40801	B40802		GM	37.0–42.0 SAND and GRAVEL, trace silt; poorly sorted; saturated; 10YR7/1 light gray.
29 30 31 38	1.2	0	39						
68 82 90/2	NR	0							
			43						
			47						
			51						
			55						
			59						
			63						
			67						
			71						
			75						
			79						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	SOIL BORING B409	Page 1 of 1



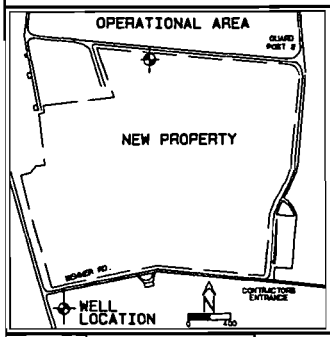
Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: 8" Hollow-Stem Auger
Drilling Dates: 6/28/94
Logged By: Mike Klidzejs
Total Depth (ft BGS): 14.0

COORDINATES
State Plane; Northing: 595279.6360
Easting: 1496942.3600
Mound Plant; South: 4985.1565
West: 3607.3880
Ground Surface Elevation (ft MSL): 797.14

GROUNDWATER	DEPTH (ft BGS)	COMMENTS
		None encountered.

BLOW COUNTS	RECOVERY (ft)	F.I.D. (ppm)	DEPTH (ft BGS)	SAMPLES: Geotech.	SAMPLES: Water	SAMPLES: Soil	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
5 9 11 15	1.7	0				B40901		CL	0-4.2 CLAY, some silt, trace gravel; organic material; 2.5Y3/1 very dark gray.
50/2	0.3	0							
16 23 50/5	1.2	0	4					CL	4.2-8.0 CLAY, some silt and gravel; 5Y6/2 light olive gray.
17 21 25 23	0.5	0							
4 11 14 22	1.2	0	8					CL	8.0-12.0 CLAY, some silt; hard; 10YR5/2 grayish brown.
38 35 50/5	0.1	0				B40902			
33 50/5	0.5	0	12						12.0-14.0 Interbedded shale and limestone bedrock.
			16						
			20						
			24						
			28						
			32						

MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	WELL LOG W411	Page 1 of 2

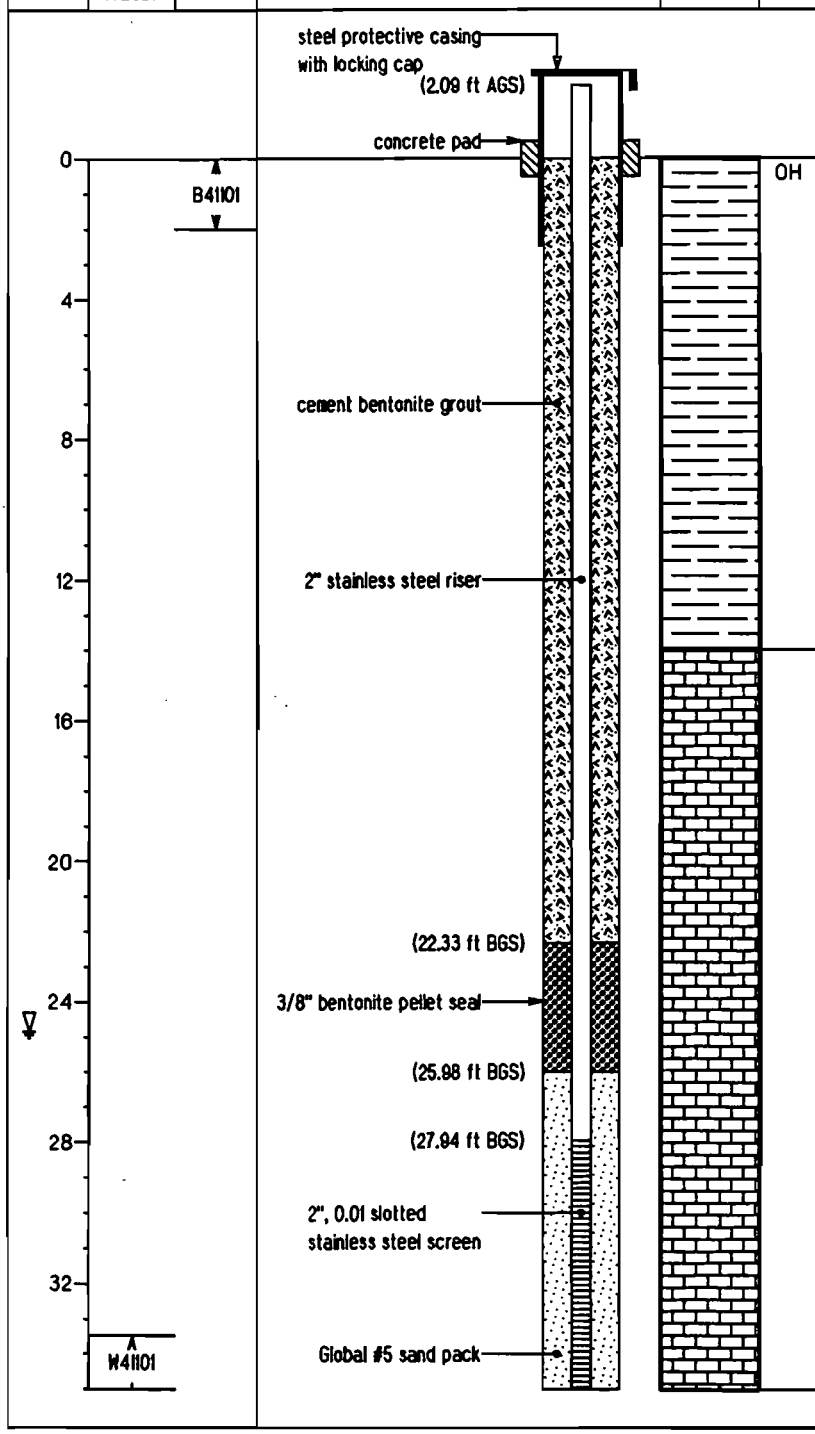


Area of Concern: New Property
Drilling Company: Bowser-Morner
Drilling Method: Cable Tool
Drilling Fluid: Water
Drilling Completed: 6/20/94
Well Installed: 6/20/94
Logged By: Susan Abston
Total Depth (ft BGS): 40.05

COORDINATES	
State Plane: Northing:	596364.2132
Easting:	1496136.5799
Mound Plant; South:	3664.5790
West:	3893.1582
Ground Surface Elevation (ft MSL):	836.65
Top of Casing Elevation (ft MSL):	838.40

GROUNDWATER	DATE	DEPTH (ft BGS)	COMMENTS
▼	6/20/94	36.2	Encountered during drilling.
▽	6/20/94	24.6	Maximum recharge prior to well placement.

DEPTH (ft BGS)	SAMPLES: Water	SAMPLES: Soil	WELL CONSTRUCTION	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
0			steel protective casing with locking cap (2.09 ft AGS); concrete pad			
0–14.0					OH	0–14.0 CLAY, some silt, trace gravel; 5YR3/2 greyish brown.
14.0–40.05						14.0–40.05 Interbedded shale and limestone bedrock.



MOUND / NEW PROPERTY	OU5 NEW PROPERTY EXTENDED PHASE FIELD INVESTIGATION	WELL LOG W411	Page 2 of 2

DEPTH (ft BGS)	SAMPLES Water	SAMPLES Soil	WELL CONSTRUCTION	LITHOLOGY	USCS	DESCRIPTION / COMMENTS
	W41101					
39			(37.95 ft BGS) stainless steel cap (40.05 ft BGS) 8" borehole diameter			
43						
47						
51						
55						
59						
63						
67						
71						
75						
79						

Borehole Lithology Pattern Explanations

USCS or Rock Type	Description
FL	Fill
SP-SW	Gravelly sand
CH	Clay with high plasticity
CL	Clay
CL	Gravelly clay
CL	Gravelly sandy clay
CL	Gravelly sandy silty clay
CL	Silty clay
CL	Silty clay with gravel
CL	Silty clay with sand and gravel
CL	Silty clay with sand
CL	Sandy clay
GC	Clayey gravel
GC-GM	Clayey silty gravel
GC	Clayey sandy gravel
GM	Silty gravel
GM	Silty sandy gravel
GP or GW	Clean gravel
GP or GW	Sandy gravel
GC-GM	Sand and gravel with silt and clay

USCS or Rock Type	Description
LS-SH	Interbedded limestone and shale
LS	Limestone
CL-ML	Silt and clay
ML	Silt
ML	Clayey silt
ML-GM	Gravelly silt
ML-GM	Sandy gravelly silt
ML	Sandy silt
ML	Sandy clayey silt
NR	No recovery
OL	Organic, silt to silty clay
OH	Organic clay
SP or SW	Sand (poorly and well graded)
SC	Clayey sand
SC-SP or SC-SW	Clayey gravelly sand
SH	Shale
SM	Silty sand
SC-SM	Silty sand to clayey sand
SM-SP or SM-SW	Silty gravelly sand
CL-SP	Interlayered clay and sand

USCS or Rock Type	Description
ST	Siltstone
ST-SH	Interbedded siltstone and shale
ST-LS	Interbedded siltstone and limestone
TI	Glacial till
TS	Topsoil

GEOLOGIC LOG	MOUND PLANT	Project Manager John B. Price	PAGE: 1 of 2

Drilling Company	Bowser Morner	Borehole/Well Id	0158
Drilling Method	Cable Tool	STATE PLANE COORDINATES	
Drilling Fluid	None	North (ft)	594037.51
Date Started	11/9/87	East (ft)	1495276.62
Date Completed	11/9/87	Ground Surface Elev. (ft)	702.80
Logged By	Lyn Lawlor	Top of Casing Elev. (ft)	704.46
Checked By	Tom Tharp	Total Depth (ft)	39.2
Comments:			

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
0				CASING: Stainless steel, 4". BACKFILL: Cement and bentonite grout.			SP	Brown to light brown gravelly sand, coarse grained, dry, nonstratified, no cement, approximately 40% gravel up to 1 inch in diameter, subrounded, HNU=0
5								
	SS	LI	0001				CL	Brown silty, sandy clay, dark brown mottling, firm, high plasticity, homogeneous, moist, no cement, nonstratified, approximately 5% gravel up to 1/4 inch in diameter, HNU=0.
10								
	SS	LI	0002				SM-SP	Light brown to brown silty, gravelly sand, nonstratified, no cement, moist, poorly graded, approximately 40% gravel up to 1 inch in diameter, subrounded, HNU=0.
15								
	SS	LI	0003				SP	Light brown to gray gravelly sand, coarse grained, poorly graded, weakly cemented, wet, approximately 30% gravel up to 1/2 inch in diameter, subangular, HNU=0.
20								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	27.78	07:20	11/19/87
▼	27.83	10:30	12/11/87

WESTON

GEOLOGIC LOG

MOUND PLANT

Project Manager: John B. Price

Borehole/Well Id: 0158

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
20								
	SS	LI	0004				SP	Light brown silty, gravelly sand, coarse grained, poorly graded, weakly cemented, wet, nonstratified, 40% gravel up to 1 inch in diameter, subrounded, HNU=0.
25				SEAL: Bentonite pellets.				
	SS	LI	0005				SP	Light brown to gray gravelly sand, coarse grained, poorly graded, saturated, nonstratified, no cement, approximately 40% gravel up to 1 inch in diameter, subrounded, HNU=0.
30								
	SS	LI	0006				SM-SP	Light brown silty, gravelly sand, coarse grained, poorly graded, saturated, nonstratified, weakly cemented, approximately 30% gravel up to 1 inch in diameter, subrounded, HNU=0.
				FILTER PACK: #4 quartz sand.				
35								
	SS	LI	0007	SCREEN: Stainless steel, 4".				
40								Total Depth = 39.2 feet.
45								

GROUNDWATER

DEPTH	HOUR	DATE
27.78	07:20	11/19/87
27.83	10:30	12/11/87

WESTON

GEOLOGIC LOG | MOUND PLANT

Project Manager: John B. Price

Drilling Company	Bowser Morner	Borehole/Well Id	0319
Drilling Method	Cable Tool	STATE PLANE COORDINATES	
Drilling Fluid	None	North (ft)	595512.27
Date Started	8/20/89	East (ft)	1495148.29
Date Completed	8/23/89	Ground Surface Elev. (ft)	701.70
Logged By	Cate Grube	Top of Casing Elev. (ft)	703.48
Checked By	Tom Tharp	Total Depth (ft)	95.0

Comments:

Depth	Sample T	Sample A	Sample ID	Well Materials	USCS or Rock Type	Lithologic Description
0					CL	Dark yellowish brown (10YR 3/4) silty clay, stiff, low plasticity, moist, trace of sand.
				BACKFILL: Cement and bentonite grout.	CL	Dark yellowish brown (10YR 3/4) sandy clay, very stiff, low plasticity, moist, trace fine to coarse gravel.
5	SS	LI	0001			
				CASING: Stainless steel, 4".	CL	Brown (10YR 3/4) sandy, gravelly clay, very stiff, low plasticity, moist.
10	SS	LI	0002			
					SP-SC	Brown (10YR 3/4) clayey, gravelly sand, poorly graded, moderately dense, moist.
15	SS	LI	0003			
					SM	Brown (10YR 5/3) silty sand, well graded, very dense.
20						

GROUNDWATER

	DEPTH	HOUR	DATE
∇			
▼	22.21	08:38	09/20/90

GEOLOGIC LOG

MOUND PLANT

Project Manager: John B. Price

Borehole/Well Id: 0319

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
20	SS	LI	0004					
				BACKFILL: Cement and bentonite grout.			SC-SP	Olive brown (2.5Y 5/4) clayey, gravelly sand, dense, wet.
25	SS	LI	0005	CASING: Stainless steel, 4".			SC-SP	Olive brown (2.5Y 5/4) clayey, gravelly sand, poorly graded, dense, wet.
30	SS	LI	0006				CL	Dark gray (5Y 4/1) sandy, gravelly clay, medium stiff, low plasticity, moist.
35	SS	LI	0007				SC-SP	Clayey, gravelly sand, very dense, poorly graded, wet.
40	SS	LI	0008	SEAL: Bentonite pellets.			SC-SP	Light yellowish brown (2.5Y 5/4) clayey, gravelly sand, very dense, wet.
45	SS	LI	0009					

GROUNDWATER

DEPTH	HOUR	DATE
22.21	08:38	09/20/90

WESTON

GEOLOGIC LOG | MOUND PLANT

Project Manager: John B. Price

Borehole/Well Id: 0319

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
				SCREEN: Stainless steel, 4", with .01" wire wrap slot.			SM-SP	Light olive brown (2.5Y 5/4) silty, gravelly sand, dense, wet.
50	SS	LI	0010	FILTER PACK: 10-20 quartz sand.				
							SM-SP	Olive brown (2.5Y 4/4) silty, gravelly sand, dense, wet.
55	SS	LI	0011					
							SM	Dark grayish brown (2.5Y 4/2) silty sand, poorly graded, dense, wet.
				SEAL: Bentonite hole plug.				
60	SS	LI	0012					
							SP-SW	Dark grayish brown (2.5Y 4/2) gravelly sand, poorly to well graded, moderately dense, wet.
65	SS	LI	0013					
	SS	LI	0014				SP-SW	Olive brown (2.5Y 4/4) sand, poorly to well graded, very dense, wet.
70	SS	LI	0015				ML	Olive gray (5Y 4/2) sandy, clayey silt, moist, hard.

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼	22.21	08:38	09/20/90

WESTON

GEOLOGIC LOG	MOUND PLANT	Project Manager John B. Price	PAGE: 4 of 4

Borehole/Well Id 0319

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
75	SS	LI	0016				GC	Light olive brown (2.5Y 5/4) clayey, sandy gravel, very dense, wet.
80	SS	LI	0017	SEAL: bentonite hole plug.			SC-SW	Light yellowish brown (2.5Y 6/4) to olive brown (2.5Y 4/4) clayey, gravelly sand, well graded, dense, wet.
85	SS	LI	0018				SC-SW	Light yellowish brown (2.5Y 6/4) to olive brown (2.5Y 4/4) clayey, gravelly sand, well graded, dense, wet.
90	SS	LI	0019				SC-SW	Olive brown (2.5Y 4/4) clayey, gravelly sand, well graded, very dense, wet.
95	SS	LI	0020				SC-SW	Olive brown (2.5Y 4/4) clayey, gravelly sand, well graded, very dense, wet.
								Total Depth = 95.0 feet.

GROUNDWATER

	DEPTH	HOUR	DATE
▽			
▼	22.21	08:38	09/20/90

WESTON

GEOLOGIC LOG	MOUND PLANT	Project Manager John B. Price	PAGE: 1 of 5

Drilling Company	Bowser Morner	Borehole/Well Id	0320
Drilling Method	Cable Tool	STATE PLANE COORDINATES	
Drilling Fluid	None	North (ft)	595023.61
Date Started	8/15/89	East (ft)	1495353.86
Date Completed	8/19/89	Ground Surface Elev. (ft)	704.70
Logged By	Cate Grube	Top of Casing Elev. (ft)	706.44
Checked By	Tom Tharp	Total Depth (ft)	117.0

Comments:

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
0							CL	Dark yellowish brown (10YR 4/4) silty clay, lean, stiff, low plasticity, slightly moist, some sand.
	SS	LI	0001				CL	Dark yellowish brown (10YR 4/6) sandy, silty clay, stiff to very stiff, medium plasticity, moist.
5				CASING: Stainless steel, 4".				
	SS	LI	0002				SC	Dark yellowish brown (10YR 4/4 to 4/6) clayey sand, soft to medium stiff, medium plasticity, very moist, trace fine to medium gravel.
10				BACKFILL: Cement and bentonite grout.				
	SS	LI	0003				SC	Yellowish brown (10YR 5/8) clayey sand, well graded, very dense, moist.
15								
	SS	LI	0004				SC-SM	Light yellowish brown (10YR 6/4) clayey, silty sand, medium dense, moist.
20								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	25.55	08:42	08/19/89
▼	25.26	08:42	09/20/90

GEOLOGIC LOG

MOUND PLANT

Project Manager: John B. Price

Borehole/Well Id: 0320

Depth	Sample T	Sample A	Sample ID	Well Materials	USCS or Rock Type	Lithologic Description
20						
	SS	LI	0005	SEAL: Bentonite pellets.	CL	Light olive brown (2.5YR 5/4) gravelly, sandy, silty clay, stiff, low plasticity, moist.
25						
	SS	LI	0006		CL	Grayish brown (2.5Y 5/2) sandy clay, very stiff, low plasticity, moist.
30						
	SS	LI	0007	SCREEN: Stainless steel, 4", with .01" wire wrap slot.	CL	Dark gray (5Y 4/1) sandy clay, very stiff to hard, low plasticity, moist.
35	SS	LI	0008		SW	Brown (10YR 5/3) sand, well graded, dense, wet, trace of silt.
40				FILTER PACK: Coarse silica sand.		
	SS	LI	0009		SP-SW	Light olive brown (2.5YR 5/4) sand, interlayered poorly and well graded, dense, wet, trace of fine to medium gravel.
45				SEAL: Bentonite hole plug.		

GROUNDWATER

	DEPTH	HOUR	DATE
▽	25.55	08:42	08/19/89
▼	25.26	08:42	09/20/90

WESTON

GEOLOGIC LOG

MOUND PLANT

Project Manager: John B. Price

Borehole/Well Id: 0320

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
	SS	LI	0010				SC-SM	Olive brown (2.5Y 4/4) sand with silt and clay, interlayered, well and poorly graded, medium dense, wet.
50								
	SS	LI	0011				SM-SP	Dark grayish brown (2.5YR 4/2) silty, gravelly sand, poorly graded, dense, wet.
55				SEAL: Bentonite hole plug.				
	SS	LI	0012				SW	Dark grayish brown (2.5Y 4/2) gravelly sand, well graded, moderately dense, wet, trace of silt.
60								
	SS	LI	0013				SP	Grayish brown (2.5Y 5/2) sand, poorly graded, coarse grained, moderately dense, wet, trace fine gravel.
65								
	SS	LI	0014				SP	Grayish brown (2.5Y 5/2) sand, poorly graded, coarse grained, moderately dense, wet, trace fine gravel.
70								
	SS	LI	0015					

GROUNDWATER

	DEPTH	HOUR	DATE
▽	25.55	08:42	08/19/89
▼	25.26	08:42	09/20/90

WESTON

GEOLOGIC LOG | MOUND PLANT

Project Manager: John B. Price

Borehole/Well Id: 0320

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
75							SP	Dark grayish brown (2.5Y 4/2) sand, poorly graded, moderately dense, wet.
	SS	LI	0016				SM	Dark grayish brown (2.5Y 5/2) silty sand, well graded, moderately dense, wet, trace fine to medium gravel.
80				SEAL: Bentonite hole plug.				
	SS	LI	0017				SW	Dark grayish brown (2.5Y 5/2) sand, well graded, coarse grained, moderately dense, wet, trace fine to medium grained gravel.
85								
	SS	LI	0018				SP	Dark grayish brown (2.5Y 4/2) sand, poorly graded, fine grained, moderately dense, wet.
90								
	SS	LI	0019				SW	Dark grayish brown (2.5Y 4/2) gravelly sand, well graded, moderately dense, wet.
95								
	SS	LI	0020				SM	Dark grayish brown (2.5Y 4/2) silty sand, poorly graded, moderately dense, wet.

GROUNDWATER

	DEPTH	HOUR	DATE
▽	25.55	08:42	08/19/89
▼	25.26	08:42	09/20/90

WESTON

GEOLOGIC LOG

MOUND PLANT

Project Manager: John B. Price

Borehole/Well Id: 0320

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
100								
	SS	LI	0021				SM	Olive brown (2.5Y 4/4) silty sand, interlayered, well and poorly graded, moderately dense, wet.
105				SEAL: Bentonite hole plug.				
	SS	LI	0022				SC-SM	Olive brown (2.5Y 4/4) clayey, silty sand, interlayered, well and poorly graded, dense to very dense, wet.
110								
	SS	LI	0023				SM	Olive brown (2.5Y 4/4) silty sand, poorly graded, moderately dense, wet.
115								
								Total Depth = 117.0 feet.
120								
125								

GROUNDWATER

DEPTH	HOUR	DATE
25.55	08:42	08/19/89
25.26	08:42	09/20/90

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 1 of 7

Drilling Company	NORTH STAR DRILLING	Borehole/Well Id	0344
Drilling Method	ROTOSONIC DRILL	STATE PLANE COORDINATES	
Drilling Fluid	WATER	North (ft)	595521.96
Date Started	1/26/93	East (ft)	1495145.72
Date Completed	2/1/93	Ground Surface Elev. (ft)	701.38
Logged By	DALE FLORES	Top of Casing Elev. (ft)	702.98
Checked By	PAUL DARR	Total Depth (ft)	175.5
Comments:	South of gate 100 along new gravel road.		

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
0	A	GC	0005	Casing: Stainless steel, 4"			TS	0.0 to 5.0' - Grayish brown silty clay, very dense, moderate plasticity, root structure to 8", trace fine sand, moist. Topsoil.
	A	GC	1005	Backfill: Cement - bentonite grout				
5							GM	5.0 to 14.5' - Yellowish brown silty gravel, gravel both angular blocky to 5" and rounded cobbles to 4", 70% gravel, 30% silty sand.
10	A	GC	0015					
15	A	GC	0018				GP	14.5 to 17.0' - Yellowish brown sandy gravel, 60% gravel, pebble to cobble, 40% coarse sand, trace silt, gravel to 4", first water.
							GM	17.0 to 24.0' - Yellowish brown silty gravel, gravel both angular blocky to 5" and rounded cobbles to 4", 70% gravel, 30% silty sand.
	A	GT	0025					
20								

GROUNDWATER

DEPTH	HOUR	DATE
20.63	09:06	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 2 of 7

Borehole/Well Id 0344

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
20							GM	
25	A	GT	0035				TI	24.0 to 28.0' - Moderate yellowish brown (10YR 5/4) to medium gray (N5) gravelly clay, fine to medium gravel, ~70% silty clay, ~30% pebble gravel, stiff, moist. Till unit.
30							SP	28.0 to 31.0' - Yellowish brown gravelly sand, ~80% medium to course sand, ~20% pebble gravel, little to no fines, moist but not saturated.
35	A	GT	0040				TI	31.0 to 35.0' - Medium gray (N5) silty gravelly sand, fine sand, fine to medium gravel, ~50% fine sand and silt making up matrix, 50% gravel, nonplastic, medium gray below 32.0', moist to wet. Till. 35.0 to 40.0' - Medium gray (N5) silty gravelly sand, fine sand, fine to medium gravel, more silt in matrix making till unit denser, nonplastic, moist.
40							SP	40.0 to 41.0' - Yellowish brown sand, medium sand, some gravel, gravel to 3 inches, well sorted, ~50% medium sand, moist to wet. 41.0 to 43.5' - Light grayish brown sand, coarse sand, trace pebble gravel, saturated. 43.5 to 45.0' - Moderate yellowish brown sand, well sorted fine grained sand, moist but not saturated. 45.0 to 55.0' - Moderate yellowish brown sand, well sorted medium sand, has coarse thin sand lenses, no gravel, moist.
45								

GROUNDWATER

DEPTH	HOUR	DATE
20.63	09:06	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 3 of 7

Borehole/Well Id 0344

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
50								
55	A	GT	0060				SP	55.0 to 62.5' - Moderate yellowish brown (10YR 5/4) sand, medium grained sand, well sorted, has thin coarse sand lenses throughout, some gravel, moist.
60	A	GT	0065					62.5 to 64.5' - Medium gray (N5) sand, medium sand, very well sorted, moist.
65							GM	64.5 to 65.0' - Medium gray silty gravel with significant cobble size gravel, cobbles to 6", matrix of coarse sand, pebbles and silt, occurs as 6" lens, saturated zone.
							TI	65.0 to 66.0' - Moderate yellow brown (10YR 5/4) gravelly clay, fine to medium gravel, ~70% silty clay, ~30% fine gravel, stiff, moist. Till.
							GM	66.0 to 69.0' - Dark yellowish brown silty gravel, angular to rounded gravel, pebble to cobble size, matrix of coarse sand pebbles and silt, ~50% gravel, ~50% coarse sand and silt.
70							TI	69.0 to 71.0' - Moderate olive brown, silty clay with pebble gravel, very dense, moderate plasticity, dry. Till.
							GM	71.0 to 75.0' - Dark yellowish brown silty gravel, angular to rounded gravel, pebble to cobble size, matrix of coarse sand pebbles and silt, ~50% gravel, ~50% coarse sand and silt.

GROUNDWATER

	DEPTH	HOUR	DATE
▽	20.63	09:06	05/19/93
▽			

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 4 of 7

Borehole/Well Id 0344

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
75							SP-SM	75.0 to 76.0' - Medium gray (N5) silty gravelly sand, fine to medium gravel, ~50% fine sand and silt, ~50% gravel, nonplastic, moist.
							TI	76.0 to 76.5' - Grayish olive (10Y 4/2) silty clay, fine gravel, very dense, moderate plasticity, occurs as thin lens in gravel. Till.
80							GM	76.5 to 80.0' - Dark yellowish brown silty gravel, angular to rounded gravel, pebble to cobble size, matrix of coarse sand pebbles and silt, ~50% gravel, ~50% coarse sand and silt. Has interbedded till layers, has more cobble size gravel. 80.0 to 85.0' - Dark yellowish brown silty gravel, angular to rounded gravel, pebble to cobble size, matrix of coarse sand pebbles and silt, ~50% gravel, ~50% coarse sand and silt. Has thin till lens (lens is dark yellowish orange).
85								
90							GP	86.0 to 95.0' - Dark yellowish brown sandy gravel, little to no fines, gravel pebble size to 1 1/2", vertically grades to coarse sand with no gravel between 86.0 - 95.0', saturated.
95							GP	95.0 to 104.0' - Moderate olive brown sandy gravel, coarse sand, moderate good sorting, 5% gravel > 1/2", little to no fines.

GROUNDWATER

	DEPTH	HOUR	DATE
▼	20.63	09:06	05/19/93
▼			

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 5 of 7

Borehole/Well Id 0344

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
100								
							GM	104.0 to 105.0' - Dark yellowish brown silty gravel, angular to rounded gravel, pebble to cobble size, matrix of coarse sand pebbles and silt, ~50% gravel, ~50% coarse sand and silt, saturated.
105	A	GT	0115				SP	105.0 to 108.0' - Moderate olive brown sand, medium to coarse, 10% pebbles, medium to poor sorting, moist, no fines.
							SP-GP	108.0 to 110.0' - Light gray, pebble gravel lens with coarse sand, moist, pebble gravel to 1/2", no fines.
110							SP	110.0' - Moderate olive brown sand, medium to coarse, 10% pebbles medium to poor sorting, moist, no fines.
115								116.0 to 125.0' - Moderate olive gray (5Y 4/4) sand, medium sand, well sorted, trace pebble gravel from 116.0 to 125.0', medium sand grades into sand with no gravel, saturated.
120								
								125.0' for the day.
125								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	20.63	09:06	05/19/93
▼			

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 6 of 7

Borehole/Well Id 0344

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
							NR	
130							GP	129.0 to 140.0' - Moderate olive gray sandy gravel, coarse sand to fine gravel, little to no fines, moderate sorting, trace gravel > 0.5", moist.
135								
140								
145								
150							NR	150.0 to 160.5' - Lost sample out of core barrel, no recovery, most likely material is as above 145.0 to 150' - Course sand and pebble gravel, little to no fines, moderate sorting, trace gravel > 1/2", moderate olive gray, saturated.

GROUNDWATER

	DEPTH	HOUR	DATE
▼	20.63	09:06	05/19/93
▼			

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 7 of 7

Borehole/Well Id 0344

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
							NR	
155				Seal: 1/4" Bentonite chips				
160								
				Filter Pack: 10/20 Colorado silica sand				
165				Screen: Stainless steel, 4", slot # 10				
170								
175							SH	175.0 to 175.5' - Medium gray weathered silty shale with thin fossiliferous lenses of limestone, very dense, moderate plasticity.
								Total Depth = 175.5'.

GROUNDWATER

	DEPTH	HOUR	DATE
▽	20.63	09:06	05/19/93
▼			

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 1 of 1

Drilling Company	NORTH STAR DRILLING	Borehole/Well Id	0353
Drilling Method	ROTOSONIC DRILL	STATE PLANE COORDINATES	
Drilling Fluid	WATER	North (ft)	596241.80
Date Started	2/8/93	East (ft)	1495668.78
Date Completed	2/9/93	Ground Surface Elev. (ft)	744.95
Logged By	DALE FLORES	Top of Casing Elev. (ft)	747.07
Checked By	PAUL DARR	Total Depth (ft)	18.0
Comments:	Northeast of spoils area along fence line.		

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
0				Casing: Stainless steel, 4"			TS	0.0 to 0.5' - Dark yellowish brown (10YR 4/2), sandy silt, trace clay, roots, low plasticity. Topsoil.
				Backfill: Cement - bentonite grout			TI	0.5 to 16.0' - Moderate yellowish brown (10YR 5/4), sandy silt, 10% gravels to 1", very dense, moist. Color change to olive gray (5Y 3/2) at 8.0'. Till.
5	B	GC	0005					
				Seal: 1/4" Bentonite chips				
10				Filter Pack: 10/20 Colorado silica sand				
				Screen: Stainless steel, 4", slot # 10				
15	B	GC	0020				SH	16.0 to 18.0' - Medium dark gray (N4) silty shale with thinly bedded fossiliferous limestone lenses, fissile, powdery dry. Bedrock.
								Total Depth = 18.0'.
20								

GROUNDWATER

DEPTH	HOUR	DATE
0.67		04/03/93
	18:30	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 1 of 2

Drilling Company	NORTH STAR DRILLING	Borehole/Well Id	0354
Drilling Method	ROTOSONIC DRILL	STATE PLANE COORDINATES	
Drilling Fluid	WATER	North (ft)	595602.10
Date Started	4/20/93	East (ft)	1496322.15
Date Completed	4/20/93	Ground Surface Elev. (ft)	767.95
Logged By	GARY STOOPES	Top of Casing Elev. (ft)	771.01
Checked By	PAUL DARR	Total Depth (ft)	23.0
Comments:	On Mound south property. Approximately 1/4 mile south of fence line, near power lines, access through gate 100.		

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
0				Casing: Stainless steel, 4"			TS	0.0 to 1.5' - Dark yellow brown (10YR 4/2) silty clay, firm, moderately plastic, abundant roots, slightly moist. Topsoil.
	B	GC	0005	Backfill: Cement - bentonite grout			CL	1.5 to 5.0' - Dusky yellow (5Y 6/4) silty clay, clasts 1/4" to 1.5 inches some fossiliferous, weathered out fossil fragments, mottled coloring at 4' to greenish gray (5G 6/1), dry to slightly moist.
5								5.0 to 11.5' - Mottled coloring throughout, dusky yellow (5Y 6/4) to greenish gray (5G 6/1) silty clay, ~50% clay remainder silt and limestone clasts, dense to very firm, crumbly, dry.
				Seal: 1/4" Bentonite chips				
10	B	GC	0012	Filter Pack: 10/20 Colorado silica sand			ST	11.5 to 12.5' - Medium bluish gray (5B 5/1) siltstone weathered to clay, limestone lenses, slightly moist to moist. Weathered bedrock.
				Screen: Stainless steel, 4", slot # 10				12.5 to 23.0' - Medium gray (N5) siltstone, fossils present, limestone lenses throughout, slightly moist, at 14 ft. approximately 5 inch thick fracture zone, other fracture zones at 16.0', 17.0' and ~20.0', slightly moist to damp at fracture zones, otherwise dry. Bedrock.
15								
20								

GROUNDWATER

DEPTH	HOUR	DATE
16.77	08:49	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 2 of 2

Borehole/Well Id 0354

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
20								
								Total Depth = 23.0'.
25								
30								
35								
40								
45								

GROUNDWATER

	DEPTH	HOUR	DATE
⊽			
⊽	16.77	08:49	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 1 of 8

Drilling Company	NORTH STAR DRILLING	Borehole/Well Id	0356
Drilling Method	ROTOSONIC DRILL	STATE PLANE COORDINATES	
Drilling Fluid	WATER	North (ft)	595011.45
Date Started	1/18/93	East (ft)	1495353.58
Date Completed	1/24/93	Ground Surface Elev. (ft)	704.07
Logged By	DALE FLORES	Top of Casing Elev. (ft)	706.24
Checked By	PAUL DARR	Total Depth (ft)	182.0
Comments:	South property access thru gate 100.		

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
0				Casing: Stainless steel, 4"			TS	0.0 to 1.0' - Dark brown silty clay, very dense, moderate plasticity, root structures, moist. Topsoil.
				Backfill: Cement - bentonite grout			CL	1.0 to 9.0' - Rust brown to yellowish brown (10YR 5/4) silty clay, trace fine grained sand, moderate plasticity, very dense, has areas of gray and rust colored zones, moist to wet.
5	B	GC	0005					
							GC-GM	9.0 to 10.0' - Moderate yellowish brown (10YR 5/4) silty clayey gravel, some fine gravel, some coarse to fine sand, ~50% silty clay, gravel to 2", gravel subrounded to rounded, trace angular limestone.
10	B	GC	0015				SM	10.0 to 10.5' - Moderate yellowish brown (10YR 5/4) silty sand, very moist.
							GC-GM	10.5 to 14.0' - Moderate yellowish brown (10YR 5/4) silty clayey gravel, some fine gravel, some coarse to fine sand, ~50% silty clay, gravel to 2", gravel subrounded to rounded, trace angular limestone.
15							GP	14.0 to 16.0' - Moderate yellowish brown (10YR 5/4) sandy gravel, fine gravel to coarse sand, ~20% sand and silt, gravels subrounded, some angular limestone clasts.
							SP	16.0 to 16.5' - Moderate yellowish brown (10YR 5/4) gravelly sand, coarse sand, fine gravels, saturated.
							GP	16.5 to 23.5' - Sandy gravel, ~50% fine to coarse gravel, ~30% coarse sand, ~20% silty clay, trace of cobbles to 4 inches, moist.
20								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	22.17	17:12	01/24/93
▼	23.86	09:01	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 2 of 8

Borehole/Well Id 0356

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
20								
25							TI	23.5 to 32.0' - Gray to yellowish brown (10YR 5/4) silty clay, some angular to rounded gravel, fine to coarse gravel, some fine sand, matrix composed of ~50% silty clay, very stiff/dense, reddish brown staining at interface of gravel above and silty clay, moist, out of saturated zone. Till.
30								
							SM	32.0' to 32.5' - Silty sand, medium to fine sand, trace fine gravel.
							TI	32.5 to 34.5' - Light olive gray (5Y 5/2) silty clay, some angular to rounded gravel, fine to coarse gravel, some fine sand, matrix composed of ~50% silty clay, very stiff, very dense, moist. Till.
35							SP	34.5 to 37.0' - Moderate yellow brown (10YR 5/4) gravelly sand, fine gravel, trace of cobbles gravel, ~50% medium to coarse sand, ~40% fine gravel, saturated.
							ML	37.0 to 40.0' - Medium gray (N5) to olive brown sandy silt, fine grained sand, trace of medium grained sand, very dry, crumbly.
40							SP	40.0 to 44.5' - Sand, medium to coarse, well sorted, has silt lense 1 to 3 inches thick, saturated.
45							ML	44.5 to 45.0' - Medium gray (N5) to olive brown sandy silt, fine grained sand, trace of medium grained sand, very dry, crumbly.
							GP	45.0 to 46.0' - Moderate yellow brown (10YR 5/4) sandy gravel, trace of gravel to 1", saturated.

GROUNDWATER

	DEPTH	HOUR	DATE
▽	22.17	17:12	01/24/93
▼	23.86	09:01	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 3 of 8

Borehole/Well Id 0356

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
							SP	46.0 to 47.0' - Light brown sand lense, medium grained trace gravel, saturated.
							GP	47.0 to 52.0' - Light brown sandy gravel, loose, sand to fine gravel, saturated.
50								
							SP	52.0 to 57.0' - Light brown sand, medium grained sand, trace silt, trace fine gravel, saturated.
55								
							GP	57.0 to 69.5' - Olive brown to gray brown sandy gravel, coarse sand to fine gravel, coarse gravel lense at 62.0', gravel lense to 4" thick, little sand, saturated.
60								
65								
70							SP	69.5 to 72.0' - Olive brown sand, trace fine gravel, moderate good sorting, saturated.
							GP	72.0 to 77.0' - Olive brown to gray brown sandy gravel, coarse sand

GROUNDWATER

	DEPTH	HOUR	DATE
▽	22.17	17:12	01/24/93
▼	23.86	09:01	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 4 of 8

Borehole/Well Id 0356

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
							GP	to fine gravel, coarse gravel lense at 62.0', gravel lense to 4" thick, little sand, saturated.
75								
							SP	77.0 to 80.0' - Moderate yellowish brown (10YR 5/4) sand, trace fine gravel, coarse sand, wet but not saturated.
80								80.0 to 85.0' - Sand, medium to coarse sand, moderate good sorting, little to no fines, trace gravel, wet.
85								85.0 to 87.0' - Brownish gray sand, medium grained sand, little to no fines, trace gravel, well sorted, wet.
								87.0 to 90.0' - Brownish gray sand, medium to coarse grained sand, trace of gravel to 1", ~10% silt holding sand together, wet.
90								90.0 to 93.0' - Brownish gray sand, medium to coarse grained sand, ~10% silt holding sand together, some gravel, saturated.
							GM-GP	93.0 to 95.0' - Moderate yellowish brown (10YR 5/4) silty sandy gravel, ~40% fine to coarse gravel saturated. Outwash.
95							GP	95.0 to 105.0' - Moderate yellowish brown (10YR 5/4) sandy gravel, coarse sand, % sand to gravel varies, little to no fines, gravel to 2", saturated.

GROUNDWATER

	DEPTH	HOUR	DATE
▽	22.17	17:12	01/24/93
▼	23.86	09:01	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 5 of 8

Borehole/Well Id 0356

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
100								
105							GP	105.0 to 115.0' - Moderate to light yellowish brown (10YR 5/4) sandy gravel, coarse sand, % of sand to gravel varies, little to no fines, gravel to 2", saturated.
110								
115							GP	115.0 to 125.0' - Moderate olive brown (5Y 4/4) sandy gravel, fine to coarse gravel, ~5% gravel >1", saturated.
120								
125							SP	125.0 to 135.0' - Light olive brown (5Y 5/6) sand, medium sand.

GROUNDWATER

	DEPTH	HOUR	DATE
▽	22.17	17:12	01/24/93
▼	23.86	09:01	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 6 of 8

Borehole/Well Id 0356

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
							SP	well sorted, little to no fines, pebble gravel lense at 127.0 to 127.5, wet but not saturated.
130								
135							SP	135.0 to 145.0' - Olive gray (5Y 3/2) sand, medium grained, well sorted, no fines, no gravel, moist.
140								
145							SP	145.0 to 150.0' - Olive gray (5Y 3/2) sand, coarse sand, moderate good sorting, wet.
150							GP	150.0 to 165.0' - Moderate yellowish brown (10YR 5/4) gravel, fine gravel, no fines, piece of 4" angular limestone, gravel to 1 1/2 inches, saturated.

GROUNDWATER

	DEPTH	HOUR	DATE
▽	22.17	17:12	01/24/93
▼	23.86	09:01	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 7 of 8

Borehole/Well Id 0356

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
155								
160								
165				Seal: 1/4" Bentonite chips			GP	165.0 to 181.5' - Moderate yellowish brown (10YR 5/4) gravel, fine gravel, no fines, gravel to 1.5 inches, saturated.
				Filter Pack: 10/20 Colorado silica sand				
170								
				Screen: Stainless steel, 4", slot # 10				
175								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	22.17	17:12	01/24/93
▼	23.86	09:01	05/19/93

WESTON

GEOLOGIC LOG	MOUND - OU9	Project Manager GORDON HORN	PAGE: 8 of 8

Borehole/Well Id 0356

Depth	Sample T	Sample A	Sample ID	Well Materials	Well Con	Lith	USCS or Rock Type	Lithologic Description
180								
							SH	181.5 to 182.0' - Greenish gray (5GY 4/1) silty shale, moderately fissile, thinly bedded limestone lenses, trace fossils in limestone, dry.
								Total Depth = 182.0'.
185								
190								
195								
200								
205								

GROUNDWATER

	DEPTH	HOUR	DATE
▽	22.17	17:12	01/24/93
▼	23.86	09:01	05/19/93

WESTON

Appendix B

APPENDIX B
ANALYTES DETECTED ABOVE BACKGROUND CRITERIA IN SOILS, SEDIMENTS, GROUNDWATER, AND SEEPS

B.1 SOIL AND SEDIMENT RESULTS SORTED BY LOCATION
B.2 GROUNDWATER AND SEEP RESULTS SORTED BY LOCATION
B.3 SOIL AND SEDIMENT RESULTS SORTED BY ANALYTE
B.4 GROUNDWATER AND SEEP RESULTS SORTED BY ANALYTE

EXPLANATION OF QUALIFIERS

1. LABORATORY DATA QUALIFIERS

The following qualifiers were applied to the organic analysis results by the laboratory, in accordance with CLP SOW direction and the OU9 QAPjP (DOE 1993e):

U Indicates compound was analyzed for but not detected. The associated sample quantitation limit will be the CRQL, corrected for dilution and for percent moisture.

J Indicates an estimated value. This flag is used under the following circumstances: 1) when estimating a concentration for tentatively identified compounds (TICs) assuming a 1:1 response, 2) when the qualitative data indicated the presence of a compound that meets the volatile, semivolatile, and pesticide/Aroclor identification criteria, and the result is less then the CRQL but greater than zero.

N Indicates presumptive evidence of a compound. This flag is used only for TICs, where identification has been confirmed by GC/MS.

P Used for pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.

C Applies to pesticide results where the identification has been confirmed by GC/MS.

B Used when the analyte is found in the associated blank as well as in the sample. This flag must be used for a TIC as well as for a positively identified target compound.

E Identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

D Identifies all compounds identified in an analysis at a secondary dilution factor.

A Indicates that TIC is suspected aldo-condensation product.

The following qualifiers were applied to the inorganic analysis results by the laboratory, in accordance with CLP SOW direction and the OU9 QAPjP (DOE 1993e):

B Indicates that the reported value was obtained from a reading that was less than the CRDL but greater than or equal to the Instrument Detection Limit (IDL).

U Indicates that the analyte was analyzed for but not detected.

E Indicates that reported value is estimated because of the presence of interferences.

M Duplicate injection precision was not met.

N Spiked sample recovery not within control limits.

S Reported value was determined by the Method of Standard Additions (MSA).

W Post-digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less that 50% of spike absorbance.

* Duplicate analysis not within control limits.

+ Correlation coefficient for the MSA is less than 0.995.

2. DATA VALIDATION QUALIFIERS

The primary data validation qualifiers applied, as described in the CLP Functional Guidelines and in Section 4.0 and 5.0 of Appendix H, of the OU9 QAPjP (DOE 1993e) are as follows:

U - The material was analyzed, but was not detected. The associated numerical value is the sample quantitation limit.

J - The associated numerical value is an estimated quantity.

R - The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

N - Presumptive evidence of presence of material.

NJ - Presumptive evidence of the presence of the material at an estimated quantity.

UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

Subqualifiers are used to assist in data assessment by indicating the source of the primary qualifier. These subqualifiers are attached to the primary qualifier, separated by a hyphen. The following is a list of allowable subqualifiers.

SUBQUALIFIERS - ORGANICS

B - Qualified due to method blank or a field blank
C - Qualified due to calibration
H - Holding time exceeded
K - Qualified due to surrogate recovery

S	-	Qualified due to matrix spike recovery
I	-	Qualified due to internal recovery
P	-	Pesticide/PCB results have >25% difference on two different columns
(+)	-	Potential positive bias (added after subqualifier with a parentheses)
(-)	-	Potential negative bias (added after subqualifier with a parentheses)

SUBQUALIFIERS - INORGANICS

B	-	Qualified due to method blank of field blank
C	-	Qualified due to calibration
H	-	Holding time exceeded
S	-	Qualified due to matrix spike recovery
I	-	Interference (ICP serial dilution, ICS, or GFAA spike recovery)
D	-	Duplicate (replicate limits exceeded)
L	-	Qualified due to LCS
(+)	-	Potential positive bias (added after subqualifier with a parentheses)
(-)	-	Potential negative bias (added after subqualifier with a parentheses)

Examples of final qualification might be J-C, UJ-S(+), UJ-BC(-), etc.

APPENDIX B.1
SOIL AND SEDIMENT RESULTS SORTED BY LOCATION

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=AH Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		1.40	=	0.2330	0.13	10.8

---------- Location=New Property Group=Above 2 feet STATION=AH Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Arsenic (MG/KG)		8.70	=	.	8.60	1.0
Zinc (MG/KG)	*	238.00	=	.	140.00	1.7
Benzoic Acid (UG/KG)	J	92.00	J	.	.	.
Methylene Chloride (UG/KG)	B	56.00	=	.	.	.
Ra-226 (PCI/G)		2.30	J	0.6430	2.00	1.2

---------- Location=New Property Group=Above 2 feet STATION=AH Depth(Ft.)=1.5-2.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (MG/KG)		21500.00	=	.	19000.00	1.1
Arsenic (MG/KG)		15.80	=	.	8.60	1.8
Chromium (MG/KG)		29.60	=	.	20.00	1.5
Copper (MG/KG)		33.10	=	.	26.00	1.3
Iron (MG/KG)		43600.00	=	.	35000.00	1.2
Nickel (MG/KG)		41.90	=	.	32.00	1.3
Vanadium (MG/KG)		38.30	=	.	25.00	1.5
Benzoic Acid (UG/KG)	J	82.00	J	.	.	.
Methylene Chloride (UG/KG)	B	66.00	=	.	.	.
Ra-226 (PCI/G)		2.97	J	0.6830	2.00	1.5

---------- Location=New Property Group=Above 2 feet STATION=AJ Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		2.90	=	0.4840	0.13	22.3

---------- Location=New Property Group=Above 2 feet STATION=AJ Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Arsenic (MG/KG)		8.70	=	.	8.60	1.0
Vanadium (MG/KG)		28.10	=	.	25.00	1.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=AJ Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Zinc (MG/KG)	*	220.00	=	.	140.00	1.6
Benzoic Acid (UG/KG)	J	90.00	J	.	.	.
Fluoranthene (UG/KG)	J	50.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=AJ Depth(Ft.)=0.2-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		1.06	=	0.2740	0.13	8.2

---------- Location=New Property Group=Above 2 feet STATION=AJ Depth(Ft.)=1.5-2.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sodium (MG/KG)	B	619.00	J	.	240.00	2.6
Vanadium (MG/KG)		25.60	=	.	25.00	1.0
beta-BHC (UG/KG)	JP	0.18	J	.	.	.
Benzoic Acid (UG/KG)	J	78.00	J	.	.	.
Methylene Chloride (UG/KG)	B	26.00	=	.	.	.
Ra-226 (PCI/G)		2.57	J	0.6050	2.00	1.3

---------- Location=New Property Group=Above 2 feet STATION=AK Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.63	=	0.1910	0.13	4.8

---------- Location=New Property Group=Above 2 feet STATION=AK Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chromium (MG/KG)		22.90	=	.	20.00	1.1
Potassium (MG/KG)		2680.00	=	.	1900.00	1.4
Sodium (MG/KG)	B	903.00	J	.	240.00	3.8
Vanadium (MG/KG)		25.80	=	.	25.00	1.0
Zinc (MG/KG)	*	282.00	=	.	140.00	2.0
Benzoic Acid (UG/KG)	J	95.00	J	.	.	.
Methylene Chloride (UG/KG)	B	43.00	=	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=AK Depth(Ft.)=0.2-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.73	=	0.2020	0.13	5.6

---------- Location=New Property Group=Above 2 feet STATION=AK Depth(Ft.)=1.5-2.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		1180.00	=	.	107.00	11.0
Aluminum (MG/KG)		20000.00	=	.	19000.00	1.1
Chromium (MG/KG)		24.20	=	.	20.00	1.2
Potassium (MG/KG)		2970.00	=	.	1900.00	1.6
Sodium (MG/KG)		1770.00	J	.	240.00	7.4
Vanadium (MG/KG)		27.20	=	.	25.00	1.1
Benzoic Acid (UG/KG)	J	86.00	J	.	.	.
Methylene Chloride (UG/KG)	B	68.00	=	.	.	.
Ra-226 (PCI/G)		2.93	J	0.6340	2.00	1.5

---------- Location=New Property Group=Above 2 feet STATION=B398 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		320.00	J	.	107.00	3.0
Sulfate (MG/KG)		1370.00	=	.	150.00	9.1
2,4,6-Trinitrotoluene (MG/KG)	J	0.11	J	.	.	.
Th-228 (PCI/G)		1.77	=	0.3000	1.50	1.2
Th-232 (PCI/G)		1.44	=	0.2600	1.40	1.0

---------- Location=New Property Group=Above 2 feet STATION=B401 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		183.00	J	.	107.00	1.7
Sulfate (MG/KG)		356.00	J	.	150.00	2.4
Organic Carbon (MG/KG)		30200.00	J	.	28000.00	1.1
Organic Carbon (MG/KG)		31600.00	J	.	28000.00	1.1
Organic Carbon (MG/KG)		41400.00	J	.	28000.00	1.5
Organic Carbon (MG/KG)		29900.00	J	.	28000.00	1.1
2-Methylnaphthalene (UG/KG)	J	63.00	J	.	.	.
Benzo(a)anthracene (UG/KG)	J	58.00	J	.	.	.
Benzo(a)pyrene (UG/KG)	J	51.00	J	.	.	.
Benzo(b)fluoranthene (UG/KG)	XJ	98.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	170.00	J	.	.	.
Chrysene (UG/KG)	J	78.00	J	.	.	.
Fluoranthene (UG/KG)	J	110.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=B401 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Phenanthrene (UG/KG)	J	78.00	J	.	.	.
Pyrene (UG/KG)	J	98.00	J	.	.	.
U-235 (PCI/G)		0.16	J	0.0700	0.11	1.5

---------- Location=New Property Group=Above 2 feet STATION=B403 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		362.00	J	.	150.00	2.4
Aluminum (MG/KG)		19200.00	=	.	19000.00	1.0
Potassium (MG/KG)		3720.00	=	.	1900.00	2.0
Sodium (MG/KG)		544.00	=	.	240.00	2.3
Vanadium (MG/KG)		25.90	=	.	25.00	1.0
Organic Carbon (MG/KG)		90200.00	J	.	28000.00	3.2
Fluoranthene (UG/KG)	J	57.00	J	.	.	.
Pyrene (UG/KG)	J	62.00	J	.	.	.
Pu-238 (PCI/G)		0.17	=	0.1300	0.13	1.3
Th-228 (PCI/G)		1.54	=	0.2300	1.50	1.0

---------- Location=New Property Group=Above 2 feet STATION=B404 Depth(Ft.)=0.1-0.6 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Benzo(a)pyrene (UG/KG)	J	42.00	J	.	.	.
Benzo(b)fluoranthene (UG/KG)	XJ	68.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	140.00	J	.	.	.
Fluoranthene (UG/KG)	J	57.00	J	.	.	.
Pyrene (UG/KG)	J	70.00	J	.	.	.
Pu-238 (PCI/G)		0.19	J	0.1400	0.13	1.5

---------- Location=New Property Group=Above 2 feet STATION=B405 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		359.00	=	.	150.00	2.4
1,3-Dinitrobenzene (MG/KG)	J	0.10	J	.	.	.
2,4,6-Trinitrotoluene (MG/KG)	J	0.20	J	.	.	.
Di-n-butylphthalate (UG/KG)	J	67.00	J	.	.	.
Th-228 (PCI/G)		1.64	J	0.2200	1.50	1.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=B406 Depth(Ft.)=0.2-0.7 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		795.00	=	.	150.00	5.3
Arsenic (MG/KG)		11.80	=	.	8.60	1.4
Di-n-butylphthalate (UG/KG)	J	68.00	J	.	.	.
Th-230 (PCI/G)		1.91	J	0.2700	1.90	1.0
U-234 (PCI/G)		1.17	J	0.2100	1.10	1.1
U-235 (PCI/G)		0.20	J	0.0800	0.11	1.8

---------- Location=New Property Group=Above 2 feet STATION=B407 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		328.00	J	.	150.00	2.2
Benzo(b)fluoranthene (UG/KG)	XJ	59.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	100.00	J	.	.	.
Fluoranthene (UG/KG)	J	65.00	J	.	.	.
Pyrene (UG/KG)	J	56.00	J	.	.	.
Pu-238 (PCI/G)		0.15	J	0.0900	0.13	1.2

---------- Location=New Property Group=Above 2 feet STATION=B408 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		296.00	J	.	150.00	2.0
Organic Carbon (MG/KG)		37800.00	J	.	28000.00	1.4
Organic Carbon (MG/KG)		55600.00	J	.	28000.00	2.0
Organic Carbon (MG/KG)		33800.00	J	.	28000.00	1.2
Organic Carbon (MG/KG)		33700.00	J	.	28000.00	1.2
Benzo(b)fluoranthene (UG/KG)	XJ	37.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	65.00	J	.	.	.
Fluoranthene (UG/KG)	J	41.00	J	.	.	.
Pyrene (UG/KG)	J	36.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=B409 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		331.00	J	.	150.00	2.2
Aluminum (MG/KG)		21400.00	=	.	19000.00	1.1
Chromium (MG/KG)		22.50	=	.	20.00	1.1
Lithium (MG/KG)		27.30	=	.	26.00	1.1
Potassium (MG/KG)		3550.00	=	.	1900.00	1.9
Vanadium (MG/KG)		37.00	=	.	25.00	1.5
4,4'-DDD (UG/KG)	P	6.60	J	.	4.20	1.6

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=B409 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Benzo(b)fluoranthene (UG/KG)	XJ	49.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	100.00	J	.	.	.
Pyrene (UG/KG)	J	47.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=BH Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.22	J	0.0437	0.13	1.7

---------- Location=New Property Group=Above 2 feet STATION=BH Depth(Ft.)=0.2-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.25	J	0.0544	0.13	1.9

---------- Location=New Property Group=Above 2 feet STATION=BJ Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.27	=	0.1130	0.13	2.1

---------- Location=New Property Group=Above 2 feet STATION=BJ Depth(Ft.)=0.2-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.21	=	0.1110	0.13	1.6

---------- Location=New Property Group=Above 2 feet STATION=BK Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.28	J	0.0703	0.13	2.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=CJ Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Arsenic (MG/KG)		11.00	=	.	8.60	1.3
Bismuth (MG/KG)		40.20	=	.	39.00	1.0
Chromium (MG/KG)		21.60	=	.	20.00	1.1
Copper (MG/KG)	*	27.00	J	.	26.00	1.0
Potassium (MG/KG)		2270.00	=	.	1900.00	1.2
Selenium (MG/KG)	*	2.20	J	.	0.59	3.7
Vanadium (MG/KG)	E	31.20	J	.	25.00	1.2
Benzo(g,h,i)perylene (UG/KG)	J	47.00	J	.	.	.
Fluoranthene (UG/KG)	J	43.00	J	.	.	.
Ra-226 (PCI/G)		2.80	=	0.5890	2.00	1.4

---------- Location=New Property Group=Above 2 feet STATION=CJ Depth(Ft.)=1.5-2.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Bismuth (MG/KG)		70.40	=	.	39.00	1.8
Magnesium (MG/KG)	*	43700.00	=	.	40000.00	1.1
Potassium (MG/KG)		2020.00	=	.	1900.00	1.1
Selenium (MG/KG)	*	1.60	J	.	0.59	2.7
Thallium (MG/KG)	B	0.94	=	.	0.46	2.0
Ra-226 (PCI/G)		2.35	=	0.6220	2.00	1.2

---------- Location=New Property Group=Above 2 feet STATION=CK Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.52	J	0.0889	0.13	4.0

---------- Location=New Property Group=Above 2 feet STATION=CK Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Arsenic (MG/KG)		10.90	=	.	8.60	1.3
Bismuth (MG/KG)		54.40	=	.	39.00	1.4
Copper (MG/KG)	*	28.60	J	.	26.00	1.1
Selenium (MG/KG)	*	1.30	J	.	0.59	2.2
Vanadium (MG/KG)	E	28.50	J	.	25.00	1.1
Ra-226 (PCI/G)		2.76	=	0.7590	2.00	1.4

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=CK Depth(Ft.)=0.2-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.28	=	0.0506	0.13	2.2

---------- Location=New Property Group=Above 2 feet STATION=CK Depth(Ft.)=1.5-2.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Bismuth (MG/KG)		69.50	=	.	39.00	1.8
Magnesium (MG/KG)	*	44100.00	=	.	40000.00	1.1
Potassium (MG/KG)		1980.00	=	.	1900.00	1.0
Selenium (MG/KG)	*	2.00	J	.	0.59	3.4
Acetone (UG/KG)	J	4.00	J	.	.	.
Ra-226 (PCI/G)		2.83	=	0.6550	2.00	1.4

---------- Location=New Property Group=Above 2 feet STATION=GJ Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.47	=	0.1840	0.13	3.6

---------- Location=New Property Group=Above 2 feet STATION=GJ Depth(Ft.)=0.2-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.27	=	0.1240	0.13	2.0

---------- Location=New Property Group=Above 2 feet STATION=HJ Depth(Ft.)=0.0-0.2 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.20	=	0.0786	0.13	1.5

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=HJ Depth(Ft.)=0.2-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.13	=	0.0693	0.13	1.0

---------- Location=New Property Group=Above 2 feet STATION=HK Depth(Ft.)=0.2-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Pu-238 (PCI/G)		0.14	=	0.0426	0.13	1.0

---------- Location=New Property Group=Above 2 feet STATION=NPS1 Depth(Ft.)=0.0-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Magnesium (MG/KG)		52400.00	=	.	40000.00	1.3

---------- Location=New Property Group=Above 2 feet STATION=NPS3 Depth(Ft.)=0.0-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Arsenic (MG/KG)	N	10.00	J	.	8.60	1.2
Di-n-butylphthalate (UG/KG)	J	240.00	J	.	.	.
2-Butanone (UG/KG)	J	8.50	J	.	.	.
Carbon Tetrachloride (UG/KG)	J	9.60	J	.	.	.
Ethylbenzene (UG/KG)	J	2.10	J	.	.	.
Methylene Chloride (UG/KG)	B	97.00	=	.	.	.
Toluene (UG/KG)	J	4.70	J	.	.	.
Xylene, Total (UG/KG)	J	2.10	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=NPS4 Depth(Ft.)=0.0-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Di-n-butylphthalate (UG/KG)	J	180.00	J	.	.	.

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=NPS5 Depth(Ft.)=0.0-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Magnesium (MG/KG)		40600.00	=	.	40000.00	1.0
Di-n-butylphthalate (UG/KG)		420.00	=	.	.	.
Sr-90 (PCI/G)		1.58	=	0.7010	0.72	2.2

---------- Location=New Property Group=Above 2 feet STATION=NPS6 Depth(Ft.)=0.0-1.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Mercury (MG/KG)	N*	0.42	J	.	0.15	2.8
Ra-226 (PCI/G)		2.42	=	0.2830	2.00	1.2

---------- Location=New Property Group=Above 2 feet STATION=SD01 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Nitrate-Nitrite-N (MG/KG)		65.70	J	.	26.00	2.5
Aluminum (MG/KG)		23000.00	J	.	19000.00	1.2
Chromium (MG/KG)		23.50	=	.	20.00	1.2
Lithium (MG/KG)		26.90	=	.	26.00	1.0
Potassium (MG/KG)	E	5230.00	J	.	1900.00	2.8
Selenium (MG/KG)	B	1.20	=	.	0.59	2.0
Sodium (MG/KG)	B	750.00	=	.	240.00	3.1
Vanadium (MG/KG)		31.90	=	.	25.00	1.3
Benzo(a)anthracene (UG/KG)	J	44.00	J	.	.	.
Benzo(b)fluoranthene (UG/KG)	XJ	130.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	210.00	J	.	.	.
Chrysene (UG/KG)	J	51.00	J	.	.	.
Fluoranthene (UG/KG)	J	97.00	J	.	.	.
Phenanthrene (UG/KG)	J	47.00	J	.	.	.
Pyrene (UG/KG)	J	60.00	J	.	.	.
Pu-238 (PCI/G)		0.25	=	0.1500	0.13	1.9
Th-228 (PCI/G)		1.63	=	0.2400	1.50	1.1

---------- Location=New Property Group=Above 2 feet STATION=SD02 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		237.00	J	.	107.00	2.2
Sulfate (MG/KG)		734.00	J	.	150.00	4.9
Potassium (MG/KG)	E	2680.00	J	.	1900.00	1.4
Selenium (MG/KG)	B	0.77	=	.	0.59	1.3
Sodium (MG/KG)		1890.00	=	.	240.00	7.9
Benzo(a)anthracene (UG/KG)	J	48.00	J	.	.	.

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Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD02 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Benzo(b)fluoranthene (UG/KG)	XJ	120.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	200.00	J	.	.	.
Chrysene (UG/KG)	J	51.00	J	.	.	.
Fluoranthene (UG/KG)	J	98.00	J	.	.	.
Phenanthrene (UG/KG)	J	48.00	J	.	.	.
Pyrene (UG/KG)	J	62.00	J	.	.	.
Pu-238 (PCI/G)		0.25	=	0.1100	0.13	1.9
Th-228 (PCI/G)		1.60	=	0.2500	1.50	1.1

---------- Location=New Property Group=Above 2 feet STATION=SD03 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		183.00	J	.	107.00	1.7
Nitrate-Nitrite-N (MG/KG)		9170.00	J	.	26.00	353
Arsenic (MG/KG)	*	10.50	=	.	8.60	1.2
Potassium (MG/KG)	E	2370.00	J	.	1900.00	1.2
Sodium (MG/KG)		1510.00	=	.	240.00	6.3
Vanadium (MG/KG)		29.90	=	.	25.00	1.2
Benzo(b)fluoranthene (UG/KG)	XJ	34.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	63.00	J	.	.	.
Pu-238 (PCI/G)		11.23	J	0.8100	0.13	86.4
Th-228 (PCI/G)		3.78	=	0.3800	1.50	2.5
Th-230 (PCI/G)		2.21	J	0.2700	1.90	1.2
Th-232 (PCI/G)		2.12	J	0.2600	1.40	1.5

---------- Location=New Property Group=Above 2 feet STATION=SD04 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		350.00	J	.	107.00	3.3
Fluoride (MG/KG)		13.10	J	.	6.70	2.0
Sulfate (MG/KG)		540.00	J	.	150.00	3.6
Aluminum (MG/KG)	*	19800.00	J	.	19000.00	1.0
Arsenic (MG/KG)	*	9.60	=	.	8.60	1.1
Chromium (MG/KG)		21.50	J	.	20.00	1.1
Potassium (MG/KG)	E	2360.00	J	.	1900.00	1.2
Sodium (MG/KG)		3450.00	=	.	240.00	14.4
Vanadium (MG/KG)		38.10	=	.	25.00	1.5
Benzo(a)anthracene (UG/KG)	J	130.00	J	.	.	.
Benzo(a)pyrene (UG/KG)	J	130.00	J	.	.	.
Benzo(b)fluoranthene (UG/KG)	XJ	230.00	J	.	.	.
Benzo(g,h,i)perylene (UG/KG)	J	41.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	X	440.00	=	.	.	.
Chrysene (UG/KG)	J	110.00	J	.	.	.
Fluoranthene (UG/KG)	J	260.00	J	.	.	.

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD04 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Indeno(1,2,3-c,d)pyrene (UG/KG)	J	49.00	J	.	.	.
Phenanthrene (UG/KG)	J	170.00	J	.	.	.
Pyrene (UG/KG)	J	190.00	J	.	.	.
Pu-238 (PCI/G)		0.79	=	0.1300	0.13	6.1

---------- Location=New Property Group=Above 2 feet STATION=SD05 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		215.00	J	.	150.00	1.4
Potassium (MG/KG)	E	2000.00	J	.	1900.00	1.1
Sodium (MG/KG)	B	658.00	=	.	240.00	2.7
Vanadium (MG/KG)		26.20	=	.	25.00	1.0
Benzo(b)fluoranthene (UG/KG)	XJ	69.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	130.00	J	.	.	.
Di-n-butylphthalate (UG/KG)	J	47.00	J	.	.	.
Fluoranthene (UG/KG)	J	64.00	J	.	.	.
Pyrene (UG/KG)	J	50.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD06 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		403.00	J	.	150.00	2.7
Antimony (MG/KG)	N*	3.00	J	.	0.45	6.7
Potassium (MG/KG)		2020.00	=	.	1900.00	1.1
Benzo(b)fluoranthene (UG/KG)	XJ	63.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	130.00	J	.	.	.
Benzoic Acid (UG/KG)	J	86.00	J	.	.	.
Chrysene (UG/KG)	J	43.00	J	.	.	.
Fluoranthene (UG/KG)	J	59.00	J	.	.	.
Pyrene (UG/KG)	J	51.00	J	.	.	.
Pu-238 (PCI/G)		0.46	=	0.1200	0.13	3.5
Th-228 (PCI/G)		1.69	=	0.2500	1.50	1.1

---------- Location=New Property Group=Above 2 feet STATION=SD07 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		553.00	J	.	150.00	3.7
Antimony (MG/KG)	N*	1.90	J	.	0.45	4.2
Potassium (MG/KG)		2620.00	=	.	1900.00	1.4

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD07 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Acetone (UG/KG)		55.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD08 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		637.00	J	.	150.00	4.2
Potassium (MG/KG)		2200.00	=	.	1900.00	1.2
Acetone (UG/KG)		19.00	J	.	.	.
Th-228 (PCI/G)		1.52	=	0.3300	1.50	1.0
U-235 (PCI/G)		0.17	J	0.0700	0.11	1.5

---------- Location=New Property Group=Above 2 feet STATION=SD09 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Antimony (MG/KG)	BN	1.30	J	.	0.45	2.9
Arsenic (MG/KG)		17.10	J	.	8.60	2.0
Bismuth (MG/KG)		61.50	=	.	39.00	1.6
Cadmium (MG/KG)		5.00	J	.	2.10	2.4
Cerium (MG/KG)	B	23.60	=	.	.	.
Copper (MG/KG)		27.50	J	.	26.00	1.1
Iron (MG/KG)		40500.00	=	.	35000.00	1.2
Lead (MG/KG)		255.00	J	.	48.00	5.3
Manganese (MG/KG)		5240.00	J	.	1400.00	3.7
Neodymium (MG/KG)	B	20.30	=	.	.	.
Potassium (MG/KG)	E	2040.00	J	.	1900.00	1.1
Selenium (MG/KG)	B	1.00	=	.	0.59	1.7
Sodium (MG/KG)	B	865.00	=	.	240.00	3.6
Thallium (MG/KG)	B	2.10	J	.	0.46	4.6
Tin (MG/KG)		41.10	=	.	20.00	2.1
Zinc (MG/KG)		1310.00	J	.	140.00	9.4
Benzo(a)anthracene (UG/KG)	J	98.00	J	.	.	.
Benzo(a)pyrene (UG/KG)	J	100.00	J	.	.	.
Benzo(b)fluoranthene (UG/KG)	XJ	220.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	380.00	J	.	.	.
Chrysene (UG/KG)	J	92.00	J	.	.	.
Fluoranthene (UG/KG)	J	150.00	J	.	.	.
Phenanthrene (UG/KG)	J	88.00	J	.	.	.
Pyrene (UG/KG)	J	130.00	J	.	.	.
bis(2-Ethylhexyl)phthalate (UG/KG)	J	81.00	J	.	.	.
Tritium (PCI/G)		2.60	=	1.9000	1.60	1.6
U-235 (PCI/G)		0.12	J	0.0600	0.11	1.1

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Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD10 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		345.00	J	.	150.00	2.3
Cerium (MG/KG)	B	44.20	=	.	.	.
Neodymium (MG/KG)	B	23.10	=	.	.	.
Sodium (MG/KG)	B	492.00	=	.	240.00	2.1
Hexane (UG/KG)	J	10.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD11 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		264.00	J	.	150.00	1.8
Cerium (MG/KG)	B	32.70	=	.	.	.
Neodymium (MG/KG)	B	23.40	=	.	.	.
Sodium (MG/KG)	B	607.00	=	.	240.00	2.5
Benzo(b)fluoranthene (UG/KG)	XJ	62.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	100.00	J	.	.	.
Fluoranthene (UG/KG)	J	69.00	J	.	.	.
Pyrene (UG/KG)	J	45.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD12 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		418.00	J	.	150.00	2.8
Antimony (MG/KG)	N*	2.50	J	.	0.45	5.6

---------- Location=New Property Group=Above 2 feet STATION=SD13 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		277.00	J	.	150.00	1.8
Antimony (MG/KG)	N*	2.90	J	.	0.45	6.4
Benzo(b)fluoranthene (UG/KG)	XJ	48.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	98.00	J	.	.	.
Benzoic Acid (UG/KG)	J	43.00	J	.	.	.
Fluoranthene (UG/KG)	J	42.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD14 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		119.00	=	.	107.00	1.1
Sulfate (MG/KG)		1150.00	J	.	150.00	7.7
Antimony (MG/KG)	N*	2.50	J	.	0.45	5.6
Potassium (MG/KG)		2040.00	=	.	1900.00	1.1
Anthracene (UG/KG)	J	150.00	J	.	.	.
Benzo(a)anthracene (UG/KG)		900.00	=	.	.	.
Benzo(a)pyrene (UG/KG)		860.00	=	.	.	.
Benzo(b)fluoranthene (UG/KG)	X	1300.00	=	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	690.00	J	.	.	.
Chrysene (UG/KG)		940.00	=	.	.	.
Fluoranthene (UG/KG)		1500.00	=	.	.	.
Indeno(1,2,3-c,d)pyrene (UG/KG)	J	390.00	J	.	.	.
Phenanthrene (UG/KG)		900.00	=	.	.	.
Pyrene (UG/KG)		1800.00	=	.	.	.
Acetone (UG/KG)		12.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD15 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		215.00	J	.	150.00	1.4
Antimony (MG/KG)	N*	2.60	J	.	0.45	5.8
2-Methylnaphthalene (UG/KG)	J	110.00	J	.	.	.
Acenaphthene (UG/KG)	J	120.00	J	.	.	.
Acenaphthylene (UG/KG)	J	290.00	J	.	.	.
Anthracene (UG/KG)		690.00	=	.	.	.
Benzo(a)anthracene (UG/KG)		2800.00	=	.	.	.
Benzo(a)pyrene (UG/KG)		2500.00	=	.	.	.
Benzo(b)fluoranthene (UG/KG)	XE	4800.00	=	.	.	.
Benzo(g,h,i)perylene (UG/KG)	J	220.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XE	8600.00	J	.	.	.
Carbazole (UG/KG)		420.00	=	.	.	.
Chrysene (UG/KG)		2400.00	=	.	.	.
Dibenzo(a,h)anthracene (UG/KG)	J	130.00	J	.	.	.
Dibenzofuran (UG/KG)	J	250.00	J	.	.	.
Fluoranthene (UG/KG)	E	5000.00	=	.	.	.
Fluorene (UG/KG)		460.00	=	.	.	.
Indeno(1,2,3-c,d)pyrene (UG/KG)		850.00	=	.	.	.
Naphthalene (UG/KG)	J	200.00	J	.	.	.
Phenanthrene (UG/KG)	E	3700.00	=	.	.	.
Pyrene (UG/KG)	E	3300.00	=	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD16 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Bismuth (MG/KG)		43.90	=	.	39.00	1.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD16 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Potassium (MG/KG)	E	2950.00	J	.	1900.00	1.6
Sodium (MG/KG)	B	721.00	=	.	240.00	3.0
Vanadium (MG/KG)		28.00	=	.	25.00	1.1
bis(2-Ethylhexyl)phthalate (UG/KG)	J	58.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD17 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Bismuth (MG/KG)		46.60	=	.	39.00	1.2
Sodium (MG/KG)	B	562.00	=	.	240.00	2.3
Acenaphthylene (UG/KG)	J	69.00	J	.	.	.
Anthracene (UG/KG)	J	120.00	J	.	.	.
Benzo(a)anthracene (UG/KG)		770.00	=	.	.	.
Benzo(a)pyrene (UG/KG)		740.00	=	.	.	.
Benzo(b)fluoranthene (UG/KG)	X	1500.00	=	.	.	.
Benzo(g,h,i)perylene (UG/KG)	J	190.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	X	2700.00	=	.	.	.
Benzoic Acid (UG/KG)	J	49.00	J	.	.	.
Chrysene (UG/KG)		710.00	=	.	.	.
Dibenzo(a,h)anthracene (UG/KG)	J	60.00	J	.	.	.
Fluoranthene (UG/KG)		1200.00	=	.	.	.
Fluorene (UG/KG)	J	53.00	J	.	.	.
Indeno(1,2,3-c,d)pyrene (UG/KG)	J	230.00	J	.	.	.
Phenanthrene (UG/KG)		520.00	=	.	.	.
Pyrene (UG/KG)		920.00	=	.	.	.
bis(2-Ethylhexyl)phthalate (UG/KG)	J	67.00	J	.	.	.
Tritium (PCI/G)		3.00	=	1.9000	1.60	1.9

---------- Location=New Property Group=Above 2 feet STATION=SD18 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Bismuth (MG/KG)		43.50	=	.	39.00	1.1
Sodium (MG/KG)	B	592.00	=	.	240.00	2.5
Acenaphthylene (UG/KG)	J	73.00	J	.	.	.
Anthracene (UG/KG)	J	200.00	J	.	.	.
Benzo(a)anthracene (UG/KG)		770.00	=	.	.	.
Benzo(a)pyrene (UG/KG)		770.00	=	.	.	.
Benzo(b)fluoranthene (UG/KG)	X	1600.00	=	.	.	.
Benzo(g,h,i)perylene (UG/KG)	J	250.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	X	2900.00	=	.	.	.
Carbazole (UG/KG)	J	78.00	J	.	.	.
Chrysene (UG/KG)		640.00	=	.	.	.
Dibenzo(a,h)anthracene (UG/KG)	J	95.00	J	.	.	.
Dibenzofuran (UG/KG)	J	42.00	J	.	.	.

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Mound New Property Investigation
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Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD18 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Fluoranthene (UG/KG)		1300.00	=	.	.	.
Fluorene (UG/KG)	J	100.00	J	.	.	.
Indeno(1,2,3-c,d)pyrene (UG/KG)	J	330.00	J	.	.	.
Phenanthrene (UG/KG)		870.00	=	.	.	.
Pyrene (UG/KG)		970.00	=	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD19 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sodium (MG/KG)	B	581.00	=	.	240.00	2.4
alpha-Chlordane (UG/KG)	P	3.50	J	.	1.90	1.8
Acenaphthylene (UG/KG)	J	44.00	J	.	.	.
Anthracene (UG/KG)	J	94.00	J	.	.	.
Benzo(a)anthracene (UG/KG)		460.00	=	.	.	.
Benzo(a)pyrene (UG/KG)		440.00	=	.	.	.
Benzo(b)fluoranthene (UG/KG)	X	900.00	=	.	.	.
Benzo(g,h,i)perylene (UG/KG)	J	180.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	X	1600.00	=	.	.	.
Carbazole (UG/KG)	J	41.00	J	.	.	.
Chrysene (UG/KG)		390.00	=	.	.	.
Dibenzo(a,h)anthracene (UG/KG)	J	46.00	J	.	.	.
Fluoranthene (UG/KG)		740.00	=	.	.	.
Fluorene (UG/KG)	J	50.00	J	.	.	.
Indeno(1,2,3-c,d)pyrene (UG/KG)	J	190.00	J	.	.	.
Phenanthrene (UG/KG)		460.00	=	.	.	.
Pyrene (UG/KG)		560.00	=	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD20 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Potassium (MG/KG)	E	1930.00	J	.	1900.00	1.0
Sodium (MG/KG)	B	728.00	=	.	240.00	3.0
Hexane (UG/KG)	J	4.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD21 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Nitrate-Nitrite-N (MG/KG)		10500.00	J	.	26.00	404
Sodium (MG/KG)	B	620.00	=	.	240.00	2.6

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD21 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Acenaphthene (UG/KG)	J	42.00	J	.	.	.
Anthracene (UG/KG)	J	150.00	J	.	.	.
Benzo(a)anthracene (UG/KG)		540.00	=	.	.	.
Benzo(a)pyrene (UG/KG)		570.00	=	.	.	.
Benzo(b)fluoranthene (UG/KG)	X	1100.00	=	.	.	.
Benzo(g,h,i)perylene (UG/KG)	J	160.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	X	2200.00	=	.	.	.
Carbazole (UG/KG)	J	85.00	J	.	.	.
Chrysene (UG/KG)		500.00	=	.	.	.
Fluoranthene (UG/KG)		1300.00	=	.	.	.
Fluorene (UG/KG)	J	99.00	J	.	.	.
Indeno(1,2,3-c,d)pyrene (UG/KG)	J	160.00	J	.	.	.
Phenanthrene (UG/KG)		910.00	=	.	.	.
Pyrene (UG/KG)		830.00	=	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=SD22 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Potassium (MG/KG)	E	3030.00	J	.	1900.00	1.6
Sodium (MG/KG)	B	700.00	=	.	240.00	2.9
Vanadium (MG/KG)		28.60	=	.	25.00	1.1
Benzo(b)fluoranthene (UG/KG)	XJ	70.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	110.00	J	.	.	.
Fluoranthene (UG/KG)	J	56.00	J	.	.	.
Pyrene (UG/KG)	J	39.00	J	.	.	.
bis(2-Ethylhexyl)phthalate (UG/KG)	J	68.00	J	.	.	.
Pu-238 (PCI/G)		0.90	=	0.1600	0.13	6.9

---------- Location=New Property Group=Above 2 feet STATION=SD23 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		331.00	J	.	150.00	2.2
Cerium (MG/KG)		50.90	=	.	.	.
Neodymium (MG/KG)	B	33.40	=	.	.	.
Potassium (MG/KG)	E	2590.00	J	.	1900.00	1.4
Sodium (MG/KG)	B	628.00	=	.	240.00	2.6
Vanadium (MG/KG)		28.40	=	.	25.00	1.1
Benzo(b)fluoranthene (UG/KG)	XJ	35.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	58.00	J	.	.	.
bis(2-Ethylhexyl)phthalate (UG/KG)	J	120.00	J	.	.	.
Pu-238 (PCI/G)		21.87	=	1.6700	0.13	168
Pu-239/240 (PCI/G)		0.21	=	0.0800	0.18	1.2
Th-228 (PCI/G)		1.71	J	0.2900	1.50	1.1
Th-230 (PCI/G)		1.94	=	0.3100	1.90	1.0

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Mound New Property Investigation
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Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD23 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Th-232 (PCI/G)		1.80	=	0.3000	1.40	1.3

---------- Location=New Property Group=Above 2 feet STATION=SD24 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Nitrate-Nitrite-N (MG/KG)		48.70	J	.	26.00	1.9
Sulfate (MG/KG)		167.00	J	.	150.00	1.1
Cerium (MG/KG)	B	40.90	=	.	.	.
Neodymium (MG/KG)	B	16.50	=	.	.	.
Potassium (MG/KG)	E	1930.00	J	.	1900.00	1.0
Sodium (MG/KG)	B	691.00	=	.	240.00	2.9
Pu-238 (PCI/G)		4.99	=	0.4100	0.13	38.4
Th-228 (PCI/G)		1.79	J	0.3100	1.50	1.2
U-235 (PCI/G)		0.14	=	0.0800	0.11	1.3

---------- Location=New Property Group=Above 2 feet STATION=SD25 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		293.00	J	.	150.00	2.0
Cerium (MG/KG)	B	40.40	=	.	.	.
Potassium (MG/KG)	E	2730.00	J	.	1900.00	1.4
Sodium (MG/KG)	B	763.00	=	.	240.00	3.2
Vanadium (MG/KG)		31.00	=	.	25.00	1.2
Th-230 (PCI/G)		2.26	=	0.3300	1.90	1.2

---------- Location=New Property Group=Above 2 feet STATION=SD26 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Nitrate-Nitrite-N (MG/KG)		4900.00	J	.	26.00	188
Aluminum (MG/KG)		19100.00	J	.	19000.00	1.0
Chromium (MG/KG)		21.30	=	.	20.00	1.1
Potassium (MG/KG)	E	3380.00	J	.	1900.00	1.8
Selenium (MG/KG)	B	0.94	=	.	0.59	1.6
Sodium (MG/KG)	B	761.00	=	.	240.00	3.2
Vanadium (MG/KG)		31.70	=	.	25.00	1.3
Benzo(a)anthracene (UG/KG)	J	48.00	J	.	.	.
Benzo(a)pyrene (UG/KG)	J	56.00	J	.	.	.
Benzo(b)fluoranthene (UG/KG)	XJ	120.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	220.00	J	.	.	.

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=SD26 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chrysene (UG/KG)	J	58.00	J	.	.	.
Fluoranthene (UG/KG)	J	81.00	J	.	.	.
Phenanthrene (UG/KG)	J	58.00	J	.	.	.
Pyrene (UG/KG)	J	78.00	J	.	.	.
Pu-238 (PCI/G)		0.43	J	0.1300	0.13	3.3

---------- Location=New Property Group=Above 2 feet STATION=SD27 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		225.00	J	.	150.00	1.5
Cerium (MG/KG)	B	48.40	=	.	.	.
Neodymium (MG/KG)	B	28.70	=	.	.	.
Potassium (MG/KG)	E	2880.00	J	.	1900.00	1.5
Selenium (MG/KG)	B	0.80	=	.	0.59	1.4
Sodium (MG/KG)	B	591.00	=	.	240.00	2.5
Vanadium (MG/KG)		26.40	=	.	25.00	1.1
Pu-238 (PCI/G)		1.73	J	0.4500	0.13	13.3

---------- Location=New Property Group=Above 2 feet STATION=W399 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Benzo(a)anthracene (UG/KG)	J	42.00	J	.	.	.
Benzo(a)pyrene (UG/KG)	J	42.00	J	.	.	.
Benzo(b)fluoranthene (UG/KG)	XJ	95.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	160.00	J	.	.	.
Chrysene (UG/KG)	J	54.00	J	.	.	.
Fluoranthene (UG/KG)	J	78.00	J	.	.	.
Pyrene (UG/KG)	J	78.00	J	.	.	.
U-235 (PCI/G)		0.21	J	0.1000	0.11	1.9

---------- Location=New Property Group=Above 2 feet STATION=W400 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Fluoride (MG/KG)		7.13	J	.	6.70	1.1
Sulfate (MG/KG)		891.00	J	.	150.00	5.9
Antimony (MG/KG)	N*	2.00	J	.	0.45	4.4
Potassium (MG/KG)		2440.00	=	.	1900.00	1.3
Benzo(b)fluoranthene (UG/KG)	XJ	64.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	XJ	130.00	J	.	.	.

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Above 2 feet STATION=W400 Depth(Ft.)=0.0-0.5 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Fluoranthene (UG/KG)	J	54.00	J	.	.	.
Pyrene (UG/KG)	J	59.00	J	.	.	.
Pu-238 (PCI/G)		0.29	=	0.0800	0.13	2.2

---------- Location=New Property Group=Above 2 feet STATION=W402 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		165.00	J	.	150.00	1.1
Antimony (MG/KG)	N*	3.30	J	.	0.45	7.3
Benzo(a)anthracene (UG/KG)	J	90.00	J	.	.	.
Benzo(a)pyrene (UG/KG)	J	98.00	J	.	.	.
Benzo(b)fluoranthene (UG/KG)	J	160.00	J	.	.	.
Benzo(k)fluoranthene (UG/KG)	J	320.00	J	.	.	.
Chrysene (UG/KG)	J	84.00	J	.	.	.
Fluoranthene (UG/KG)	J	170.00	J	.	.	.
Indeno(1,2,3-c,d)pyrene (UG/KG)	J	56.00	J	.	.	.
Phenanthrene (UG/KG)	J	100.00	J	.	.	.
Pyrene (UG/KG)	J	170.00	J	.	.	.

---------- Location=New Property Group=Above 2 feet STATION=W411 Depth(Ft.)=0.0-0.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		524.00	J	.	107.00	4.9
Fluoride (MG/KG)		20.50	J	.	6.70	3.1
Sulfate (MG/KG)		1910.00	J	.	150.00	12.7
Sodium (MG/KG)		445.00	=	.	240.00	1.9
Pu-238 (PCI/G)		1.21	J	0.1800	0.13	9.3
U-235 (PCI/G)		0.20	J	0.0800	0.11	1.8

---------- Location=New Property Group=Below 2 feet STATION=B401 Depth(Ft.)=24.0-30.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Bismuth (MG/KG)		66.90	=	.	39.00	1.7
Di-n-octylphthalate (UG/KG)	J	130.00	J	.	.	.
bis(2-Ethylhexyl)phthalate (UG/KG)	J	340.00	J	.	.	.
U-235 (PCI/G)		0.18	J	0.0800	0.11	1.6

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Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Below 2 feet STATION=B403 Depth(Ft.)=4.5-7.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/KG)		176.00	J	.	107.00	1.6
Sulfate (MG/KG)		248.00	J	.	150.00	1.7
Antimony (MG/KG)	N*	2.90	J	.	0.45	6.4
Lithium (MG/KG)		33.00	=	.	26.00	1.3
Potassium (MG/KG)		3140.00	=	.	1900.00	1.7

---------- Location=New Property Group=Below 2 feet STATION=B404 Depth(Ft.)=4.0-8.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		921.00	J	.	150.00	6.1
Antimony (MG/KG)	N*	2.90	J	.	0.45	6.4
Magnesium (MG/KG)		56500.00	=	.	40000.00	1.4
Organic Carbon (MG/KG)		28200.00	J	.	28000.00	1.0
Organic Carbon (MG/KG)		29800.00	J	.	28000.00	1.1
Organic Carbon (MG/KG)		37000.00	J	.	28000.00	1.3

---------- Location=New Property Group=Below 2 feet STATION=B405 Depth(Ft.)=5.0-11.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		330.00	=	.	150.00	2.2
Acetone (UG/KG)		33.00	J	.	.	.
Sr-90 (PCI/G)		2.77	J	0.8600	0.72	3.8

---------- Location=New Property Group=Below 2 feet STATION=B406 Depth(Ft.)=43.0-48.5 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Antimony (MG/KG)	BN	1.80	J	.	0.45	4.0
Bismuth (MG/KG)		69.10	=	.	39.00	1.8

---------- Location=New Property Group=Below 2 feet STATION=B407 Depth(Ft.)=10.0-15.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		208.00	J	.	150.00	1.4
Antimony (MG/KG)	BN	1.80	J	.	0.45	4.0
Tetryl (MG/KG)	J	0.29	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Below 2 feet STATION=B407 Depth(Ft.)=10.0-15.0 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Di-n-butylphthalate (UG/KG)	J	37.00	J	.	.	.
Di-n-octylphthalate (UG/KG)	J	68.00	J	.	.	.
bis(2-Ethylhexyl)phthalate (UG/KG)	J	60.00	J	.	.	.

---------- Location=New Property Group=Below 2 feet STATION=B408 Depth(Ft.)=37.0-42.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Bismuth (MG/KG)		57.20	=	.	39.00	1.5
Organic Carbon (MG/KG)		43600.00	J	.	28000.00	1.6
Di-n-octylphthalate (UG/KG)	J	47.00	J	.	.	.
bis(2-Ethylhexyl)phthalate (UG/KG)	J	170.00	J	.	.	.
Acetone (UG/KG)		18.00	J	.	.	.

---------- Location=New Property Group=Below 2 feet STATION=B409 Depth(Ft.)=9.0-13.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		187.00	J	.	150.00	1.2
Antimony (MG/KG)	N*	2.60	J	.	0.45	5.8
Lithium (MG/KG)		41.40	=	.	26.00	1.6
Potassium (MG/KG)		4320.00	=	.	1900.00	2.3
Acetone (UG/KG)		51.00	J	.	.	.

---------- Location=New Property Group=Below 2 feet STATION=W400 Depth(Ft.)=27.0-31.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Antimony (MG/KG)	N*	2.90	J	.	0.45	6.4
Magnesium (MG/KG)		40900.00	=	.	40000.00	1.0
Organic Carbon (MG/KG)		38400.00	J	.	28000.00	1.4
Organic Carbon (MG/KG)		37100.00	J	.	28000.00	1.3
Organic Carbon (MG/KG)		38700.00	J	.	28000.00	1.4
Acetone (UG/KG)		31.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Location=New Property Group=Below 2 feet STATION=W402 Depth(Ft.)=24.0-26.0 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/KG)		480.00	J	.	150.00	3.2
Antimony (MG/KG)	N*	2.30	J	.	0.45	5.1
Magnesium (MG/KG)		40300.00	=	.	40000.00	1.0

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

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APPENDIX B.2

GROUNDWATER AND SEEP RESULTS SORTED BY LOCATION

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

---------- Location=New Property Group=All STATION=0158 DATE_COL=09/23/93 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum, Dissolved (UG/L)	B	15.50		.	9.54	1.6
Vanadium, Dissolved (UG/L)		19.40		.	15.80	1.2
Pu-239/240 (PCI/L)		0.20		.	0.06	3.7
Th-230 (PCI/L)		0.35		.	0.28	1.3

---------- Location=New Property Group=All STATION=0158 DATE_COL=03/25/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Nitrate-Nitrite-N (MG/L)		8.80		.	6.46	1.4
Sodium (UG/L)		417000.00		.	105374.19	4.0
Aluminum, Dissolved (UG/L)	B	12.70		.	9.54	1.3
Sodium, Dissolved (UG/L)		419000.00		.	96589.01	4.3
Organic Carbon (MG/L)		6.50		.	1.80	3.6
Th-230 (PCI/L)		0.49		.	0.28	1.8

---------- Location=New Property Group=All STATION=0319 DATE_COL=09/22/93 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum, Dissolved (UG/L)	B	12.80		.	9.54	1.3
Chromium, Dissolved (UG/L)	B	2.60		.	2.35	1.1
Copper, Dissolved (UG/L)	B	3.10		.	2.56	1.2
Th-228 (PCI/L)		0.81		.	0.80	1.0
U-234 (PCI/L)		1.14		.	0.77	1.5
U-238 (PCI/L)		0.91		.	0.68	1.3

---------- Location=New Property Group=All STATION=0319 DATE_COL=03/21/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Nitrite As Nitrogen (MG/L)		0.02		.	.	.
Selenium (UG/L)	J	3.60	J	.	1.85	1.9

---------- Location=New Property Group=All STATION=0320 DATE_COL=09/22/93 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum, Dissolved (UG/L)	B	17.70		.	9.54	1.9

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

---------- Location=New Property Group=All STATION=0320 DATE_COL=09/22/93 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Vanadium, Dissolved (UG/L)		16.80		.	15.80	1.1
Am-241 (PCI/L)		0.15		.	0.12	1.2
Pu-239/240 (PCI/L)		0.23		.	0.06	4.2
Th-230 (PCI/L)	J	0.71	J	.	0.28	2.6

---------- Location=New Property Group=All STATION=0320 DATE_COL=03/22/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Beryllium (UG/L)		0.54		.	0.24	2.2
Beryllium, Dissolved (UG/L)		0.54		.	0.22	2.4

---------- Location=New Property Group=All STATION=0344 DATE_COL=10/14/93 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Barium (UG/L)		343.00		.	315.01	1.1
Iron (UG/L)	J	4640.00	J	.	3777.95	1.2
Barium, Dissolved (UG/L)		348.00		.	287.66	1.2
Iron, Dissolved (UG/L)	J	4620.00	J	.	3286.04	1.4
Nitrogen (MG/L)		0.36		.	0.33	1.1
Pu-239/240 (PCI/L)		0.21		.	0.06	3.7
Ra-226 (PCI/L)		1.67		.	1.02	1.6
Th-230 (PCI/L)		0.87		.	0.28	3.1
Tritium (PCI/L)		2150.00		.	1379.20	1.6

---------- Location=New Property Group=All STATION=0344 DATE_COL=03/24/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Ammonia (MG/L)		0.21		.	0.16	1.3
Barium (UG/L)	J	342.00	J	.	315.01	1.1
Iron (UG/L)	J	4170.00	J	.	3777.95	1.1
Sodium (UG/L)		134000.00		.	105374.19	1.3
Aluminum, Dissolved (UG/L)	B	12.40		.	9.54	1.3
Barium, Dissolved (UG/L)	J	348.00	J	.	287.66	1.2
Iron, Dissolved (UG/L)	J	4220.00	J	.	3286.04	1.3
Sodium, Dissolved (UG/L)		123000.00		.	96589.01	1.3
Nitrogen (MG/L)		0.34		.	0.33	1.0
Tritium (PCI/L)		2400.00		.	1379.20	1.7

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

---------- Location=New Property Group=All STATION=0353 DATE_COL=09/16/93 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Ammonia (MG/L)		0.56		.	0.16	3.4
Aluminum (UG/L)	J	424.00	J	.	121.98	3.5
Calcium (UG/L)	J	145000.00	J	.	123303.13	1.2
Magnesium (UG/L)	J	53700.00	J	.	41401.84	1.3
Vanadium (UG/L)		23.60		.	18.13	1.3
Aluminum, Dissolved (UG/L)	B	11.70		.	9.54	1.2
Antimony, Dissolved (UG/L)	J	11.70	J	.	5.62	2.1
Calcium, Dissolved (UG/L)	J	177000.00	J	.	119789.03	1.5
Magnesium, Dissolved (UG/L)	J	54500.00	J	.	40005.42	1.4
Vanadium, Dissolved (UG/L)		21.20		.	15.80	1.3

---------- Location=New Property Group=All STATION=0353 DATE_COL=04/12/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Calcium (UG/L)	J	129000.00	J	.	123303.13	1.0
Magnesium (UG/L)	J	45400.00	J	.	41401.84	1.1
Aluminum, Dissolved (UG/L)	B	19.70		.	9.54	2.1
Calcium, Dissolved (UG/L)	J	129000.00	J	.	119789.03	1.1
Magnesium, Dissolved (UG/L)	J	45500.00	J	.	40005.42	1.1
Tritium (PCI/L)		1860.00		.	1379.20	1.3

---------- Location=New Property Group=All STATION=0354 DATE_COL=10/11/93 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Sulfate (MG/L)		198.00		.	134.56	1.5
Aluminum (UG/L)		307.00		.	121.98	2.5
Magnesium (UG/L)	J	50100.00	J	.	41401.84	1.2
Antimony, Dissolved (UG/L)		6.30		.	5.62	1.1
Magnesium, Dissolved (UG/L)	J	50800.00	J	.	40005.42	1.3
Organic Carbon (MG/L)		3.20		.	1.80	1.8

---------- Location=New Property Group=All STATION=0354 DATE_COL=03/23/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		876.00		.	121.98	7.2
Magnesium (UG/L)		47100.00		.	41401.84	1.1
Aluminum, Dissolved (UG/L)	B	11.50		.	9.54	1.2
Bismuth, Dissolved (UG/L)	B	32.50		.	16.44	2.0
Magnesium, Dissolved (UG/L)		48400.00		.	40005.42	1.2

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

---------- Location=New Property Group=All STATION=0356 DATE_COL=09/25/93 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)	J	180.00	J	.	121.98	1.5
Aluminum, Dissolved (UG/L)	B	16.50		.	9.54	1.7
Organic Carbon (MG/L)		1.90		.	1.80	1.1
Pu-239/240 (PCI/L)		0.10		.	0.06	1.8
U-238 (PCI/L)		0.74		.	0.68	1.1

---------- Location=New Property Group=All STATION=0356 DATE_COL=03/22/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Beryllium (UG/L)	B	0.54		.	0.24	2.2
Aluminum, Dissolved (UG/L)	B	15.10		.	9.54	1.6
Beryllium, Dissolved (UG/L)	B	0.32		.	0.22	1.4
Cadmium, Dissolved (UG/L)	B	0.84		.	0.55	1.5
Tritium (PCI/L)		1430.00		.	1379.20	1.0
U-234 (PCI/L)		0.90		.	0.77	1.2
U-238 (PCI/L)		0.74		.	0.68	1.1

---------- Location=New Property Group=All STATION=610 DATE_COL=03/29/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		302.00	J-D	.	121.98	2.5
Calcium (UG/L)		128000.00	=	.	123303.13	1.0
Silver (UG/L)	B	1.00	=	.	0.79	1.3
Vanadium (UG/L)		28.10	=	.	18.13	1.5
Alkalinity (MG/L)		280.00	=	.	.	.
Organic Carbon (MG/L)		4.50	J	.	1.80	2.5

---------- Location=New Property Group=All STATION=614 DATE_COL=03/30/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		3910.00	J-D	.	121.98	32.1
Cobalt (UG/L)	B	3.10	=	.	2.16	1.4
Copper (UG/L)	B	6.20	J-D	.	3.42	1.8
Iron (UG/L)		6180.00	J-D	.	3777.95	1.6
Silver (UG/L)	B	1.40	=	.	0.79	1.8
Vanadium (UG/L)		29.30	=	.	18.13	1.6
Alkalinity (MG/L)		227.00	=	.	.	.
Organic Carbon (MG/L)		3.50	J	.	1.80	1.9
Suspended Solids (MG/L)		330.00	=	.	33.02	10.0
Total Phosphorus (MG/L)		0.37	=	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

---------- Location=New Property Group=All STATION=614 DATE_COL=03/30/94 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
1,3,5-Trinitrobenzene (UG/L)	+	1.80	=	.	0.65	2.8
1,3-Dinitrobenzene (UG/L)	+	2.90	J-C-	.	0.16	18.7
PETN (UG/L)	+	2.70	J-C-	.	0.50	5.4
Ac-227 (PCI/L)		0.22	J-D	0.20	.	.

---------- Location=New Property Group=All STATION=617 DATE_COL=03/30/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/L)	- +	357.00	=	.	248.46	1.4
Aluminum (UG/L)		727.00	J-D	.	121.98	6.0
Calcium (UG/L)		174000.00	=	.	123303.13	1.4
Magnesium (UG/L)		75500.00	=	.	41401.84	1.8
Silver (UG/L)	B	1.70	=	.	0.79	2.2
Vanadium (UG/L)		42.80	=	.	18.13	2.4
Alkalinity (MG/L)		298.00	=	.	.	.
Dissolved Solids (MG/L)		1130.00	=	.	843.04	1.3
Organic Carbon (MG/L)		4.60	J	.	1.80	2.6
Trichloroethene (UG/L)		8.00	=	.	0.60	13.3
Am-241 (PCI/L)		0.22	J-D	0.21	0.12	1.8

---------- Location=New Property Group=All STATION=618 DATE_COL=03/29/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/L)	+	1026.00	=	.	248.46	4.1
Sulfate (MG/L)	+	144.00	J-H,C-	.	134.56	1.1
Aluminum (UG/L)		472.00	J-D	.	121.98	3.9
Calcium (UG/L)		277000.00	=	.	123303.13	2.2
Magnesium (UG/L)		64400.00	=	.	41401.84	1.6
Sodium (UG/L)		387000.00	=	.	105374.19	3.7
Vanadium (UG/L)		57.60	=	.	18.13	3.2
Alkalinity (MG/L)		285.00	=	.	.	.
Dissolved Solids (MG/L)		2350.00	=	.	843.04	2.8
Organic Carbon (MG/L)		5.70	J	.	1.80	3.2
PETN (UG/L)	+	3.40	J-C-	.	0.50	6.8
Sr-90 (PCI/L)		2.80	J-L	1.30	0.97	2.9
U-234 (PCI/L)		0.96	=	0.53	0.77	1.2

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

---------- Location=New Property Group=All STATION=619 DATE_COL=03/30/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		3040.00	J-D	.	121.98	24.9
Copper (UG/L)	B	5.70	J-D	.	3.42	1.7
Vanadium (UG/L)		22.00	=	.	18.13	1.2
Alkalinity (MG/L)		177.00	=	.	.	.
Organic Carbon (MG/L)		5.10	J	.	1.80	2.8
Suspended Solids (MG/L)		139.00	=	.	33.02	4.2
Total Phosphorus (MG/L)		0.19	=	.	.	.
PETN (UG/L)	+	11.00	J-C-	.	0.50	22.0
Ac-227 (PCI/L)		0.43	J-D	0.31	.	.
Am-241 (PCI/L)		0.40	J-D	0.35	0.12	3.2
Th-230 (PCI/L)		0.39	J-S	0.30	0.28	1.4
U-234 (PCI/L)		0.80	=	0.48	0.77	1.0

---------- Location=New Property Group=All STATION=620 DATE_COL=03/30/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		5490.00	J-D	.	121.98	45.0
Calcium (UG/L)		139000.00	=	.	123303.13	1.1
Cobalt (UG/L)	B	3.40	=	.	2.16	1.6
Copper (UG/L)		7.60	J-D	.	3.42	2.2
Iron (UG/L)		7830.00	J-D	.	3777.95	2.1
Silver (UG/L)	B	1.00	=	.	0.79	1.3
Vanadium (UG/L)		36.30	=	.	18.13	2.0
Alkalinity (MG/L)		245.00	=	.	.	.
Organic Carbon (MG/L)		2.20	J	.	1.80	1.2
Suspended Solids (MG/L)		317.00	=	.	33.02	9.6
Total Phosphorus (MG/L)		0.42	=	.	.	.
PETN (UG/L)	+	1.60	J-C-	.	0.50	3.2
U-234 (PCI/L)		0.96	=	0.49	0.77	1.2

---------- Location=New Property Group=All STATION=621 DATE_COL=03/30/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		254.00	J-D	.	121.98	2.1
Vanadium (UG/L)		18.60	=	.	18.13	1.0
Alkalinity (MG/L)		211.00	=	.	.	.
Am-241 (PCI/L)		0.32	J-D	0.31	0.12	2.6

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

---------- Location=New Property Group=All STATION=623 DATE_COL=03/30/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/L)	+	363.00	=	.	248.46	1.5
Aluminum (UG/L)		546.00	J-D	.	121.98	4.5
Calcium (UG/L)		142000.00	=	.	123303.13	1.2
Sodium (UG/L)		130000.00	=	.	105374.19	1.2
Vanadium (UG/L)		35.60	=	.	18.13	2.0
Alkalinity (MG/L)		280.00	=	.	.	.
Dissolved Solids (MG/L)		1060.00	=	.	843.04	1.3
Organic Carbon (MG/L)		2.30	J	.	1.80	1.3
Am-241 (PCI/L)		0.29	J-D	0.24	0.12	2.3
Th-230 (PCI/L)		0.48	J-S	0.28	0.28	1.7

---------- Location=New Property Group=All STATION=B401 DATE_COL=06/15/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		40200.00	=	.	121.98	330
Bismuth (UG/L)		688.00	J	.	16.44	41.9
Calcium (UG/L)		703000.00	=	.	123303.13	5.7
Copper (UG/L)		160.00	=	.	3.42	46.8
Iron (UG/L)	E	136000.00	J	.	3777.95	36.0
Lead (UG/L)		80.70	=	.	1.44	56.0
Lithium (UG/L)		70.10	=	.	50.28	1.4
Magnesium (UG/L)	E*	242000.00	J	.	41401.84	5.8
Manganese (UG/L)	E	2190.00	J	.	214.08	10.2
Molybdenum (UG/L)		168.00	=	.	6.36	26.4
Potassium (UG/L)		10800.00	=	.	5381.30	2.0
Vanadium (UG/L)	EN	84.40	J	.	18.13	4.7
Zinc (UG/L)	EN	413.00	J	.	100.15	4.1
Nitrogen (MG/L)		0.37	J	.	0.33	1.1
Organic Carbon (MG/L)		2.72	=	.	1.80	1.5
Organic Carbon (MG/L)		2.78	=	.	1.80	1.5
Organic Carbon (MG/L)		2.78	=	.	1.80	1.5
Organic Carbon (MG/L)		2.70	=	.	1.80	1.5
Suspended Solids (MG/L)		6170.00	=	.	33.02	187
Total Phosphorus (MG/L)		0.67	J	.	.	.
Acrylonitrile (UG/L)	J	25.00	J	.	5.00	5.0
Hexane (UG/L)	J	1.00	J	.	.	.
Ra-226 (PCI/L)		1.22	J	0.18	1.02	1.2

---------- Location=New Property Group=All STATION=B408 DATE_COL=06/20/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		58800.00	=	.	121.98	482
Arsenic (UG/L)		472.00	J	.	28.17	16.8
Barium (UG/L)	EN	552.00	J	.	315.01	1.8
Bismuth (UG/L)		1460.00	J	.	16.44	88.8

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

---------- Location=New Property Group=All STATION=B408 DATE_COL=06/20/94 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Calcium (UG/L)		1760000.00	=	.	123303.13	14.3
Chromium (UG/L)	N	164.00	J	.	135.96	1.2
Cobalt (UG/L)	N	126.00	J	.	2.16	58.3
Copper (UG/L)		485.00	=	.	3.42	142
Iron (UG/L)	E	470000.00	J	.	3777.95	124
Lead (UG/L)		148.00	=	.	1.44	103
Magnesium (UG/L)	E*	462000.00	J	.	41401.84	11.2
Manganese (UG/L)	E	7000.00	J	.	214.08	32.7
Mercury (UG/L)		0.40	=	.	0.05	8.0
Nickel (UG/L)	N	322.00	J	.	152.46	2.1
Potassium (UG/L)		13300.00	=	.	5381.30	2.5
Vanadium (UG/L)	EN	138.00	J	.	18.13	7.6
Zinc (UG/L)	EN	1140.00	J	.	100.15	11.4
Nitrogen (MG/L)		0.37	J	.	0.33	1.1
Organic Carbon (MG/L)		2.96	=	.	1.80	1.6
Organic Carbon (MG/L)		2.93	=	.	1.80	1.6
Organic Carbon (MG/L)		2.74	=	.	1.80	1.5
Organic Carbon (MG/L)		2.98	=	.	1.80	1.7
Suspended Solids (MG/L)		19400.00	=	.	33.02	588
Am-241 (PCI/L)		0.47	J	0.44	0.12	3.8
Ra-226 (PCI/L)		1.22	J	0.19	1.02	1.2
Th-230 (PCI/L)		0.43	J	0.22	0.28	1.6
Th-232 (PCI/L)		0.35	=	0.20	0.23	1.5
U-234 (PCI/L)		0.94	J	0.24	0.77	1.2
U-235 (PCI/L)		0.07	=	0.07	0.04	1.8
U-238 (PCI/L)		1.12	=	0.27	0.68	1.6

---------- Location=New Property Group=All STATION=W399 DATE_COL=08/29/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Chloride (MG/L)		488.00	=	.	248.46	2.0
Fluoride (MG/L)		1.04	=	.	0.41	2.5
Sulfate (MG/L)		399.00	=	.	134.56	3.0
Aluminum (UG/L)	E	1130.00	J	.	121.98	9.3
Antimony (UG/L)	B	2.30	=	.	0.54	4.3
Chromium (UG/L)		309.00	=	.	135.96	2.3
Cobalt (UG/L)	B	8.30	=	.	2.16	3.8
Copper (UG/L)	B	8.30	=	.	3.42	2.4
Magnesium (UG/L)		63200.00	=	.	41401.84	1.5
Manganese (UG/L)		220.00	=	.	214.08	1.0
Nickel (UG/L)		394.00	=	.	152.46	2.6
Potassium (UG/L)		65000.00	=	.	5381.30	12.1
Sodium (UG/L)		423000.00	=	.	105374.19	4.0
Thallium (UG/L)	B	3.60	=	.	1.10	3.3
Zinc (UG/L)	E	109.00	J	.	100.15	1.1
Suspended Solids (MG/L)		138.00	=	.	33.02	4.2
Ra-226 (PCI/L)		1.08	J	0.21	1.02	1.1
U-234 (PCI/L)		3.23	J	0.62	0.77	4.2
U-235 (PCI/L)		0.36	J	0.19	0.04	9.5

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

---------- Location=New Property Group=All STATION=W399 DATE_COL=08/29/94 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
U-238 (PCI/L)		1.02	J	0.33	0.68	1.5

---------- Location=New Property Group=All STATION=W400 DATE_COL=07/14/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		4810.00	=	.	121.98	39.4
Bismuth (UG/L)		193.00	=	.	16.44	11.7
Calcium (UG/L)		420000.00	=	.	123303.13	3.4
Cobalt (UG/L)	* B	6.90	=	.	2.16	3.2
Copper (UG/L)		26.90	J	.	3.42	7.9
Iron (UG/L)		4950.00	=	.	3777.95	1.3
Lead (UG/L)		8.50	J	.	1.44	5.9
Magnesium (UG/L)	E	86100.00	J	.	41401.84	2.1
Manganese (UG/L)	E	1010.00	J	.	214.08	4.7
Potassium (UG/L)	E	7550.00	J	.	5381.30	1.4
Zinc (UG/L)		261.00	=	.	100.15	2.6
Alkalinity (MG/L)		247.00	=	.	.	.
Organic Carbon (MG/L)		3.14	=	.	1.80	1.7
Organic Carbon (MG/L)		3.31	=	.	1.80	1.8
Organic Carbon (MG/L)		3.12	=	.	1.80	1.7
Organic Carbon (MG/L)		3.00	=	.	1.80	1.7
Suspended Solids (MG/L)		4680.00	=	.	33.02	142
Total Phosphorus (MG/L)		0.33	=	.	.	.
2,4,6-Trinitrotoluene (UG/L)	J	0.76	J	.	0.65	1.2
Am-241 (PCI/L)		0.27	=	0.25	0.12	2.2
U-235 (PCI/L)		0.14	J	0.14	0.04	3.7

---------- Location=New Property Group=All STATION=W402 DATE_COL=07/20/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		9950.00	=	.	121.98	81.6
Bismuth (UG/L)	B	147.00	=	.	16.44	8.9
Calcium (UG/L)		179000.00	=	.	123303.13	1.5
Cobalt (UG/L)	B	7.00	=	.	2.16	3.2
Iron (UG/L)		10300.00	=	.	3777.95	2.7
Lead (UG/L)		6.00	J	.	1.44	4.2
Magnesium (UG/L)	E	55600.00	J	.	41401.84	1.3
Manganese (UG/L)	E	317.00	J	.	214.08	1.5
Potassium (UG/L)	E	7410.00	J	.	5381.30	1.4
Alkalinity (MG/L)		312.00	=	.	.	.
Dissolved Solids (MG/L)		908.00	=	.	843.04	1.1
Organic Carbon (MG/L)		2.00	=	.	1.80	1.1
Organic Carbon (MG/L)		1.81	=	.	1.80	1.0
Suspended Solids (MG/L)		47.00	=	.	33.02	1.4

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

---------- Location=New Property Group=All STATION=W402 DATE_COL=07/20/94 ----------
(continued)

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Total Phosphorus (MG/L)		0.14	=	.	.	.
Am-241 (PCI/L)		0.13	J	0.09	0.12	1.0
Tritium (PCI/L)	-	1673.30	=	393.00	1379.20	1.2
U-234 (PCI/L)		0.91	J	0.33	0.77	1.2
U-235 (PCI/L)		0.15	=	0.13	0.04	3.9

---------- Location=New Property Group=All STATION=W411 DATE_COL=07/19/94 ----------

Analyte (units)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Aluminum (UG/L)		31500.00	=	.	121.98	258
Bismuth (UG/L)		264.00	=	.	16.44	16.1
Calcium (UG/L)		255000.00	J	.	123303.13	2.1
Cobalt (UG/L)	B	18.20	=	.	2.16	8.4
Iron (UG/L)		31500.00	=	.	3777.95	8.3
Lead (UG/L)		5.70	J	.	1.44	4.6
Lithium (UG/L)		132.00	=	.	50.28	2.6
Magnesium (UG/L)	E	81900.00	J	.	41401.84	2.0
Manganese (UG/L)	E	1120.00	J	.	214.08	5.2
Potassium (UG/L)	E	28400.00	J	.	5381.30	5.3
Vanadium (UG/L)	B	29.10	=	.	18.13	1.6
Alkalinity (MG/L)		335.00	=	.	.	.
Dissolved Solids (MG/L)		1100.00	=	.	843.04	1.3
Nitrogen (MG/L)		0.80	J	.	0.33	2.4
Organic Carbon (MG/L)		2.15	=	.	1.80	1.2
Organic Carbon (MG/L)		2.32	=	.	1.80	1.3
Organic Carbon (MG/L)		2.32	=	.	1.80	1.3
Organic Carbon (MG/L)		2.34	=	.	1.80	1.3
Suspended Solids (MG/L)		97.00	=	.	33.02	2.9
Total Phosphorus (MG/L)		0.24	=	.	.	.
1,2-Dichloroethene (UG/L)	J	4.00	J	.	0.50	8.0
Trichloroethene (UG/L)		8.00	=	.	0.60	13.3
Th-230 (PCI/L)		1.17	J	0.47	0.28	4.2
Th-232 (PCI/L)		0.39	J	0.27	0.23	1.7

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

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APPENDIX B.3
SOIL AND SEDIMENT RESULTS SORTED BY ANALYTE

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Anions Analyte (units)=Chloride (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AK	1.5-2.0		1180.00	=	.	107.00	11.0
Soil	New Property	Above 2 feet	B398	0.0-0.5		320.00	J	.	107.00	3.0
Soil	New Property	Above 2 feet	B401	0.0-0.5		183.00	J	.	107.00	1.7
Soil	New Property	Above 2 feet	SD02	0.0-0.5		237.00	J	.	107.00	2.2
Soil	New Property	Above 2 feet	SD03	0.0-0.5		183.00	J	.	107.00	1.7
Soil	New Property	Above 2 feet	SD04	0.0-0.5		350.00	J	.	107.00	3.3
Soil	New Property	Above 2 feet	SD14	0.0-0.5		119.00	=	.	107.00	1.1
Soil	New Property	Above 2 feet	W411	0.0-0.5		524.00	J	.	107.00	4.9
Soil	New Property	Below 2 feet	B403	4.5-7.0		176.00	J	.	107.00	1.6

Analysis Type=Anions Analyte (units)=Fluoride (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD04	0.0-0.5		13.10	J	.	6.70	2.0
Soil	New Property	Above 2 feet	W400	0.0-0.5		7.13	J	.	6.70	1.1
Soil	New Property	Above 2 feet	W411	0.0-0.5		20.50	J	.	6.70	3.1

Analysis Type=Anions Analyte (units)=Nitrate-Nitrite-N (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD01	0.0-0.5		65.70	J	.	26.00	2.5
Soil	New Property	Above 2 feet	SD03	0.0-0.5		9170.00	J	.	26.00	353
Soil	New Property	Above 2 feet	SD21	0.0-0.5		10500.00	J	.	26.00	404
Soil	New Property	Above 2 feet	SD24	0.0-0.5		48.70	J	.	26.00	1.9
Soil	New Property	Above 2 feet	SD26	0.0-0.5		4900.00	J	.	26.00	188

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Analysis Type=Anions Analyte (units)=Sulfate (MG/KG) ----------

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B398	0.0-0.5		1370.00	=	.	150.00	9.1
Soil	New Property	Above 2 feet	B401	0.0-0.5		356.00	J	.	150.00	2.4
Soil	New Property	Above 2 feet	B403	0.0-0.5		362.00	J	.	150.00	2.4
Soil	New Property	Above 2 feet	B405	0.0-0.5		359.00	=	.	150.00	2.4
Soil	New Property	Above 2 feet	B406	0.2-0.7		795.00	=	.	150.00	5.3
Soil	New Property	Above 2 feet	B407	0.0-0.5		328.00	J	.	150.00	2.2
Soil	New Property	Above 2 feet	B408	0.0-0.5		296.00	J	.	150.00	2.0
Soil	New Property	Above 2 feet	B409	0.0-0.5		331.00	J	.	150.00	2.2
Soil	New Property	Above 2 feet	SD02	0.0-0.5		734.00	J	.	150.00	4.9
Soil	New Property	Above 2 feet	SD04	0.0-0.5		540.00	J	.	150.00	3.6
Soil	New Property	Above 2 feet	SD05	0.0-0.5		215.00	J	.	150.00	1.4
Soil	New Property	Above 2 feet	SD06	0.0-0.5		403.00	J	.	150.00	2.7
Soil	New Property	Above 2 feet	SD07	0.0-0.5		553.00	J	.	150.00	3.7
Soil	New Property	Above 2 feet	SD08	0.0-0.5		637.00	J	.	150.00	4.2
Soil	New Property	Above 2 feet	SD10	0.0-0.5		345.00	J	.	150.00	2.3
Soil	New Property	Above 2 feet	SD11	0.0-0.5		264.00	J	.	150.00	1.8
Soil	New Property	Above 2 feet	SD12	0.0-0.5		418.00	J	.	150.00	2.8
Soil	New Property	Above 2 feet	SD13	0.0-0.5		277.00	J	.	150.00	1.8
Soil	New Property	Above 2 feet	SD14	0.0-0.5		1150.00	J	.	150.00	7.7
Soil	New Property	Above 2 feet	SD15	0.0-0.5		215.00	J	.	150.00	1.4
Soil	New Property	Above 2 feet	SD23	0.0-0.5		331.00	J	.	150.00	2.2
Soil	New Property	Above 2 feet	SD24	0.0-0.5		167.00	J	.	150.00	1.1
Soil	New Property	Above 2 feet	SD25	0.0-0.5		293.00	J	.	150.00	2.0
Soil	New Property	Above 2 feet	SD27	0.0-0.5		225.00	J	.	150.00	1.5
Soil	New Property	Above 2 feet	W400	0.0-0.5		891.00	J	.	150.00	5.9
Soil	New Property	Above 2 feet	W402	0.0-0.5		165.00	J	.	150.00	1.1
Soil	New Property	Above 2 feet	W411	0.0-0.5		1910.00	J	.	150.00	12.7
Soil	New Property	Below 2 feet	B403	4.5-7.0		248.00	J	.	150.00	1.7
Soil	New Property	Below 2 feet	B404	4.0-8.0		921.00	J	.	150.00	6.1
Soil	New Property	Below 2 feet	B405	5.0-11.0		330.00	=	.	150.00	2.2
Soil	New Property	Below 2 feet	B407	10.0-15.0		208.00	J	.	150.00	1.4
Soil	New Property	Below 2 feet	B409	9.0-13.0		187.00	J	.	150.00	1.2
Soil	New Property	Below 2 feet	W402	24.0-26.0		480.00	J	.	150.00	3.2

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Aluminum (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	1.5-2.0		21500.00	=	.	19000.00	1.1
Soil	New Property	Above 2 feet	AK	1.5-2.0		20000.00	=	.	19000.00	1.1
Soil	New Property	Above 2 feet	B403	0.0-0.5		19200.00	=	.	19000.00	1.0
Soil	New Property	Above 2 feet	B409	0.0-0.5		21400.00	=	.	19000.00	1.1
Soil	New Property	Above 2 feet	SD01	0.0-0.5		23000.00	J	.	19000.00	1.2
Soil	New Property	Above 2 feet	SD04	0.0-0.5	*	19800.00	J	.	19000.00	1.0
Soil	New Property	Above 2 feet	SD26	0.0-0.5		19100.00	J	.	19000.00	1.0

Analysis Type=Metals Analyte (units)=Antimony (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD06	0.0-0.5	N*	3.00	J	.	0.45	6.7
Soil	New Property	Above 2 feet	SD07	0.0-0.5	N*	1.90	J	.	0.45	4.2
Soil	New Property	Above 2 feet	SD09	0.0-0.5	BN	1.30	J	.	0.45	2.9
Soil	New Property	Above 2 feet	SD12	0.0-0.5	N*	2.50	J	.	0.45	5.6
Soil	New Property	Above 2 feet	SD13	0.0-0.5	N*	2.90	J	.	0.45	6.4
Soil	New Property	Above 2 feet	SD14	0.0-0.5	N*	2.50	J	.	0.45	5.6
Soil	New Property	Above 2 feet	SD15	0.0-0.5	N*	2.60	J	.	0.45	5.8
Soil	New Property	Above 2 feet	W400	0.0-0.5	N*	2.00	J	.	0.45	4.4
Soil	New Property	Above 2 feet	W402	0.0-0.5	N*	3.30	J	.	0.45	7.3
Soil	New Property	Below 2 feet	B403	4.5-7.0	N*	2.90	J	.	0.45	6.4
Soil	New Property	Below 2 feet	B404	4.0-8.0	N*	2.90	J	.	0.45	6.4
Soil	New Property	Below 2 feet	B406	43.0-48.5	BN	1.80	J	.	0.45	4.0
Soil	New Property	Below 2 feet	B407	10.0-15.0	BN	1.80	J	.	0.45	4.0
Soil	New Property	Below 2 feet	B409	9.0-13.0	N*	2.60	J	.	0.45	5.8
Soil	New Property	Below 2 feet	W400	27.0-31.0	N*	2.90	J	.	0.45	6.4
Soil	New Property	Below 2 feet	W402	24.0-26.0	N*	2.30	J	.	0.45	5.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Arsenic (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	0.0-0.5		8.70	=	.	8.60	1.0
Soil	New Property	Above 2 feet	AH	1.5-2.0		15.80	=	.	8.60	1.8
Soil	New Property	Above 2 feet	AJ	0.0-0.5		8.70	=	.	8.60	1.0
Soil	New Property	Above 2 feet	B406	0.2-0.7		11.80	=	.	8.60	1.4
Soil	New Property	Above 2 feet	CJ	0.0-0.5		11.00	=	.	8.60	1.3
Soil	New Property	Above 2 feet	CK	0.0-0.5		10.90	=	.	8.60	1.3
Soil	New Property	Above 2 feet	NPS3	0.0-1.0	N	10.00	J	.	8.60	1.2
Soil	New Property	Above 2 feet	SD03	0.0-0.5	*	10.50	=	.	8.60	1.2
Soil	New Property	Above 2 feet	SD04	0.0-0.5	*	9.60	=	.	8.60	1.1
Soil	New Property	Above 2 feet	SD09	0.0-0.5		17.10	J	.	8.60	2.0

Analysis Type=Metals Analyte (units)=Bismuth (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	CJ	0.0-0.5		40.20	=	.	39.00	1.0
Soil	New Property	Above 2 feet	CJ	1.5-2.0		70.40	=	.	39.00	1.8
Soil	New Property	Above 2 feet	CK	0.0-0.5		54.40	=	.	39.00	1.4
Soil	New Property	Above 2 feet	CK	1.5-2.0		69.50	=	.	39.00	1.8
Soil	New Property	Above 2 feet	SD09	0.0-0.5		61.50	=	.	39.00	1.6
Soil	New Property	Above 2 feet	SD16	0.0-0.5		43.90	=	.	39.00	1.1
Soil	New Property	Above 2 feet	SD17	0.0-0.5		46.60	=	.	39.00	1.2
Soil	New Property	Above 2 feet	SD18	0.0-0.5		43.50	=	.	39.00	1.1
Soil	New Property	Below 2 feet	B401	24.0-30.0		66.90	=	.	39.00	1.7
Soil	New Property	Below 2 feet	B406	43.0-48.5		69.10	=	.	39.00	1.8
Soil	New Property	Below 2 feet	B408	37.0-42.0		57.20	=	.	39.00	1.5

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Cadmium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD09	0.0-0.5		5.00	J	.	2.10	2.4

Analysis Type=Metals Analyte (units)=Cerium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD09	0.0-0.5	B	23.60	=	.	.	.
Soil	New Property	Above 2 feet	SD10	0.0-0.5	B	44.20	=	.	.	.
Soil	New Property	Above 2 feet	SD11	0.0-0.5	B	32.70	=	.	.	.
Soil	New Property	Above 2 feet	SD23	0.0-0.5		50.90	=	.	.	.
Soil	New Property	Above 2 feet	SD24	0.0-0.5	B	40.90	=	.	.	.
Soil	New Property	Above 2 feet	SD25	0.0-0.5	B	40.40	=	.	.	.
Soil	New Property	Above 2 feet	SD27	0.0-0.5	B	48.40	=	.	.	.

Analysis Type=Metals Analyte (units)=Chromium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	1.5-2.0		29.60	=	.	20.00	1.5
Soil	New Property	Above 2 feet	AK	0.0-0.5		22.90	=	.	20.00	1.1
Soil	New Property	Above 2 feet	AK	1.5-2.0		24.20	=	.	20.00	1.2
Soil	New Property	Above 2 feet	B409	0.0-0.5		22.50	=	.	20.00	1.1
Soil	New Property	Above 2 feet	CJ	0.0-0.5		21.60	=	.	20.00	1.1
Soil	New Property	Above 2 feet	SD01	0.0-0.5		23.50	=	.	20.00	1.2
Soil	New Property	Above 2 feet	SD04	0.0-0.5		21.50	J	.	20.00	1.1
Soil	New Property	Above 2 feet	SD26	0.0-0.5		21.30	=	.	20.00	1.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Copper (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	1.5-2.0		33.10	=	.	26.00	1.3
Soil	New Property	Above 2 feet	CJ	0.0-0.5	*	27.00	J	.	26.00	1.0
Soil	New Property	Above 2 feet	CK	0.0-0.5	*	28.60	J	.	26.00	1.1
Soil	New Property	Above 2 feet	SD09	0.0-0.5		27.50	J	.	26.00	1.1

Analysis Type=Metals Analyte (units)=Iron (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	1.5-2.0		43600.00	=	.	35000.00	1.2
Soil	New Property	Above 2 feet	SD09	0.0-0.5		40500.00	=	.	35000.00	1.2

Analysis Type=Metals Analyte (units)=Lead (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD09	0.0-0.5		255.00	J	.	48.00	5.3

Analysis Type=Metals Analyte (units)=Lithium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B409	0.0-0.5		27.30	=	.	26.00	1.1
Soil	New Property	Above 2 feet	SD01	0.0-0.5		26.90	=	.	26.00	1.0
Soil	New Property	Below 2 feet	B403	4.5-7.0		33.00	=	.	26.00	1.3
Soil	New Property	Below 2 feet	B409	9.0-13.0		41.40	=	.	26.00	1.6

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Magnesium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	CJ	1.5-2.0	*	43700.00	=	.	40000.00	1.1
Soil	New Property	Above 2 feet	CK	1.5-2.0	*	44100.00	=	.	40000.00	1.1
Soil	New Property	Above 2 feet	NPS1	0.0-1.0		52400.00	=	.	40000.00	1.3
Soil	New Property	Above 2 feet	NPS5	0.0-1.0		40600.00	=	.	40000.00	1.0
Soil	New Property	Below 2 feet	B404	4.0-8.0		56500.00	=	.	40000.00	1.4
Soil	New Property	Below 2 feet	W400	27.0-31.0		40900.00	=	.	40000.00	1.0
Soil	New Property	Below 2 feet	W402	24.0-26.0		40300.00	=	.	40000.00	1.0

Analysis Type=Metals Analyte (units)=Manganese (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD09	0.0-0.5		5240.00	J	.	1400.00	3.7

Analysis Type=Metals Analyte (units)=Mercury (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	NPS6	0.0-1.0	N*	0.42	J	.	0.15	2.8

Analysis Type=Metals Analyte (units)=Neodymium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD09	0.0-0.5	B	20.30	=	.	.	.
Soil	New Property	Above 2 feet	SD10	0.0-0.5	B	23.10	=	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Neodymium (MG/KG) (continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD11	0.0-0.5	B	23.40	=	.	.	.
Soil	New Property	Above 2 feet	SD23	0.0-0.5	B	33.40	=	.	.	.
Soil	New Property	Above 2 feet	SD24	0.0-0.5	B	16.50	=	.	.	.
Soil	New Property	Above 2 feet	SD27	0.0-0.5	B	28.70	=	.	.	.

Analysis Type=Metals Analyte (units)=Nickel (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	1.5-2.0		41.90	=	.	32.00	1.3

Analysis Type=Metals Analyte (units)=Potassium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AK	0.0-0.5		2680.00	=	.	1900.00	1.4
Soil	New Property	Above 2 feet	AK	1.5-2.0		2970.00	=	.	1900.00	1.6
Soil	New Property	Above 2 feet	B403	0.0-0.5		3720.00	=	.	1900.00	2.0
Soil	New Property	Above 2 feet	B409	0.0-0.5		3550.00	=	.	1900.00	1.9
Soil	New Property	Above 2 feet	CJ	0.0-0.5		2270.00	=	.	1900.00	1.2
Soil	New Property	Above 2 feet	CJ	1.5-2.0		2020.00	=	.	1900.00	1.1
Soil	New Property	Above 2 feet	CK	1.5-2.0		1980.00	=	.	1900.00	1.0
Soil	New Property	Above 2 feet	SD01	0.0-0.5	E	5230.00	J	.	1900.00	2.8
Soil	New Property	Above 2 feet	SD02	0.0-0.5	E	2680.00	J	.	1900.00	1.4
Soil	New Property	Above 2 feet	SD03	0.0-0.5	E	2370.00	J	.	1900.00	1.2
Soil	New Property	Above 2 feet	SD04	0.0-0.5	E	2360.00	J	.	1900.00	1.2
Soil	New Property	Above 2 feet	SD05	0.0-0.5	E	2000.00	J	.	1900.00	1.1
Soil	New Property	Above 2 feet	SD06	0.0-0.5		2020.00	=	.	1900.00	1.1
Soil	New Property	Above 2 feet	SD07	0.0-0.5		2620.00	=	.	1900.00	1.4

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Potassium (MG/KG)
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD08	0.0-0.5		2200.00	=	.	1900.00	1.2
Soil	New Property	Above 2 feet	SD09	0.0-0.5	E	2040.00	J	.	1900.00	1.1
Soil	New Property	Above 2 feet	SD14	0.0-0.5		2040.00	=	.	1900.00	1.1
Soil	New Property	Above 2 feet	SD16	0.0-0.5	E	2950.00	J	.	1900.00	1.6
Soil	New Property	Above 2 feet	SD20	0.0-0.5	E	1930.00	J	.	1900.00	1.0
Soil	New Property	Above 2 feet	SD22	0.0-0.5	E	3030.00	J	.	1900.00	1.6
Soil	New Property	Above 2 feet	SD23	0.0-0.5	E	2590.00	J	.	1900.00	1.4
Soil	New Property	Above 2 feet	SD24	0.0-0.5	E	1930.00	J	.	1900.00	1.0
Soil	New Property	Above 2 feet	SD25	0.0-0.5	E	2730.00	J	.	1900.00	1.4
Soil	New Property	Above 2 feet	SD26	0.0-0.5	E	3380.00	J	.	1900.00	1.8
Soil	New Property	Above 2 feet	SD27	0.0-0.5	E	2880.00	J	.	1900.00	1.5
Soil	New Property	Above 2 feet	W400	0.0-0.5		2440.00	=	.	1900.00	1.3
Soil	New Property	Below 2 feet	B403	4.5-7.0		3140.00	=	.	1900.00	1.7
Soil	New Property	Below 2 feet	B409	9.0-13.0		4320.00	=	.	1900.00	2.3

Analysis Type=Metals Analyte (units)=Selenium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	CJ	0.0-0.5	*	2.20	J	.	0.59	3.7
Soil	New Property	Above 2 feet	CJ	1.5-2.0	*	1.60	J	.	0.59	2.7
Soil	New Property	Above 2 feet	CK	0.0-0.5	*	1.30	J	.	0.59	2.2
Soil	New Property	Above 2 feet	CK	1.5-2.0	*	2.00	J	.	0.59	3.4
Soil	New Property	Above 2 feet	SD01	0.0-0.5	B	1.20	=	.	0.59	2.0
Soil	New Property	Above 2 feet	SD02	0.0-0.5	B	0.77	=	.	0.59	1.3
Soil	New Property	Above 2 feet	SD09	0.0-0.5	B	1.00	=	.	0.59	1.7
Soil	New Property	Above 2 feet	SD26	0.0-0.5	B	0.94	=	.	0.59	1.6
Soil	New Property	Above 2 feet	SD27	0.0-0.5	B	0.80	=	.	0.59	1.4

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Sodium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AJ	1.5-2.0	B	619.00	J	.	240.00	2.6
Soil	New Property	Above 2 feet	AK	0.0-0.5	B	903.00	J	.	240.00	3.8
Soil	New Property	Above 2 feet	AK	1.5-2.0		1770.00	J	.	240.00	7.4
Soil	New Property	Above 2 feet	B403	0.0-0.5		544.00	=	.	240.00	2.3
Soil	New Property	Above 2 feet	SD01	0.0-0.5	B	750.00	=	.	240.00	3.1
Soil	New Property	Above 2 feet	SD02	0.0-0.5		1890.00	=	.	240.00	7.9
Soil	New Property	Above 2 feet	SD03	0.0-0.5		1510.00	=	.	240.00	6.3
Soil	New Property	Above 2 feet	SD04	0.0-0.5		3450.00	=	.	240.00	14.4
Soil	New Property	Above 2 feet	SD05	0.0-0.5	B	658.00	=	.	240.00	2.7
Soil	New Property	Above 2 feet	SD09	0.0-0.5	B	865.00	=	.	240.00	3.6
Soil	New Property	Above 2 feet	SD10	0.0-0.5	B	492.00	=	.	240.00	2.1
Soil	New Property	Above 2 feet	SD11	0.0-0.5	B	607.00	=	.	240.00	2.5
Soil	New Property	Above 2 feet	SD16	0.0-0.5	B	721.00	=	.	240.00	3.0
Soil	New Property	Above 2 feet	SD17	0.0-0.5	B	562.00	=	.	240.00	2.3
Soil	New Property	Above 2 feet	SD18	0.0-0.5	B	592.00	=	.	240.00	2.5
Soil	New Property	Above 2 feet	SD19	0.0-0.5	B	581.00	=	.	240.00	2.4
Soil	New Property	Above 2 feet	SD20	0.0-0.5	B	728.00	=	.	240.00	3.0
Soil	New Property	Above 2 feet	SD21	0.0-0.5	B	620.00	=	.	240.00	2.6
Soil	New Property	Above 2 feet	SD22	0.0-0.5	B	700.00	=	.	240.00	2.9
Soil	New Property	Above 2 feet	SD23	0.0-0.5	B	628.00	=	.	240.00	2.6
Soil	New Property	Above 2 feet	SD24	0.0-0.5	B	691.00	=	.	240.00	2.9
Soil	New Property	Above 2 feet	SD25	0.0-0.5	B	763.00	=	.	240.00	3.2
Soil	New Property	Above 2 feet	SD26	0.0-0.5	B	761.00	=	.	240.00	3.2
Soil	New Property	Above 2 feet	SD27	0.0-0.5	B	591.00	=	.	240.00	2.5
Soil	New Property	Above 2 feet	W411	0.0-0.5		445.00	=	.	240.00	1.9

Analysis Type=Metals Analyte (units)=Thallium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	CJ	1.5-2.0	B	0.94	=	.	0.46	2.0
Soil	New Property	Above 2 feet	SD09	0.0-0.5	B	2.10	J	.	0.46	4.6

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Tin (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD09	0.0-0.5		41.10	=	.	20.00	2.1

Analysis Type=Metals Analyte (units)=Vanadium (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	1.5-2.0		38.30	=	.	25.00	1.5
Soil	New Property	Above 2 feet	AJ	0.0-0.5		28.10	=	.	25.00	1.1
Soil	New Property	Above 2 feet	AJ	1.5-2.0		25.60	=	.	25.00	1.0
Soil	New Property	Above 2 feet	AK	0.0-0.5		25.80	=	.	25.00	1.0
Soil	New Property	Above 2 feet	AK	1.5-2.0		27.20	=	.	25.00	1.1
Soil	New Property	Above 2 feet	B403	0.0-0.5		25.90	=	.	25.00	1.0
Soil	New Property	Above 2 feet	B409	0.0-0.5		37.00	=	.	25.00	1.5
Soil	New Property	Above 2 feet	CJ	0.0-0.5	E	31.20	J	.	25.00	1.2
Soil	New Property	Above 2 feet	CK	0.0-0.5	E	28.50	J	.	25.00	1.1
Soil	New Property	Above 2 feet	SD01	0.0-0.5		31.90	=	.	25.00	1.3
Soil	New Property	Above 2 feet	SD03	0.0-0.5		29.90	=	.	25.00	1.2
Soil	New Property	Above 2 feet	SD04	0.0-0.5		38.10	=	.	25.00	1.5
Soil	New Property	Above 2 feet	SD05	0.0-0.5		26.20	=	.	25.00	1.0
Soil	New Property	Above 2 feet	SD16	0.0-0.5		28.00	=	.	25.00	1.1
Soil	New Property	Above 2 feet	SD22	0.0-0.5		28.60	=	.	25.00	1.1
Soil	New Property	Above 2 feet	SD23	0.0-0.5		28.40	=	.	25.00	1.1
Soil	New Property	Above 2 feet	SD25	0.0-0.5		31.00	=	.	25.00	1.2
Soil	New Property	Above 2 feet	SD26	0.0-0.5		31.70	=	.	25.00	1.3
Soil	New Property	Above 2 feet	SD27	0.0-0.5		26.40	=	.	25.00	1.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Zinc (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	0.0-0.5	*	238.00	=	.	140.00	1.7
Soil	New Property	Above 2 feet	AJ	0.0-0.5	*	220.00	=	.	140.00	1.6
Soil	New Property	Above 2 feet	AK	0.0-0.5	*	282.00	=	.	140.00	2.0
Soil	New Property	Above 2 feet	SD09	0.0-0.5		1310.00	J	.	140.00	9.4

Analysis Type=Miscellaneous Analyte (units)=Organic Carbon (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5		30200.00	J	.	28000.00	1.1
Soil	New Property	Above 2 feet	B401	0.0-0.5		31600.00	J	.	28000.00	1.1
Soil	New Property	Above 2 feet	B401	0.0-0.5		41400.00	J	.	28000.00	1.5
Soil	New Property	Above 2 feet	B401	0.0-0.5		29900.00	J	.	28000.00	1.1
Soil	New Property	Above 2 feet	B403	0.0-0.5		90200.00	J	.	28000.00	3.2
Soil	New Property	Above 2 feet	B408	0.0-0.5		37800.00	J	.	28000.00	1.4
Soil	New Property	Above 2 feet	B408	0.0-0.5		55600.00	J	.	28000.00	2.0
Soil	New Property	Above 2 feet	B408	0.0-0.5		33800.00	J	.	28000.00	1.2
Soil	New Property	Above 2 feet	B408	0.0-0.5		33700.00	J	.	28000.00	1.2
Soil	New Property	Below 2 feet	B404	4.0-8.0		28200.00	J	.	28000.00	1.0
Soil	New Property	Below 2 feet	B404	4.0-8.0		29800.00	J	.	28000.00	1.1
Soil	New Property	Below 2 feet	B404	4.0-8.0		37000.00	J	.	28000.00	1.3
Soil	New Property	Below 2 feet	B408	37.0-42.0		43600.00	J	.	28000.00	1.6
Soil	New Property	Below 2 feet	W400	27.0-31.0		38400.00	J	.	28000.00	1.4
Soil	New Property	Below 2 feet	W400	27.0-31.0		37100.00	J	.	28000.00	1.3
Soil	New Property	Below 2 feet	W400	27.0-31.0		38700.00	J	.	28000.00	1.4

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Explosives Analyte (units)=1,3-Dinitrobenzene (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B405	0.0-0.5	J	0.10	J	.	.	.

Analysis Type=Organics-Explosives Analyte (units)=2,4,6-Trinitrotoluene (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B398	0.0-0.5	J	0.11	J	.	.	.
Soil	New Property	Above 2 feet	B405	0.0-0.5	J	0.20	J	.	.	.

Analysis Type=Organics-Explosives Analyte (units)=Tetryl (MG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Below 2 feet	B407	10.0-15.0	J	0.29	J	.	.	.

Analysis Type=Organics-Pesticide/PCB Analyte (units)=4,4'-DDD (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B409	0.0-0.5	P	6.60	J	.	4.20	1.6

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Pesticide/PCB Analyte (units)=alpha-Chlordane (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD19	0.0-0.5	P	3.50	J	.	1.90	1.8

Analysis Type=Organics-Pesticide/PCB Analyte (units)=beta-BHC (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AJ	1.5-2.0	JP	0.18	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=2-Methylnaphthalene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5	J	63.00	J	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5	J	110.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Acenaphthene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD15	0.0-0.5	J	120.00	J	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5	J	42.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Acenaphthylene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD15	0.0-0.5	J	290.00	J	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	J	69.00	J	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	J	73.00	J	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	J	44.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Anthracene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD14	0.0-0.5	J	150.00	J	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5		690.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	J	120.00	J	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	J	200.00	J	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	J	94.00	J	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5	J	150.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(a)anthracene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5	J	58.00	J	.	.	.
Soil	New Property	Above 2 feet	SD01	0.0-0.5	J	44.00	J	.	.	.
Soil	New Property	Above 2 feet	SD02	0.0-0.5	J	48.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	J	130.00	J	.	.	.
Soil	New Property	Above 2 feet	SD09	0.0-0.5	J	98.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5		900.00	=	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5		2800.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5		770.00	=	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5		770.00	=	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5		460.00	=	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(a)anthracene (UG/KG)
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD21	0.0-0.5		540.00	=	.	.	.
Soil	New Property	Above 2 feet	SD26	0.0-0.5	J	48.00	J	.	.	.
Soil	New Property	Above 2 feet	W399	0.0-0.5	J	42.00	J	.	.	.
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	90.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(a)pyrene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5	J	51.00	J	.	.	.
Soil	New Property	Above 2 feet	B404	0.1-0.6	J	42.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	J	130.00	J	.	.	.
Soil	New Property	Above 2 feet	SD09	0.0-0.5	J	100.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5		860.00	=	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5		2500.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5		740.00	=	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5		770.00	=	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5		440.00	=	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5		570.00	=	.	.	.
Soil	New Property	Above 2 feet	SD26	0.0-0.5	J	56.00	J	.	.	.
Soil	New Property	Above 2 feet	W399	0.0-0.5	J	42.00	J	.	.	.
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	98.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(b)fluoranthene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5	XJ	98.00	J	.	.	.
Soil	New Property	Above 2 feet	B404	0.1-0.6	XJ	68.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(b)fluoranthene (UG/KG)
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B407	0.0-0.5	XJ	59.00	J	.	.	.
Soil	New Property	Above 2 feet	B408	0.0-0.5	XJ	37.00	J	.	.	.
Soil	New Property	Above 2 feet	B409	0.0-0.5	XJ	49.00	J	.	.	.
Soil	New Property	Above 2 feet	SD01	0.0-0.5	XJ	130.00	J	.	.	.
Soil	New Property	Above 2 feet	SD02	0.0-0.5	XJ	120.00	J	.	.	.
Soil	New Property	Above 2 feet	SD03	0.0-0.5	XJ	34.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	XJ	230.00	J	.	.	.
Soil	New Property	Above 2 feet	SD05	0.0-0.5	XJ	69.00	J	.	.	.
Soil	New Property	Above 2 feet	SD06	0.0-0.5	XJ	63.00	J	.	.	.
Soil	New Property	Above 2 feet	SD09	0.0-0.5	XJ	220.00	J	.	.	.
Soil	New Property	Above 2 feet	SD11	0.0-0.5	XJ	62.00	J	.	.	.
Soil	New Property	Above 2 feet	SD13	0.0-0.5	XJ	48.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5	X	1300.00	=	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5	XE	4800.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	X	1500.00	=	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	X	1600.00	=	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	X	900.00	=	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5	X	1100.00	=	.	.	.
Soil	New Property	Above 2 feet	SD22	0.0-0.5	XJ	70.00	J	.	.	.
Soil	New Property	Above 2 feet	SD23	0.0-0.5	XJ	35.00	J	.	.	.
Soil	New Property	Above 2 feet	SD26	0.0-0.5	XJ	120.00	J	.	.	.
Soil	New Property	Above 2 feet	W399	0.0-0.5	XJ	95.00	J	.	.	.
Soil	New Property	Above 2 feet	W400	0.0-0.5	XJ	64.00	J	.	.	.
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	160.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(g,h,i)perylene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	CJ	0.0-0.5	J	47.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	J	41.00	J	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5	J	220.00	J	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	J	190.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

---------- Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(g,h,i)perylene (UG/KG) ----------
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD18	0.0-0.5	J	250.00	J	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	J	180.00	J	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5	J	160.00	J	.	.	.

---------- Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(k)fluoranthene (UG/KG) ----------

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5	XJ	170.00	J	.	.	.
Soil	New Property	Above 2 feet	B404	0.1-0.6	XJ	140.00	J	.	.	.
Soil	New Property	Above 2 feet	B407	0.0-0.5	XJ	100.00	J	.	.	.
Soil	New Property	Above 2 feet	B408	0.0-0.5	XJ	65.00	J	.	.	.
Soil	New Property	Above 2 feet	B409	0.0-0.5	XJ	100.00	J	.	.	.
Soil	New Property	Above 2 feet	SD01	0.0-0.5	XJ	210.00	J	.	.	.
Soil	New Property	Above 2 feet	SD02	0.0-0.5	XJ	200.00	J	.	.	.
Soil	New Property	Above 2 feet	SD03	0.0-0.5	XJ	63.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	X	440.00	=	.	.	.
Soil	New Property	Above 2 feet	SD05	0.0-0.5	XJ	130.00	J	.	.	.
Soil	New Property	Above 2 feet	SD06	0.0-0.5	XJ	130.00	J	.	.	.
Soil	New Property	Above 2 feet	SD09	0.0-0.5	XJ	380.00	J	.	.	.
Soil	New Property	Above 2 feet	SD11	0.0-0.5	XJ	100.00	J	.	.	.
Soil	New Property	Above 2 feet	SD13	0.0-0.5	XJ	98.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5	XJ	690.00	J	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5	XE	8600.00	J	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	X	2700.00	=	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	X	2900.00	=	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	X	1600.00	=	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5	X	2200.00	=	.	.	.
Soil	New Property	Above 2 feet	SD22	0.0-0.5	XJ	110.00	J	.	.	.
Soil	New Property	Above 2 feet	SD23	0.0-0.5	XJ	58.00	J	.	.	.
Soil	New Property	Above 2 feet	SD26	0.0-0.5	XJ	220.00	J	.	.	.
Soil	New Property	Above 2 feet	W399	0.0-0.5	XJ	160.00	J	.	.	.
Soil	New Property	Above 2 feet	W400	0.0-0.5	XJ	130.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Benzo(k)fluoranthene (UG/KG)
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	320.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Benzoic Acid (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	0.0-0.5	J	92.00	J	.	.	.
Soil	New Property	Above 2 feet	AH	1.5-2.0	J	82.00	J	.	.	.
Soil	New Property	Above 2 feet	AJ	0.0-0.5	J	90.00	J	.	.	.
Soil	New Property	Above 2 feet	AJ	1.5-2.0	J	78.00	J	.	.	.
Soil	New Property	Above 2 feet	AK	0.0-0.5	J	95.00	J	.	.	.
Soil	New Property	Above 2 feet	AK	1.5-2.0	J	86.00	J	.	.	.
Soil	New Property	Above 2 feet	SD06	0.0-0.5	J	86.00	J	.	.	.
Soil	New Property	Above 2 feet	SD13	0.0-0.5	J	43.00	J	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	J	49.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Carbazole (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD15	0.0-0.5		420.00	=	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	J	78.00	J	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	J	41.00	J	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5	J	85.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Chrysene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5	J	78.00	J	.	.	.
Soil	New Property	Above 2 feet	SD01	0.0-0.5	J	51.00	J	.	.	.
Soil	New Property	Above 2 feet	SD02	0.0-0.5	J	51.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	J	110.00	J	.	.	.
Soil	New Property	Above 2 feet	SD06	0.0-0.5	J	43.00	J	.	.	.
Soil	New Property	Above 2 feet	SD09	0.0-0.5	J	92.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5		940.00	=	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5		2400.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5		710.00	=	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5		640.00	=	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5		390.00	=	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5		500.00	=	.	.	.
Soil	New Property	Above 2 feet	SD26	0.0-0.5	J	58.00	J	.	.	.
Soil	New Property	Above 2 feet	W399	0.0-0.5	J	54.00	J	.	.	.
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	84.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Di-n-butylphthalate (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B405	0.0-0.5	J	67.00	J	.	.	.
Soil	New Property	Above 2 feet	B406	0.2-0.7	J	68.00	J	.	.	.
Soil	New Property	Above 2 feet	NPS3	0.0-1.0	J	240.00	J	.	.	.
Soil	New Property	Above 2 feet	NPS4	0.0-1.0	J	180.00	J	.	.	.
Soil	New Property	Above 2 feet	NPS5	0.0-1.0		420.00	=	.	.	.
Soil	New Property	Above 2 feet	SD05	0.0-0.5	J	47.00	J	.	.	.
Soil	New Property	Below 2 feet	B407	10.0-15.0	J	37.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Di-n-octylphthalate (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Below 2 feet	B401	24.0-30.0	J	130.00	J	.	.	.
Soil	New Property	Below 2 feet	B407	10.0-15.0	J	68.00	J	.	.	.
Soil	New Property	Below 2 feet	B408	37.0-42.0	J	47.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Dibenzo(a,h)anthracene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD15	0.0-0.5	J	130.00	J	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	J	60.00	J	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	J	95.00	J	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	J	46.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Dibenzofuran (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD15	0.0-0.5	J	250.00	J	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	J	42.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Fluoranthene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AJ	0.0-0.5	J	50.00	J	.	.	.
Soil	New Property	Above 2 feet	B401	0.0-0.5	J	110.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Fluoranthene (UG/KG)
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B403	0.0-0.5	J	57.00	J	.	.	.
Soil	New Property	Above 2 feet	B404	0.1-0.6	J	57.00	J	.	.	.
Soil	New Property	Above 2 feet	B407	0.0-0.5	J	65.00	J	.	.	.
Soil	New Property	Above 2 feet	B408	0.0-0.5	J	41.00	J	.	.	.
Soil	New Property	Above 2 feet	CJ	0.0-0.5	J	43.00	J	.	.	.
Soil	New Property	Above 2 feet	SD01	0.0-0.5	J	97.00	J	.	.	.
Soil	New Property	Above 2 feet	SD02	0.0-0.5	J	98.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	J	260.00	J	.	.	.
Soil	New Property	Above 2 feet	SD05	0.0-0.5	J	64.00	J	.	.	.
Soil	New Property	Above 2 feet	SD06	0.0-0.5	J	59.00	J	.	.	.
Soil	New Property	Above 2 feet	SD09	0.0-0.5	J	150.00	J	.	.	.
Soil	New Property	Above 2 feet	SD11	0.0-0.5	J	69.00	J	.	.	.
Soil	New Property	Above 2 feet	SD13	0.0-0.5	J	42.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5		1500.00	=	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5	E	5000.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5		1200.00	=	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5		1300.00	=	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5		740.00	=	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5		1300.00	=	.	.	.
Soil	New Property	Above 2 feet	SD22	0.0-0.5	J	56.00	J	.	.	.
Soil	New Property	Above 2 feet	SD26	0.0-0.5	J	81.00	J	.	.	.
Soil	New Property	Above 2 feet	W399	0.0-0.5	J	78.00	J	.	.	.
Soil	New Property	Above 2 feet	W400	0.0-0.5	J	54.00	J	.	.	.
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	170.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Fluorene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD15	0.0-0.5		460.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	J	53.00	J	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	J	100.00	J	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	J	50.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Fluorene (UG/KG)
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD21	0.0-0.5	J	99.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Indeno(1,2,3-c,d)pyrene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD04	0.0-0.5	J	49.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5	J	390.00	J	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5		850.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	J	230.00	J	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5	J	330.00	J	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5	J	190.00	J	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5	J	160.00	J	.	.	.
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	56.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Naphthalene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD15	0.0-0.5	J	200.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmpl4 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Phenanthrene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5	J	78.00	J	.	.	.
Soil	New Property	Above 2 feet	SD01	0.0-0.5	J	47.00	J	.	.	.
Soil	New Property	Above 2 feet	SD02	0.0-0.5	J	48.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	J	170.00	J	.	.	.
Soil	New Property	Above 2 feet	SD09	0.0-0.5	J	88.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5		900.00	=	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5	E	3700.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5		520.00	=	.	.	.
Soil	New Property	Above 2 feet	SD18	0.0-0.5		870.00	=	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5		460.00	=	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5		910.00	=	.	.	.
Soil	New Property	Above 2 feet	SD26	0.0-0.5	J	58.00	J	.	.	.
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	100.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=Pyrene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5	J	98.00	J	.	.	.
Soil	New Property	Above 2 feet	B403	0.0-0.5	J	62.00	J	.	.	.
Soil	New Property	Above 2 feet	B404	0.1-0.6	J	70.00	J	.	.	.
Soil	New Property	Above 2 feet	B407	0.0-0.5	J	56.00	J	.	.	.
Soil	New Property	Above 2 feet	B408	0.0-0.5	J	36.00	J	.	.	.
Soil	New Property	Above 2 feet	B409	0.0-0.5	J	47.00	J	.	.	.
Soil	New Property	Above 2 feet	SD01	0.0-0.5	J	60.00	J	.	.	.
Soil	New Property	Above 2 feet	SD02	0.0-0.5	J	62.00	J	.	.	.
Soil	New Property	Above 2 feet	SD04	0.0-0.5	J	190.00	J	.	.	.
Soil	New Property	Above 2 feet	SD05	0.0-0.5	J	50.00	J	.	.	.
Soil	New Property	Above 2 feet	SD06	0.0-0.5	J	51.00	J	.	.	.
Soil	New Property	Above 2 feet	SD09	0.0-0.5	J	130.00	J	.	.	.
Soil	New Property	Above 2 feet	SD11	0.0-0.5	J	45.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5		1800.00	=	.	.	.
Soil	New Property	Above 2 feet	SD15	0.0-0.5	E	3300.00	=	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5		920.00	=	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Semivolatile Analyte (units)=Pyrene (UG/KG)
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD18	0.0-0.5		970.00	=	.	.	.
Soil	New Property	Above 2 feet	SD19	0.0-0.5		560.00	=	.	.	.
Soil	New Property	Above 2 feet	SD21	0.0-0.5		830.00	=	.	.	.
Soil	New Property	Above 2 feet	SD22	0.0-0.5	J	39.00	J	.	.	.
Soil	New Property	Above 2 feet	SD26	0.0-0.5	J	78.00	J	.	.	.
Soil	New Property	Above 2 feet	W399	0.0-0.5	J	78.00	J	.	.	.
Soil	New Property	Above 2 feet	W400	0.0-0.5	J	59.00	J	.	.	.
Soil	New Property	Above 2 feet	W402	0.0-0.5	J	170.00	J	.	.	.

Analysis Type=Organics-Semivolatile Analyte (units)=bis(2-Ethylhexyl)phthalate (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD09	0.0-0.5	J	81.00	J	.	.	.
Soil	New Property	Above 2 feet	SD16	0.0-0.5	J	58.00	J	.	.	.
Soil	New Property	Above 2 feet	SD17	0.0-0.5	J	67.00	J	.	.	.
Soil	New Property	Above 2 feet	SD22	0.0-0.5	J	68.00	J	.	.	.
Soil	New Property	Above 2 feet	SD23	0.0-0.5	J	120.00	J	.	.	.
Soil	New Property	Below 2 feet	B401	24.0-30.0	J	340.00	J	.	.	.
Soil	New Property	Below 2 feet	B407	10.0-15.0	J	60.00	J	.	.	.
Soil	New Property	Below 2 feet	B408	37.0-42.0	J	170.00	J	.	.	.

Analysis Type=Organics-Volatile Analyte (units)=2-Butanone (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	NPS3	0.0-1.0	J	8.50	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Volatile Analyte (units)=Acetone (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	CK	1.5-2.0	J	4.00	J	.	.	.
Soil	New Property	Above 2 feet	SD07	0.0-0.5		55.00	J	.	.	.
Soil	New Property	Above 2 feet	SD08	0.0-0.5		19.00	J	.	.	.
Soil	New Property	Above 2 feet	SD14	0.0-0.5		12.00	J	.	.	.
Soil	New Property	Below 2 feet	B405	5.0-11.0		33.00	J	.	.	.
Soil	New Property	Below 2 feet	B408	37.0-42.0		18.00	J	.	.	.
Soil	New Property	Below 2 feet	B409	9.0-13.0		51.00	J	.	.	.
Soil	New Property	Below 2 feet	W400	27.0-31.0		31.00	J	.	.	.

Analysis Type=Organics-Volatile Analyte (units)=Carbon Tetrachloride (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	NPS3	0.0-1.0	J	9.60	J	.	.	.

Analysis Type=Organics-Volatile Analyte (units)=Ethylbenzene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	NPS3	0.0-1.0	J	2.10	J	.	.	.

Analysis Type=Organics-Volatile Analyte (units)=Hexane (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD10	0.0-0.5	J	10.00	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Organics-Volatile Analyte (units)=Hexane (UG/KG)
(continued)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD20	0.0-0.5	J	4.00	J	.	.	.

Analysis Type=Organics-Volatile Analyte (units)=Methylene Chloride (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	0.0-0.5	B	56.00	=	.	.	.
Soil	New Property	Above 2 feet	AH	1.5-2.0	B	66.00	=	.	.	.
Soil	New Property	Above 2 feet	AJ	1.5-2.0	B	26.00	=	.	.	.
Soil	New Property	Above 2 feet	AK	0.0-0.5	B	43.00	=	.	.	.
Soil	New Property	Above 2 feet	AK	1.5-2.0	B	68.00	=	.	.	.
Soil	New Property	Above 2 feet	NPS3	0.0-1.0	B	97.00	=	.	.	.

Analysis Type=Organics-Volatile Analyte (units)=Toluene (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	NPS3	0.0-1.0	J	4.70	J	.	.	.

Analysis Type=Organics-Volatile Analyte (units)=Xylene, Total (UG/KG)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	NPS3	0.0-1.0	J	2.10	J	.	.	.

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Radioisotopes Analyte (units)=Pu-238 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	0.0-0.2		1.40	=	0.2330	0.13	10.8
Soil	New Property	Above 2 feet	AJ	0.0-0.2		2.90	=	0.4840	0.13	22.3
Soil	New Property	Above 2 feet	AJ	0.2-1.0		1.06	=	0.2740	0.13	8.2
Soil	New Property	Above 2 feet	AK	0.0-0.2		0.63	=	0.1910	0.13	4.8
Soil	New Property	Above 2 feet	AK	0.2-1.0		0.73	=	0.2020	0.13	5.6
Soil	New Property	Above 2 feet	B403	0.0-0.5		0.17	=	0.1300	0.13	1.3
Soil	New Property	Above 2 feet	B404	0.1-0.6		0.19	J	0.1400	0.13	1.5
Soil	New Property	Above 2 feet	B407	0.0-0.5		0.15	J	0.0900	0.13	1.2
Soil	New Property	Above 2 feet	BH	0.0-0.2		0.22	J	0.0437	0.13	1.7
Soil	New Property	Above 2 feet	BH	0.2-1.0		0.25	J	0.0544	0.13	1.9
Soil	New Property	Above 2 feet	BJ	0.0-0.2		0.27	=	0.1130	0.13	2.1
Soil	New Property	Above 2 feet	BJ	0.2-1.0		0.21	=	0.1110	0.13	1.6
Soil	New Property	Above 2 feet	BK	0.0-0.2		0.28	J	0.0703	0.13	2.1
Soil	New Property	Above 2 feet	CK	0.0-0.2		0.52	J	0.0889	0.13	4.0
Soil	New Property	Above 2 feet	CK	0.2-1.0		0.28	=	0.0506	0.13	2.2
Soil	New Property	Above 2 feet	GJ	0.0-0.2		0.47	=	0.1840	0.13	3.6
Soil	New Property	Above 2 feet	GJ	0.2-1.0		0.27	=	0.1240	0.13	2.0
Soil	New Property	Above 2 feet	HJ	0.0-0.2		0.20	=	0.0786	0.13	1.5
Soil	New Property	Above 2 feet	HJ	0.2-1.0		0.13	=	0.0693	0.13	1.0
Soil	New Property	Above 2 feet	HK	0.2-1.0		0.14	=	0.0426	0.13	1.0
Soil	New Property	Above 2 feet	SD01	0.0-0.5		0.25	=	0.1500	0.13	1.9
Soil	New Property	Above 2 feet	SD02	0.0-0.5		0.25	=	0.1100	0.13	1.9
Soil	New Property	Above 2 feet	SD03	0.0-0.5		11.23	J	0.8100	0.13	86.4
Soil	New Property	Above 2 feet	SD04	0.0-0.5		0.79	=	0.1300	0.13	6.1
Soil	New Property	Above 2 feet	SD06	0.0-0.5		0.46	=	0.1200	0.13	3.5
Soil	New Property	Above 2 feet	SD22	0.0-0.5		0.90	=	0.1600	0.13	6.9
Soil	New Property	Above 2 feet	SD23	0.0-0.5		21.87	=	1.6700	0.13	168
Soil	New Property	Above 2 feet	SD24	0.0-0.5		4.99	=	0.4100	0.13	38.4
Soil	New Property	Above 2 feet	SD26	0.0-0.5		0.43	J	0.1300	0.13	3.3
Soil	New Property	Above 2 feet	SD27	0.0-0.5		1.73	J	0.4500	0.13	13.3
Soil	New Property	Above 2 feet	W400	0.0-0.5		0.29	=	0.0800	0.13	2.2
Soil	New Property	Above 2 feet	W411	0.0-0.5		1.21	J	0.1800	0.13	9.3

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Radioisotopes Analyte (units)=Pu-239/240 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD23	0.0-0.5		0.21	=	0.0800	0.18	1.2

Analysis Type=Radioisotopes Analyte (units)=Ra-226 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	AH	0.0-0.5		2.30	J	0.6430	2.00	1.2
Soil	New Property	Above 2 feet	AH	1.5-2.0		2.97	J	0.6830	2.00	1.5
Soil	New Property	Above 2 feet	AJ	1.5-2.0		2.57	J	0.6050	2.00	1.3
Soil	New Property	Above 2 feet	AK	1.5-2.0		2.93	J	0.6340	2.00	1.5
Soil	New Property	Above 2 feet	CJ	0.0-0.5		2.80	=	0.5890	2.00	1.4
Soil	New Property	Above 2 feet	CJ	1.5-2.0		2.35	=	0.6220	2.00	1.2
Soil	New Property	Above 2 feet	CK	0.0-0.5		2.76	=	0.7590	2.00	1.4
Soil	New Property	Above 2 feet	CK	1.5-2.0		2.83	=	0.6550	2.00	1.4
Soil	New Property	Above 2 feet	NPS6	0.0-1.0		2.42	=	0.2830	2.00	1.2

Analysis Type=Radioisotopes Analyte (units)=Sr-90 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	NPS5	0.0-1.0		1.58	=	0.7010	0.72	2.2
Soil	New Property	Below 2 feet	B405	5.0-11.0		2.77	J	0.8600	0.72	3.8

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Radioisotopes Analyte (units)=Th-228 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B398	0.0-0.5		1.77	=	0.3000	1.50	1.2
Soil	New Property	Above 2 feet	B403	0.0-0.5		1.54	=	0.2300	1.50	1.0
Soil	New Property	Above 2 feet	B405	0.0-0.5		1.64	J	0.2200	1.50	1.1
Soil	New Property	Above 2 feet	SD01	0.0-0.5		1.63	=	0.2400	1.50	1.1
Soil	New Property	Above 2 feet	SD02	0.0-0.5		1.60	=	0.2500	1.50	1.1
Soil	New Property	Above 2 feet	SD03	0.0-0.5		3.78	=	0.3800	1.50	2.5
Soil	New Property	Above 2 feet	SD06	0.0-0.5		1.69	=	0.2500	1.50	1.1
Soil	New Property	Above 2 feet	SD08	0.0-0.5		1.52	=	0.3300	1.50	1.0
Soil	New Property	Above 2 feet	SD23	0.0-0.5		1.71	J	0.2900	1.50	1.1
Soil	New Property	Above 2 feet	SD24	0.0-0.5		1.79	J	0.3100	1.50	1.2

Analysis Type=Radioisotopes Analyte (units)=Th-230 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B406	0.2-0.7		1.91	J	0.2700	1.90	1.0
Soil	New Property	Above 2 feet	SD03	0.0-0.5		2.21	J	0.2700	1.90	1.2
Soil	New Property	Above 2 feet	SD23	0.0-0.5		1.94	=	0.3100	1.90	1.0
Soil	New Property	Above 2 feet	SD25	0.0-0.5		2.26	=	0.3300	1.90	1.2

Analysis Type=Radioisotopes Analyte (units)=Th-232 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B398	0.0-0.5		1.44	=	0.2600	1.40	1.0
Soil	New Property	Above 2 feet	SD03	0.0-0.5		2.12	J	0.2600	1.40	1.5
Soil	New Property	Above 2 feet	SD23	0.0-0.5		1.80	=	0.3000	1.40	1.3

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

Mound New Property Investigation
Comparison of Soil Results with OU 9 Background Criteria
Sample results exceeding background concentrations.

Analysis Type=Radioisotopes Analyte (units)=Tritium (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	SD09	0.0-0.5		2.60	=	1.9000	1.60	1.6
Soil	New Property	Above 2 feet	SD17	0.0-0.5		3.00	=	1.9000	1.60	1.9

Analysis Type=Radioisotopes Analyte (units)=U-234 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B406	0.2-0.7		1.17	J	0.2100	1.10	1.1

Analysis Type=Radioisotopes Analyte (units)=U-235 (PCI/G)

Media	Location	Group	STATION	Depth(Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Soil	New Property	Above 2 feet	B401	0.0-0.5		0.16	J	0.0700	0.11	1.5
Soil	New Property	Above 2 feet	B406	0.2-0.7		0.20	J	0.0800	0.11	1.8
Soil	New Property	Above 2 feet	SD08	0.0-0.5		0.17	J	0.0700	0.11	1.5
Soil	New Property	Above 2 feet	SD09	0.0-0.5		0.12	J	0.0600	0.11	1.1
Soil	New Property	Above 2 feet	SD24	0.0-0.5		0.14	=	0.0800	0.11	1.3
Soil	New Property	Above 2 feet	W399	0.0-0.5		0.21	J	0.1000	0.11	1.9
Soil	New Property	Above 2 feet	W411	0.0-0.5		0.20	J	0.0800	0.11	1.8
Soil	New Property	Below 2 feet	B401	24.0-30.0		0.18	J	0.0800	0.11	1.6

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp14 on 18SEP95 at 17:30 using datasets mndnew02.

APPENDIX B.4

GROUNDWATER AND SEEP RESULTS SORTED BY ANALYTE

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Anions Analyte (units)=Ammonia (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.		0.21		.	0.16	1.3
Groundwater	New Property	All	0353	.-.		0.56		.	0.16	3.4

Analysis Type=Anions Analyte (units)=Chloride (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	617	0.0-0.0	+	357.00	=	.	248.46	1.4
Seeps/Springs	New Property	All	618	0.0-0.0	+	1026.00	=	.	248.46	4.1
Seeps/Springs	New Property	All	623	0.0-0.0	+	363.00	=	.	248.46	1.5
Groundwater	New Property	All	W399	0.0-31.5		488.00	=	.	248.46	2.0

Analysis Type=Anions Analyte (units)=Fluoride (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	W399	0.0-31.5		1.04	=	.	0.41	2.5

Analysis Type=Anions Analyte (units)=Nitrate-Nitrite-N (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0158	.-.		8.80		.	6.46	1.4

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Anions Analyte (units)=Nitrite As Nitrogen (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0319	.-.		0.02		.	.	.

Analysis Type=Anions Analyte (units)=Sulfate (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0354	.-.		198.00		.	134.56	1.5
Seeps/Springs	New Property	All	618	0.0-0.0	+	144.00	J-H,C-	.	134.56	1.1
Groundwater	New Property	All	W399	0.0-31.5		399.00	=	.	134.56	3.0

Analysis Type=Metals Analyte (units)=Aluminum (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0353	.-.	J	424.00	J	.	121.98	3.5
Groundwater	New Property	All	0354	.-.		307.00		.	121.98	2.5
Groundwater	New Property	All	0354	.-.		876.00		.	121.98	7.2
Groundwater	New Property	All	0356	.-.	J	180.00	J	.	121.98	1.5
Seeps/Springs	New Property	All	610	0.0-0.0		302.00	J-D	.	121.98	2.5
Seeps/Springs	New Property	All	614	0.0-0.0		3910.00	J-D	.	121.98	32.1
Seeps/Springs	New Property	All	617	0.0-0.0		727.00	J-D	.	121.98	6.0
Seeps/Springs	New Property	All	618	0.0-0.0		472.00	J-D	.	121.98	3.9
Seeps/Springs	New Property	All	619	0.0-0.0		3040.00	J-D	.	121.98	24.9
Seeps/Springs	New Property	All	620	0.0-0.0		5490.00	J-D	.	121.98	45.0
Seeps/Springs	New Property	All	621	0.0-0.0		254.00	J-D	.	121.98	2.1
Seeps/Springs	New Property	All	623	0.0-0.0		546.00	J-D	.	121.98	4.5
Groundwater	New Property	All	B401	0.0-28.9		40200.00	=	.	121.98	330
Groundwater	New Property	All	B408	0.0-37.1		58800.00	=	.	121.98	482
Groundwater	New Property	All	W399	0.0-31.5	E	1130.00	J	.	121.98	9.3
Groundwater	New Property	All	W400	0.0-24.8		4810.00	=	.	121.98	39.4

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Aluminum (UG/L) (continued)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	W402	0.0-24.0		9950.00	=	.	121.98	81.6
Groundwater	New Property	All	W411	0.0-33.6		31500.00	=	.	121.98	258

Analysis Type=Metals Analyte (units)=Antimony (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	W399	0.0-31.5	B	2.30	=	.	0.54	4.3

Analysis Type=Metals Analyte (units)=Arsenic (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B408	0.0-37.1		472.00	J	.	28.17	16.8

Analysis Type=Metals Analyte (units)=Barium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.		343.00		.	315.01	1.1
Groundwater	New Property	All	0344	.-.	J	342.00	J	.	315.01	1.1
Groundwater	New Property	All	B408	0.0-37.1	EN	552.00	J	.	315.01	1.8

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Beryllium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0320	.-.		0.54		.	0.24	2.2
Groundwater	New Property	All	0356	.-.	B	0.54		.	0.24	2.2

Analysis Type=Metals Analyte (units)=Bismuth (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9		688.00	J	.	16.44	41.9
Groundwater	New Property	All	B408	0.0-37.1		1460.00	J	.	16.44,	88.8
Groundwater	New Property	All	W400	0.0-24.8		193.00	=	.	16.44	11.7
Groundwater	New Property	All	W402	0.0-24.0	B	147.00	=	.	16.44	8.9
Groundwater	New Property	All	W411	0.0-33.6		264.00	=	.	16.44	16.1

Analysis Type=Metals Analyte (units)=Calcium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0353	.-.	J	145000.00	J	.	123303.13	1.2
Groundwater	New Property	All	0353	.-.	J	129000.00	J	.	123303.13	1.0
Seeps/Springs	New Property	All	610	0.0-0.0		128000.00	=	.	123303.13	1.0
Seeps/Springs	New Property	All	617	0.0-0.0		174000.00	=	.	123303.13	1.4
Seeps/Springs	New Property	All	618	0.0-0.0		277000.00	=	.	123303.13	2.2
Seeps/Springs	New Property	All	620	0.0-0.0		139000.00	=	.	123303.13	1.1
Seeps/Springs	New Property	All	623	0.0-0.0		142000.00	=	.	123303.13	1.2
Groundwater	New Property	All	B401	0.0-28.9		703000.00	=	.	123303.13	5.7
Groundwater	New Property	All	B408	0.0-37.1		1760000.00	=	.	123303.13	14.3
Groundwater	New Property	All	W400	0.0-24.8		420000.00	=	.	123303.13	3.4
Groundwater	New Property	All	W402	0.0-24.0		179000.00	=	.	123303.13	1.5
Groundwater	New Property	All	W411	0.0-33.6		255000.00	J	.	123303.13	2.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Chromium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B408	0.0-37.1	N	164.00	J	.	135.96	1.2
Groundwater	New Property	All	W399	0.0-31.5		309.00	=	.	135.96	2.3

Analysis Type=Metals Analyte (units)=Cobalt (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	614	0.0-0.0	B	3.10	=	.	2.16	1.4
Seeps/Springs	New Property	All	620	0.0-0.0	B	3.40	=	.	2.16	1.6
Groundwater	New Property	All	B408	0.0-37.1	N	126.00	J	.	2.16	58.3
Groundwater	New Property	All	W399	0.0-31.5	B	8.30	=	.	2.16	3.8
Groundwater	New Property	All	W400	0.0-24.8	B	6.90	=	.	2.16	3.2
Groundwater	New Property	All	W402	0.0-24.0	B	7.00	=	.	2.16	3.2
Groundwater	New Property	All	W411	0.0-33.6	B	18.20	=	.	2.16	8.4

Analysis Type=Metals Analyte (units)=Copper (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	614	0.0-0.0	B	6.20	J-D	.	3.42	1.8
Seeps/Springs	New Property	All	619	0.0-0.0	B	5.70	J-D	.	3.42	1.7
Seeps/Springs	New Property	All	620	0.0-0.0		7.60	J-D	.	3.42	2.2
Groundwater	New Property	All	B401	0.0-28.9		160.00	=	.	3.42	46.8
Groundwater	New Property	All	B408	0.0-37.1		485.00	=	.	3.42	142
Groundwater	New Property	All	W399	0.0-31.5	B	8.30	=	.	3.42	2.4
Groundwater	New Property	All	W400	0.0-24.8		26.90	J	.	3.42	7.9

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Iron (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.	J	4640.00	J	.	3777.95	1.2
Groundwater	New Property	All	0344	.-.	J	4170.00	J	.	3777.95	1.1
Seeps/Springs	New Property	All	614	0.0-0.0		6180.00	J-D	.	3777.95	1.6
Seeps/Springs	New Property	All	620	0.0-0.0		7830.00	J-D	.	3777.95	2.1
Groundwater	New Property	All	B401	0.0-28.9	E	136000.00	J	.	3777.95	36.0
Groundwater	New Property	All	B408	0.0-37.1	E	470000.00	J	.	3777.95	124
Groundwater	New Property	All	W400	0.0-24.8		4950.00	=	.	3777.95	1.3
Groundwater	New Property	All	W402	0.0-24.0		10300.00	=	.	3777.95	2.7
Groundwater	New Property	All	W411	0.0-33.6		31500.00	=	.	3777.95	8.3

Analysis Type=Metals Analyte (units)=Lead (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9		80.70	=	.	1.44	56.0
Groundwater	New Property	All	B408	0.0-37.1		148.00	=	.	1.44	103
Groundwater	New Property	All	W400	0.0-24.8		8.50	J	.	1.44	5.9
Groundwater	New Property	All	W402	0.0-24.0		6.00	J	.	1.44	4.2
Groundwater	New Property	All	W411	0.0-33.6		6.70	J	.	1.44	4.6

Analysis Type=Metals Analyte (units)=Lithium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9		70.10	=	.	50.28	1.4
Groundwater	New Property	All	W411	0.0-33.6		132.00	=	.	50.28	2.6

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Magnesium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0353	.-.	J	53700.00	J	.	41401.84	1.3
Groundwater	New Property	All	0353	.-.	J	45400.00	J	.	41401.84	1.1
Groundwater	New Property	All	0354	.-.	J	50100.00	J	.	41401.84	1.2
Groundwater	New Property	All	0354	.-.		47100.00		.	41401.84	1.1
Seeps/Springs	New Property	All	617	0.0-0.0		75500.00	=	.	41401.84	1.8
Seeps/Springs	New Property	All	618	0.0-0.0		64400.00	=	.	41401.84	1.6
Groundwater	New Property	All	B401	0.0-28.9	E*	242000.00	J	.	41401.84	5.8
Groundwater	New Property	All	B408	0.0-37.1	E*	462000.00	J	.	41401.84	11.2
Groundwater	New Property	All	W399	0.0-31.5		63200.00	=	.	41401.84	1.5
Groundwater	New Property	All	W400	0.0-24.8	E	86100.00	J	.	41401.84	2.1
Groundwater	New Property	All	W402	0.0-24.0	E	55600.00	J	.	41401.84	1.3
Groundwater	New Property	All	W411	0.0-33.6	E	81900.00	J	.	41401.84	2.0

Analysis Type=Metals Analyte (units)=Manganese (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9	E	2190.00	J	.	214.08	10.2
Groundwater	New Property	All	B408	0.0-37.1	E	7000.00	J	.	214.08	32.7
Groundwater	New Property	All	W399	0.0-31.5		220.00	=	.	214.08	1.0
Groundwater	New Property	All	W400	0.0-24.8	E	1010.00	J	.	214.08	4.7
Groundwater	New Property	All	W402	0.0-24.0	E	317.00	J	.	214.08	1.5
Groundwater	New Property	All	W411	0.0-33.6	E	1120.00	J	.	214.08	5.2

Analysis Type=Metals Analyte (units)=Mercury (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B408	0.0-37.1		0.40	=	.	0.05	8.0

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Molybdenum (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9		168.00	=	.	6.36	26.4

Analysis Type=Metals Analyte (units)=Nickel (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B408	0.0-37.1	N	322.00	J	.	152.46	2.1
Groundwater	New Property	All	W399	0.0-31.5		394.00	=	.	152.46	2.6

Analysis Type=Metals Analyte (units)=Potassium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9		10800.00	=	.	5381.30	2.0
Groundwater	New Property	All	B408	0.0-37.1		13300.00	=	.	5381.30	2.5
Groundwater	New Property	All	W399	0.0-31.5		65000.00	=	.	5381.30	12.1
Groundwater	New Property	All	W400	0.0-24.8	E	7550.00	J	.	5381.30	1.4
Groundwater	New Property	All	W402	0.0-24.0	E	7410.00	J	.	5381.30	1.4
Groundwater	New Property	All	W411	0.0-33.6	E	28400.00	J	.	5381.30	5.3

Analysis Type=Metals Analyte (units)=Selenium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0319	.-.	J	3.60	J	.	1.85	1.9

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
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Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Silver (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	610	0.0-0.0	B	1.00	=	.	0.79	1.3
Seeps/Springs	New Property	All	614	0.0-0.0	B	1.40	=	.	0.79	1.8
Seeps/Springs	New Property	All	617	0.0-0.0	B	1.70	=	.	0.79	2.2
Seeps/Springs	New Property	All	620	0.0-0.0	B	1.00	=	.	0.79	1.3

Analysis Type=Metals Analyte (units)=Sodium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0158	.-.		417000.00		.	105374.19	4.0
Groundwater	New Property	All	0344	.-.		134000.00		.	105374.19	1.3
Seeps/Springs	New Property	All	618	0.0-0.0		387000.00	=	.	105374.19	3.7
Seeps/Springs	New Property	All	623	0.0-0.0		130000.00	=	.	105374.19	1.2
Groundwater	New Property	All	W399	0.0-31.5		423000.00	=	.	105374.19	4.0

Analysis Type=Metals Analyte (units)=Thallium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	W399	0.0-31.5	B	3.60	=	.	1.10	3.3

Analysis Type=Metals Analyte (units)=Vanadium (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0353	.-.		23.60		.	18.13	1.3

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals Analyte (units)=Vanadium (UG/L)
(continued)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	610	0.0-0.0		28.10	=	.	18.13	1.5
Seeps/Springs	New Property	All	614	0.0-0.0		29.30	=	.	18.13	1.6
Seeps/Springs	New Property	All	617	0.0-0.0		42.80	=	.	18.13	2.4
Seeps/Springs	New Property	All	618	0.0-0.0		57.60	=	.	18.13	3.2
Seeps/Springs	New Property	All	619	0.0-0.0		22.00	=	.	18.13	1.2
Seeps/Springs	New Property	All	620	0.0-0.0		36.30	=	.	18.13	2.0
Seeps/Springs	New Property	All	621	0.0-0.0		18.60	=	.	18.13	1.0
Seeps/Springs	New Property	All	623	0.0-0.0		35.60	=	.	18.13	2.0
Groundwater	New Property	All	B401	0.0-28.9	EN	84.40	J	.	18.13	4.7
Groundwater	New Property	All	B408	0.0-37.1	EN	138.00	J	.	18.13	7.6
Groundwater	New Property	All	W411	0.0-33.6	B	29.10	=	.	18.13	1.6

Analysis Type=Metals Analyte (units)=Zinc (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9	EN	413.00	J	.	100.15	4.1
Groundwater	New Property	All	B408	0.0-37.1	EN	1140.00	J	.	100.15	11.4
Groundwater	New Property	All	W399	0.0-31.5	E	109.00	J	.	100.15	1.1
Groundwater	New Property	All	W400	0.0-24.8		261.00	=	.	100.15	2.6

Analysis Type=Metals, Dissolved Analyte (units)=Aluminum, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0158	.-.	B	15.50		.	9.54	1.6
Groundwater	New Property	All	0158	.-.	B	12.70		.	9.54	1.3
Groundwater	New Property	All	0319	.-.	B	12.80		.	9.54	1.3
Groundwater	New Property	All	0320	.-.	B	17.70		.	9.54	1.9

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Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals, Dissolved Analyte (units)=Aluminum, Dissolved (UG/L) (continued)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.	B	12.40		.	9.54	1.3
Groundwater	New Property	All	0353	.-.	B	11.70		.	9.54	1.2
Groundwater	New Property	All	0353	.-.	B	19.70		.	9.54	2.1
Groundwater	New Property	All	0354	.-.	B	11.50		.	9.54	1.2
Groundwater	New Property	All	0356	.-.	B	16.50		.	9.54	1.7
Groundwater	New Property	All	0356	.-.	B	15.10		.	9.54	1.6

Analysis Type=Metals, Dissolved Analyte (units)=Antimony, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0353	.-.	J	11.70	J	.	5.62	2.1
Groundwater	New Property	All	0354	.-.		6.30		.	5.62	1.1

Analysis Type=Metals, Dissolved Analyte (units)=Barium, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.		348.00		.	287.66	1.2
Groundwater	New Property	All	0344	.-.	J	348.00	J	.	287.66	1.2

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Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals, Dissolved Analyte (units)=Beryllium, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0320	.-.		0.54		.	0.22	2.4
Groundwater	New Property	All	0356	.-.	B	0.32		.	0.22	1.4

Analysis Type=Metals, Dissolved Analyte (units)=Bismuth, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0354	.-.	B	32.50		.	16.44	2.0

Analysis Type=Metals, Dissolved Analyte (units)=Cadmium, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0356	.-.	B	0.84		.	0.55	1.5

Analysis Type=Metals, Dissolved Analyte (units)=Calcium, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0353	.-.	J	177000.00	J	.	119789.03	1.5
Groundwater	New Property	All	0353	.-.	J	129000.00	J	.	119789.03	1.1

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals, Dissolved Analyte (units)=Chromium, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0319	.-.	B	2.60		.	2.35	1.1

Analysis Type=Metals, Dissolved Analyte (units)=Copper, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0319	.-.	B	3.10		.	2.56	1.2

Analysis Type=Metals, Dissolved Analyte (units)=Iron, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.	J	4620.00	J	.	3286.04	1.4
Groundwater	New Property	All	0344	.-.	J	4220.00	J	.	3286.04	1.3

Analysis Type=Metals, Dissolved Analyte (units)=Magnesium, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0353	.-.	J	54500.00	J	.	40005.42	1.4
Groundwater	New Property	All	0353	.-.	J	45500.00	J	.	40005.42	1.1
Groundwater	New Property	All	0354	.-.	J	50800.00	J	.	40005.42	1.3
Groundwater	New Property	All	0354	.-.		48400.00		.	40005.42	1.2

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Metals, Dissolved Analyte (units)=Sodium, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0158	.-.		419000.00		.	96589.01	4.3
Groundwater	New Property	All	0344	.-.		123000.00		.	96589.01	1.3

Analysis Type=Metals, Dissolved Analyte (units)=Vanadium, Dissolved (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0158	.-.		19.40		.	15.80	1.2
Groundwater	New Property	All	0320	.-.		16.80		.	15.80	1.1
Groundwater	New Property	All	0353	.-.		21.20		.	15.80	1.3

Analysis Type=Miscellaneous Analyte (units)=Alkalinity (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	610	0.0-0.0		280.00	=	.	.	.
Seeps/Springs	New Property	All	614	0.0-0.0		227.00	=	.	.	.
Seeps/Springs	New Property	All	617	0.0-0.0		298.00	=	.	.	.
Seeps/Springs	New Property	All	618	0.0-0.0		285.00	=	.	.	.
Seeps/Springs	New Property	All	619	0.0-0.0		177.00	=	.	.	.
Seeps/Springs	New Property	All	620	0.0-0.0		245.00	=	.	.	.
Seeps/Springs	New Property	All	621	0.0-0.0		211.00	=	.	.	.
Seeps/Springs	New Property	All	623	0.0-0.0		280.00	=	.	.	.
Groundwater	New Property	All	W400	0.0-24.8		247.00	=	.	.	.
Groundwater	New Property	All	W402	0.0-24.0		312.00	=	.	.	.
Groundwater	New Property	All	W411	0.0-33.6		335.00	=	.	.	.

Minimum, average and maximum are based on the reported detection limit.
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Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Miscellaneous Analyte (units)=Dissolved Solids (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	617	0.0-0.0		1130.00	=	.	843.04	1.3
Seeps/Springs	New Property	All	618	0.0-0.0		2350.00	=	.	843.04	2.8
Seeps/Springs	New Property	All	623	0.0-0.0		1060.00	=	.	843.04	1.3
Groundwater	New Property	All	W402	0.0-24.0		908.00	=	.	843.04	1.1
Groundwater	New Property	All	W411	0.0-33.6		1100.00	=	.	843.04	1.3

Analysis Type=Miscellaneous Analyte (units)=Nitrogen (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.		0.36		.	0.33	1.1
Groundwater	New Property	All	0344	.-.		0.34		.	0.33	1.0
Groundwater	New Property	All	B401	0.0-28.9		0.37	J	.	0.33	1.1
Groundwater	New Property	All	B408	0.0-37.1		0.37	J	.	0.33	1.1
Groundwater	New Property	All	W411	0.0-33.6		0.80	J	.	0.33	2.4

Analysis Type=Miscellaneous Analyte (units)=Organic Carbon (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0158	.-.		6.50		.	1.80	3.6
Groundwater	New Property	All	0354	.-.		3.20		.	1.80	1.8
Groundwater	New Property	All	0356	.-.		1.90		.	1.80	1.1
Seeps/Springs	New Property	All	610	0.0-0.0		4.50	J	.	1.80	2.5
Seeps/Springs	New Property	All	614	0.0-0.0		3.50	J	.	1.80	1.9
Seeps/Springs	New Property	All	617	0.0-0.0		4.60	J	.	1.80	2.6
Seeps/Springs	New Property	All	618	0.0-0.0		5.70	J	.	1.80	3.2
Seeps/Springs	New Property	All	619	0.0-0.0		5.10	J	.	1.80	2.8
Seeps/Springs	New Property	All	620	0.0-0.0		2.20	J	.	1.80	1.2
Seeps/Springs	New Property	All	623	0.0-0.0		2.30	J	.	1.80	1.3

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Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Miscellaneous Analyte (units)=Organic Carbon (MG/L)
(continued)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9		2.72	=	.	1.80	1.5
Groundwater	New Property	All	B401	0.0-28.9		2.78	=	.	1.80	1.5
Groundwater	New Property	All	B401	0.0-28.9		2.78	=	.	1.80	1.5
Groundwater	New Property	All	B401	0.0-28.9		2.70	=	.	1.80	1.5
Groundwater	New Property	All	B408	0.0-37.1		2.96	=	.	1.80	1.6
Groundwater	New Property	All	B408	0.0-37.1		2.93	=	.	1.80	1.6
Groundwater	New Property	All	B408	0.0-37.1		2.74	=	.	1.80	1.5
Groundwater	New Property	All	B408	0.0-37.1		2.98	=	.	1.80	1.7
Groundwater	New Property	All	W400	0.0-24.8		3.14	=	.	1.80	1.7
Groundwater	New Property	All	W400	0.0-24.8		3.31	=	.	1.80	1.8
Groundwater	New Property	All	W400	0.0-24.8		3.12	=	.	1.80	1.7
Groundwater	New Property	All	W400	0.0-24.8		3.00	=	.	1.80	1.7
Groundwater	New Property	All	W402	0.0-24.0		2.00	=	.	1.80	1.1
Groundwater	New Property	All	W402	0.0-24.0		1.81	=	.	1.80	1.0
Groundwater	New Property	All	W411	0.0-33.6		2.15	=	.	1.80	1.2
Groundwater	New Property	All	W411	0.0-33.6		2.32	=	.	1.80	1.3
Groundwater	New Property	All	W411	0.0-33.6		2.32	=	.	1.80	1.3
Groundwater	New Property	All	W411	0.0-33.6		2.34	=	.	1.80	1.3

Analysis Type=Miscellaneous Analyte (units)=Suspended Solids (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	614	0.0-0.0		330.00	=	.	33.02	10.0
Seeps/Springs	New Property	All	619	0.0-0.0		139.00	=	.	33.02	4.2
Seeps/Springs	New Property	All	620	0.0-0.0		317.00	=	.	33.02	9.6
Groundwater	New Property	All	B401	0.0-28.9		6170.00	=	.	33.02	187
Groundwater	New Property	All	B408	0.0-37.1		19400.00	=	.	33.02	588
Groundwater	New Property	All	W399	0.0-31.5		138.00	=	.	33.02	4.2
Groundwater	New Property	All	W400	0.0-24.8		4680.00	=	.	33.02	142
Groundwater	New Property	All	W402	0.0-24.0		47.00	=	.	33.02	1.4
Groundwater	New Property	All	W411	0.0-33.6		97.00	=	.	33.02	2.9

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Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Miscellaneous Analyte (units)=Total Phosphorus (MG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	614	0.0-0.0		0.37	=	.	.	.
Seeps/Springs	New Property	All	619	0.0-0.0		0.19	=	.	.	.
Seeps/Springs	New Property	All	620	0.0-0.0		0.42	=	.	.	.
Groundwater	New Property	All	B401	0.0-28.9		0.67	J	.	.	.
Groundwater	New Property	All	W400	0.0-24.8		0.33	=	.	.	.
Groundwater	New Property	All	W402	0.0-24.0		0.14	=	.	.	.
Groundwater	New Property	All	W411	0.0-33.6		0.24	=	.	.	.

Analysis Type=Organics-Explosives Analyte (units)=1,3,5-Trinitrobenzene (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	614	0.0-0.0	+	1.80	=	.	0.65	2.8

Analysis Type=Organics-Explosives Analyte (units)=1,3-Dinitrobenzene (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	614	0.0-0.0	+	2.90	J-C-	.	0.16	18.7

Analysis Type=Organics-Explosives Analyte (units)=2,4,6-Trinitrotoluene (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	W400	0.0-24.8	J	0.76	J	.	0.65	1.2

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Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Organics-Explosives Analyte (units)=PETN (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	614	0.0-0.0	+	2.70	J-C-	.	0.50	5.4
Seeps/Springs	New Property	All	618	0.0-0.0	+	3.40	J-C-	.	0.50	6.8
Seeps/Springs	New Property	All	619	0.0-0.0	+	11.00	J-C-	.	0.50	22.0
Seeps/Springs	New Property	All	620	0.0-0.0	+	1.60	J-C-	.	0.50	3.2

Analysis Type=Organics-Volatile Analyte (units)=1,2-Dichloroethene (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	W411	0.0-33.6	J	4.00	J	.	0.50	8.0

Analysis Type=Organics-Volatile Analyte (units)=Acrylonitrile (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9	J	25.00	J	.	5.00	5.0

Analysis Type=Organics-Volatile Analyte (units)=Hexane (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B401	0.0-28.9	J	1.00	J	.	.	.

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Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Organics-Volatile Analyte (units)=Trichloroethene (UG/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	617	0.0-0.0		8.00	=	.	0.60	13.3
Groundwater	New Property	All	W411	0.0-33.6		8.00	=	.	0.60	13.3

Analysis Type=Radioisotopes Analyte (units)=Ac-227 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	614	0.0-0.0		0.22	J-D	0.20	.	.
Seeps/Springs	New Property	All	619	0.0-0.0		0.43	J-D	0.31	.	.

Analysis Type=Radioisotopes Analyte (units)=Am-241 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0320	.-.		0.15		.	0.12	1.2
Seeps/Springs	New Property	All	617	0.0-0.0		0.22	J-D	0.21	0.12	1.8
Seeps/Springs	New Property	All	619	0.0-0.0		0.40	J-D	0.35	0.12	3.2
Seeps/Springs	New Property	All	621	0.0-0.0		0.32	J-D	0.31	0.12	2.6
Seeps/Springs	New Property	All	623	0.0-0.0		0.29	J-D	0.24	0.12	2.3
Groundwater	New Property	All	B408	0.0-37.1		0.47	J	0.44	0.12	3.8
Groundwater	New Property	All	W400	0.0-24.8		0.27	=	0.25	0.12	2.2
Groundwater	New Property	All	W402	0.0-24.0		0.13	J	0.09	0.12	1.0

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Radioisotopes Analyte (units)=Pu-239/240 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0158	.-.		0.20		.	0.06	3.7
Groundwater	New Property	All	0320	.-.		0.23		.	0.06	4.2
Groundwater	New Property	All	0344	.-.		0.21		.	0.06	3.7
Groundwater	New Property	All	0356	.-.		0.10		.	0.06	1.8

Analysis Type=Radioisotopes Analyte (units)=Ra-226 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.		1.67		.	1.02	1.6
Groundwater	New Property	All	B401	0.0-28.9		1.22	J	0.18	1.02	1.2
Groundwater	New Property	All	B408	0.0-37.1		1.22	J	0.19	1.02	1.2
Groundwater	New Property	All	W399	0.0-31.5		1.08	J	0.21	1.02	1.1

Analysis Type=Radioisotopes Analyte (units)=Sr-90 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Seeps/Springs	New Property	All	618	0.0-0.0		2.80	J-L	1.30	0.97	2.9

Analysis Type=Radioisotopes Analyte (units)=Th-228 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0319	.-.		0.81		.	0.80	1.0

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Radioisotopes Analyte (units)=Th-230 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0158	.-.		0.35		.	0.28	1.3
Groundwater	New Property	All	0158	.-.		0.49		.	0.28	1.8
Groundwater	New Property	All	0320	.-.	J	0.71	J	.	0.28	2.6
Groundwater	New Property	All	0344	.-.		0.87		.	0.28	3.1
Seeps/Springs	New Property	All	619	0.0-0.0		0.39	J-S	0.30	0.28	1.4
Seeps/Springs	New Property	All	623	0.0-0.0		0.48	J-S	0.28	0.28	1.7
Groundwater	New Property	All	B408	0.0-37.1		0.43	J	0.22	0.28	1.6
Groundwater	New Property	All	W411	0.0-33.6		1.17	J	0.47	0.28	4.2

Analysis Type=Radioisotopes Analyte (units)=Th-232 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B408	0.0-37.1		0.35	=	0.20	0.23	1.5
Groundwater	New Property	All	W411	0.0-33.6		0.39	J	0.27	0.23	1.7

Analysis Type=Radioisotopes Analyte (units)=Tritium (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0344	.-.		2150.00		.	1379.20	1.6
Groundwater	New Property	All	0344	.-.		2400.00		.	1379.20	1.7
Groundwater	New Property	All	0353	.-.		1860.00		.	1379.20	1.3
Groundwater	New Property	All	0356	.-.		1430.00		.	1379.20	1.0
Groundwater	New Property	All	W402	0.0-24.0		1673.30	=	393.00	1379.20	1.2

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

Mound New Property Investigation
Summary for Seeps and Ground Water Compared to OU 9 Background
Sample results exceeding background concentrations.

Analysis Type=Radioisotopes Analyte (units)=U-234 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0319	.-.		1.14		.	0.77	1.5
Groundwater	New Property	All	0356	.-.		0.90		.	0.77	1.2
Seeps/Springs	New Property	All	618	0.0-0.0		0.96	=	0.53	0.77	1.2
Seeps/Springs	New Property	All	619	0.0-0.0		0.80	=	0.48	0.77	1.0
Seeps/Springs	New Property	All	620	0.0-0.0		0.96	=	0.49	0.77	1.2
Groundwater	New Property	All	B408	0.0-37.1		0.94	J	0.24	0.77	1.2
Groundwater	New Property	All	W399	0.0-31.5		3.23	J	0.62	0.77	4.2
Groundwater	New Property	All	W402	0.0-24.0		0.91	J	0.33	0.77	1.2

Analysis Type=Radioisotopes Analyte (units)=U-235 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	B408	0.0-37.1		0.07	=	0.07	0.04	1.8
Groundwater	New Property	All	W399	0.0-31.5		0.36	J	0.19	0.04	9.5
Groundwater	New Property	All	W400	0.0-24.8		0.14	J	0.14	0.04	3.7
Groundwater	New Property	All	W402	0.0-24.0		0.15	=	0.13	0.04	3.9

Analysis Type=Radioisotopes Analyte (units)=U-238 (PCI/L)

Media	Location	Group	STATION	Depth (Ft.)	LABQUAL	RESULTS	DATAQUAL	2 Sigma Rad Count Uncert.	Background Criteria	Concentration/ Criteria Ratio
Groundwater	New Property	All	0319	.-.		0.91		.	0.68	1.3
Groundwater	New Property	All	0356	.-.		0.74		.	0.68	1.1
Groundwater	New Property	All	0356	.-.		0.74		.	0.68	1.1
Groundwater	New Property	All	B408	0.0-37.1		1.12	=	0.27	0.68	1.6
Groundwater	New Property	All	W399	0.0-31.5		1.02	J	0.33	0.68	1.5

Minimum, average and maximum are based on the reported detection limit.
Generated by program mndcmp19 on 12DEC95 at 14:41 using dataset mndnew03.

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Appendix C

APPENDIX C
DATA QUALITY ASSESSMENT

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APPENDIX C

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ACRONYMS

AOC	Area of Concern
ASTM	American Society for Testing and Materials
CCV	Continuing Calibration Verification
CLP	Contract Laboratory Program
CLP SOW	Contract Laboratory Program Statement of Work
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
CC	cross check
DER	Duplicate Error Ratio
DQA	Data Quality Assessment
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
IDL	Instrument Detection Limit
LCS	Laboratory Control Sample
MG/KG	Milligrams per Kilogram
MG/L	Milligrams per Liter
MOD	Modification
MS	matrix spike
MSD	matrix spike duplicate
NA	Not Applicable
PBH	Potentially Biased High
PBL	Potentially Biased Low
PBU	Potentially Biased Unknown
PC/L	Picocuries per Liter
PE	performance evaluation
PFN	Potential False Negative
PFP	Potentially False Positive
PCB	polychlorinated biphenyl
QAPjP	Quality Assurance Project Plan
QC	quality control
RPD	relative percent difference
RRF	Relative Response Factor
RSD	Relative Standard Deviation
SD	Standard Deviation
sVOC	semivolatile organic compound
VOA	Volatile Organic Analysis
VOC	volatile organic compound
%D	Percent Difference
%R	Percent Recovery
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

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C.1.0. INTRODUCTION

Chemical data are fundamental to an environmental investigation. Inherent in the chemical data are uncertainties arising from the natural variability in the environment and measurement error. Data quality objectives (DQOs) are statements specifying the analytical and statistical goals of a study. DQOs assessed in this appendix were developed during project planning and are presented in the Operable Unit (OU) 5 Quality Assurance Project Plan (QAPjP).

This data quality assessment (DQA) evaluates the validity and performance of the data collection program by determining if the data are sufficient, adequate, and usable for supporting project decisions. Specifically, this DQA addresses the organic, inorganic, and radiological data produced from the analysis of environmental samples collected during the Non-Area of Concern (AOC), Area 7, and the New Property investigations. This DQA also evaluates the impact of all quality control (QC) measures on the overall data quality and removes all unusable values from the investigation data set.

All sampling and analysis was conducted using the QC requirements and quality assurance (QA) objectives outlined in the OU5 and OU9 QAPjPs. A summary of the environmental and field QC samples collected and analyzed during the OU5 investigations are presented in Table C.1-1 on page C-14.

Note: Due to the large amount of tabulated data in this appendix, all tables are located in numerical order beginning on page C-14.

C.1.1. ENVIRONMENTAL ANALYTICAL LABORATORIES

CompuChem Environmental Corporation, Research Triangle Park, North Carolina, performed all chemical and radiological analyses. All environmental samples (i.e., soil, groundwater, and seep water) and field QC samples (i.e., trip blanks, ambient blanks, and equipment rinsates) were analyzed using U.S. Environmental Protection Agency (EPA) and Mound OU5 QAPjP methods from the following references:

- *Contract Laboratory Program Statement of Work Modifications, OU9 Site-Wide QAPjP, Appendix B*, Revision 3, June 1993;

- *Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration,* EPA Contract Laboratory Program, March 1990 and revisions;

- *Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration,* EPA Contract Laboratory Program, March 1990 and revisions;

- *Superfund Analytical Methods for Low Concentration Water for Organics Analysis*, EPA, June 1991;

- *Superfund Analytical Methods for Low Concentration Water for Inorganics Analysis*, EPA, June 1991;

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, September 1986, with 1989 revisions; and

- *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79, March 1983.

C.1.2. ANALYTICAL DATA VALIDATION

All analytical data were validated as described in Section C.3.0 using the guidelines and specifications described in the following documents:

- *Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses*, EPA Contract Laboratory Program, February 1988;

- *National Functional Guidelines for Organic Data Review, Multi-Media, Multi-Concentration (OLM01.0) and Low Concentration Water (OLC01.0)*, EPA Contract Laboratory Program, Draft, December 1990, Revised June 1991;

- *Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses*, EPA Contract Laboratory Program, February 1988, Revised January 1993; and

- *Data Validation Guidelines for Non-Contract Laboratory Program (CLP) Analyses, OU9 Site-Wide QAPjP, Appendix H,* Revision 3, June 1993.

- *OU5 QAPjP, in the OU5 South Property Remedial Investigation/Feasibility Study Sampling and Analysis Plan,* December 1993.

The validated results, including qualifiers, were incorporated into the OU5 database and used to evaluate data quality. The data quality summary, rejected data summary, accuracy and precision summary, and completeness calculations were prepared using 100 percent of all concentration records in the OU5 database. Bias and uncertainty were determined using 100 percent of the usable (i.e., unqualified results and estimated data points only) concentration values in the database. Table C1-2 summarizes all qualified data points, as well as the associated potential bias and uncertainty.

C.1.3. QUALITY DATA MANAGEMENT

The OU5 database was populated with analytical results collected during the sampling required in the Mound OU5 investigations. All duplicate, QC blanks, and dilution results were resolved and the most appropriate data points were selected. The selection processes used are described below:

- All detected compounds in the trip blanks were evaluated and the reportable data points were adjusted using the following procedures: (1) All environmental samples were linked with the associated trip blanks, based on the applicable chain-of-custody form. (2) All potential contaminants detected in the associated trip blanks were evaluated. These blank concentrations were raised by a factor of 10 (for common laboratory contaminants) or 5 (for all other contaminants) based on the compound detected and applicable validation procedures. These adjusted values became the minimum concentration that would be considered representative in a given environmental sample. (3) All concentration values in the associated environmental samples were compared with the adjusted trip blank results. If the concentration did not exceed the minimum representative concentration (found in the trip blank), then the value was considered not detected at the concentration reported and was qualified as undetected.

- All detected compounds and elements in the equipment rinsate blanks were evaluated and the reportable data points were adjusted using the following procedures: (1) All environmental samples were linked with the associated equipment rinsate blanks, based on the applicable chain-of-custody form. (2) All potential contaminants detected in the associated rinsate blanks were evaluated. These concentrations were raised by a factor of 10 (for common laboratory contaminants), 5 (for all other contaminants), or 3 (for radiochemical contaminants) based on the compound detected and appropriate validation procedures. These values became the minimum concentration that would be considered representative in a given environmental sample. (3) All concentration values in the associated environmental samples were compared with the adjusted equipment rinsate blank results. If the concentration did not exceed the minimum representative concentration (found in the equipment rinsate), the value was considered not detected at the concentration reported and was qualified as undetected.

- All data points qualified with "R" were marked to prevent incorporation into the usable data population.

- All laboratory duplicate values for sample identification and analytical method, and all values meeting the duplicate value criteria were evaluated using the following procedure (standard logic): (1) The higher concentration value was selected. (2) The detected value was selected. (3) The most sensitive contract-required quantitation or detection limit (CRQL or CRDL, respectively) was selected for duplicate nondetected values.

- All dilution results were evaluated for best value and CRQL/CRDL using the following procedure: (1) The diluted sample results were selected for all compounds, with the exception of volatile organic compounds (VOC) methylene chloride, acetone, 2-butanone, and toluene, and semi-volatile organic compounds (SVOC) phthalate esters. The concentration value reported in the nondiluted sample was selected for those compounds only. (2) The nondiluted value was selected to prevent potential false positive value incorporation into the usable data population for duplicate nondetected and detected values. (3) The most sensitive CRQL or CRDL was selected for duplicate nondetected values.

- All reanalyses results were evaluated for best value, based on QC results, and CRQL/CRDL using the standard logic procedure.

- All field duplicate/replicate analyses results were evaluated for best value and CRQL/CRDL using the following procedure: (1) Duplicate detected values were averaged if the calculated relative percent difference (RPD) was less than 20 (water) or 35 (soil) percent. The higher concentration value was selected if the reference RPD value was exceeded. (2) The detected value was selected where the duplicate value was not detected. (3) The most sensitive CRQL/CRDL was selected where both values were not detected.

C.2.0. DATA QUALITY OBJECTIVES

As defined in the QAPjP, the following specific DQOs for accuracy, precision, completeness, representativeness and comparability were used to assess the overall quality of the analytical data collected from OU5.

The DQOs for analyses conducted during the investigations are listed in Tables C.2-1 and C.2-2.

C.2.1. ACCURACY

Accuracy is defined as the degree of difference between measured or calculated values and the true value. Accuracy was determined in the OU5 data set using matrix spike/matrix spike duplicates (MS/MSD) for organics and MS samples for inorganics and radiochemical analyses. Data were qualified on the basis of percent recoveries (%R) of these spikes in conjunction with other validation criteria. All DQOs for accuracy were met for the EG&G Mound OU5 project. Laboratory accuracy and precision performance summary tables for each analysis are presented in Section C.4.2.

C.2.2. PRECISION

Precision is defined as the reproducibility, or degree of agreement between replicate measurements of the same compound or element. No data were rejected due to unacceptable RPD results; therefore, the

precision DQOs for the OU5 projects were met. Laboratory accuracy and precision performance summary tables for each analysis are presented in Section C.4.2.

C.2.3. COMPLETENESS

Completeness is a measure of the amount of valid data obtained from a measurement system that achieves the project goals, compared to the amount expected under normal conditions. For data to be considered valid, they must have met all acceptance criteria, including accuracy and precision, as well as any other criteria specified by the analytical methods used. Samples to be collected for OU5 were predefined by depth intervals at each borehole. The initial planned number of samples was an estimation based upon the expected depth of each borehole. When the estimated number of samples were not obtained from a borehole due to bedrock, those samples planned at a greater depth, but not taken, are not considered to adversely affect the completeness of the data set. The project completeness goal per the OU5 QAPjP was 90%. Completeness is calculated by dividing the number of samples not taken (15) by the total number of samples planned (163) and multiplying by 100. Then, subtract this value (9.2) from 100 to get completeness, which is 91%. Neither total samples planned nor samples not taken, includes samples planned from locations which are on or below bedrock.

C.2.4. REPRESENTATIVENESS

Representativeness is defined as the degree to which the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling location, a process condition, or an environmental condition. Sample representativeness was ensured during OU5 investigation by collecting sufficient samples of a population medium, properly distributed with respect to location and time. Representativeness was assessed by reviewing the drilling techniques, sample collection methods, equipment, and sample containers used. Representativeness was also assessed by evaluating the RPD values calculated from the field duplicate samples, the duplicate concentration values reported from redundant analyses, and the concentrations of contaminants detected in the field and laboratory QC blanks. The reproducibility of a representative set of samples reflects the degree of heterogeneity of the sampled medium.

C.2.5. COMPARABILITY

Comparability is defined as the confidence with which one data set can be compared to another. To achieve data comparability, the data set used for OU5 was generated by employing standardized analytical methods and standardized data validation procedures where available (i.e., CLP Methods and Functional Guidelines). Where general guidance was unavailable, Mound specific methods and data validation procedures common to all Mound remedial investigations were used.

Additionally, CompuChem participated in the analysis of Performance Evaluation (PE) samples for organics and inorganics and Cross Check (CC) samples for radionuclides. The results of the samples are listed in Tables C.2-3 and C.2-4. The laboratory's performance over the period presented indicates their ability to generate accurate results over time. Based on the overall quality of the PE and CC sample results, and the stringent QC requirements set by the standardized methods, the data generated is considered comparable to other data generated through similar processes.

C.3.0. DATA VALIDATION AND ASSESSMENT

The OU5 data were validated as described in the following subsections. Data quality was assessed and the usable data population was then determined using the preparation and selection process described in Section C.1.3.

C.3.1. DATA VALIDATION PROCESS

All data received from the laboratories were subjected to an initial review to ensure that all elements of the required deliverable were submitted. All analytical data were validated according to the guidelines and procedures described in the documents listed in Section C.1.2.1. Ten percent of the data received full validation including recalculation of selected data. The remaining 90% went through a verification process that reviewed QC information and other enclosed forms. Validators were responsible for (1) reviewing the laboratory data (i.e., ensuring that the required information was complete), (2) comparing the laboratory QC results with the required control limits (using professional judgment where specific limits were not specified), (3) verifing that selected results were correctly calculated, (4) qualifying affected data points, and (5) preparing a technical justification for the validation actions taken.

Wet chemistry methods (i.e. chloride, pH, sulfate, etc.) were validated to equivalent levels as the balance of organic, inorganic, and radiochemical data. Wet chemistry methods have fewer laboratory QA requirements and provide more general information than do CLP and CLP-type analyses. The results of wet chemistry analyses were therefore incorporated into the overall assessment of DQOs, but individual QA and method specific results are not presented in this appendix.

C.3.2. DATA VALIDATION REVIEW PROCESS

All validated analytical data were reviewed for completeness and consistency before the validation qualifiers were incorporated into the OU5 database. Approximately 10% of all data validation reports received a secondary review to ensure conformity in validation procedures among validators. Any qualifiers inconsistently or inappropriately applied were revised, as necessary. All changes were documented.

C.3.3. DATA QUALITY ASSESSMENT

The DQA was conducted using the validated results. The complete OU5 usable data set contained 25,836 concentration records. Bias and uncertainty were evaluated for all estimated (i.e., "J or UJ") data points based on 100 percent of the total estimated (i.e., those data points [records] that were qualified as "J or UJ") dataset. Of these data, 35% (3,178 concentration values) are considered to have been reported at an artificially lower concentration (i.e., potentially biased low). Approximately 9% (856 concentration values) of the OU5 dataset are considered to have been reported at a maximum value (i.e., potentially biased high). The direction of bias could not be determined for 35% (3,204 records) of the OU5 dataset with the information provided. Uncertainty was evaluated as the potential for false negative or false positive values. Based on the data evaluated, 37% (3,371 concentration values) of the estimated values reported are considered potential false negatives and approximately 9% (439 values) are considered potential false positives.

C.4.0. LABORATORY QUALITY CONTROL SUMMARY

C.4.1. HOLDING TIMES

Holding times are defined as the maximum amount of time allowed to elapse between the time of sample collection and the time of sample analysis. Analysis of samples that have exceeded the method-recommended holding times may result in the following: (1) concentrations of compounds that ordinarily would have been detected are undetected due to chemical transformation, compound volatilization, or biodegradation; (2) reported concentrations lower than those originally present, due to the factors previously stated; or (3) reported concentrations greater than those originally present in the sample, due to external contamination of water samples or changes in soil moisture content. No data was rejected due to holding time violations. Approximately 4% (1,079 records) of the usable data population were estimated due to holding time violations.

C.4.2. ACCURACY AND PRECISION

Laboratory accuracy and precision assessment and matrix effect sample evaluation was conducted using MS/MSD (for organic compounds) and spike and duplicate (for inorganic compounds and radiochemical) analyses. Accuracy and precision were expressed as the percent recovery of the spike compounds, elements or isotopes and the relative percent difference of the concentrations of the spike compounds, respectively. For samples collected and analyzed for trace metals and other inorganic chemicals, precision was expressed as the percent difference of the concentration of elements detected in the sample and associated analytical duplicate. A MS/MSD or a spike and analytical duplicate analysis was required for every 20 samples of a similar matrix.

C.4.2.1. Volatile Organic Compound Analyses

Eighteen soil samples and eight water samples were analyzed as MS/MSDs using Contract Laboratory Program (CLP) methods. These samples were spiked with the following compounds: acrylonitrile, acetonitrile, 1,1-dichloroethene, trichloroethene, benzene, toluene, and chlorobenzene. The analytical accuracy and precision results are summarized in Tables C.4-1 through C.4-4.

C.4.2.2. Semivolatile Organic Compound Analyses

Sixteen soil and four water samples were analyzed as MS/MSDs using the CLP Statement of Work (SOW). These samples were spiked with the following compounds: phenol, 2-chlorophenol, 1,4-dichlorobenzene, n-nitroso-di-n-propylamine, 1,2,4-trichlorobenzene, 4-chloro-3-methylphenol, acenaphthene, 4-nitrophenol, 2,4-dinitrotoluene, pentachlorophenol, and pyrene. The analytical accuracy and precision results are summarized in Tables C.4-5 through C.4-8.

C.4.2.3. Pesticides/Polychlorinated Biphenyl (PCB) Analyses

Sixteen soil and two water samples were analyzed as MS/MSDs using the CLP SOW. These samples were spiked with the following compounds: gamma-BHC (lindane), heptachlor, aldrin, dieldrin, endrin, and 4,4'-DDT. A summary of the recovery and difference results is presented in Tables C.4-9 through C.4-12.

C.4.2.4. Purgeable Hydrocarbons Analyses

Four water samples were analyzed as MS/MSDs using the CLP SOW. These samples were spiked with the following compounds: trans-1,2-dichloroethene, cis-1,2-dichloroethene, trichlorofluoromethane (Freon-11), and Freon-113. A summary of the recovery and difference results is presented in Tables C.4-13 through C.4-14.

C.4.2.5 Explosives Analyses

Twenty soil and four water samples were analyzed as MS/MSDs using the CLP SOW. These samples were spiked with the following compounds: RDX, 1,3,5-trinitrobenzene, 2,4,6-trinitrotoluene, 2,6-dinitrotoluene, and 2,4-dinitrotoluene. A summary of the recovery and difference results is presented in Table C.4-15 through C.4-18.

C.4.2.6. Inorganic Chemical Analyses

Ten soil and five water samples were analyzed as spike and duplicates using EPA CLP, solid waste, or other regional methods. A summary of the recovery and difference results is presented in Tables C.4-19 through C.4-22.

C.4.2.7. Lanthanide Analyses

Several soil and water samples were analyzed as spike and duplicates using EPA CLP, solid waste, or other regional methods. A summary of the recovery and difference results is presented in Tables C.4-23 through C.4-26.

C.4.2.8. Radionuclide Analyses

Several soil and water samples were analyzed as spike and duplicates using the referenced methods for radiochemical analyses. A summary of the recovery and difference results is presented in Tables C.4-27 through C.4-30.

C.4.3. COMPLETENESS

The analytical completeness goal was 95% as required by the OU5 QAPjP. Analytical completeness was calculated by determining the percentage of sample analyses that were not rejected for each method. No sample analyses were rejected, therefore the analytical completeness was 100% for all methods. Table C.4-31 presents analytical completeness on an analyses level, however these results do not impact the quality or completeness of the entire data set.

C.4.4. REPRESENTATIVENESS

Representativeness is ensured by conducting all field measurements, sample collection procedures, and laboratory analyses according to the guidelines and specifications described in the OU5 Work Plan, OU5 Field Sampling Plan (FSP), and OU5 QAPjP. Laboratory procedures initially were evaluated in the data validation process. All field procedures and any deviations are discussed in Section 2 of the report. The

field duplicate values and QC blank results were processed using the procedures described in Section C.1.3. As a result, the dataset was considered representative for the purpose of the project.

Rejected values were not included in the usable data population due to the increased potential of using false positive or excluding false negative compounds or elements. As a result, 17 VOC, 45 SVOC, 39 Pesticide/PCB, 183 explosive, 304 inorganic, and 4 radiochemical data points were not included in the usable data population. Based on the evaluation of the field and laboratory QC results, 98 percent of the total environmental sample data points collected during OU5 were considered representative (i.e., 596 data points were removed from 26,432 total data points) and used as the basis for all recommendations presented in this report. Rejected data points are presented in Table C.4-32.

C.5.0. FIELD QUALITY CONTROL SUMMARIES

Forty-three trip blanks, 11 ambient blanks, 11 sample bank blanks, 18 equipment rinsate blanks, and 20 field duplicates were collected during this investigation. Trip, ambient, and sample bank blanks were analyzed for VOCs only. Equipment rinsate blanks and field duplicates were analyzed for the same target compounds or elements using the same laboratory techniques as those used for the environmental samples. The analytical results obtained from the field QC blanks were used to assess the efficiency and effectiveness of the sample collection, handling, and equipment decontamination procedures used in the field.

C.5.1. TRIP BLANKS

Trip blanks monitor for VOC contamination during sample transport and storage. Trip blanks were prepared by the laboratory with American Society for Testing and Materials (ASTM) Type II water, stored with the unused sample bottles, and returned to the laboratory with each cooler containing VOC samples. The samples were analyzed for VOCs using the CLP SOW. Table C.5-1 summarizes the concentrations (i.e., greater than the applicable CRQL) of the detected VOCs in the trip blank samples collected during OU5 sampling. If the concentrations of the compounds detected in the environmental samples did not exceed 10 times (for methylene chloride, acetone, 2-butanone, and toluene) or 5 times (for all other compounds) that detected in the trip blank, the compound was considered not detected in the environmental sample (i.e., U) at the concentrations reported.

C.5.2. AMBIENT AND SAMPLE BANK BLANKS

Ambient blanks and sample bank blanks were collected to monitor for VOCs potentially present in the surrounding environment during sample collection and packaging respectively. Ambient blanks were collected by filling two 40-ml volatile organic analysis (VOA) containers with the ASTM Type II water at the site during the collection of the environmental samples. All ambient blanks were analyzed for CLP VOCs. Table C.5-2 summarizes the concentrations of the compounds detected in the ambient blanks.

Sample bank blanks were prepared by filling two 40-ml VOA containers with ASTM type II water at the location where the samples were packaged for shipment. The VOA vials were left uncapped during packaging. After the last environmental sample for a particular shipment had been prepared and placed in the shipping cooler, the vials were sealed and placed into the sample cooler. Sample bank blanks were tested for CLP VOCs.

C.5.3. EQUIPMENT RINSATE BLANKS

Equipment rinsate blanks were collected to evaluate the decontamination technique used for manual sampling equipment. Equipment rinsate blanks were collected by pouring ASTM Type II reagent water through a decontaminated piece of equipment into a prepared sample container appropriate for the required analysis. Equipment rinsate blanks were shipped to the laboratory, and analyzed for the same analytes as the environmental samples which the equipment was used to collect. All detected compounds and elements in the equipment rinsate blanks were evaluated and the reportable data points were adjusted using the procedure described for trip blanks. Table C.5-3 summarizes the concentrations of the compounds and elements detected in the equipment rinsate blanks collected during the OU5 projects.

C.5.4. FIELD REPLICATES

Replicate environmental samples were collected at selected locations to evaluate the precision of the sampling technique. The RPD value of each detected compound or element was reviewed to assess the sample collection reproducibility and matrix variability. Table C.5-4 summarizes the calculated RPD values (i.e. less than 20 percent [water samples] and less than 35 percent [soil samples]) for samples collected and analyzed for trace metals and organic compounds.

All field duplicate analyses results were evaluated for best value and CRQL/CRDL to be used in the OU5 data sets using the following procedure: (1) Duplicate detected values were averaged if the calculated RPD was less than or equal to 20 (water) or 35 (soil) percent. The higher concentration value was selected if the reference RPD value was exceeded. (2) The detected value was selected where the duplicate value was not detected. (3) The most sensitive CRQL/CRDL was selected where both values were not detected.

Table C.1-1. Samples Collected and Analyzed During the OU5 Field Investigation

Analysis	Soils		Water		
	Number of Environmental Samples	Number of Field Duplicate Samples	Number of Environmental Samples	Number of Field Duplicate Samples	Nymber of Field QC Samples
Volatile Organics	123	15	19	5	84
Semi-Volatile Organics	115	14	14	3	16
Pesticide/PCBs	115	14	13	3	16
Explosives	121	15	13	3	17
Inorganics	116	14	14	3	16
Gamma Spectroscopy	121	15	14	3	17
Alpha Spectroscopy	103	14	12	3	14
Liquid Scintillation	121	15	14	3	17
Alpha Scintillation	0	0	14	3	17
Conventional Analysis	115	14	14	3	16

PCB polychlorinated biphenyls
QC quality control

Table C.1-2. Validated Data Summary
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Validation Code	Validation Parameter	Reason	Bias	Uncertainty	Number of records
A01	Holding Times	Extraction Holding Times Were Exceeded.	PBL	PFN	117
A03	Holding Times	Analysis Holding Times were exceeded.	PBL	PFN	962
C01	Initial/Continuing Calibration - Organics	Initial Calibration RRF was <0.05.	PBL	PFN	26
C02	Initial/Continuing Calibration - Organics	Initial Calibration RSD was >30%.	PBU	NA	95
C05	Initial/Continuing Calibration - Organics	Continuing Calibration %D was >25%.	PBU	NA	242
C08	Initial/Continuing Calibration - Organics	RPD criteria were not met.	PBU	NA	53
C09	Initial/Continuing Calibration - Organics	RSD criteria were not met.	PBU	NA	23
C14	Initial/Continuing Calibration - Organics	Professional Judgement was used to qualify the data.	PBU	NA	13
D04	Initial/Continuing Calibration - Inorganic	CCV Recovery was above the upper control limit.	PBH	NA	2
D08	Initial/Continuing Calibration - Inorganic	Correlation coefficient was <0.995.	PBU	NA	16
E01	ICP/Furnace requirements	Interference check sample recovery was outside the control limit.	PBH	PFP	1
E03	ICP/Furnace requirements	Post digestion spike recovery was outside the control limit.	PBU	NA	88
E05	ICP/Furnace requirements	Correlation coefficient was <0.995.	PBL	NA	1

Table C.1-2. Validated Data Summary
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Validation Code	Validation Parameter	Reason	Bias	Uncertainty	Number of records
E07	ICP/Furnace requirements	Serial dilution criteria were not met.	PBU	NA	400
E08	ICP/Furnace requirements	Professional judgement was used to quality the data.	PBU	NA	22
F01	Blanks	Sample data were qualified as a result of the method blank.	PBH	PFP	188
F02	Blanks	Sample data were qualified as a result of the field blank.	PBH	PFP	4
F03	Blanks	Sample data were qualified as a result of the equipment rinsate.	PBH	PFP	4
F06	Blanks	Concentration of the contaminant was detected at a level below the CRQL.	PBH	PFP	238
F07	Blanks	Concentration of the contaminant was detected at a level less than the action limit, but greater than the CRQL.	NA	NA	372
F08	Blanks	Concentration of the contaminant was detected at a level that exceeds the action level.	NA	NA	7
F10	Blanks	Blank had a negative value >5 times the IDL.	PBU	NA	351
G01	Surrogate/Radiological chemical recovery	Surrogate/Radiological chemical recovery was above the upper control limit.	PBH	NA	269
G02	Surrogate/Radiological chemical recovery	Surrogate/Radiological chemical recovery was below the lower control limit.	PBL	PFN	1368
G03	Surrogate/Radiological chemical recovery	Surrogate recovery was <10%.	PBL	PFN	32
G05	Surrogate/Radiological chemical recovery	Surrogate/Radiological chemical recovery data was not present.	PBU	NA	130

Table C.1-2. Validated Data Summary
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Validation Code	Validation Parameter	Reason	Bias	Uncertainty	Number of records
G06	Surrogate/Radiological chemical recovery	Professional Judgement was used to qualify the data.	PBU	NA	139
G07	Surrogate/Radiological chemical recovery	Radiological chemcial recovery was <20%.	PBL	PFN	3
H02	MS/MSD	MS/MSD recovery was below the lower control limit.	PBL	PFN	2
H04	MS/MSD	MS/MSD pairs exceed the RPD limit.	PBU	NA	16
I01	Matrix Spike	MS recovery was above the upper control limit.	PBH	NA	67
I02	Matrix Spike	MS recovery was below the lower control limit.	PBL	PFN	455
I03	Matrix Spike	MS Recovery was <30%.	PBL	PFN	118
J01	Laboratory Duplicate	Duplicate RPD/Radiological duplicate error ratio (DER) was outside the control limit.	PBU	NA	199
J02	Laboratory Duplicate	Duplicate sample results were >5 times the CRDL.	PBU	NA	60
J03	Laboratory Duplicate	Duplicate sample results were <5 times the CRDL.	PBU	NA	1
J04	Laboratory Duplicate	Professional judgement was used to qualify the data.	PBU	NA	19
K01	Internal area summary	Area counts were outside the control limits.	PBL	PFN	89
M07	Target compound ID	Professional judgement was used to qualify the data.	PBU	NA	24
M08	Target compound ID	The %D between the two pesticide/PCB column checks was >25%.	PBU	NA	146
N02	Comp. Quant/RPT'd CRQL	MDL'S reported by the laboratory exceeded corresponding CRQL'S.	NA	PFN	194

Table C.1-2. Validated Data Summary
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Validation Code	Validation Parameter	Reason	Bias	Uncertainty	Number of records
N03	Comp. Quant/RPT'd CRQL	Professional judgement used to qualify the data.	PBU	NA	51
O01	Tentatively identified compounds	Compound was suspected laboratory contaminant and was not detected in the blank.	NA	PFP	4
P01	LCS	LCS recovery was above upper control limit.	PBH	NA	83
P02	LCS	LCS recovery was below lower control limit.	PBL	PFN	5
P05	LCS	LCS was not analyzed at required frequency	PBU	NA	4
P08	LCS	Professional judgement was used to qualify the data.	PBU	NA	2
Q01	Field Duplicates	Field duplicate RPD's were >30% for waters and/or >50% for soils.	PBU	NA	650
R02	RAD Calibration	Energy calibration criteria were not met.	PBU	NA	93
R08	RAD Calibration	Professional judgement was used to qualify the data.	PBU	NA	88
S02	RAD Calibration verification	Energy verification criteria were not met.	PBU	NA	62
T04	RAD Quantitiation	Professional judgement was used to qualify the data.	PBU	NA	41
U03	Tagret RAD (GAMMA)	Professional judgement was used to qualify the data.	PBU	NA	33

CRQL Contract required detection level
%D Percent difference
IDL Instrument detection level
LCS Laboratory control sample
MSD Matrix spike duplicate
MS matrix spike
NA Not applicable
PBH Potentially biased high
PBL Potentially biased low
PBU Potential bias unknown
PFN Potential false negative
PFP Potential false postive
RPD Relative percent difference
RRF relative response factor
RSD Relative standard deviation

Table C.2-1. OU5 Data Quality Objectives for Water Samples

Analysis	Method	Accuracy* (% R)	Precision (RPD)	Completeness (%)
Volatile Organic Compounds	CLP SOW	61-145	14	95%
Semivolatile Organic Compounds	CLP SOW	9-127	50	95%
Pesticides/PCBs	CLP SOW	38-131	27	95%
Purgeable Hydrocarbons	SW846 8010	13-191	15	95%
Inorganics	CLP SOW	75-125	20	95%
Lanthanides	CLP SOW MOD C	75-125	20	95%
Explosives	SW846 8330	62-102	45	95%
Radiological Data	Various	± 3 x SD	± 4 x SD	95%

-- Actual limits not stated in the QAPjP
* Accuracy values presented in table represent a compilation of all acceptable recovery ranges of individual compounds (i.e., the maximum and minimum limit of any target list compound (TLC).
CLP SOW Contract laboratory program statment of work
MOD Modification
PCB Polychlorinated biphenyl
%R Percent recovery
RPD Relative percent difference
SD Standard Deivation

Table C.2-2. OU5 Data Quality Objectives for Soil Samples

Analysis	Method	Accuracy* (% R)	Precision (RPD)	Completeness (%)
Volatile Organic Compounds	CLP SOW	59-172	24	95%
Semivolatile Organic Compounds	CLP SOW	11-142	50	95%
Pesticides/PCBs	CLP SOW	23-139	50	95%
Purgeable Hydrocarbons	SW846 8010	60-140	30	95%
Inorganics	CLP SOW	75-125	35	95%
Lanthanides	CLP SOW MOD C	75-125	20	95%
Explosives	SW8330	--	--	95%
Radiological Data	Various	± 3 x SD	+ 4 x SD	95%

-- Actual limits not stated in the QAPjP
SD Standard Deviation - number determined by laboratory
* Accuracy values presented in table represent a compilation of all acceptable recovery ranges of individual compounds (i.e., the maximum and minimum limit of any target list compound (TLC).
CLP SOW Contract laboratory program statment of work
MOD Modification
PCB Polychlorinated biphenyl
%R Percent recovery
RPD Relative percent difference

Table C.2-3. Performance Evaluation Report for CompuChem
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Analyte	Test Date					
	Third Quarter 1994			Fourth Quarter 1994		
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3
Aluminum	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----	Satisfactory
Antimony	Unsatisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory
Arsenic	Satisfactory	Unsatisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory
Barium	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----
Beryllium	Satisfactory	Satisfactory	Satisfactory	Unsatisfactory	Satisfactory	----
Cadmium	Satisfactory	Satisfactory	Warning	Satisfactory	Satisfactory	Satisfactory
Calcium	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----
Chromium	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Unsatisfactory	Unsatisfactory
Cobalt	----	Satisfactory	Satisfactory	----	Unsatisfactory	Satisfactory
Copper	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----
Iron	Satisfactory	Satisfactory	Unsatisfactory	Satisfactory	Satisfactory	Satisfactory
Lead	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory
Magnesium	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory
Manganese	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----	Satisfactory
Mercury	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Unsatisfactory	Satisfactory
Nickel	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----
Potassium	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----	Satisfactory

Table C.2-3. Performance Evaluation Report for CompuChem
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Analyte	Test Date					
	Third Quarter 1994			Fourth Quarter 1994		
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3
Selenium	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----	Satisfactory
Silver	Satisfactory	----	Unsatisfactory	Satisfactory	Unsatisfactory	Satisfactory
Sodium	----	Satisfactory	Satisfactory	Unsatisfactory	Satisfactory	----
Thallium	----	Satisfactory	Satisfactory	Satisfactory	----	Satisfactory
Vanadium	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----	Satisfactory
Zinc	Satisfactory	Satisfactory	Satisfactory	Satisfactory	----	Satisfactory
Bromomethane	----	----	----	Satisfactory	----	----
Bromodichloromethane	----	----	----	Unsatisfactory	----	----
Trichloroethene	----	----	----	Satisfactory	----	----
trans-1,3-Dichloropropene	----	----	----	Satisfactory	----	----
2-pentanone,4-Methylene	----	----	----	Satisfactory	----	----
2-Hexanone	----	----	----	Satisfactory	----	----
Tetrachloroethene	----	----	----	Satisfactory	----	----
1,1,2,2-Tetrachloroethane	----	----	----	Warning	----	----
Ethyl benzene	----	----	----	Satisfactory	----	----
Styrene	----	----	----	Satisfactory	----	----
Phenol	----	----	----	Satisfactory	----	----

Table C.2-3. Performance Evaluation Report for CompuChem
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Analyte	Test Date					
	Third Quarter 1994			Fourth Quarter 1994		
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3
2-Chlorophenol	----	----	-----	Satisfactory	----	----
1,4-Dichlorobenzene	----	----	----	Satisfactory	----	----
2,2'-oxybis(1-Chloropropene)	----	----	----	Satisfactory	----	----
Naphthalene	----	----	-----	Satisfactory	----	----
Acenaphthylene	----	----		Satisfactory	----	----
Dibenzofuran	----	----	----	Satisfactory	----	----
Diethylphthalate	----	----	----	Satisfactory	----	----
Fluorene	----	----	----	Satisfactory	----	----
Hexachlorobenzene	----	----	----	Satisfactory	----	----
Pentachlorophenol	----	----	----	Satisfactory	----	----
Fluoranthene	----	----	----	Satisfactory	----	----
Pyrene	----	----	----	Satisfactory	----	----
Dibenzo(a,h)anthracene	----	----	----	Satisfactory	----	----
gamma-BHC	----	----	----	Warning	----	----
Aldrin	----	----	----	Satisfactory	----	----
Dieldrin	----	----	----	Satisfactory	----	----
4,4'-DDE	----	----	----	Satisfactory	----	----

Table C.2-3. Performance Evaluation Report for CompuChem
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Analyte	Test Date					
	Third Quarter 1994			Fourth Quarter 1994		
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3
Endrin	----	----	----	Satisfactory	----	----
4,4'-DDD	----	----	----	Satisfactory	----	----
Methoxychlor	----	----	----	Satisfactory	----	----
Aroclor-1016	----	----	----	----	----	----

---	Not Provided
Satisfactory	Result $\leq \pm$ 2 Standard Deviations from Actual Concentrations
Warning	Result between 2 and 3 Standard Deviations from Actual Concentrations
Unsatisfactory	Result $> \pm$ 3 Standard Deviations from Actual Concentrations

Table C.2-4. Cross Check Samples for CompuChem

Analyte	Date of Study
	April-94
Cesium-134 in Water	Satisfactory
Cesium-137 in Water	Satisfactory
Cobalt-60 in Water	Satisfactory
Gross Alpha in Water	Satisfactory
Gross Beta in Water	Satisfactory
Radium-226 in Water	Satisfactory
Radium-228 in Water	Satisfactory
Strontium-90 in Water	Satisfactory
Strontium-89 in Water	Satisfactory
Uranium (Natural) in Water	Satisfactory

Satisfactory Results were within action limits.

Table C.4-1. Volatiles Accuracy Summary - Soil Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimim Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
1,1-Dichloroethene	18	18	78	112	59-172
Trichloroethene	18	18	79	107	62-137
Benzene	18	18	80	104	66-142
Toluene	18	18	93	120	59-139
Chlorobenzene	18	18	85	105	60-133
Acetonitrile	18	16	31	124	60-140
Acrylonitrile	18	18	82	118	60-140

Table C.4-2. Volatiles Accuracy Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
1,1-Dichloroethene	8	8	86	103	61-145
Trichloroethene	8	8	90	113	71-120
Benzene	8	8	87	106	76-127
Toluene	8	8	87	98	76-125
Chlorobenzene	8	8	88	102	75-130
Acetonitrile	8	7	94	156	70-130
Acrylonitrile	8	8	80	116	70-130

Table C.4-3. Volatiles Precision Summary - Soil Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
1,1-Dichloroethene	9	9	0	13	22
Trichloroethene	9	9	0	20	24
Benzene	9	9	0	10	21
Toluene	9	9	0	16	21
Chlorobenzene	9	9	0	16	21
Acetonitrile	9	6	2	107	25
Acrylonitrile	9	9	1	15	25

RPD relative percent difference

Table C.4-4. Volatiles Precision Summary - Water Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
1,1-Dichloroethene	4	4	3	12	14
Trichloroethene	4	4	0	7	14
Benzene	4	4	0	5	11
Toluene	4	4	1	3	13
Chlorobenzene	4	4	1	4	13
Acetonitrile	4	3	1	49	15
Acrylonitrile	4	3	3	15	15

RPD relative percent difference

Table C.4-5. Semivolatiles Accuracy Summary - Soil Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
Phenol	16	14	62	102	26-90
2-Chlorophenol	16	16	53	93	25-102
1,4-Dichlorobenzene	16	16	69	94	28-104
n-Nitroso-di-n-propylamine	16	16	70	111	41-126
1,2,4-Trichlorobenzene	16	12	79	122	38-107
4-Chloro-3-methylphenol	16	10	89	125	26-103
Acenaphthylene	16	16	68	102	31-137
4-Nitrophenol	16	16	62	107	11-114
2,4-Dinitrotoluene	16	7	75	102	28-89
Pentachlorophenol	16	14	51	119	17-109
Pyrene	16	14	12	127	35-142

Table C.4-6. Semivolatiles Accuracy Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
Phenol	4	4	68	75	12-110
2-Chlorophenol	4	4	66	75	27-123
1,4-Dichlorobenzene	4	4	59	75	36-97
n-Nitroso-di-n-propylamine	4	4	77	88	41-116
1,2,4-Trichlorobenzene	4	4	64	98	39-98
4-Chloro-3-methylphenol	4	3	80	104	23-97
Acenaphthylene	4	4	70	85	46-118
4-Nitrophenol	4	2	74	109	10-80
2,4-Dinitrotoluene	4	4	64	72	24-96
Pentachlorophenol	4	3	86	107	9-103
Pyrene	4	4	64	76	26-127

Table C.4-7. Semivolatiles Precision Summary - Soil Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Phenol	8	8	0	11	35
2-Chlorophenol	8	8	1	11	50
1,4-Dichlorobenzene	8	8	0	10	27
n-Nitroso-di-n-propylamine	8	8	1	26	38
1,2,4-Trichlorobenzene	8	8	2	18	23
4-Chloro-3-methylphenol	8	8	2	20	33
Acenaphthylene	8	7	0	23	19
4-Nitrophenol	8	8	0	25	50
2,4-Dinitrotoluene	8	8	4	25	47
Pentachlorophenol	8	8	1	29	47
Pyrene	8	6	1	77	36

RPD relative percent difference

Table C.4-8. Semivolatiles Precision Summary - Water Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Phenol	2	2	1	4	42
2-Chlorophenol	2	2	0	4	40
1,4-Dichlorobenzene	2	2	10	16	28
n-Nitroso-di-n-propylamine	2	2	5	9	38
1,2,4-Trichlorobenzene	2	2	14	17	28
4-Chloro-3-methylphenol	2	2	0	10	42
Acenaphthylene	2	2	1	8	31
4-Nitrophenol	2	2	3	9	50
2,4-Dinitrotoluene	2	2	3	9	38
Pentachlorophenol	2	2	0	12	50
Pyrene	2	2	3	5	31

RPD relative percent difference

Table C.4-9. Pesticide/PCBs Accuracy Summary - Soil Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
Lindane	16	16	55	86	46-127
Heptachlor	16	16	61	91	35-130
Aldrin	16	16	49	91	34-132
Dieldrin	16	16	56	88	31-134
Endrin	16	16	67	93	42-139
4,4'-DDT	16	16	61	87	23-134

Table C.4-10. Pesticide/PCBs Accuracy Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
Lindane	2	2	68	72	56-123
Heptachlor	2	2	70	72	40-131
Aldrin	2	2	58	60	40-120
Dieldrin	2	2	64	67	52-126
Endrin	2	2	68	71	56-121
4,4'-DDT	2	2	71	71	38-127

Table C.4-11. Pesticide/PCBs Precision Summary - Soil Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Gamma	8	8	0	14	50
Heptachlor	8	8	0	19	31
Aldrin	8	8	0	19	43
Dieldrin	8	8	1	20	38
Endrin	8	8	1	17	45
4,4'-DDT	8	8	0	17	50

RPD relative percent difference

Table C.4-12. Pesticide/PCBs Precision Summary - Water Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Gamma	1	1	6	6	15
Heptachlor	1	1	3	3	20
Aldrin	1	1	3	3	22
Dieldrin	1	1	5	5	18
Endrin	1	1	4	4	21
4,4'-DDT	1	1	0	0	27

RPD relative percent difference

Table C.4-13. Purgeable Hydrocarbons Accuracy Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
trans-1,2-Dichloroethene	4	4	117	130	38-155
cis-1,2-Dichloroethene	4	4	118	131	38-155
trichlorofluoromethane	4	4	116	136	21-156
Freon-113	4	4	116	144	21-156

Table C.4-14. Purgeable Hydrocarbons Precision Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
trans-1,2-Dichloroethene	2	2	2	2	20
cis-1,2-Dichloroethene	2	2	1	5	20
trichlorofluoromethane	2	2	5	6	20
Freon-113	2	2	3	4	20

Table C.4-15. Explosives Accuracy Summary - Soil Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
RDX	20	18	57	211	40-160
1,3,5-Trinitrobenzene	20	18	57	212	40-160
2,4-Dinitrotoluene	20	17	55	177	40-160
2,6-Dinitrotoluene	20	18	49	171	40-160
2,4,6-Trinitrotoluene	20	19	70	288	40-160

Table C.4-16. Explosives Accuracy Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spiked Recovery (%)	Lab Acceptance Limits
RDX	4	1	52	112	62-87
1,3,5-Trinitrobenzene	4	3	59	99	85-100
2,4-Dinitrotoluene	4	3	53	99	75-99
2,6-Dinitrotoluene	4	2	58	109	66-102
2,4,6-Trinitrotoluene	4	1	65	126	78-102

Table C.4-17. Explosives Precision Summary - Soil Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
RDX	10	8	0	61	40
1,3,5-Trinitrobenzene	10	8	2	51	30
2,4-Dinitrotoluene	10	6	0	59	40
2,6-Dinitrotoluene	10	10	1	57	60
2,4,6-Trinitrotoluene	10	8	0	103	40

RPD relative percent difference

Table C.4-18. Explosives Precision Summary - Water Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
RDX	2	1	1	42	32
1,3,5-Trinitrobenzene	2	1	6	37	19
2,4-Dinitrotoluene	2	1	0	34	31
2,6-Dinitrotoluene	2	2	38	45	45
2,4,6-Trinitrotoluene	2	1	40	10	29

RPD relative percent difference

Table C.4-19. Metals Accuracy Summary - Soil Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spiked Recovery (%)	Maximum Spiked Recovery (%)	Lab Acceptance Limits
Aluminum	0	--	--	--	--
Antimony	10	1	8	76	75-125
Arsenic	10	8	60	96	75-125
Barium	10	8	70	105	75-125
Beryllium	10	8	65	100	75-125
Bismuth	10	10	76	94	75-125
Cadmium	10	5	64	97	75-125
Calcium	0	--	--	--	--
Chromium	10	7	70	125	75-125
Cobalt	10	8	68	95	75-125
Copper	10	10	79	111	75-125
Iron	0	--	--	--	--
Lead	12	8	68	151	75-125
Magnesium	0	--	--	--	--
Manganese	10	3	-106	419	75-125
Mercury	10	10	86	125	75-125
Nickel	10	8	74	96	75-125
Potassium	0	--	--	--	--
Selenium	10	9	68	107	75-125
Silver	10	10	78	98	75-125
Sodium	0	--	--	--	--
Thallium	10	5	46	96	75-125
Tin	10	10	81	105	75-125
Vanadium	10	6	62	106	75-125
Zinc	10	8	68	124	75-125
Lithium	9	9	88	101	75-125
Molybdenum	9	4	28	3624	75-125
Cyanide	10	10	86	100	75-125

-- Not Applicable

Table C.4-20. Metals Accuracy Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spike Recovery (%)	Maximum Spike Recovery (%)	Lab Acceptance Limits
Aluminum	5	2	7	235	75-125
Antimony	5	4	32	97	75-125
Arsenic	5	4	22	102	75-125
Barium	5	4	74	97	75-125
Beryllium	5	5	76	101	75-125
Bismuth	5	5	86	100	75-125
Cadmium	5	4	51	93	75-125
Calcium	0	--	--	--	--
Chromium	5	4	57	97	75-125
Cobalt	5	4	63	96	75-125
Copper	5	5	75	98	75-125
Iron	5	3	1	845	75-125
Lead	5	5	89	106	75-125
Magnesium	0	--	--	--	--
Manganese	5	4	47	104	75-125
Mercury	5	4	98	128	75-125
Nickel	5	4	58	112	75-125
Potassium	0	--	--	--	--
Selenium	5	4	0	111	75-125
Silver	5	4	65	96	75-125
Sodium	0	--	--	--	--
Thallium	5	4	42	98	75-125
Tin	5	2	50	98	75-125
Vanadium	5	4	65	96	75-125
Zinc	5	4	65	98	75-125
Lithium	2	2	98	105	75-125
Molybdenum	2	2	95	99	75-125
Cyanide	5	5	90	95	75-125

-- Not Applicable

Table C.4-21. Metals Precision Summary - Soil Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Aluminum	10	8	1	43	35
Antimony	3	3	2	23	35
Arsenic	10	9	1	45	35
Barium	10	7	1	67	35
Beryllium	8	6	1	39	35
Bismuth	8	8	2	19	35
Cadmium	3	3	1	17	35
Calcium	10	8	1	49	35
Chromium	10	9	2	37	35
Cobalt	10	10	1	22	35
Copper	10	8	1	46	35
Iron	10	10	1	26	35
Lead	12	11	1	57	35
Magnesium	10	8	2	48	35
Manganese	10	9	1	42	35
Mercury	1	1	12	12	35
Nickel	10	9	1	51	35
Potassium	10	9	3	37	35
Selenium	0	--	--	--	--
Silver	1	0	69	69	35
Sodium	10	10	1	29	35
Thallium	1	1	12	12	35
Tin	2	1	1	37	35
Vanadium	10	9	2	38	35
Zinc	10	10	2	35	35
Lithium	9	9	1	28	35
Molybdenum	6	6	5	19	35
Cyanide	0	--	--	--	--

-- not applicable RPD relative percent difference

Table C.4-22. Metals Precision Summary - Water Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Aluminum	4	3	5	101	20
Antimony	0	--	--	--	--
Arsenic	1	1	10	10	20
Barium	4	3	9	45	20
Beryllium	1	1	1	1	20
Bismuth	2	2	2	9	20
Cadmium	0	--	--	--	--
Calcium	5	5	1	16	20
Chromium	2	2	1	5	20
Cobalt	3	1	13	44	20
Copper	4	2	8	28	20
Iron	5	2	1	141	20
Lead	3	3	2	14	20
Magnesium	5	4	1	26	20
Manganese	3	3	1	5	20
Mercury	0	--	--	--	--
Nickel	3	2	3	171	20
Potassium	4	4	2	15	20
Selenium	0	--	--	--	--
Silver	0	--	--	--	--
Sodium	5	5	1	13	20
Thallium	0	--	--	--	--
Tin	0	--	--	--	--
Vanadium	3	2	4	95	20
Zinc	5	3	1	65	20
Lithium	1	1	2	2	20
Molybdenum	1	1	1	1	20
Cyanide	0	--	--	--	--

-- not applicable RPD relative percent difference

Table C.4-23. Lanthanides Accuracy Summary - Soil Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spiked Recovery (%)	Maximum Spiked Recovery (%)	Lab Acceptance Limits
Cerium	4	4	93	101	75-125
Dypsprosium	4	4	89	95	75-125
Erbium	4	0	126	138	75-125
Europium	4	4	91	98	75-125
Gadolinium	4	2	33	96	75-125
Holmium	4	4	91	100	75-125
Lanthanum	4	4	93	98	75-125
Lutetium	4	4	95	100	75-125
Neodymium	4	4	92	98	75-125
Praseodymium	4	4	79	93	75-125
Samarium	4	4	98	101	75-125
Terbium	4	4	88	96	75-125
Thulium	4	4	86	89	75-125
Ytterbium	4	4	94	95	75-125

Table C.4-24. Lanthanides Accuracy Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spiked Recovery (%)	Maximum Spiked Recovery (%)	Lab Acceptance Limits
Cerium	2	2	99	104	075-125
Dypsprosium	2	2	93	94	75-125
Erbium	2	0	140	146	75-125
Europium	2	2	97	102	75-125
Gadolinium	2	1	73	103	75-125
Holmium	2	2	103	105	75-125
Lanthanum	2	2	98	103	75-125
Lutetium	2	2	103	105	75-125
Neodymium	2	2	96	97	75-125
Praseodymium	2	2	96	97	75-125
Samarium	2	2	100	100	75-125
Terbium	2	2	96	102	75-125
Thulium	2	2	94	101	75-125
Ytterbium	2	2	98	102	75-125

Table C.4-25. Lanthanides Precision Summary - Soil Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Cerium	4	3	7	43	35
Dypsprosium	2	2	11	15	35
Erbium	1	1	25	25	35
Europium	1	1	35	35	35
Gadolinium	1	1	1	1	35
Holmium	0	--	--	--	--
Lanthanum	4	3	6	54	35
Lutetium	0	--	--	--	--
Neodymium	3	2	11	78	35
Praseodymium	1	1	20	20	35
Samarium	0	--	--	--	--
Terbium	0	--	--	--	--
Thulium	0	--	--	--	--
Ytterbium	2	2	2	14	35

-- not applicable
RPD relative percent difference

Table C.4-26. Lanthanides Precision Summary - Water Samples

Analyte	Number of Spike Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Cerium	0	--	--	--	--
Dypsprosium	0	--	--	--	--
Erbium	0	--	--	--	--
Europium	0	--	--	--	--
Gadolinium	1	1	6	6	20
Holmium	0	--	--	--	--
Lanthanum	0	--	--	--	--
Lutetium	0	--	--	--	--
Neodymium	0	--	--	--	--
Praseodymium	0	--	--	--	--
Samarium	0	--	--	--	--
Terbium	0	--	--	--	--
Thulium	0	--	--	--	--
Ytterbium	0	--	--	--	--

-- not applicable
RPD relative percent difference

Table C.4-27. Radionuclides Accuracy Summary - Soil Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spiked Recovery (%)	Maximum Spiked Recovery (%)	Lab Acceptance Limits
Uranium-238	9	9	85	103	75-125
Thorium-230	9	9	95	119	75-125
Plutonium-238	9	9	95	110	75-125
Tritium	9	9	87	109	75-125
Strontium-90	9	9	92	123	75-125

Table C.4-28. Radionuclides Accuracy Summary - Water Samples

Analyte	Number of Spiked Samples	Spiked Recoveries Within Limits	Minimum Spiked Recovery (%)	Maximum Spiked Recovery (%)	Lab Acceptance Limits
Uranium-238	6	6	96	105	75-125
Thorium-230	6	6	93	113	75-125
Plutonium-238	6	6	96	103	75-125
Tritium	6	6	94	99	75-125
Strontium-90	6	6	90	114	75-125
Radium-226	6	6	98	104	75-125
Americium-241	6	6	88	97	75-125

Table C.4-29. Radionuclides Precision Summary - Soil Samples

Analyte	Number of Spiked Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Uranium-238	9	8	2	54	50
Uranium-235	2	1	40	123	50
Uranium-234	8	8	0	34	50
Plutonium-239/240	0	--	--	--	--
Plutonium-238	3	2	13	105	50
Thorium-232	8	5	2	82	50
Thorium-230	9	5	1	113	50
Thorium-228	9	9	3	35	50
Actinium-227	0	--	--	--	--
Americium-241	0	--	--	--	--
Cobalt-60	0	--	--	--	--
Cesium-137	4	3	3	57	50
Bismuth-210	0	--	--	--	--
Bismuth-207	0	--	--	--	--
Potassium-40	9	9	2	40	50
Radium-226	7	6	6	57	50
Tritium	2	2	7	23	50
Strontium-90	0	--	--	--	--

-- not applicable
RPD relative percent difference

Table C.4-30. Radionuclides Precision Summary - Water Samples

Analyte	Number of Spiked Duplicate Pairs	Number of Calculated RPDs Within Limits	Minimum RPD	Maximum RPD	Lab Acceptance Limits
Uranium-238	0	--	--	--	--
Uranium-235	0	--	--	--	--
Uranium-234	3	1	27	159	50
Plutonium-239/240	2	1	22	118	50
Plutonium-238	0	--	--	--	--
Thorium-232	1	1	36	36	50
Thorium-230	3	0	60	89	50
Thorium-228	6	6	9	28	50
Actinium-227	0	--	--	--	--
Americium-241	4	2	11	132	50
Cobalt-60	0	--	--	--	--
Cesium-137	0	--	--	--	--
Bismuth-210	0	--	--	--	--
Bismuth-207	0	--	--	--	--
Potassium-40	0	--	--	--	--
Radium-226	2	2	4	30	50
Tritium	1	1	11	11	50
Strontium-90	0	--	--	--	--

-- not applicable
RPD relative percent difference

Table C.4-31. Summary of Analytical Completeness

Analysis	Number of Samples Collected and Analyzed	Number of Concentration Values from Samples	Number of Concentration Values Rejected	Completeness (%)	Reason for Rejected Concentration Values
VOC	142	5460	17	100	Unacceptable QC results
SVOC	129	8303	45	99	Unacceptable QC results
Pesticides/PCBs	128	3593	39	99	Secondary column confirmation %RPD outside acceptable limits
Explosives	134	1496	183	88	Required QC data not present
Inorganics (trace metals and cyanide)	130	4622	304	93	Unacceptable QC results
Alpha Spectrometry[a]	115	943	3	99	Unacceptable QC results
Liquid Scintillation	135	263	1	99	Unacceptable QC results
Gamma Spectrometry[b]	125	1052	0	100	NA
Alpha Scintilliation	14	14	0	10	NA

[a] Alpha spectrometry included the analysis of plutonium, uranium, thorium, and americium-241 (in water samples only).
[b] Gamma spectrometry included the analysis of potassium-40, cesium-137, cobalt-60, bismuth-207, bismuth-210, radium-226, and americium-241 (in soils only).
NA Not applicable
PCB polychlorinated biphenyls
QC quality control
SVOC semivolatile organic compound
VOC volatile organic compound

Table C.4-32. Rejected Data Summary
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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B01001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B01001	Pesticide/PCBs	gamma-BHC (Lindane)	0.19	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B01002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B01002	Pesticide/PCBs	alpha-Chlordane	0.098	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was above the upper control limit.
B01003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B01004	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B01005	Inorganics	Molybdenum	1.2	MG/KG	MS recovery was <30%.
B01005	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B01006	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B01007	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B02001	Inorganics	Molybdenum	1.2	MG/KG	MS recovery was <30%.
B02001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B02001	Pesticide/PCBs	alpha-Chlordane	0.13	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B02002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B03001	Inorganics	Molybdenum	1.2	MG/KG	MS recovery was <30%.
B03001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B03001	Pesticide/PCBs	Dieldrin	0.63	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
B03001	Pesticide/PCBs	Endosulfan Sulfate	0.90	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
B03001	Pesticide/PCBs	alpha-Chlordane	0.58	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.

Table C.4-32. Rejected Data Summary
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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B03002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B03002	Pesticide/PCBs	4,4'-DDD	0.60	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
B03003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B03004	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B03005	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B03007	Volatile Organics	Acetonitrile	110	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B04001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B04001	Pesticide/PCBs	Dieldrin	2.9	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B04002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B04102	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B05001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B05002	Inorganics	Antimony	1.70	MG/KG	MS recovery was <30%.
B05002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B06001	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B06001	Inorganics	Cadmium	0.77	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06001	Inorganics	Chromium	10.50	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06001	Inorganics	Cobalt	7.50	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06001	Inorganics	Copper	13.60	MG/KG	Professional judgment was used to qualify the data.
B06001	Inorganics	Nickel	14.90	MG/KG	CCV recovery was above the upper control limit.; MS recovery was below the lower control limit.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B06001	Inorganics	Thallium	0.17	MG/KG	Blank had a negative value >5X's the IDL.; MS recovery was below the lower control limit.
B06001	Inorganics	Vanadium	13.30	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B06001	Semi-volatile Organics	2,4,5-Trichlorophenol	1800	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	2,4,6-Trichlorophenol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	2,4-Dichlorophenol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	2,4-Dimethylphenol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	2,4-Dinitrophenol	1800	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	2-Chlorophenol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	2-Methylphenol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	2-Nitrophenol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	4,6-Dinitro-2-methylphenol	1800	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	4-Chloro-3-methylphenol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	4-Methylphenol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	4-Nitrophenol	1800	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	Benzoic Acid	1800	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	Benzyl Alcohol	380	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	Pentachlorophenol	1800	UG/KG	Surrogate recovery was <10%.
B06001	Semi-volatile Organics	Phenol	380	UG/KG	Surrogate recovery was <10%.
B06002	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B06002	Inorganics	Cadmium	0.72	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B06002	Inorganics	Chromium	12.70	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06002	Inorganics	Cobalt	7.60	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06002	Inorganics	Copper	13.00	MG/KG	Professional judgment was used to qualify the data.
B06002	Inorganics	Nickel	18.20	MG/KG	CCV recovery was above the upper control limit.; MS recovery was below the lower control limit.
B06002	Inorganics	Thallium	0.17	MG/KG	Blank had a negative value >5X's the IDL.; MS recovery was below the lower control limit.
B06002	Inorganics	Vanadium	11.60	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B06003	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B06003	Inorganics	Cadmium	0.95	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06003	Inorganics	Chromium	11.80	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06003	Inorganics	Cobalt	9.10	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06003	Inorganics	Copper	19.40	MG/KG	Professional judgment was used to qualify the data.
B06003	Inorganics	Nickel	18.80	MG/KG	CCV recovery was above the upper control limit.; MS recovery was below the lower control limit.
B06003	Inorganics	Thallium	0.17	MG/KG	Blank had a negative value >5X's the IDL.; MS recovery was below the lower control limit.
B06003	Inorganics	Vanadium	11.10	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B06003	Explosives	1,3,5-Trinitrobenzene	0.0100	MG/KG	Analysis holding times were exceeded.; LCS recovery was above the upper control limit.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B06003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B06003	Explosives	RDX	0.036	MG/KG	Analysis holding times were exceeded.; LCS recovery was above the upper control limit.
B07001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B07001	Semi-volatile Organics	4-Chloroaniline	380	UG/KG	Initial calibration RRF was <0.05.
B07001	Volatile Organics	Acetonitrile	110	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B07002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B07002	Semi-volatile Organics	4-Chloroaniline	400	UG/KG	Initial calibration RRF was <0.05.
B07002	Volatile Organics	Acetonitrile	120	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B07003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B07003	Semi-volatile Organics	4-Chloroaniline	390	UG/KG	Initial calibration RRF was <0.05.
B07003	Volatile Organics	Acetonitrile	120	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B07004	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B07101	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B07101	Semi-volatile Organics	4-Chloroaniline	380	UG/KG	Initial calibration RRF was <0.05.
B07101	Volatile Organics	Acetonitrile	110	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B08001	Inorganics	Dypsprosium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B08001	Inorganics	Europium	0.90	MG/KG	Blank had a negative value >5X's the IDL.
B08001	Inorganics	Lutetium	0.45	MG/KG	Blank had a negative value >5X's the IDL.
B08001	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B08001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B08001	Pesticide/PCBs	Heptachlor	0.33	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B08002	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B08002	Inorganics	Dypsprosium	2.70	MG/KG	Blank had a negative value >5X's the IDL.
B08002	Inorganics	Europium	0.97	MG/KG	Blank had a negative value >5X's the IDL.
B08002	Inorganics	Lutetium	0.48	MG/KG	Blank had a negative value >5X's the IDL.
B08002	Inorganics	Thulium	2.40	MG/KG	Blank had a negative value >5X's the IDL.
B08002	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B08002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B08003	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B08003	Inorganics	Dypsprosium	2.70	MG/KG	Blank had a negative value >5X's the IDL.
B08003	Inorganics	Europium	0.97	MG/KG	Blank had a negative value >5X's the IDL.
B08003	Inorganics	Lutetium	0.48	MG/KG	Blank had a negative value >5X's the IDL.
B08003	Inorganics	Thulium	2.40	MG/KG	Blank had a negative value >5X's the IDL.
B08003	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B08003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B09001	Inorganics	Dypsprosium	2.40	MG/KG	Blank had a negative value >5X's the IDL.
B09001	Inorganics	Europium	0.89	MG/KG	Blank had a negative value >5X's the IDL.
B09001	Inorganics	Lutetium	0.44	MG/KG	Blank had a negative value >5X's the IDL.
B09001	Inorganics	Thulium	2.20	MG/KG	Blank had a negative value >5X's the IDL.
B09001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B09001	Pesticide/PCBs	Endrin Aldehyde	1.7	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B09001	Pesticide/PCBs	p,p'-Methoxychlor	1.5	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
B09002	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B09002	Inorganics	Dypsprosium	2.60	MG/KG	Blank had a negative value >5X's the IDL.
B09002	Inorganics	Europium	0.95	MG/KG	Blank had a negative value >5X's the IDL.
B09002	Inorganics	Lutetium	0.47	MG/KG	Blank had a negative value >5X's the IDL.
B09002	Inorganics	Thulium	2.40	MG/KG	Blank had a negative value >5X's the IDL.
B09002	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B09002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B09002	Pesticide/PCBs	alpha-Chlordane	0.56	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B09003	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B09003	Inorganics	Dypsprosium	2.80	MG/KG	Blank had a negative value >5X's the IDL.
B09003	Inorganics	Europium	1.00	MG/KG	Blank had a negative value >5X's the IDL.
B09003	Inorganics	Lutetium	0.51	MG/KG	Blank had a negative value >5X's the IDL.
B09003	Inorganics	Thulium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B09003	Inorganics	Bismuth	0.13	MG/KG	Blank had a negative value >5X's the IDL.
B09003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B09004	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B09004	Inorganics	Dypsprosium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B09004	Inorganics	Europium	0.92	MG/KG	Blank had a negative value >5X's the IDL.
B09004	Inorganics	Lutetium	0.46	MG/KG	Blank had a negative value >5X's the IDL.
B09004	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B09004	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B09004	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B09005	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B09005	Inorganics	Dypsprosium	2.60	MG/KG	Blank had a negative value >5X's the IDL.
B09005	Inorganics	Europium	0.93	MG/KG	Blank had a negative value >5X's the IDL.
B09005	Inorganics	Lutetium	0.47	MG/KG	Blank had a negative value >5X's the IDL.
B09005	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B09005	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B09005	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B09102	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B09102	Inorganics	Dypsprosium	2.60	MG/KG	Blank had a negative value >5X's the IDL.
B09102	Inorganics	Europium	0.94	MG/KG	Blank had a negative value >5X's the IDL.
B09102	Inorganics	Lutetium	0.47	MG/KG	Blank had a negative value >5X's the IDL.
B09102	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B09102	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B09102	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B10001	Inorganics	Dypsprosium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B10001	Inorganics	Europium	0.92	MG/KG	Blank had a negative value >5X's the IDL.
B10001	Inorganics	Lutetium	0.46	MG/KG	Blank had a negative value >5X's the IDL.
B10001	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B10001	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B10001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B10002	Inorganics	Antimony	0.05	MG/KG	MS recovery was <30%.
B10002	Inorganics	Dypsprosium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B10002	Inorganics	Europium	0.91	MG/KG	Blank had a negative value >5X's the IDL.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B10002	Inorganics	Lutetium	0.46	MG/KG	Blank had a negative value >5X's the IDL.
B10002	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B10002	Inorganics	Bismuth	0.10	MG/KG	Blank had a negative value >5X's the IDL.
B10002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B10003	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B10003	Inorganics	Europium	0.92	MG/KG	Blank had a negative value >5X's the IDL.
B10003	Inorganics	Lutetium	0.46	MG/KG	Blank had a negative value >5X's the IDL.
B10003	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B10003	Inorganics	Bismuth	0.11	MG/KG	Blank had a negative value >5X's the IDL.
B10003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B11001	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B11001	Inorganics	Dypsprosium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B11001	Inorganics	Europium	0.93	MG/KG	Blank had a negative value >5X's the IDL.
B11001	Inorganics	Lutetium	0.46	MG/KG	Blank had a negative value >5X's the IDL.
B11001	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B11001	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B11001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B11001	Pesticide/PCBs	Endrin Aldehyde	0.47	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
B11001	Pesticide/PCBs	alpha-Chlordane	1.6	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
B11002	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B11002	Inorganics	Dypsprosium	2.60	MG/KG	Blank had a negative value >5X's the IDL.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B11002	Inorganics	Europium	0.94	MG/KG	Blank had a negative value >5X's the IDL.
B11002	Inorganics	Lutetium	0.47	MG/KG	Blank had a negative value >5X's the IDL.
B11002	Inorganics	Thulium	2.40	MG/KG	Blank had a negative value >5X's the IDL.
B11002	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B11002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B11003	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B11003	Inorganics	Dypsprosium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B11003	Inorganics	Europium	0.93	MG/KG	Blank had a negative value >5X's the IDL.
B11003	Inorganics	Lutetium	0.46	MG/KG	Blank had a negative value >5X's the IDL.
B11003	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B11003	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B11003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B11004	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B11004	Inorganics	Dypsprosium	2.70	MG/KG	Blank had a negative value >5X's the IDL.
B11004	Inorganics	Europium	0.98	MG/KG	Blank had a negative value >5X's the IDL.
B11004	Inorganics	Lutetium	0.49	MG/KG	Blank had a negative value >5X's the IDL.
B11004	Inorganics	Thulium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B11004	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B11004	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B11102	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B11102	Inorganics	Dypsprosium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B11102	Inorganics	Europium	0.92	MG/KG	Blank had a negative value >5X's the IDL.
B11102	Inorganics	Lutetium	0.46	MG/KG	Blank had a negative value >5X's the IDL.
B11102	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B11102	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B11102	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B11102	Pesticide/PCBs	Endrin Aldehyde	0.41	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
B12001	Inorganics	Europium	0.84	MG/KG	Blank had a negative value >5X's the IDL.
B12001	Inorganics	Lutetium	0.42	MG/KG	Blank had a negative value >5X's the IDL.
B12001	Inorganics	Thulium	2.10	MG/KG	Blank had a negative value >5X's the IDL.
B12001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B12002	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B12002	Inorganics	Dypsprosium	2.70	MG/KG	Blank had a negative value >5X's the IDL.
B12002	Inorganics	Europium	0.97	MG/KG	Blank had a negative value >5X's the IDL.
B12002	Inorganics	Lutetium	0.48	MG/KG	Blank had a negative value >5X's the IDL.
B12002	Inorganics	Thulium	2.40	MG/KG	Blank had a negative value >5X's the IDL.
B12002	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B12002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B12003	Inorganics	Antimony	0.06	MG/KG	MS recovery was <30%.
B12003	Inorganics	Dypsprosium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
B12003	Inorganics	Europium	0.93	MG/KG	Blank had a negative value >5X's the IDL.
B12003	Inorganics	Lutetium	0.46	MG/KG	Blank had a negative value >5X's the IDL.
B12003	Inorganics	Thulium	2.30	MG/KG	Blank had a negative value >5X's the IDL.
B12003	Inorganics	Bismuth	0.12	MG/KG	Blank had a negative value >5X's the IDL.
B12003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B13001	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B13001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B13001	Semi-volatile Organics	4-Chloroaniline	360	UG/KG	Initial calibration RRF was <0.05.
B13001	Volatile Organics	Acetonitrile	110	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B13002	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
B13002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B13002	Semi-volatile Organics	4-Chloroaniline	390	UG/KG	Initial calibration RRF was <0.05.
B13002	Volatile Organics	Acetonitrile	120	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B13003	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
B13003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B13003	Semi-volatile Organics	4-Chloroaniline	390	UG/KG	Initial calibration RRF was <0.05.
B13003	Volatile Organics	Acetonitrile	120	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B13004	Inorganics	Antimony	1.90	MG/KG	MS recovery was <30%.
B13004	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
B13004	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B13004	Semi-volatile Organics	4-Chloroaniline	410	UG/KG	Initial calibration RRF was <0.05.
B13004	Volatile Organics	Acetonitrile	120	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B13005	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
B13005	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B13005	Semi-volatile Organics	4-Chloroaniline	380	UG/KG	Initial calibration RRF was <0.05.
B13005	Volatile Organics	Acetonitrile	110	UG/KG	Initial calibration RRF was <0.05.; Continuing calibration %d was >25%.
B13006	Volatile Organics	Acetonitrile	110	UG/KG	Initial calibration RRF was <0.05.; Continuing calibration %d was >25%.
B14001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B14001	Semi-volatile Organics	4-Chloroaniline	370	UG/KG	Initial calibration RRF was <0.05.
B14001	Volatile Organics	Acetonitrile	110	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B14002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B14002	Semi-volatile Organics	4-Chloroaniline	360	UG/KG	Initial calibration RRF was <0.05.
B14002	Volatile Organics	Acetonitrile	110	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B14003	Volatile Organics	Acetonitrile	120	UG/KG	Initial calibration RRF was <0.05.; Continuing calibration %d was >25%.
B14004	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B14004	Semi-volatile Organics	4-Chloroaniline	430	UG/KG	Initial calibration RRF was <0.05.
B14004	Volatile Organics	Acetonitrile	130	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B14104	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B14104	Semi-volatile Organics	4-Chloroaniline	390	UG/KG	Initial calibration RRF was <0.05.
B14104	Volatile Organics	Acetonitrile	120	UG/KG	Continuing calibration %d was >25%.; Initial calibration RRF was <0.05.
B15001	Inorganics	Antimony	0.15	MG/KG	MS recovery was <30%.; Concentration of the contaminant was detected at a level below the CRQL.
B15001	Inorganics	Cadmium	1.10	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B15001	Inorganics	Chromium	11.80	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15001	Inorganics	Cobalt	7.00	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15001	Inorganics	Copper	18.80	MG/KG	Professional judgment was used to qualify the data.
B15001	Inorganics	Nickel	14.60	MG/KG	CCV recovery was above the upper control limit.; MS recovery was below the lower control limit.
B15001	Inorganics	Thallium	0.23	MG/KG	Blank had a negative value >5X's the IDL.; MS recovery was below the lower control limit.
B15001	Inorganics	Vanadium	15.40	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B15001	Pesticide/PCBs	Endosulfan Sulfate	0.36	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B15001	Pesticide/PCBs	alpha-Chlordane	1.4	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B15001	Pesticide/PCBs	delta-BHC	0.24	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B15002	Inorganics	Antimony	0.14	MG/KG	MS recovery was <30%.; Concentration of the contaminant was detected at a level below the CRQL.
B15002	Inorganics	Cadmium	1.40	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15002	Inorganics	Chromium	19.70	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15002	Inorganics	Cobalt	11.90	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15002	Inorganics	Nickel	25.90	MG/KG	CCV recovery was above the upper control limit.; MS recovery was below the lower control limit.
B15002	Inorganics	Thallium	0.35	MG/KG	Blank had a negative value >5X's the IDL.; MS recovery was below the lower control limit.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B15002	Inorganics	Vanadium	26.20	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B15002	Pesticide/PCBs	alpha-Chlordane	1.2	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B15003	Inorganics	Antimony	0.41	MG/KG	MS recovery was <30%.
B15003	Inorganics	Cadmium	0.45	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15003	Inorganics	Chromium	21.10	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15003	Inorganics	Cobalt	15.40	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15003	Inorganics	Copper	29.40	MG/KG	Professional judgment was used to qualify the data.
B15003	Inorganics	Thallium	1.20	MG/KG	Blank had a negative value >5X's the IDL.; MS recovery was below the lower control limit.
B15003	Inorganics	Vanadium	29.10	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15003	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B15004	Inorganics	Antimony	0.30	MG/KG	Concentration of the contaminant was detected at a level below the CRQL.; MS recovery was <30%.
B15004	Inorganics	Cadmium	1.70	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15004	Inorganics	Chromium	29.30	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15004	Inorganics	Cobalt	18.50	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15004	Inorganics	Copper	39.10	MG/KG	Professional judgment was used to qualify the data.
B15004	Inorganics	Nickel	43.50	MG/KG	CCV recovery was above the upper control limit.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B15004	Inorganics	Thallium	0.37	MG/KG	Blank had a negative value >5X's the IDL.; MS recovery was below the lower control limit.
B15004	Inorganics	Vanadium	36.40	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15004	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B15101	Inorganics	Antimony	0.13	MG/KG	MS recovery was <30%.; Concentration of the contaminant was detected at a level below the CRQL.
B15101	Inorganics	Cadmium	0.87	MG/KG	Professional judgment was used to qualify the data.
B15101	Inorganics	Chromium	9.40	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15101	Inorganics	Cobalt	6.60	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15101	Inorganics	Copper	16.40	MG/KG	Professional judgment was used to qualify the data.
B15101	Inorganics	Nickel	12.90	MG/KG	CCV recovery was above the upper control limit.; MS recovery was below the lower control limit.
B15101	Inorganics	Thallium	0.20	MG/KG	Blank had a negative value >5X's the IDL.
B15101	Inorganics	Vanadium	12.10	MG/KG	Professional judgment was used to qualify the data.
B15101	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B15101	Pesticide/PCBs	alpha-Chlordane	0.88	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B15104	Inorganics	Antimony	0.13	MG/KG	MS recovery was <30%.
B15104	Inorganics	Cadmium	2.00	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15104	Inorganics	Chromium	26.40	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15104	Inorganics	Cobalt	20.80	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15104	Inorganics	Copper	36.30	MG/KG	Professional judgment was used to qualify the data.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B15104	Inorganics	Nickel	42.20	MG/KG	CCV recovery was above the upper control limit.; MS recovery was below the lower control limit.
B15104	Inorganics	Thallium	0.38	MG/KG	Blank had a negative value >5X's the IDL.; MS recovery was below the lower control limit.
B15104	Inorganics	Vanadium	27.70	MG/KG	Professional judgment was used to qualify the data.; MS recovery was below the lower control limit.
B15104	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B15104	Semi-volatile Organics	2,4,5-Trichlorophenol	4000	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	2,4,6-Trichlorophenol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	2,4-Dichlorophenol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	2,4-Dimethylphenol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	2,4-Dinitrophenol	4000	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	2-Chlorophenol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	2-Methylphenol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	2-Nitrophenol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	4,6-Dinitro-2-methylphenol	4000	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	4-Chloro-3-methylphenol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	4-Methylphenol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	4-Nitrophenol	4000	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	Benzoic Acid	4000	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	Benzyl Alcohol	830	UG/KG	Surrogate recovery was <10%.
B15104	Semi-volatile Organics	Pentachlorophenol	4000	UG/KG	Surrogate recovery was <10%.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B15104	Semi-volatile Organics	Phenol	830	UG/KG	Surrogate recovery was <10%.
B16002	Volatile Organics	Acetonitrile	110	UG/KG	Initial calibration RRF was <0.05.; Continuing calibration %d was >25%.
B17001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B17001	Pesticide/PCBs	Endrin Aldehyde	9.0	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B17002	Inorganics	Gadolinium	7.20	MG/KG	MS recovery was <30%.
B17002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B17002	Pesticide/PCBs	Endrin Aldehyde	1.9	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B18001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B18002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B19001	Inorganics	Gadolinium	6.30	MG/KG	MS recovery was <30%.
B19001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B19002	Inorganics	Gadolinium	7.00	MG/KG	MS recovery was <30%.
B19002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B19002	Pesticide/PCBs	alpha-Chlordane	0.67	UG/KG	Surrogate/radiological chemical recovery was below the lower control limit.; The %D between the two pesticide/PCB column checks was >25%.
B20001	Inorganics	Gadolinium	6.20	MG/KG	MS recovery was <30%.
B20001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B20002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
BB2001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
BB2101	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
BB3001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
BB4001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
BB5001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
BB6001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
BB7001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
S01001	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
S01101	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
S02001	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W03001	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
W11001	Inorganics	Chromium	0.5	UG/L	Blank had a negative value >5X's the IDL.
W11001	Inorganics	Bismuth	2.0	UG/L	Blank had a negative value >5X's the IDL.
W11001	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W13001	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W13101	Inorganics	Cyanide	20.0	UG/L	Samples were not preserved properly.; Professional judgment was used to qualify the data.
W13101	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W14001	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
B39801	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B39901	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40101	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40102	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B40201	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40202	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40301	Inorganics	Antimony	2.00	MG/KG	MS recovery was <30%.
B40301	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40302	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40311	Inorganics	Antimony	2.10	MG/KG	MS recovery was <30%.
B40311	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40401	Inorganics	Antimony	1.90	MG/KG	MS recovery was <30%.
B40401	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40401	Pesticide/PCBs	Endrin	2.0	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B40402	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40412	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40501	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40502	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40601	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40602	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
B40701	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40701	Pesticide/PCBs	4,4'-DDD	0.22	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
B40702	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40801	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40802	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40802	GRPC	Stronium-90	-0.47	PCI/G	Radiological chemical recovery was <20%.
B40811	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
B40901	Inorganics	Antimony	1.90	MG/KG	MS recovery was <30%.
B40901	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B40902	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Analysis holding times were exceeded.
B41001	Inorganics	Thallium	0.68	MG/KG	Blank had a negative value >5X's the IDL.
B41001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B41002	Inorganics	Antimony	0.24	MG/KG	MS recovery was <30%.
B41002	Inorganics	Thallium	0.73	MG/KG	Blank had a negative value >5X's the IDL.
B41002	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B41012	Inorganics	Thallium	0.73	MG/KG	Blank had a negative value >5X's the IDL.
B41012	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
B41101	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.; Professional judgment was used to qualify the data.
SD0101	Inorganics	Antimony	0.25	MG/KG	MS recovery was <30%.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
SD0101	Inorganics	Thallium	0.74	MG/KG	Blank had a negative value >5X's the IDL.
SD0101	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0201	Inorganics	Antimony	0.24	MG/KG	MS recovery was <30%.
SD0201	Inorganics	Thallium	0.73	MG/KG	Blank had a negative value >5X's the IDL.
SD0201	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0301	Inorganics	Thallium	0.77	MG/KG	Blank had a negative value >5X's the IDL.
SD0301	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0401	Inorganics	Thallium	0.74	MG/KG	Blank had a negative value >5X's the IDL.
SD0401	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0401	Pesticide/PCBs	4,4'-DDE	0.33	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
SD0501	Inorganics	Thallium	0.70	MG/KG	Blank had a negative value >5X's the IDL.
SD0501	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0601	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
SD0601	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0601	Pesticide/PCBs	Aldrin	0.099	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
SD0701	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0801	Inorganics	Antimony	1.90	MG/KG	MS recovery was <30%.
SD0801	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0901	Inorganics	Dypsprosium	2.80	MG/KG	Blank had a negative value >5X's the IDL.
SD0901	Inorganics	Europium	1.00	MG/KG	Blank had a negative value >5X's the IDL.
SD0901	Inorganics	Lutetium	0.52	MG/KG	Blank had a negative value >5X's the IDL.
SD0901	Inorganics	Thulium	2.60	MG/KG	Blank had a negative value >5X's the IDL.
SD0901	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0901	Pesticide/PCBs	Endrin Aldehyde	2.3	UG/KG	The %D between the two pesticide/PCB column checks was >25%.

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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
SD0911	Inorganics	Antimony	0.28	MG/KG	MS recovery was <30%.
SD0911	Inorganics	Thallium	0.85	MG/KG	Blank had a negative value >5X's the IDL.
SD0911	Inorganics	Dypsprosium	3.10	MG/KG	Blank had a negative value >5X's the IDL.
SD0911	Inorganics	Europium	1.10	MG/KG	Blank had a negative value >5X's the IDL.
SD0911	Inorganics	Lutetium	0.57	MG/KG	Blank had a negative value >5X's the IDL.
SD0911	Inorganics	Thulium	2.80	MG/KG	Blank had a negative value >5X's the IDL.
SD0911	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD0911	Pesticide/PCBs	Endrin Aldehyde	4.0	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
SD1001	Inorganics	Antimony	0.25	MG/KG	MS recovery was <30%.
SD1001	Inorganics	Thallium	0.74	MG/KG	Blank had a negative value >5X's the IDL.
SD1001	Inorganics	Dypsprosium	2.70	MG/KG	Blank had a negative value >5X's the IDL.
SD1001	Inorganics	Europium	0.99	MG/KG	Blank had a negative value >5X's the IDL.
SD1001	Inorganics	Lutetium	0.50	MG/KG	Blank had a negative value >5X's the IDL.
SD1001	Inorganics	Thulium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
SD1001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1101	Inorganics	Antimony	0.26	MG/KG	MS recovery was <30%.
SD1101	Inorganics	Thallium	0.78	MG/KG	Blank had a negative value >5X's the IDL.
SD1101	Inorganics	Europium	1.00	MG/KG	Blank had a negative value >5X's the IDL.
SD1101	Inorganics	Lutetium	0.52	MG/KG	Blank had a negative value >5X's the IDL.
SD1101	Inorganics	Thulium	2.60	MG/KG	Blank had a negative value >5X's the IDL.
SD1101	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1201	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
SD1201	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1301	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.

Table C.4-32. Rejected Data Summary
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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
SD1301	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1311	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
SD1311	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1401	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
SD1401	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1401	Pesticide/PCBs	Endosulfan I	0.20	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
SD1501	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1501	Pesticide/PCBs	Endosulfan I	0.18	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
SD1601	Inorganics	Antimony	0.24	MG/KG	MS recovery was <30%.
SD1601	Inorganics	Thallium	0.72	MG/KG	Blank had a negative value >5X's the IDL.
SD1601	Explosives	1,3,5-Trinitrobenzene	1.5	MG/KG	Initial calibration RSD was >30%.
SD1601	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1701	Inorganics	Antimony	0.24	MG/KG	MS recovery was <30%.
SD1701	Inorganics	Thallium	0.73	MG/KG	Blank had a negative value >5X's the IDL.
SD1701	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1701	Pesticide/PCBs	4,4'-DDE	5.2	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
SD1701	Pesticide/PCBs	Endrin Aldehyde	6.2	UG/KG	The %D between the two pesticide/PCB column checks was >25%.; Surrogate/radiological chemical recovery was below the lower control limit.
SD1801	Inorganics	Antimony	0.22	MG/KG	MS recovery was above the upper control limit.
SD1801	Inorganics	Thallium	0.66	MG/KG	Blank had a negative value >5X's the IDL.
SD1801	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1801	Pesticide/PCBs	p,p'-Methoxychlor	3.3	UG/KG	The %D between the two pesticide/PCB column checks was >25%.

Table C.4-32. Rejected Data Summary
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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
SD1901	Inorganics	Antimony	0.22	MG/KG	MS recovery was above the upper control limit.
SD1901	Inorganics	Thallium	0.65	MG/KG	Blank had a negative value >5X's the IDL.
SD1901	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD1901	Pesticide/PCBs	Endrin Aldehyde	4.0	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
SD1901	Pesticide/PCBs	p,p'-Methoxychlor	6.0	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
SD2001	Inorganics	Antimony	0.24	MG/KG	MS recovery was above the upper control limit.
SD2001	Inorganics	Thallium	0.73	MG/KG	Blank had a negative value >5X's the IDL.
SD2001	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD2101	Inorganics	Antimony	0.25	MG/KG	MS recovery was above the upper control limit.
SD2101	Inorganics	Thallium	0.74	MG/KG	Blank had a negative value >5X's the IDL.
SD2101	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD2101	Pesticide/PCBs	Endrin Aldehyde	0.91	UG/KG	The %D between the two pesticide/PCB column checks was >25%.
SD2111	Inorganics	Antimony	0.25	MG/KG	MS recovery was above the upper control limit.
SD2111	Inorganics	Thallium	0.75	MG/KG	Blank had a negative value >5X's the IDL.
SD2111	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD2201	Inorganics	Antimony	0.24	MG/KG	MS recovery was <30%.
SD2201	Inorganics	Thallium	0.71	MG/KG	Blank had a negative value >5X's the IDL.
SD2201	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD2301	Inorganics	Antimony	0.25	MG/KG	MS recovery was above the upper control limit.
SD2301	Inorganics	Thallium	0.75	MG/KG	Blank had a negative value >5X's the IDL.
SD2301	Inorganics	Europium	1.00	MG/KG	Blank had a negative value >5X's the IDL.
SD2301	Inorganics	Lutetium	0.50	MG/KG	Blank had a negative value >5X's the IDL.
SD2301	Inorganics	Thulium	2.50	MG/KG	Blank had a negative value >5X's the IDL.
SD2301	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.

Table C.4-32. Rejected Data Summary
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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
SD2401	Inorganics	Antimony	0.26	MG/KG	MS recovery was <30%.
SD2401	Inorganics	Thallium	0.79	MG/KG	Blank had a negative value >5X's the IDL.
SD2401	Inorganics	Dypsprosium	2.90	MG/KG	Blank had a negative value >5X's the IDL.
SD2401	Inorganics	Europium	1.00	MG/KG	Blank had a negative value >5X's the IDL.
SD2401	Inorganics	Lutetium	0.52	MG/KG	Blank had a negative value >5X's the IDL.
SD2401	Inorganics	Thulium	2.60	MG/KG	Blank had a negative value >5X's the IDL.
SD2401	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD2501	Inorganics	Antimony	0.24	MG/KG	MS recovery was <30%.
SD2501	Inorganics	Thallium	0.72	MG/KG	Blank had a negative value >5X's the IDL.
SD2501	Inorganics	Dypsprosium	2.70	MG/KG	Blank had a negative value >5X's the IDL.
SD2501	Inorganics	Europium	0.96	MG/KG	Blank had a negative value >5X's the IDL.
SD2501	Inorganics	Lutetium	0.48	MG/KG	Blank had a negative value >5X's the IDL.
SD2501	Inorganics	Thulium	2.40	MG/KG	Blank had a negative value >5X's the IDL.
SD2501	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD2601	Inorganics	Antimony	0.24	MG/KG	MS recovery was above the upper control limit.
SD2601	Inorganics	Thallium	0.73	MG/KG	Blank had a negative value >5X's the IDL.
SD2601	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.
SD2701	Inorganics	Antimony	0.26	MG/KG	MS recovery was <30%.
SD2701	Inorganics	Thallium	0.79	MG/KG	Blank had a negative value >5X's the IDL.
SD2701	Inorganics	Dypsprosium	2.90	MG/KG	Blank had a negative value >5X's the IDL.
SD2701	Inorganics	Europium	1.10	MG/KG	Blank had a negative value >5X's the IDL.
SD2701	Inorganics	Lutetium	0.53	MG/KG	Blank had a negative value >5X's the IDL.
SD2701	Inorganics	Thulium	2.60	MG/KG	Blank had a negative value >5X's the IDL.
SD2701	Explosives	PETN	1.0	MG/KG	Surrogate/radiological chemical recovery data was not present.

Table C.4-32. Rejected Data Summary
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Sample ID	Analysis Type	Parameter	Results	Units	Rejection Explanation
W40001	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W40101	Inorganics	Selenium	39.00	UG/L	MS recovery was <30%.
W40101	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W40201	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W40211	Inorganics	Lead	1.10	UG/L	Blank had a negative value >5X's the IDL.
W40211	Inorganics	Nickel	0.80	UG/L	Blank had a negative value >5X's the IDL.
W40211	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W40801	Inorganics	Selenium	39.00	UG/L	MS recovery was <30%.
W40801	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W41001	Inorganics	Copper	0.30	UG/L	Blank had a negative value >5X's the IDL.
W41001	Inorganics	Lead	1.10	UG/L	Blank had a negative value >5X's the IDL.
W41001	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.
W41101	Explosives	PETN	1.0	UG/L	Surrogate/radiological chemical recovery data was not present.

CCV continuing calibration verification
CRQL contract-required quantitation limit
IDL instrument detection limit
LCS laboratory control sample
MG/KG milligrams per kilogram
MS matrix spike
PCB polychlorinated biphenyl
%D percent difference
RRF relative response factor
RSD relative standard deviation
UG/KG micrograms per kilogram
UG/L micrograms per liter

Table C.5-1. Summary of Trip Blank Detections

Collection Date	Trip Blank Sample ID	Parameter	Results (µg/L)	Data Qualifier
27-Jun-94	TBN007	Methylene Chloride	2	J
28-Jun-94	TBN008	1,1-Dichloroethane	1	J
28-Jun-94	TBN008	Methylene Chloride	6	
29-Jun-94	TBN009	Methylene Chloride	5	
30-Jun-94	TBN010	Methylene Chloride	3	J
07-Jul-94	TBN013	Acrylonitrile	47	J
11-Jul-94	TBN014	Acrylonitrile	15	J
11-Jul-94	TBN014	Chloroform	1	J
20-Jul-94	TBN018	4-Methyl-2-pentanone	1	J
21-Jul-94	TBN019	4-Methyl-2-pentanone	1	J
22-Jun-94	TBA003	Trichloroethene	1	J
27-Jun-94	TBA005	Acrylonitrile	9	J
27-Jun-94	TBA005	Methylene Chloride	2	J
28-Jun-94	TBA006	Methylene Chloride	7	
29-Jun-94	TBA007	Methylene Chloride	5	
30-Jun-94	TBA008	Methylene Chloride	4	J
07-Jul-94	TBA011	Acetone	6	J
07-Jul-94	TBA011	Chloromethane	13	
08-Jul-94	TBA012	Trichloroethene	3	J
09-Aug-94	TBA022	Methylene Chloride	14	
10-Aug-94	TBA023	Acetone	5	J
10-Aug-94	TBA023	Methylene Chloride	13	

ID identification
J The result value is an estimated value
µg/L micrograms per liter
Note: No qualifier in the Data Qualifier column indicates that the data was not qualified.

Table C.5-2. Summary of Sample Bank Blanks
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Collection Date	Bank Blank Sample	Parameter	Results (µg/L)	Data Qualifier
20-Jun-94	BB0009	Bromodichloromethane	4	J
20-Jun-94	BB0009	Chloroform	18	
30-Jun-94	BB0010	Chloroform	6	
30-Jun-94	BB0010	Hexane	4	J
30-Jun-94	BB0010	Methylene Chloride	7	
30-Jun-94	BB0010	Xylene, Total	1	J
05-Jul-94	BB0011	Acetone	12	
05-Jul-94	BB0011	Bromodichloromethane	2	J
05-Jul-94	BB0011	Chloroform	14	
11-Jul-94	BB0012	Bromodichloromethane	4	J
11-Jul-94	BB0012	Carbon Tetrachloride	2	J
11-Jul-94	BB0012	Chloroform	65	
14-Jul-94	BB0013	Bromodichloromethane	2	J
14-Jul-94	BB0013	Chloroform	27	
20-Jun-94	BB0001	Bromodichloromethane	4	J
20-Jun-94	BB0001	Chloroform	16	
27-Jun-94	BB0002	Acetone	16	
27-Jun-94	BB0002	Chloroform	7	
27-Jun-94	BB0002	Methylene Chloride	6	
28-Jun-94	BB0003	1,1-Dichloroethane	1	J
28-Jun-94	BB0003	Bromodichloromethane	2	J
28-Jun-94	BB0003	Chloroform	20	
28-Jun-94	BB0003	Hexane	1	J
28-Jun-94	BB0003	Methylene Chloride	8	
07-Jul-94	BB0004	Acetone	23	

Table C.5-2. Summary of Sample Bank Blanks
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Collection Date	Bank Blank Sample	Parameter	Results (µg/L)	Data Qualifier
19-Jul-94	BB0005	Bromodichloromethane	6	
19-Jul-94	BB0005	Carbon Tetrachloride	3	J
19-Jul-94	BB0005	Chloroform	67	
27-Jul-94	BB0006	Bromodichloromethane	2	J
27-Jul-94	BB0006	Chloroform	15	

J The result value is an estimated value
µg/L micrograms per liter
Note: No qualifier in the Data Qualifier column indicates that the data was not qualified.

Table C.5-3. Summary of Equipment Rinsate Detections
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Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
15-Jun-94	ER0015	Acetone	2	J	UG/L
15-Jun-94	ER0015	Acrylonitrile	16	J	UG/L
15-Jun-94	ER0015	Bromodichloromethane	6		UG/L
15-Jun-94	ER0015	Calcium	576.00		UG/L
15-Jun-94	ER0015	Carbon Tetrachloride	4	J	UG/L
15-Jun-94	ER0015	Chloroform	44		UG/L
15-Jun-94	ER0015	Di-n-butylphthalate	1	J	UG/L
15-Jun-94	ER0015	Diethylphthalate	1	J	UG/L
15-Jun-94	ER0015	Phenol	1	J	UG/L
15-Jun-94	ER0015	Radium-226	0.88	J	PCI/L
27-Jun-94	ER0017	Bromodichloromethane	3	J	UG/L
27-Jun-94	ER0016	Chloroform	13		UG/L
27-Jun-94	ER0017	Chloroform	30		UG/L
27-Jun-94	ER0017	Kjeldahl Nitrogen	0.6560		MG/L
27-Jun-94	ER0016	Methylene Chloride	5		UG/L
27-Jun-94	ER0017	Methylene Chloride	6		UG/L
27-Jun-94	ER0016	Organic Carbon	2.8600		MG/L
27-Jun-94	ER0016	Organic Carbon	2.9500		MG/L
27-Jun-94	ER0016	Organic Carbon	3.0100		MG/L
27-Jun-94	ER0016	Organic Carbon	3.0800		MG/L
27-Jun-94	ER0017	Organic Carbon	3.4200		MG/L
27-Jun-94	ER0017	Organic Carbon	3.4800		MG/L
27-Jun-94	ER0017	Organic Carbon	3.5000		MG/L
27-Jun-94	ER0017	Organic Carbon	3.7600		MG/L
27-Jun-94	ER0016	Xylene, Total	1	J	UG/L
29-Jun-94	ER0018	1,1,1-Trichloroethane	1	J	UG/L

Table C.5-3. Summary of Equipment Rinsate Detections
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Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
29-Jun-94	ER0018	Aluminum	106.00		UG/L
29-Jun-94	ER0018	Antimony	1.20		UG/L
29-Jun-94	ER0018	Barium	2.90		UG/L
29-Jun-94	ER0018	Bromodichloromethane	3	J	UG/L
29-Jun-94	ER0018	Chloroform	30		UG/L
29-Jun-94	ER0018	Copper	2.40		UG/L
29-Jun-94	ER0018	Methylene Chloride	4	J	UG/L
05-Jul-94	ER0019	1,1,1-Trichloroethane	1	J	UG/L
05-Jul-94	ER0019	Aluminum	121.00		UG/L
05-Jul-94	ER0019	Americium-241	0.52		PCI/L
05-Jul-94	ER0019	Barium	1.10		UG/L
05-Jul-94	ER0019	Bromodichloromethane	3	J	UG/L
05-Jul-94	ER0019	Calcium	722.00		UG/L
05-Jul-94	ER0019	Chloroform	22		UG/L
05-Jul-94	ER0019	Cobalt	1.20		UG/L
05-Jul-94	ER0019	Copper	4.60		UG/L
05-Jul-94	ER0019	Endosulfan Sulfate	0.015	J	UG/L
05-Jul-94	ER0019	Magnesium	212.00		UG/L
05-Jul-94	ER0019	Phenol	1	J	UG/L
05-Jul-94	ER0019	Plutonium-238	0.10		PCI/L
05-Jul-94	ER0019	Plutonium-239/40	0.11		PCI/L
05-Jul-94	ER0019	Tritium	464.4		PCI/L
07-Jul-94	ER0020	1,3-Dinitrobenzene	0.53	J	UG/L
07-Jul-94	ER0020	Acetone	25		UG/L
07-Jul-94	ER0020	Aluminum	119.00		UG/L
07-Jul-94	ER0020	Americium-241	0.22	J	PCI/L
07-Jul-94	ER0020	Hexane	2	J	UG/L

Table C.5-3. Summary of Equipment Rinsate Detections
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Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
07-Jul-94	ER0020	Methylene Chloride	34		UG/L
07-Jul-94	ER0020	Sulfate	2.1700		MG/L
11-Jul-94	ER0021	1,3-Dinitrobenzene	0.43	J	UG/L
11-Jul-94	ER0021	Acrylonitrile	13	J	UG/L
11-Jul-94	ER0021	Aluminum	161.00		UG/L
11-Jul-94	ER0021	Americium-241	0.33		PCI/L
11-Jul-94	ER0021	Antimony	1.20		UG/L
11-Jul-94	ER0021	Barium	2.50		UG/L
11-Jul-94	ER0021	Bromodichloromethane	3	J	UG/L
11-Jul-94	ER0021	Calcium	376.00		UG/L
11-Jul-94	ER0021	Carbon Tetrachloride	2	J	UG/L
11-Jul-94	ER0021	Chloroform	57		UG/L
11-Jul-94	ER0021	Magnesium	117.00		UG/L
11-Jul-94	ER0021	Phenol	3	J	UG/L
11-Jul-94	ER0021	Plutonium-239/40	0.13		PCI/L
11-Jul-94	ER0021	Thorium-230	1.31		PCI/L
11-Jul-94	ER0021	Thorium-232	0.26		PCI/L
11-Jul-94	ER0021	Toluene	1	J	UG/L
12-Jul-94	ER0022	2-Amino-4,6-dinitrotoluene	0.24	J	UG/L
12-Jul-94	ER0022	Aluminum	104.00		UG/L
12-Jul-94	ER0022	Americium-241	0.26		PCI/L
12-Jul-94	ER0022	Bromodichloromethane	4	J	UG/L
12-Jul-94	ER0022	Calcium	356.00		UG/L
12-Jul-94	ER0022	Carbon Tetrachloride	3	J	UG/L
12-Jul-94	ER0022	Chloroform	66		UG/L
12-Jul-94	ER0022	Copper	1.10		UG/L
12-Jul-94	ER0022	Magnesium	116.00		UG/L

Table C.5-3. Summary of Equipment Rinsate Detections
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Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
12-Jul-94	ER0022	Radium-226	0.25	J	PCI/L
12-Jul-94	ER0022	Sulfate	2.4900		MG/L
12-Jul-94	ER0022	bis(2-Ethylhexyl)phthalate	1	J	UG/L
20-Jun-94	ER0001	Bromodichloromethane	6		UG/L
20-Jun-94	ER0001	Carbon Tetrachloride	2	J	UG/L
20-Jun-94	ER0001	Chloroform	43		UG/L
20-Jun-94	ER0001	Chromium	1.40		UG/L
20-Jun-94	ER0001	Iron	20.10		UG/L
20-Jun-94	ER0001	Magnesium	86.20		UG/L
20-Jun-94	ER0001	Organic Carbon	3.1500		MG/L
20-Jun-94	ER0001	Organic Carbon	3.1800		MG/L
20-Jun-94	ER0001	Organic Carbon	3.4700		MG/L
20-Jun-94	ER0001	Organic Carbon	3.6300		MG/L
20-Jun-94	ER0001	Plutonium-38	1.74	J	PCI/L
20-Jun-94	ER0001	Plutonium-239/40	0.17	J	PCI/L
20-Jun-94	ER0001	Radium-226	0.08	J	PCI/L
20-Jun-94	ER0001	Sodium	315.00		UG/L
20-Jun-94	ER0001	Thorium-228	0.67	J	PCI/L
20-Jun-94	ER0001	Thorium-230	0.26	J	PCI/L
21-Jun-94	ER0002	2,4,6-Trinitrotoluene	10.0	J	UG/L
21-Jun-94	ER0002	2,4-Dinitrotoluene	2.4	J	UG/L
21-Jun-94	ER0002	2,6-Dinitrotoluene	2.6	J	UG/L
21-Jun-94	ER0002	Aluminum	38.00		UG/L
21-Jun-94	ER0002	Bromodichloromethane	5		UG/L
21-Jun-94	ER0002	Carbon Tetrachloride	2	J	UG/L
21-Jun-94	ER0002	Chloroform	36		UG/L
21-Jun-94	ER0002	Iron	31.20		UG/L

Table C.5-3. Summary of Equipment Rinsate Detections
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Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
21-Jun-94	ER0002	Magnesium	79.20		UG/L
21-Jun-94	ER0002	Organic Carbon	3.5000		MG/L
21-Jun-94	ER0002	Organic Carbon	3.6400		MG/L
21-Jun-94	ER0002	Organic Carbon	3.8000		MG/L
21-Jun-94	ER0002	Organic Carbon	3.8600		MG/L
21-Jun-94	ER0002	Plutonium-239/40	0.13	J	PCI/L
21-Jun-94	ER0002	Radium-226	0.24	J	PCI/L
21-Jun-94	ER0002	Sodium	360.00		UG/L
21-Jun-94	ER0002	Thorium-228	1.24	J	PCI/L
21-Jun-94	ER0002	Thorium-230	0.71	J	PCI/L
21-Jun-94	ER0002	Thorium-232	0.57	J	PCI/L
28-Jun-94	ER0003	Aluminum	43.80		UG/L
28-Jun-94	ER0003	Chloroform	5		UG/L
28-Jun-94	ER0003	Holmium	10.00		UG/L
28-Jun-94	ER0003	Iron	35.50		UG/L
28-Jun-94	ER0003	Methylene Chloride	3	J	UG/L
28-Jun-94	ER0003	Organic Carbon	2.3100		MG/L
28-Jun-94	ER0003	Organic Carbon	2.4400		MG/L
28-Jun-94	ER0003	Organic Carbon	2.5300		MG/L
28-Jun-94	ER0003	Radium-226	0.24	J	PCI/L
28-Jun-94	ER0003	Samarium	82.00		UG/L
28-Jun-94	ER0003	Sodium	278.00		UG/L
28-Jun-94	ER0003	Thorium-228	0.66	J	PCI/L
28-Jun-94	ER0003	Thorium-230	0.44	J	PCI/L
29-Jun-94	ER0004	Bromodichloromethane	3	J	UG/L
29-Jun-94	ER0004	Chloroform	25		UG/L
29-Jun-94	ER0004	Copper	1.90		UG/L

Table C.5-3. Summary of Equipment Rinsate Detections
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Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
29-Jun-94	ER0004	Kjeldahl Nitrogen	0.7160		MG/L
29-Jun-94	ER0004	Methylene Chloride	5		UG/L
29-Jun-94	ER0004	Organic Carbon	3.2000		MG/L
29-Jun-94	ER0004	Organic Carbon	3.2400		MG/L
29-Jun-94	ER0004	Organic Carbon	3.2800		MG/L
29-Jun-94	ER0004	Organic Carbon	3.4100		MG/L
29-Jun-94	ER0004	Radium-226	0.01	J	PCI/L
29-Jun-94	ER0004	Sulfate	2.0500		MG/L
29-Jun-94	ER0004	Thorium-228	1.08	J	PCI/L
29-Jun-94	ER0004	Thorium-230	0.47	J	PCI/L
30-Jun-94	ER0005	Bromodichloromethane	3	J	UG/L
30-Jun-94	ER0005	Chloroform	23		UG/L
30-Jun-94	ER0005	Methylene Chloride	5		UG/L
30-Jun-94	ER0005	Plutonium-239/40	0.16	J	PCI/L
30-Jun-94	ER0005	Radium-226	0.81	J	PCI/L
06-Jul-94	ER0006	2-Amino-4,6-dinitrotoluene	2.9	J	UG/L
06-Jul-94	ER0006	Acetone	11		UG/L
06-Jul-94	ER0006	Americium-241	0.26	J	PCI/L
06-Jul-94	ER0006	Organic Carbon	1.3800		MG/L
06-Jul-94	ER0006	Organic Carbon	1.4200		MG/L
06-Jul-94	ER0006	Organic Carbon	1.4700		MG/L
06-Jul-94	ER0006	Organic Carbon	1.7000		MG/L
06-Jul-94	ER0006	Thorium-228	1.06	J	PCI/L
06-Jul-94	ER0006	Thorium-230	0.28	J	PCI/L
06-Jul-94	ER0006	Tritium	401.7		PCI/L
20-Jul-94	ER0008	Americium-241	0.49	J	PCI/L
20-Jul-94	ER0008	Bromodichloromethane	5		UG/L

Table C.5-3. Summary of Equipment Rinsate Detections
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Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
20-Jul-94	ER0008	Calcium	326.00		UG/L
20-Jul-94	ER0008	Carbon Tetrachloride	2	J	UG/L
20-Jul-94	ER0008	Cerium	52.00		UG/L
20-Jul-94	ER0008	Chloroform	54		UG/L
20-Jul-94	ER0008	Dypsprosium	11.00		UG/L
20-Jul-94	ER0008	Erbium	30.00		UG/L
20-Jul-94	ER0008	Europium	4.00		UG/L
20-Jul-94	ER0008	Gadolinium	31.00		UG/L
20-Jul-94	ER0008	Holmium	9.00		UG/L
20-Jul-94	ER0008	Lanthanum	17.00		UG/L
20-Jul-94	ER0008	Lutetium	2.00		UG/L
20-Jul-94	ER0008	Magnesium	101.00		UG/L
20-Jul-94	ER0008	Neodymium	50.00		UG/L
20-Jul-94	ER0008	Organic Carbon	1.8000	J	MG/L
20-Jul-94	ER0008	Organic Carbon	1.8200	J	MG/L
20-Jul-94	ER0008	Organic Carbon	1.9200	J	MG/L
20-Jul-94	ER0008	Organic Carbon	1.9500	J	MG/L
20-Jul-94	ER0008	Potassium	137.00	J	UG/L
20-Jul-94	ER0008	Praseodymium	32.00		UG/L
20-Jul-94	ER0008	Samarium	82.00		UG/L
20-Jul-94	ER0008	Terbium	60.00		UG/L
20-Jul-94	ER0008	Thulium	10.00		UG/L
20-Jul-94	ER0008	Ytterbium	15.00		UG/L
20-Jul-94	ER0008	Zinc	12.20		UG/L
22-Jul-94	ER0009	Americium-241	0.19		PCI/L
22-Jul-94	ER0009	Barium	1.10		UG/L
22-Jul-94	ER0009	Bromodichloromethane	5		UG/L

Table C.5-3. Summary of Equipment Rinsate Detections
Page 8 of 9

Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
22-Jul-94	ER0009	Calcium	322.00		UG/L
22-Jul-94	ER0009	Carbon Tetrachloride	2	J	UG/L
22-Jul-94	ER0009	Cerium	52.00		UG/L
22-Jul-94	ER0009	Chloroform	47		UG/L
22-Jul-94	ER0009	Dypsprosium	11.00		UG/L
22-Jul-94	ER0009	Erbium	30.00		UG/L
22-Jul-94	ER0009	Europium	4.00		UG/L
22-Jul-94	ER0009	Gadolinium	31.00		UG/L
22-Jul-94	ER0009	Holmium	9.00		UG/L
22-Jul-94	ER0009	Lanthanum	17.00		UG/L
22-Jul-94	ER0009	Lutetium	2.00		UG/L
22-Jul-94	ER0009	Magnesium	105.00		UG/L
22-Jul-94	ER0009	Neodymium	50.00		UG/L
22-Jul-94	ER0009	Organic Carbon	1.1200	J	MG/L
22-Jul-94	ER0009	Organic Carbon	1.1800	J	MG/L
22-Jul-94	ER0009	Organic Carbon	1.2100	J	MG/L
22-Jul-94	ER0009	Organic Carbon	1.2200	J	MG/L
22-Jul-94	ER0009	Potassium	147.00	J	UG/L
22-Jul-94	ER0009	Praseodymium	32.00		UG/L
22-Jul-94	ER0009	Samarium	82.00		UG/L
22-Jul-94	ER0009	Terbium	60.00		UG/L
22-Jul-94	ER0009	Thulium	10.00		UG/L
22-Jul-94	ER0009	Ytterbium	15.00		UG/L
26-Jul-94	ER0010	Am-241	0.17	J	PCI/L
26-Jul-94	ER0010	Barium	2.30		UG/L
26-Jul-94	ER0010	Bromodichloromethane	5		UG/L
26-Jul-94	ER0010	Calcium	334.00		UG/L

Table C.5-3. Summary of Equipment Rinsate Detections
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Collection Date	Equipment Rinsate Sample ID	Analyte	Results	Data Qualifier	Units
26-Jul-94	ER0010	Carbon Tetrachloride	2	J	UG/L
26-Jul-94	ER0010	Cerium	52.00		UG/L
26-Jul-94	ER0010	Chloroform	46		UG/L
26-Jul-94	ER0010	Dypsprosium	11.00		UG/L
26-Jul-94	ER0010	Erbium	30.00		UG/L
26-Jul-94	ER0010	Europium	4.00		UG/L
26-Jul-94	ER0010	Gadolinium	31.00		UG/L
26-Jul-94	ER0010	Holmium	9.00		UG/L
26-Jul-94	ER0010	Lanthanum	17.00		UG/L
26-Jul-94	ER0010	Lutetium	2.00		UG/L
26-Jul-94	ER0010	Magnesium	107.00		UG/L
26-Jul-94	ER0010	Manganese	1.90		UG/L
26-Jul-94	ER0010	Neodymium	50.00		UG/L
26-Jul-94	ER0010	Organic Carbon	1.3300	J	MG/L
26-Jul-94	ER0010	Organic Carbon	1.3600	J	MG/L
26-Jul-94	ER0010	Organic Carbon	1.6300	J	MG/L
26-Jul-94	ER0010	Potassium	153.00	J	UG/L
26-Jul-94	ER0010	Praseodymium	32.00		UG/L
26-Jul-94	ER0010	Samarium	82.00		UG/L
26-Jul-94	ER0010	Terbium	60.00		UG/L
26-Jul-94	ER0010	Thulium	10.00		UG/L
26-Jul-94	ER0010	Ytterbium	15.00		UG/L
26-Jul-94	ER0010	bis(2-Ethylhexyl)phthalate	2	J	UG/L

ID identification
J The result value is an estimated value
MG/L milligrams per liter
PCI/L picocuries per liter
UG/L micrograms per liter
Note: No qualifier in the Data Qualifier column indicates that the data was not qualified.

Table C.5-4. Field Precision Summary
Page 1 of 5

Matrix	Analyte	Number of Field Duplicate Pairs	Minimum RPD	Maximum RPD	Number Within Acceptance Limits	Percentage Within Limits
Soil	1,2-Dichloroethene	1	0.00	40.00	0	0.00
	4,4'-DDE	1	9.30	9.30	1	100.00
	Acenaphthylene	2	0.00	0.00	2	100.00
	Acetone	3	0.00	0.00	3	100.00
	Aluminum	13	0.00	21.20	13	100.00
	Anthracene	4	0.00	0.00	4	100.00
	Antimony	4	0.00	12.90	4	100.00
	Aroclor-1254	2	0.00	0.00	2	100.00
	Arsenic	13	0.00	56.20	11	84.62
	Barium	13	0.00	37.20	12	92.31
	Benzo(a)anthracene	6	0.00	80.50	5	83.33
	Benzo(a)pyrene	6	0.00	68.20	5	83.33
	Benzo(b)fluoranthene	7	0.00	73.30	6	85.71
	Benzo(g,h,i)perylene	2	0.00	0.00	2	100.00
	Benzo(k)fluoranthene	7	0.00	81.20	6	85.71
	Beryllium	10	0.00	8.00	10	100.00
	Bismuth	10	0.00	43.80	8	80.00
	Cadmium	1	0.00	0.00	1	100.00
	Calcium	13	0.00	32.20	13	100.00
	Carbazole	1	0.00	0.00	1	100.00
	Cerium	4	0.00	0.00	4	100.00
	Chloride	11	0.00	19.60	11	100.00
	Chromium	11	0.00	18.40	11	100.00
	Chrysene	6	0.00	77.80	5	83.33
	Cobalt	11	0.00	11.80	11	100.00
	Copper	11	0.00	10.10	11	100.00
	Di-n-butylphthalate	2	0.00	22.20	2	100.00

Table C.5-4. Field Precision Summary
Page 2 of 5

Matrix	Analyte	Number of Field Duplicate Pairs	Minimum RPD	Maximum RPD	Number Within Acceptance Limits	Percentage Within Limits
Soil (continued)	Dibenzofuran	1	0.00	0.00	1	100.00
	Dieldrin	1	0.00	0.00	1	100.00
	Dypsprosium	2	0.00	0.00	2	100.00
	Endrin	1	0.00	0.00	1	100.00
	Europium	2	0.00	0.00	2	100.00
	Fluoranthene	8	0.00	101.00	6	75.00
	Fluorene	1	0.00	0.00	1	100.00
	Fluoride	11	0.00	108.00	9	81.82
	Gadolinium	1	0.00	0.00	1	100.00
	Heptachlor Epoxide	1	0.00	0.00	1	100.00
	Holmium	1	0.00	0.00	1	100.00
	Indeno(1,2,3-cd)pyrene	4	0.00	0.00	4	100.00
	Iron	13	0.00	35.70	12	92.31
	Potassium-40	9	0.00	16.80	9	100.00
	Lead	14	0.00	66.30	13	92.86
	Lithium	7	0.00	7.10	7	100.00
	Magnesium	14	0.00	42.20	13	92.86
	Manganese	13	0.00	146.00	12	92.31
	Mercury	3	0.00	0.00	3	100.00
	Molybdenum	5	0.00	16.20	5	100.00
	Naphthalene	2	0.00	0.00	2	100.00
	Neodymium	7	0.00	0.00	7	100.00
	Nickel	11	0.00	19.40	11	100.00
	Nitrate-Nitrite-N	9	0.00	199.00	6	66.67
	Organic Carbon	10	0.00	81.80	8	80.00

Table C.5-4. Field Precision Summary
Page 3 of 5

Matrix	Analyte	Number of Field Duplicate Pairs	Minimum RPD	Maximum RPD	Number Within Acceptance Limits	Percentage Within Limits
Soil (continued)	Phenanthrene	6	0.00	122.00	5	83.33
	Potassiumium	14	0.00	36.20	13	92.86
	Praseodym	1	0.00	0.00	1	100.00
	Plutonium-238	2	0.00	0.00	2	100.00
	Plutonium-239/40	1	0.00	0.00	1	100.00
	Pyrene	6	0.00	91.20	5	83.33
	Radium-226	13	0.00	28.60	13	100.00
	Samarium	1	0.00	0.00	1	100.00
	Silver	2	0.00	0.00	2	100.00
	Sodium	8	0.00	22.70	8	100.00
	Sulfate	11	0.00	124.00	7	63.64
	Terbium	1	0.00	0.00	1	100.00
	Tetrachloroethene	1	0.00	0.00	1	100.00
	Thorium-228	5	0.00	37.80	3	60.00
	Thorium-230	9	0.00	39.20	8	88.89
	Thorium-232	9	0.00	73.90	8	88.89
	Tin	1	0.00	0.00	1	100.00
	Trichloroethene	1	18.20	18.20	1	100.00
	Uranium-234	12	0.00	46.20	11	91.67
	Uranium-235	3	0.00	0.00	3	100.00
	Uranium-238	12	0.00	47.50	10	83.33
	Vanadium	11	0.00	19.80	11	100.00
	Ytterbium	1	0.00	0.00	1	100.00
	Zinc	13	0.00	160.00	12	92.31

Table C.5-4. Field Precision Summary
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Matrix	Analyte	Number of Field Duplicate Pairs	Minimum RPD	Maximum RPD	Number Within Acceptance Limits	Percentage Within Limits
Soil (continued)	alpha-Chlordane	1	0.00	0.00	1	100.00
	bis(2-Ethylhexyl)phthalate	2	0.00	0.00	2	100.00
	gamma-Chlordane	2	0.00	0.00	2	100.00
Water	Alkalinity	1	2.50	2.50	1	100.00
	Alkalinity as Calcium Carbonate	1	0.00	0.00	1	100.00
	Aluminum	2	0.00	0.00	2	100.00
	Arsenic	1	0.00	0.00	1	100.00
	Barium	2	0.00	0.00	2	100.00
	Benzoic Acid	1	0.00	0.00	1	100.00
	Bismuth	2	0.00	0.00	2	100.00
	Calcium	2	0.00	0.00	2	100.00
	Chloride	2	0.00	0.00	2	100.00
	Chromium	1	0.00	0.00	1	100.00
	Cobalt	1	0.00	0.00	1	100.00
	Copper	1	0.00	0.00	1	100.00
	Dissolved Solids	2	0.00	0.00	2	100.00
	Fluoride	2	0.00	0.00	2	100.00
	Iron	3	0.00	121.00	2	66.67
	Kjeldahl Nitrogen	3	0.00	7.90	3	100.00
	Lead	1	0.00	0.00	1	100.00
	Magnesium	3	0.00	20.20	2	66.67
	Manganese	2	0.00	0.00	2	100.00
	Nitrate-Nitrite-N	2	0.00	0.00	2	100.00
	Organic Carbon	2	0.00	0.00	2	100.00
	Potassium	2	0.00	0.00	2	100.00

Table C.5-4. Field Precision Summary
Page 5 of 5

Matrix	Analyte	Number of Field Duplicate Pairs	Minimum RPD	Maximum RPD	Number Within Acceptance Limits	Percentage Within Limits
Water (continued)	Radium-226	2	0.00	67.70	1	50.00
	Sodium	2	0.00	0.00	2	100.00
	Sulfate	2	0.00	0.00	2	100.00
	Suspended Solids	2	0.00	0.00	2	100.00
	Thorium-228	2	0.00	0.00	2	100.00
	Thorium-232	1	0.00	0.00	1	100.00
	Total Phosphorus	2	0.00	0.00	2	100.00
	Tritium	3	0.00	5.00	3	100.00
	Uranium-234	2	0.00	0.00	2	100.00
	Uranium-238	3	0.00	6.20	3	100.00
	Vanadium	2	0.00	0.00	2	100.00
	Zinc	2	0.00	0.00	2	100.00

RPD relative percent difference

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Appendix D

APPENDIX D

STATISTICAL TESTS USED TO DETERMINE COPCs

APPENDIX D

STATISTICAL TESTS USED IN IDENTIFICATION OF CONTAMINANTS OF POTENTIAL CONCERN

This appendix describes the statistical tests used to determine the background criteria and compare the site results to the background criteria. These were the first steps in identifying contaminants of potential concern (COPC). The statistical tests described here were performed with SAS® software (SAS 1989; SAS 1990).

D.1. DETERMINATION OF BACKGROUND CRITERIA

Each site result was compared to a background criterion to determine which analytes were detected above background for each medium. The background criterion was chosen to represent a reasonable maximum concentration that would be expected if the site values were not different from background.

The background criterion was calculated as the 95% upper tolerance limit (UTL) of the 95th percentile (U.S. EPA 1989). If an analyte at the site had the same distribution of concentrations as the background, 5% or fewer site samples would exceed the UTL. The background UTL values for soil were provided in the OU9 Background Soils Investigation: Soil Chemistry Report (DOE 1994). The background UTL values for groundwater were provided in the OU9 Hydrogeologic Investigation: Groundwater Sweeps Report (DOE 1995).

D.2. COMPARISON OF CHEMICAL CONCENTRATIONS WITH BACKGROUND

A series of screening criteria were used to determine which analytes were potentially site-related. Each screen removed analytes that were not considered to be higher than background levels. The following background screens were used:

1) Analytes that were never measured above the detection limit were removed from consideration.

2) Inorganic analytes, radionuclides, and pesticides that were never measured above the background criteria were removed from consideration.

3) Analytes detected above the background criteria were removed from consideration if: (a) detected infrequently, (found above background criteria in fewer than 5% of the samples), (b) only found in one medium or in low concentration, (maximum detect was less than five times the contract required detection limit), and (c) there is no reason to believe they are actually present (i.e., may be sampling artifacts).

4) Analytes detected above background in fewer than 5% of the samples were removed from consideration if the Wilcoxon Rank Sum Test (SAS/STAT PROC NPAR1WAY) indicated that there was not a significant difference between the site and background concentration distributions at the 0.05 probability level (EPA 1992).

Those analytes that passed through the background screens were subjected to further screening (e.g., Is contaminant an essential nutrient?) to identify COPCs with respect to human health (Section 6.1.2.5) and ecological contaminants of potential concern (ecoCOPCs) (Section 6.2.4.4).

D.3. DETERMINATION OF EXPOSURE CONCENTRATIONS FOR RISK ASSESSMENT

An exposure concentration was calculated for each analyte that passed through the background screens. The exposure concentration was used for computing the ecological and human health risk associated with that analyte. Results with 'R' validation flags (rejected) were not included in the exposure concentration calculations. Results less than or equal to zero were treated as missing values when log-transformed. Results reported as less than the detection limit were included in the calculations at one half the reported detection limit except for radionuclides which were included at the reported value. Because the actual concentration of a non-detect could range from zero to the detection limit, one half the detection limit is used to represent the concentration in the absence of any other information. The full detection limit was used for radionuclides because they were not censored as reported.

For each medium and analyte, the distribution of concentrations was tested to determine if it was normal or log-normal. The Shapiro-Wilk statistic was calculated for the untransformed concentrations and for the log-transformed concentrations. If the probability of the Shapiro-Wilk statistic was greater than 0.05 for the log-transformed data and greater than the Shapiro-Wilk probability for the un-transformed data, then the distribution was treated as log-normal. Otherwise, the distribution was treated as normal. If the shape of the distribution could not be reliably determined because there were fewer than five detects, then the distribution was treated as normal.

For each medium and analyte, a mean and upper 95% confidence limit of the mean (UCL) were computed. The method for calculating both the mean and UCL depended on the distribution of the results. For analytes that were not log-normal, the arithmetic average was used for the estimate of the mean, and the UCL was based on the t-distribution.

$$UCL=X + t * E$$

where X=arithmetic average

t=1-tailed 95 % t value (dependent on the number of observations)

E=standard error of the mean

For distributions considered log-normal, the mean was calculated by the formula for the minimum variance unbiased estimator for a log-normal distribution (see Eq. 13.3 in Gilbert, 1987) and the UCL using the Land statistic (see Eq. 13.13 in Gilbert, 1987).

The exposure concentration was the UCL or the maximum concentration detected, which ever was smaller.

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Appendix E

APPENDIX E

BASELINE RISK ASSESSMENT TABLES AND FIGURES

APPENDIX E

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Current Land Use - Trespasser (Adolescent)
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Exposure Concentration in Soil (mg/kg)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Oral Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	1.28E+00	3.65E-07	4.00E-04	9.12E-04	4.17E-08	--	NA
Arsenic	7.87E+00	2.24E-06	3.00E-04	7.47E-03	2.56E-07	1.75E+00	4.48E-07
Bismuth	2.88E+01	8.21E-06	--	NA	9.38E-07	--	NA
Cadmium	3.92E-01	1.12E-07	1.00E-03	1.12E-04	1.28E-08	--	NA
Cerium	4.71E+01	1.34E-05	--	NA	1.53E-06	--	NA
Lead	2.86E+01	8.15E-06	--	NA	9.31E-07	--	NA
Manganese	9.13E+02	2.60E-04	1.40E-01	1.86E-03	2.97E-05	--	NA
Mercury	8.13E-02	2.32E-08	3.00E-04	7.72E-05	2.65E-09	--	NA
Neodymium	2.81E+01	8.01E-06	--	NA	9.15E-07	--	NA
Selenium	6.52E-01	1.86E-07	5.00E-03	3.72E-05	2.12E-08	--	NA
Thallium	5.32E-01	1.52E-07	8.00E-05	1.89E-03	1.73E-08	--	NA
Tin	9.09E+00	2.59E-06	--	NA	2.96E-07	--	NA
Vanadium	2.13E+01	6.07E-06	7.00E-03	8.67E-04	6.94E-07	--	NA
Zinc	1.22E+02	3.48E-05	3.00E-01	1.16E-04	3.97E-06	--	NA
alpha-Chlordane	1.00E-03	2.85E-10	--	NA	3.26E-11	--	NA
Acenaphthylene	2.10E-01	5.98E-08	3.00E-02	1.99E-06	6.84E-09	--	NA
Anthracene	2.21E-01	6.30E-08	3.00E-01	2.10E-07	7.20E-09	--	NA
Benzo(a)anthracene	3.58E-01	1.02E-07	3.00E-02	3.40E-06	1.17E-08	7.30E-01	8.51E-09
Benzo(a)pyrene	3.46E-01	9.86E-08	3.00E-02	3.29E-06	1.13E-08	7.30E+00	8.22E-08
Benzo(b)fluoranthene	4.96E-01	1.41E-07	3.00E-02	4.71E-06	1.62E-08	7.30E-01	1.18E-08
Benzo(g,h,i)perylene	2.10E-01	5.98E-08	3.00E-02	1.99E-06	6.84E-09	--	NA
Benzo(k)fluoranthene	7.80E-01	2.22E-07	3.00E-02	7.41E-06	2.54E-08	7.30E-02	1.85E-09
Benzoic Acid	9.50E-02	2.71E-08	4.00E+00	6.77E-09	3.09E-09	--	NA
Carbazole	2.14E-01	6.10E-08	--	NA	6.97E-09	2.00E-02	1.39E-10
Chrysene	3.32E-01	9.46E-08	3.00E-02	3.15E-06	1.08E-08	7.30E-03	7.89E-11
Di-n-butylphthalate	2.07E-01	5.90E-08	1.00E-01	5.90E-07	6.74E-09	--	NA
Dibenzo(a,h)anthracene	1.30E-01	3.70E-08	3.00E-02	1.23E-06	4.23E-09	7.30E+00	3.09E-08
Fluoranthene	4.94E-01	1.41E-07	4.00E-02	3.52E-06	1.61E-08	--	NA
Fluorene	2.14E-01	6.10E-08	4.00E-02	1.52E-06	6.97E-09	--	NA
Indeno(1,2,3-c,d)pyrene	2.36E-01	6.72E-08	3.00E-02	2.24E-06	7.69E-09	7.30E-01	5.61E-09
Phenanthrene	4.08E-01	1.16E-07	3.00E-02	3.88E-06	1.33E-08	--	NA
Pyrene	4.01E-01	1.14E-07	3.00E-02	3.81E-06	1.31E-08	--	NA
Bis(2-Ethylhexyl)phthalate	1.20E-01	3.42E-08	2.00E-02	1.71E-06	3.91E-09	1.40E-02	5.47E-11
Acetone	1.01E-02	2.88E-09	1.00E-01	2.88E-08	3.29E-10	--	NA
Methylene Chloride	1.93E-02	5.50E-09	6.00E-02	9.17E-08	6.28E-10	7.50E-03	4.71E-12
			TOTAL	1.34E-02		TOTAL	5.90E-07

Table VI-1.8 (continued). Risk Characterization for Soil Ingestion:
Current Land Use - Trespasser (Adolescent)
Mound New Property

Radionuclide	Exposure Concentration in Soil (pCi/g)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	1.46E+00	6.07E+01	2.20E-10	1.34E-08
Radium 226	1.24E+00	5.16E+01	1.20E-10	6.19E-09
Thorium 228	1.35E+00	5.62E+01	1.10E-11	6.18E-10
Thorium 230	1.49E+00	6.20E+01	1.30E-11	8.06E-10
Thorium 232	9.94E-01	4.14E+01	1.20E-11	4.96E-10
Uranium 235	6.26E-02	2.60E+00	1.60E-11	4.17E-11
			TOTAL	2.15E-08

Table VI-1.9. Risk Characterization for Dermal Contact with Soil:
Current Land Use - Trespasser (Adolescent)
Mound New Property

Chemical	Exposure Concentration in Soil (mg/kg)	Noncarcinogens			Carcinogens		
		Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (AD/RfD)	Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Dermal Route (mg/kg-day)-1	Excess Lifetime Cancer Risk (AD x CSF)
Antimony	1.28E+00	1.68E-07	8.00E-06	2.10E-02	1.92E-08	--	NA
Arsenic	7.87E+00	1.03E-06	1.23E-04	8.39E-03	1.18E-07	4.27E+00	5.03E-07
Bismuth	2.88E+01	3.77E-06	--	NA	4.31E-07	--	NA
Cadmium	3.92E-01	5.14E-08	1.00E-05	5.14E-03	5.87E-09	--	NA
Cerium	4.71E+01	6.17E-06	--	NA	7.06E-07	--	NA
Lead	2.86E+01	3.75E-06	--	NA	4.28E-07	--	NA
Manganese	9.13E+02	1.20E-04	1.40E-01	8.55E-04	1.37E-05	--	NA
Mercury	8.13E-02	1.07E-08	3.00E-08	3.55E-01	1.22E-09	--	NA
Neodymium	2.81E+01	3.68E-06	--	NA	4.21E-07	--	NA
Selenium	6.52E-01	8.55E-08	2.20E-03	3.88E-05	9.77E-09	--	NA
Thallium	5.32E-01	6.97E-08	1.20E-05	5.81E-03	7.97E-09	--	NA
Tin	9.09E+00	1.19E-06	--	NA	1.36E-07	--	NA
Vanadium	2.13E+01	2.79E-06	7.00E-05	3.99E-02	3.19E-07	--	NA
Zinc	1.22E+02	1.60E-05	6.00E-02	2.67E-04	1.83E-06	--	NA
alpha-Chlordane	1.00E-03	1.31E-09	--	NA	1.50E-10	--	NA
Acenaphthylene	2.10E-01	2.75E-07	9.30E-03	2.96E-05	3.15E-08	--	NA
Anthracene	2.21E-01	2.90E-07	2.28E-01	1.27E-06	3.31E-08	--	NA
Benzo(a)anthracene	3.58E-01	4.69E-07	3.00E-02	1.56E-05	5.36E-08	7.30E-01	3.91E-08
Benzo(a)pyrene	3.46E-01	4.53E-07	9.30E-03	4.88E-05	5.18E-08	2.35E+01	1.22E-06
Benzo(b)fluoranthene	4.96E-01	6.50E-07	9.30E-03	6.99E-05	7.43E-08	2.35E+00	1.75E-07
Benzo(g,h,i)perylene	2.10E-01	2.75E-07	9.30E-03	2.96E-05	3.15E-08	--	NA
Benzo(k)fluoranthene	7.80E-01	1.02E-06	9.30E-03	1.10E-04	1.17E-07	2.35E-01	2.75E-08
Benzoic Acid	9.50E-02	1.25E-07	4.00E+00	3.11E-08	1.42E-08	--	NA
Carbazole	2.14E-01	2.80E-07	--	NA	3.21E-08	2.00E-02	6.41E-10
Chrysene	3.32E-01	4.35E-07	9.30E-03	4.68E-05	4.97E-08	2.35E-02	1.17E-09
Di-n-butylphthalate	2.07E-01	2.71E-07	1.00E-01	2.71E-06	3.10E-08	--	NA
Dibenzo(a,h)anthracene	1.30E-01	1.70E-07	3.00E-02	5.68E-06	1.95E-08	7.30E+00	1.42E-07
Fluoranthene	4.94E-01	6.47E-07	1.24E-02	5.22E-05	7.40E-08	--	NA
Fluorene	2.14E-01	2.80E-07	4.00E-02	7.01E-06	3.21E-08	--	NA
Indeno(1,2,3-c,d)pyrene	2.36E-01	3.09E-07	9.30E-03	3.33E-05	3.54E-08	2.35E+00	8.32E-08
Phenanthrene	4.08E-01	5.35E-07	2.19E-02	2.44E-05	6.11E-08	--	NA
Pyrene	4.01E-01	5.26E-07	9.30E-03	5.65E-05	6.01E-08	--	NA
Bis(2-Ethylhexyl)phthalate	1.20E-01	1.57E-07	3.80E-03	4.14E-05	1.80E-08	7.37E-02	1.32E-09
Acetone	1.01E-02	3.31E-08	8.30E-02	3.99E-07	3.78E-09	--	NA
Methylene Chloride	1.93E-02	6.32E-08	5.70E-02	1.11E-06	7.23E-09	7.89E-03	5.71E-11
			TOTAL	4.37E-01		TOTAL	2.19E-06

Table VI-1.10. Risk Characterization for Inhalation of Dust:
Current Land Use - Trespasser (Adolescent)
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Exposure Concentration in Air (mg/m^3)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	2.76E-10	2.62E-12	--	NA	2.99E-13	--	NA
Arsenic	1.70E-09	1.61E-11	--	NA	1.84E-12	5.00E+01	9.19E-11
Bismuth	6.22E-09	5.88E-11	--	NA	6.72E-12	--	NA
Cadmium	8.47E-11	8.01E-13	--	NA	9.15E-14	--	NA
Cerium	1.02E-08	9.62E-11	--	NA	1.10E-11	--	NA
Lead	6.18E-09	5.84E-11	--	NA	6.68E-12	--	NA
Manganese	1.97E-07	1.87E-09	1.43E-05	1.31E-04	2.13E-10	--	NA
Mercury	1.76E-11	1.66E-13	8.57E-05	1.94E-09	1.90E-14	--	NA
Neodymium	6.07E-09	5.74E-11	--	NA	6.56E-12	--	NA
Selenium	1.41E-10	1.33E-12	--	NA	1.52E-13	--	NA
Thallium	1.15E-10	1.09E-12	--	NA	1.24E-13	--	NA
Tin	1.96E-09	1.86E-11	--	NA	2.12E-12	--	NA
Vanadium	4.60E-09	4.35E-11	--	NA	4.97E-12	--	NA
Zinc	2.63E-08	2.49E-10	--	NA	2.85E-11	--	NA
alpha-Chlordane	2.16E-13	2.04E-15	--	NA	2.34E-16	--	NA
Acenaphthylene	4.54E-11	4.29E-13	--	NA	4.90E-14	--	NA
Anthracene	4.77E-11	4.52E-13	--	NA	5.16E-14	--	NA
Benzo(a)anthracene	7.73E-11	7.31E-13	--	NA	8.36E-14	--	NA
Benzo(a)pyrene	7.47E-11	7.07E-13	--	NA	8.08E-14	--	NA
Benzo(b)fluoranthene	1.07E-10	1.01E-12	--	NA	1.16E-13	--	NA
Benzo(g,h,i)perylene	4.54E-11	4.29E-13	--	NA	4.90E-14	--	NA
Benzo(k)fluoranthene	1.68E-10	1.59E-12	--	NA	1.82E-13	--	NA
Benzoic Acid	2.05E-11	1.94E-13	--	NA	2.22E-14	--	NA
Carbazole	4.62E-11	4.37E-13	--	NA	5.00E-14	--	NA
Chrysene	7.17E-11	6.78E-13	--	NA	7.75E-14	--	NA
Di-n-butylphthalate	4.47E-11	4.23E-13	--	NA	4.83E-14	--	NA
Dibenzo(a,h)anthracene	2.81E-11	2.66E-13	--	NA	3.04E-14	--	NA
Fluoranthene	1.07E-10	1.01E-12	--	NA	1.15E-13	--	NA
Fluorene	4.62E-11	4.37E-13	--	NA	5.00E-14	--	NA
Indeno(1,2,3-c,d)pyrene	5.10E-11	4.82E-13	--	NA	5.51E-14	--	NA
Phenanthrene	8.81E-11	8.34E-13	--	NA	9.53E-14	--	NA
Pyrene	8.66E-11	8.19E-13	--	NA	9.36E-14	--	NA
Bis(2-Ethylhexyl)phthalate	2.59E-11	2.45E-13	--	NA	2.80E-14	--	NA
Acetone	2.18E-12	2.06E-14	--	NA	2.36E-15	--	NA
Methylene Chloride	4.17E-12	3.94E-14	8.57E-01	4.60E-14	4.51E-15	--	NA
			TOTAL	1.31E-04		TOTAL	9.19E-11

Table VI-1.10 (continued). Risk Characterization for Inhalation of Dust: Current Land Use - Trespasser (Adolescent) Mound New Property

Radionuclide	Exposure Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	3.15E-07	4.36E-04	3.90E-08	1.70E-11
Radium 226	2.68E-07	3.70E-04	3.00E-09	1.11E-12
Thorium 228	2.92E-07	4.03E-04	7.70E-08	3.10E-11
Thorium 230	3.22E-07	4.44E-04	2.90E-08	1.29E-11
Thorium 232	2.15E-07	2.97E-04	2.80E-08	8.30E-12
Uranium 235	1.35E-08	1.87E-05	2.50E-08	4.67E-13
			TOTAL	7.08E-11

Table VI-1.11. Risk Characterization for Inhalation of Vapors
Current Land Use - Trespasser (Adolescent)
Mound New Property

Chemical	Exposure Concentration in Air (mg/m^3)	Noncarcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	Noncarcinogens: HQ Effects (CDI/RfD)	Carcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Carcinogens: Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	0.00E+00	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Bismuth	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	0.00E+00	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	0.00E+00	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Thallium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Tin	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
alpha-Chlordane	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	1.95E-07	8.85E-09	--	NA	3.79E-09	--	NA
Methylene Chloride	4.78E-06	2.17E-07	8.57E-01	2.53E-07	9.31E-08	--	NA
			TOTAL	2.53E-07		TOTAL	0.00E+00

Table VI-1.12. Risk Characterization for Direct Radiation from Soils: Current Land Use - Trespasser (Adolescent) Mound New Property

Radionuclide	Exposure Concentration in Soil (pCi/g)	Chronic Absorbed dose (CAD) (pCi/g of soil/yr)	Toxicity Criteria Slope Factor (CSF) External Radiation (Risk/yr per pCi/g soil)	Excess Lifetime Cancer Risk (CAD x CSF)
Plutonium 238	1.46E+00	1.95E+00	2.80E-11	5.45E-11
Radium 226	1.24E+00	1.65E+00	1.20E-08	1.98E-08
Thorium 228	1.35E+00	1.80E+00	5.50E-10	9.90E-10
Thorium 230	1.49E+00	1.99E+00	5.40E-11	1.07E-10
Thorium 232	9.94E-01	1.33E+00	2.60E-11	3.45E-11
Uranium 235	6.26E-02	8.35E-02	2.40E-07	2.00E-08
			TOTAL	4.11E-08

Table VI-1.13. Risk Characterization for Inhalation of Radon:
Current Land Use - Trespasser (Adolescent)
Mound New Property

Radionuclide	Exposure Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Radon 222+daughters	1.55E-01	2.14E+02	7.70E-12	1.65E-09
			TOTAL	1.65E-09

Table VI-1.14. Risk Characterization for Dermal Contact with Surface Water (Seeps):
Current Land Use - Trespasser (Adolescent)
Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Absorbed Dose (CAD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (CAD/RfD)	Chronic Absorbed Dose (CAD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Dermal Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CAD x CSF)
Aluminum	5.49E+00	1.38E-05	--	NA	1.58E-06	--	NA
Cobalt	3.40E-03	8.57E-09	--	NA	9.79E-10	--	NA
Copper	7.46E-03	1.88E-08	1.11E-02	1.69E-06	2.15E-09	--	NA
Silver	1.42E-03	3.58E-09	9.00E-04	3.98E-06	4.09E-10	--	NA
Vanadium	4.65E-02	1.17E-07	7.00E-05	1.67E-03	1.34E-08	--	NA
1,3,5-Trinitrobenzene	6.90E-04	3.69E-09	5.00E-05	7.38E-05	4.22E-10	--	NA
1,3-Dinitrobenzene	1.09E-03	4.86E-08	1.00E-04	4.86E-04	5.55E-09	--	NA
PETN	1.10E-02	0.00E+00	--	NA	0.00E+00	--	NA
Trichloroethene	4.49E-03	3.71E-07	--	NA	4.24E-08	7.30E-02	3.10E-09
			TOTAL	2.24E-03		TOTAL	3.10E-09

Table VI-1.15. Risk Characterization for Soil Ingestion:
Future Land Use - Commercial/Industrial Worker
Mound New Property

Chemical	Exposure Concentration in Soil (mg/kg)	Noncarcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	Noncarcinogens: HQ Effects (CDI/RfD)	Carcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Oral Route $(mg/kg\text{-}day)^{-1}$	Carcinogens: Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	1.28E+00	6.26E-07	4.00E-04	1.57E-03	2.24E-07	- -	NA
Arsenic	7.87E+00	3.85E-06	3.00E-04	1.28E-02	1.38E-06	1.75E+00	2.41E-06
Bismuth	2.88E+01	1.41E-05	- -	NA	5.03E-06	- -	NA
Cadmium	3.92E-01	1.92E-07	1.00E-03	1.92E-04	6.85E-08	- -	NA
Cerium	4.71E+01	2.30E-05	- -	NA	8.23E-06	- -	NA
Lead	2.86E+01	1.40E-05	- -	NA	5.00E-06	- -	NA
Manganese	9.13E+02	4.47E-04	1.40E-01	3.19E-03	1.60E-04	- -	NA
Mercury	8.13E-02	3.98E-08	3.00E-04	1.33E-04	1.42E-08	- -	NA
Neodymium	2.81E+01	1.37E-05	- -	NA	4.91E-06	- -	NA
Selenium	6.52E-01	3.19E-07	5.00E-03	6.38E-05	1.14E-07	- -	NA
Thallium	5.32E-01	2.60E-07	8.00E-05	3.25E-03	9.30E-08	- -	NA
Tin	9.09E+00	4.45E-06	- -	NA	1.59E-06	- -	NA
Vanadium	2.13E+01	1.04E-05	7.00E-03	1.49E-03	3.72E-06	- -	NA
Zinc	1.22E+02	5.97E-05	3.00E-01	1.99E-04	2.13E-05	- -	NA
alpha-Chlordane	1.00E-03	4.89E-10	- -	NA	1.75E-10	- -	NA
Acenaphthylene	2.10E-01	1.03E-07	3.00E-02	3.42E-06	3.67E-08	- -	NA
Anthracene	2.21E-01	1.08E-07	3.00E-01	3.60E-07	3.86E-08	- -	NA
Benzo(a)anthracene	3.58E-01	1.75E-07	3.00E-02	5.84E-06	6.26E-08	7.30E-01	4.57E-08
Benzo(a)pyrene	3.46E-01	1.69E-07	3.00E-02	5.64E-06	6.05E-08	7.30E+00	4.41E-07
Benzo(b)fluoranthene	4.96E-01	2.43E-07	3.00E-02	8.09E-06	8.67E-08	7.30E-01	6.33E-08
Benzo(g,h,i)perylene	2.10E-01	1.03E-07	3.00E-02	3.42E-06	3.67E-08	- -	NA
Benzo(k)fluoranthene	7.80E-01	3.82E-07	3.00E-02	1.27E-05	1.36E-07	7.30E-02	9.95E-09
Benzoic Acid	9.50E-02	4.65E-08	4.00E+00	1.16E-08	1.66E-08	- -	NA
Carbazole	2.14E-01	1.05E-07	- -	NA	3.74E-08	2.00E-02	7.48E-10
Chrysene	3.32E-01	1.62E-07	3.00E-02	5.41E-06	5.80E-08	7.30E-03	4.23E-10
Di-n-butylphthalate	2.07E-01	1.01E-07	1.00E-01	1.01E-06	3.62E-08	- -	NA
Dibenzo(a,h)anthracene	1.30E-01	6.36E-08	3.00E-02	2.12E-06	2.27E-08	7.30E+00	1.66E-07
Fluoranthene	4.94E-01	2.42E-07	4.00E-02	6.04E-06	8.63E-08	- -	NA
Fluorene	2.14E-01	1.05E-07	4.00E-02	2.62E-06	3.74E-08	- -	NA
Indeno(1,2,3-c,d)pyrene	2.36E-01	1.15E-07	3.00E-02	3.85E-06	4.12E-08	7.30E-01	3.01E-08
Phenanthrene	4.08E-01	2.00E-07	3.00E-02	6.65E-06	7.13E-08	- -	NA
Pyrene	4.01E-01	1.96E-07	3.00E-02	6.54E-06	7.01E-08	- -	NA
Bis(2-Ethylhexyl)phthalate	1.20E-01	5.87E-08	2.00E-02	2.94E-06	2.10E-08	1.40E-02	2.94E-10
Acetone	1.01E-02	4.94E-09	1.00E-01	4.94E-08	1.76E-09	- -	NA
Methylene Chloride	1.93E-02	9.44E-09	6.00E-02	1.57E-07	3.37E-09	7.50E-03	2.53E-11
			TOTAL	2.30E-02		TOTAL	3.16E-06

Table VI-1.15 (continued). Risk Characterization for Soil Ingestion:
Future Land Use - Commercial/Industrial Worker
Mound New Property

Radionuclide	Exposure Concentration in Soil (pCi/g)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	1.46E+00	4.56E+02	2.20E-10	1.00E-07
Radium 226	1.24E+00	3.88E+02	1.20E-10	4.65E-08
Thorium 228	1.35E+00	4.22E+02	1.10E-11	4.64E-09
Thorium 230	1.49E+00	4.66E+02	1.30E-11	6.05E-09
Thorium 232	9.94E-01	3.11E+02	1.20E-11	3.73E-09
Uranium 235	6.26E-02	1.96E+01	1.60E-11	3.13E-10
			TOTAL	1.62E-07

Table VI-1.16. Risk Characterization for Dermal Contact with Soil:
Future Land Use - Commercial/Industrial Worker
Mound New Property

Chemical	Exposure Concentration in Soil (mg/kg)	Noncarcinogens			Carcinogens		
		Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (AD/RfD)	Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Dermal Route (mg/kg-day)-1	Excess Lifetime Cancer Risk (AD x CSF)
Antimony	1.28E+00	7.26E-07	8.00E-06	9.08E-02	2.59E-07	- -	NA
Arsenic	7.87E+00	4.47E-06	1.23E-04	3.63E-02	1.60E-06	4.27E+00	6.81E-06
Bismuth	2.88E+01	1.63E-05	- -	NA	5.84E-06	- -	NA
Cadmium	3.92E-01	2.22E-07	1.00E-05	2.22E-02	7.95E-08	- -	NA
Cerium	4.71E+01	2.67E-05	- -	NA	9.55E-06	- -	NA
Lead	2.86E+01	1.62E-05	- -	NA	5.80E-06	- -	NA
Manganese	9.13E+02	5.18E-04	1.40E-01	3.70E-03	1.85E-04	- -	NA
Mercury	8.13E-02	4.61E-08	3.00E-08	1.54E+00	1.65E-08	- -	NA
Neodymium	2.81E+01	1.59E-05	- -	NA	5.70E-06	- -	NA
Selenium	6.52E-01	3.70E-07	2.20E-03	1.68E-04	1.32E-07	- -	NA
Thallium	5.32E-01	3.02E-07	1.20E-05	2.52E-02	1.08E-07	- -	NA
Tin	9.09E+00	5.16E-06	- -	NA	1.84E-06	- -	NA
Vanadium	2.13E+01	1.21E-05	7.00E-05	1.73E-01	4.32E-06	- -	NA
Zinc	1.22E+02	6.92E-05	6.00E-02	1.15E-03	2.47E-05	- -	NA
alpha-Chlordane	1.00E-03	5.68E-09	- -	NA	2.03E-09	- -	NA
Acenaphthylene	2.10E-01	1.19E-06	9.30E-03	1.28E-04	4.26E-07	- -	NA
Anthracene	2.21E-01	1.25E-06	2.28E-01	5.50E-06	4.48E-07	- -	NA
Benzo(a)anthracene	3.58E-01	2.03E-06	3.00E-02	6.77E-05	7.26E-07	7.30E-01	5.30E-07
Benzo(a)pyrene	3.46E-01	1.96E-06	9.30E-03	2.11E-04	7.01E-07	2.35E+01	1.65E-05
Benzo(b)fluoranthene	4.96E-01	2.81E-06	9.30E-03	3.03E-04	1.01E-06	2.35E+00	2.37E-06
Benzo(g,h,i)perylene	2.10E-01	1.19E-06	9.30E-03	1.28E-04	4.26E-07	- -	NA
Benzo(k)fluoranthene	7.80E-01	4.43E-06	9.30E-03	4.76E-04	1.58E-06	2.35E-01	3.72E-07
Benzoic Acid	9.50E-02	5.39E-07	4.00E+00	1.35E-07	1.93E-07	- -	NA
Carbazole	2.14E-01	1.21E-06	- -	NA	4.34E-07	2.00E-02	8.67E-09
Chrysene	3.32E-01	1.88E-06	9.30E-03	2.03E-04	6.73E-07	2.35E-02	1.58E-08
Di-n-butylphthalate	2.07E-01	1.17E-06	1.00E-01	1.17E-05	4.20E-07	- -	NA
Dibenzo(a,h)anthracene	1.30E-01	7.38E-07	3.00E-02	2.46E-05	2.63E-07	7.30E+00	1.92E-06
Fluoranthene	4.94E-01	2.80E-06	1.24E-02	2.26E-04	1.00E-06	- -	NA
Fluorene	2.14E-01	1.21E-06	4.00E-02	3.04E-05	4.34E-07	- -	NA
Indeno(1,2,3-c,d)pyrene	2.36E-01	1.34E-06	9.30E-03	1.44E-04	4.78E-07	2.35E+00	1.13E-06
Phenanthrene	4.08E-01	2.32E-06	2.19E-02	1.06E-04	8.27E-07	- -	NA
Pyrene	4.01E-01	2.28E-06	9.30E-03	2.45E-04	8.13E-07	- -	NA
Bis(2-Ethylhexyl)phthalate	1.20E-01	6.81E-07	3.80E-03	1.79E-04	2.43E-07	7.37E-02	1.79E-08
Acetone	1.01E-02	1.43E-07	8.30E-02	1.73E-06	5.12E-08	- -	NA
Methylene Chloride	1.93E-02	2.74E-07	5.70E-02	4.80E-06	9.78E-08	7.89E-03	7.72E-10
			TOTAL	1.89E+00		TOTAL	2.97E-05

Table VI-1.17. Risk Characterization for Inhalation of Dust:
Future Land Use - Commercial/Industrial Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Exposure Concentration in Air (mg/m^3)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	2.76E-10	1.80E-11	--	NA	6.41E-12	--	NA
Arsenic	1.70E-09	1.10E-10	--	NA	3.94E-11	5.00E+01	1.97E-09
Bismuth	6.22E-09	4.04E-10	--	NA	1.44E-10	--	NA
Cadmium	8.47E-11	5.50E-12	--	NA	1.96E-12	--	NA
Cerium	1.02E-08	6.61E-10	--	NA	2.36E-10	--	NA
Lead	6.18E-09	4.01E-10	--	NA	1.43E-10	--	NA
Manganese	1.97E-07	1.28E-08	1.43E-05	8.97E-04	4.58E-09	--	NA
Mercury	1.76E-11	1.14E-12	8.57E-05	1.33E-08	4.07E-13	--	NA
Neodymium	6.07E-09	3.94E-10	--	NA	1.41E-10	--	NA
Selenium	1.41E-10	9.15E-12	--	NA	3.27E-12	--	NA
Thallium	1.15E-10	7.47E-12	--	NA	2.67E-12	--	NA
Tin	1.96E-09	1.28E-10	--	NA	4.56E-11	--	NA
Vanadium	4.60E-09	2.99E-10	--	NA	1.07E-10	--	NA
Zinc	2.63E-08	1.71E-09	--	NA	6.11E-10	--	NA
alpha-Chlordane	2.16E-13	1.40E-14	--	NA	5.01E-15	--	NA
Acenaphthylene	4.54E-11	2.95E-12	--	NA	1.05E-12	--	NA
Anthracene	4.77E-11	3.10E-12	--	NA	1.11E-12	--	NA
Benzo(a)anthracene	7.73E-11	5.02E-12	--	NA	1.79E-12	--	NA
Benzo(a)pyrene	7.47E-11	4.86E-12	--	NA	1.73E-12	--	NA
Benzo(b)fluoranthene	1.07E-10	6.96E-12	--	NA	2.49E-12	--	NA
Benzo(g,h,i)perylene	4.54E-11	2.95E-12	--	NA	1.05E-12	--	NA
Benzo(k)fluoranthene	1.68E-10	1.09E-11	--	NA	3.91E-12	--	NA
Benzoic Acid	2.05E-11	1.33E-12	--	NA	4.76E-13	--	NA
Carbazole	4.62E-11	3.00E-12	--	NA	1.07E-12	--	NA
Chrysene	7.17E-11	4.66E-12	--	NA	1.66E-12	--	NA
Di-n-butylphthalate	4.47E-11	2.90E-12	--	NA	1.04E-12	--	NA
Dibenzo(a,h)anthracene	2.81E-11	1.82E-12	--	NA	6.52E-13	--	NA
Fluoranthene	1.07E-10	6.93E-12	--	NA	2.48E-12	--	NA
Fluorene	4.62E-11	3.00E-12	--	NA	1.07E-12	--	NA
Indeno(1,2,3-c,d)pyrene	5.10E-11	3.31E-12	--	NA	1.18E-12	--	NA
Phenanthrene	8.81E-11	5.73E-12	--	NA	2.04E-12	--	NA
Pyrene	8.66E-11	5.63E-12	--	NA	2.01E-12	--	NA
Bis(2-Ethylhexyl)phthalate	2.59E-11	1.68E-12	--	NA	6.01E-13	--	NA
Acetone	2.18E-12	1.42E-13	--	NA	5.06E-14	--	NA
Methylene Chloride	4.17E-12	2.71E-13	8.57E-01	3.16E-13	9.67E-14	--	NA
			TOTAL	8.97E-04		TOTAL	1.97E-09

Table VI-1.17 (continued). Risk Characterization for Inhalation of Dust: Future Land Use - Commercial/Industrial Worker Mound New Property

Radionuclide	Exposure Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	3.15E-07	1.31E-02	3.90E-08	5.10E-10
Radium 226	2.68E-07	1.11E-02	3.00E-09	3.33E-11
Thorium 228	2.92E-07	1.21E-02	7.70E-08	9.32E-10
Thorium 230	3.22E-07	1.34E-02	2.90E-08	3.87E-10
Thorium 232	2.15E-07	8.91E-03	2.80E-08	2.49E-10
Uranium 235	1.35E-08	5.61E-04	2.50E-08	1.40E-11
			TOTAL	2.13E-09

Table VI-1.18. Risk Characterization for Inhalation of Vapors
Future Land Use - Commercial/Industrial Worker
Mound New Property

Chemical	Exposure Concentration in Air (mg/m^3)	Noncarcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	Noncarcinogens: HQ Effects (CDI/RfD)	Carcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Carcinogens: Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	0.00E+00	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Bismuth	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	0.00E+00	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	0.00E+00	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Thallium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Tin	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
alpha-Chlordane	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	1.95E-07	5.31E-08	--	NA	2.28E-08	--	NA
Methylene Chloride	4.78E-06	1.30E-06	8.57E-01	1.52E-06	5.59E-07	--	NA
			TOTAL	1.52E-06		TOTAL	0.00E+00

Table VI-1.19. Risk Characterization for Direct Radiation from Soils:
Future Land Use - Commercial/Industrial Worker
Mound New Property

Radionuclide	Exposure Concentration in Soil (pCi/g)	Chronic Absorbed dose (CAD) (pCi/g of soil/yr)	Toxicity Criteria Slope Factor (CSF) External Radiation (Risk/yr per pCi/g soil)	Excess Lifetime Cancer Risk (CAD x CSF)
Plutonium 238	1.46E+00	1.22E+01	2.80E-11	3.41E-10
Radium 226	1.24E+00	1.03E+01	1.20E-08	1.24E-07
Thorium 228	1.35E+00	1.13E+01	5.50E-10	6.19E-09
Thorium 230	1.49E+00	1.24E+01	5.40E-11	6.71E-10
Thorium 232	9.94E-01	8.28E+00	2.60E-11	2.15E-10
Uranium 235	6.26E-02	5.22E-01	2.40E-07	1.25E-07
			TOTAL	2.57E-07

Table VI-1.20. Risk Characterization for Inhalation of Radon:
Future Land Use - Commercial/Industrial Worker
Mound New Property

Radionuclide	Exposure Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Radon 222+daughters	1.55E-01	6.43E+03	7.70E-12	4.95E-08
			TOTAL	4.95E-08

Table VI-1.21. Risk Characterization for Soil Ingestion:
Future Land Use - Construction/Excavation Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Exposure Concentration in Soil (mg/kg)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Oral Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	1.42E+00	6.65E-06	4.00E-04	1.66E-02	4.76E-08	- -	NA
Arsenic	7.65E+00	3.58E-05	3.00E-04	1.19E-01	2.57E-07	1.75E+00	4.49E-07
Bismuth	2.78E+01	1.30E-04	- -	NA	9.33E-07	- -	NA
Cadmium	3.70E-01	1.73E-06	1.00E-03	1.73E-03	1.24E-08	- -	NA
Cerium	4.71E+01	2.21E-04	- -	NA	1.58E-06	- -	NA
Lead	2.71E+01	1.27E-04	- -	NA	9.09E-07	- -	NA
Manganese	8.73E+02	4.09E-03	1.40E-01	2.92E-02	2.93E-05	- -	NA
Mercury	8.00E-02	3.75E-07	3.00E-04	1.25E-03	2.68E-09	- -	NA
Neodymium	2.81E+01	1.32E-04	- -	NA	9.43E-07	- -	NA
Selenium	6.30E-01	2.95E-06	5.00E-03	5.90E-04	2.11E-08	- -	NA
Thallium	5.10E-01	2.39E-06	8.00E-05	2.99E-02	1.71E-08	- -	NA
Tin	9.09E+00	4.26E-05	- -	NA	3.05E-07	- -	NA
Vanadium	2.05E+01	9.60E-05	7.00E-03	1.37E-02	6.88E-07	- -	NA
Zinc	1.15E+02	5.39E-04	3.00E-01	1.80E-03	3.86E-06	- -	NA
Acenaphthylene	2.08E-01	9.74E-07	3.00E-02	3.25E-05	6.98E-09	- -	NA
Anthracene	2.18E-01	1.02E-06	3.00E-01	3.40E-06	7.31E-09	- -	NA
Benzo(a)anthracene	3.44E-01	1.61E-06	3.00E-02	5.37E-05	1.15E-08	7.30E-01	8.42E-09
Benzo(a)pyrene	3.33E-01	1.56E-06	3.00E-02	5.20E-05	1.12E-08	7.30E+00	8.16E-08
Benzo(b)fluoranthene	4.71E-01	2.21E-06	3.00E-02	7.35E-05	1.58E-08	7.30E-01	1.15E-08
Benzo(g,h,i)perylene	2.08E-01	9.74E-07	3.00E-02	3.25E-05	6.98E-09	- -	NA
Benzo(k)fluoranthene	7.32E-01	3.43E-06	3.00E-02	1.14E-04	2.46E-08	7.30E-02	1.79E-09
Benzoic Acid	9.50E-02	4.45E-07	4.00E+00	1.11E-07	3.19E-09	- -	NA
Carbazole	2.12E-01	9.93E-07	- -	NA	7.11E-09	2.00E-02	1.42E-10
Chrysene	3.20E-01	1.50E-06	3.00E-02	5.00E-05	1.07E-08	7.30E-03	7.84E-11
Di-n-butylphthalate	2.03E-01	9.51E-07	1.00E-01	9.51E-06	6.81E-09	- -	NA
Dibenzo(a,h)anthracene	1.30E-01	6.09E-07	3.00E-02	2.03E-05	4.36E-09	7.30E+00	3.18E-08
Fluoranthene	4.69E-01	2.20E-06	4.00E-02	5.49E-05	1.57E-08	- -	NA
Fluorene	2.12E-01	9.93E-07	4.00E-02	2.48E-05	7.11E-09	- -	NA
Indeno(1,2,3-c,d)pyrene	2.32E-01	1.09E-06	3.00E-02	3.62E-05	7.78E-09	7.30E-01	5.68E-09
Phenanthrene	3.89E-01	1.82E-06	3.00E-02	6.07E-05	1.31E-08	- -	NA
Pyrene	3.84E-01	1.80E-06	3.00E-02	6.00E-05	1.29E-08	- -	NA
Bis(2-Ethylhexyl)phthalate	1.20E-01	5.62E-07	2.00E-02	2.81E-05	4.03E-09	1.40E-02	5.64E-11
Acetone	1.18E-02	5.53E-08	1.00E-01	5.53E-07	3.96E-10	- -	NA
Methylene Chloride	1.82E-02	8.52E-08	6.00E-02	1.42E-06	6.11E-10	7.50E-03	4.58E-12
			TOTAL	2.15E-01		TOTAL	5.90E-07

Table VI-1.21 (continued). Risk Characterization for Soil Ingestion:
Future Land Use - Construction/Excavation Worker
Mound New Property

Radionuclide	Exposure Concentration in Soil (pCi/g)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	1.36E+00	8.16E+01	2.20E-10	1.80E-08
Radium 226	1.20E+00	7.20E+01	1.20E-10	8.64E-09
Thorium 228	1.33E+00	7.98E+01	1.10E-11	8.78E-10
Thorium 230	1.46E+00	8.76E+01	1.30E-11	1.14E-09
Thorium 232	9.80E-01	5.88E+01	1.20E-11	7.06E-10
Uranium 235	6.00E-02	3.60E+00	1.60E-11	5.76E-11
			TOTAL	2.94E-08

Table VI-1.22. Risk Characterization for Dermal Contact with Soil:
Future Land Use - Construction/Excavation Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Exposure Concentration in Soil (mg/kg)	Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (AD/RfD)	Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Dermal Route (mg/kg-day)-1	Excess Lifetime Cancer Risk (AD x CSF)
Antimony	1.42E+00	8.04E-07	8.00E-06	1.00E-01	5.76E-09	--	NA
Arsenic	7.65E+00	4.33E-06	1.23E-04	3.52E-02	3.10E-08	4.27E+00	1.32E-07
Bismuth	2.78E+01	1.57E-05	--	NA	1.13E-07	--	NA
Cadmium	3.70E-01	2.09E-07	1.00E-05	2.09E-02	1.50E-09	--	NA
Cerium	4.71E+01	2.67E-05	--	NA	1.91E-07	--	NA
Lead	2.71E+01	1.53E-05	--	NA	1.10E-07	--	NA
Manganese	8.73E+02	4.94E-04	1.40E-01	3.53E-03	3.54E-06	--	NA
Mercury	8.00E-02	4.53E-08	3.00E-08	1.51E+00	3.24E-10	--	NA
Neodymium	2.81E+01	1.59E-05	--	NA	1.14E-07	--	NA
Selenium	6.30E-01	3.57E-07	2.20E-03	1.62E-04	2.55E-09	--	NA
Thallium	5.10E-01	2.89E-07	1.20E-05	2.41E-02	2.07E-09	--	NA
Tin	9.09E+00	5.14E-06	--	NA	3.68E-08	--	NA
Vanadium	2.05E+01	1.16E-05	7.00E-05	1.66E-01	8.31E-08	--	NA
Zinc	1.15E+02	6.51E-05	6.00E-02	1.08E-03	4.66E-07	--	NA
Acenaphthylene	2.08E-01	1.18E-06	9.30E-03	1.27E-04	8.43E-09	--	NA
Anthracene	2.18E-01	1.23E-06	2.28E-01	5.41E-06	8.84E-09	--	NA
Benzo(a)anthracene	3.44E-01	1.95E-06	3.00E-02	6.49E-05	1.39E-08	7.30E-01	1.02E-08
Benzo(a)pyrene	3.33E-01	1.88E-06	9.30E-03	2.03E-04	1.35E-08	2.35E+01	3.18E-07
Benzo(b)fluoranthene	4.71E-01	2.67E-06	9.30E-03	2.87E-04	1.91E-08	2.35E+00	4.50E-08
Benzo(g,h,i)perylene	2.08E-01	1.18E-06	9.30E-03	1.27E-04	8.43E-09	--	NA
Benzo(k)fluoranthene	7.32E-01	4.14E-06	9.30E-03	4.45E-04	2.97E-08	2.35E-01	6.99E-09
Benzoic Acid	9.50E-02	5.38E-07	4.00E+00	1.34E-07	3.85E-09	--	NA
Carbazole	2.12E-01	1.20E-06	--	NA	8.59E-09	2.00E-02	1.72E-10
Chrysene	3.20E-01	1.81E-06	9.30E-03	1.95E-04	1.30E-08	2.35E-02	3.05E-10
Di-n-butylphthalate	2.03E-01	1.15E-06	1.00E-01	1.15E-05	8.23E-09	--	NA
Dibenzo(a,h)anthracene	1.30E-01	7.36E-07	3.00E-02	2.45E-05	5.27E-09	7.30E+00	3.85E-08
Fluoranthene	4.69E-01	2.65E-06	1.24E-02	2.14E-04	1.90E-08	--	NA
Fluorene	2.12E-01	1.20E-06	4.00E-02	3.00E-05	8.59E-09	--	NA
Indeno(1,2,3-c,d)pyrene	2.32E-01	1.31E-06	9.30E-03	1.41E-04	9.40E-09	2.35E+00	2.21E-08
Phenanthrene	3.89E-01	2.20E-06	2.19E-02	1.01E-04	1.58E-08	--	NA
Pyrene	3.84E-01	2.17E-06	9.30E-03	2.34E-04	1.56E-08	--	NA
Bis(2-Ethylhexyl)phthalate	1.20E-01	6.79E-07	3.80E-03	1.79E-04	4.86E-09	7.37E-02	3.58E-10
Acetone	1.18E-02	1.67E-07	8.30E-02	2.01E-06	1.20E-09	--	NA
Methylene Chloride	1.82E-02	2.58E-07	5.70E-02	4.52E-06	1.84E-09	7.89E-03	1.46E-11
			TOTAL	1.86E+00		TOTAL	5.74E-07

Table VI-1.23. Risk Characterization for Inhalation of Dust:
Future Land Use - Construction/Excavation Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Exposure Concentration in Air (mg/m^3)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	5.68E-07	3.68E-08	--	NA	2.64E-10	--	NA
Arsenic	3.06E-06	1.98E-07	--	NA	1.42E-09	5.00E+01	7.10E-08
Bismuth	1.11E-05	7.20E-07	--	NA	5.16E-09	--	NA
Cadmium	1.48E-07	9.59E-09	--	NA	6.87E-11	--	NA
Cerium	1.88E-05	1.22E-06	--	NA	8.74E-09	--	NA
Lead	1.08E-05	7.02E-07	--	NA	5.03E-09	--	NA
Manganese	3.49E-04	2.26E-05	1.43E-05	1.58E+00	1.62E-07	--	NA
Mercury	3.20E-08	2.07E-09	8.57E-05	2.42E-05	1.49E-11	--	NA
Neodymium	1.12E-05	7.28E-07	--	NA	5.22E-09	--	NA
Selenium	2.52E-07	1.63E-08	--	NA	1.17E-10	--	NA
Thallium	2.04E-07	1.32E-08	--	NA	9.47E-11	--	NA
Tin	3.64E-06	2.36E-07	--	NA	1.69E-09	--	NA
Vanadium	8.20E-06	5.31E-07	--	NA	3.81E-09	--	NA
Zinc	4.60E-05	2.98E-06	--	NA	2.13E-08	--	NA
Acenaphthylene	8.32E-08	5.39E-09	--	NA	3.86E-11	--	NA
Anthracene	8.72E-08	5.65E-09	--	NA	4.05E-11	--	NA
Benzo(a)anthracene	1.38E-07	8.92E-09	--	NA	6.39E-11	--	NA
Benzo(a)pyrene	1.33E-07	8.63E-09	--	NA	6.18E-11	--	NA
Benzo(b)fluoranthene	1.88E-07	1.22E-08	--	NA	8.74E-11	--	NA
Benzo(g,h,i)perylene	8.32E-08	5.39E-09	--	NA	3.86E-11	--	NA
Benzo(k)fluoranthene	2.93E-07	1.90E-08	--	NA	1.36E-10	--	NA
Benzoic Acid	3.80E-08	2.46E-09	--	NA	1.76E-11	--	NA
Carbazole	8.48E-08	5.49E-09	--	NA	3.94E-11	--	NA
Chrysene	1.28E-07	8.29E-09	--	NA	5.94E-11	--	NA
Di-n-butylphthalate	8.12E-08	5.26E-09	--	NA	3.77E-11	--	NA
Dibenzo(a,h)anthracene	5.20E-08	3.37E-09	--	NA	2.41E-11	--	NA
Fluoranthene	1.88E-07	1.22E-08	--	NA	8.71E-11	--	NA
Fluorene	8.48E-08	5.49E-09	--	NA	3.94E-11	--	NA
Indeno(1,2,3-c,d)pyrene	9.28E-08	6.01E-09	--	NA	4.31E-11	--	NA
Phenanthrene	1.56E-07	1.01E-08	--	NA	7.22E-11	--	NA
Pyrene	1.54E-07	9.95E-09	--	NA	7.13E-11	--	NA
Bis(2-Ethylhexyl)phthalate	4.80E-08	3.11E-09	--	NA	2.23E-11	--	NA
Acetone	4.72E-09	3.06E-10	--	NA	2.19E-12	--	NA
Methylene Chloride	7.28E-09	4.72E-10	8.57E-01	5.50E-10	3.38E-12	--	NA
			TOTAL	1.58E+00		TOTAL	7.10E-08

Table VI-1.23 (continued). Risk Characterization for Inhalation of Dust: Future Land Use - Construction/Excavation Worker Mound New Property

Radionuclide	Exposure Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	5.44E-04	4.52E-01	3.90E-08	1.76E-08
Radium 226	4.80E-04	3.98E-01	3.00E-09	1.20E-09
Thorium 228	5.32E-04	4.42E-01	7.70E-08	3.40E-08
Thorium 230	5.84E-04	4.85E-01	2.90E-08	1.41E-08
Thorium 232	3.92E-04	3.25E-01	2.80E-08	9.11E-09
Uranium 235	2.40E-05	1.99E-02	2.50E-08	4.98E-10
			TOTAL	7.65E-08

Table VI-1.24. Risk Characterization for Inhalation of Vapors
Future Land Use - Construction/Excavation Worker
Mound New Property

Chemical	Exposure Concentration in Air (mg/m^3)	Noncarcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	Noncarcinogens: HQ Effects (CDI/RfD)	Carcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Carcinogens: Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	0.00E+00	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Bismuth	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	0.00E+00	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	0.00E+00	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Thallium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Tin	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	2.27E-07	6.20E-08	--	NA	2.66E-08	--	NA
Methylene Chloride	4.50E-06	1.23E-06	8.57E-01	1.43E-06	5.27E-07	--	NA
			TOTAL	1.43E-06		TOTAL	0.00E+00

Table VI-1.25. Risk Characterization for Direct Radiation from Soils: Future Land Use - Construction/Excavation Worker Mound New Property

Radionuclide	Exposure Concentration in Soil (pCi/g)	Chronic Absorbed dose (CAD) (pCi/g of soil/yr)	Toxicity Criteria Slope Factor (CSF) External Radiation (Risk/yr per pCi/g soil)	Excess Lifetime Cancer Risk (CAD x CSF)
Plutonium 238	1.36E+00	2.27E-01	2.80E-11	6.35E-12
Radium 226	1.20E+00	2.00E-01	1.20E-08	2.40E-09
Thorium 228	1.33E+00	2.22E-01	5.50E-10	1.22E-10
Thorium 230	1.46E+00	2.43E-01	5.40E-11	1.31E-11
Thorium 232	9.80E-01	1.63E-01	2.60E-11	4.25E-12
Uranium 235	6.00E-02	1.00E-02	2.40E-07	2.40E-09
			TOTAL	4.95E-09

Table VI-1.26. Risk Characterization for Inhalation of Radon:
Future Land Use - Construction/Excavation Worker
Mound New Property

Radionuclide	Exposure Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Radon 222+daughters	1.50E-01	1.25E+02	7.70E-12	9.59E-10
			TOTAL	9.59E-10

Table VI-1.27. Risk Characterization for Groundwater Ingestion:
Future Land Use - Off-site Resident (Adult)
Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Oral Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Aluminum	1.38E+01	3.78E-01	--	NA	1.62E-01	--	NA
Arsenic	6.63E-02	1.82E-03	3.00E-04	6.05E+00	7.78E-04	1.50E+00	1.17E-03
Barium	2.31E-01	6.33E-03	7.00E-02	9.04E-02	2.71E-03	--	NA
Beryllium	5.40E-04	1.48E-05	5.00E-03	2.96E-03	6.34E-06	4.30E+00	2.73E-05
Bismuth	2.84E-01	7.78E-03	--	NA	3.33E-03	--	NA
Cadmium	4.50E-04	1.23E-05	5.00E-04	2.47E-02	5.28E-06	--	NA
Chromium	3.09E-01	8.47E-03	5.00E-03	1.69E+00	3.63E-03	--	NA
Cobalt	2.07E-02	5.67E-04	--	NA	2.43E-04	--	NA
Copper	7.81E-02	2.14E-03	3.70E-02	5.78E-02	9.17E-04	--	NA
Lead	2.73E-02	7.48E-04	--	NA	3.21E-04	--	NA
Lithium	5.10E-02	1.40E-03	--	NA	5.99E-04	--	NA
Manganese	7.00E+00	1.92E-01	5.00E-03	3.84E+01	8.22E-02	--	NA
Mercury	1.10E-04	3.01E-06	3.00E-04	1.00E-02	1.29E-06	--	NA
Molybdenum	3.26E-02	8.93E-04	5.00E-03	1.79E-01	3.83E-04	--	NA
Nickel	3.94E-01	1.08E-02	2.00E-02	5.40E-01	4.63E-03	--	NA
Vanadium	9.64E-02	2.64E-03	7.00E-03	3.77E-01	1.13E-03	--	NA
Zinc	1.14E+00	3.12E-02	3.00E-01	1.04E-01	1.34E-02	--	NA
2,4,6-Trinitrotoluene	7.60E-04	2.08E-05	5.00E-04	4.16E-02	8.92E-06	3.00E-02	2.68E-07
1,2-Dichloroethene	4.00E-03	1.10E-04	3.00E-03	3.65E-02	4.70E-05	--	NA
Hexane	1.00E-03	2.74E-05	6.00E-02	4.57E-04	1.17E-05	--	NA
Trichloroethene	2.12E-03	5.81E-05	--	NA	2.49E-05	1.10E-02	2.74E-07
			TOTAL	4.76E+01		TOTAL	1.20E-03

Table VI-1.27 (continued). Risk Characterization for Groundwater Ingestion: Future Land Use - Off-site Resident (Adult) Mound New Property

Radionuclide	Exposure Concentration in GW (pCi/L)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF): Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Americium 241	4.70E-01	9.87E+03	2.40E-10	2.37E-06
Plutonium 239/240	8.00E-02	1.68E+03	2.30E-10	3.86E-07
Radium 226	8.80E-01	1.85E+04	1.20E-10	2.22E-06
Thorium 228	6.90E-01	1.45E+04	1.10E-11	1.59E-07
Thorium 230	7.00E-01	1.47E+04	1.30E-11	1.91E-07
Thorium 232	3.30E-01	6.93E+03	1.20E-11	8.32E-08
Tritium	1.34E+03	2.81E+07	7.15E-14	2.01E-06
Uranium 234	1.07E+00	2.25E+04	1.60E-11	3.60E-07
Uranium 235	1.60E-01	3.36E+03	1.60E-11	5.38E-08
Uranium 238	9.50E-01	2.00E+04	1.60E-11	3.19E-07
			TOTAL	8.15E-06

Table VI-1.28. Risk Characterization for Dermal Contact with Groundwater: Future Land Use - Off-site Resident (Adult) Mound New Property

Chemical	Exposure Concentration in GW (mg/L)	Noncarcinogen: Chronic Absorbed Dose (CAD) (mg/kg-day)	Noncarcinogen: Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	Noncarcinogen: HQ Effects (CAD/RfD)	Carcinogen: Chronic Absorbed Dose (CAD) (mg/kg-day)	Carcinogen: Toxicity Criteria Slope Factor (CSF): Dermal Route $(mg/kg\text{-}day)^{-1}$	Carcinogen: Excess Lifetime Cancer Risk (CAD x CSF)
Aluminum	1.38E+01	1.09E-03	--	NA	4.66E-04	--	NA
Arsenic	6.63E-02	5.22E-06	1.23E-04	4.25E-02	2.24E-06	4.27E+00	9.55E-06
Barium	2.31E-01	1.82E-05	4.30E-03	4.23E-03	7.80E-06	--	NA
Beryllium	5.40E-04	4.25E-08	5.05E-05	8.42E-04	1.82E-08	4.30E+00	7.84E-08
Bismuth	2.84E-01	2.24E-05	--	NA	9.59E-06	--	NA
Cadmium	4.50E-04	3.54E-08	5.00E-04	7.09E-05	1.52E-08	--	NA
Chromium	3.09E-01	2.43E-05	1.00E-04	2.43E-01	1.04E-05	--	NA
Cobalt	2.07E-02	6.52E-07	--	NA	2.80E-07	--	NA
Copper	7.81E-02	6.15E-06	1.11E-02	5.54E-04	2.64E-06	--	NA
Lead	2.73E-02	2.15E-06	--	NA	9.22E-07	--	NA
Lithium	5.10E-02	4.02E-06	--	NA	1.72E-06	--	NA
Manganese	7.00E+00	5.51E-04	2.00E-04	2.76E+00	2.36E-04	--	NA
Mercury	1.10E-04	8.66E-09	3.00E-08	2.89E-01	3.71E-09	--	NA
Molybdenum	3.26E-02	2.57E-06	1.90E-03	1.35E-03	1.10E-06	--	NA
Nickel	3.94E-01	3.10E-05	5.40E-03	5.75E-03	1.33E-05	--	NA
Vanadium	9.64E-02	7.59E-06	7.00E-05	1.08E-01	3.25E-06	--	NA
Zinc	1.14E+00	8.98E-05	6.00E-02	1.50E-03	3.85E-05	--	NA
2,4,6-Trinitrotoluene	7.60E-04	1.50E-06	5.00E-04	2.99E-03	6.41E-07	3.00E-02	1.92E-08
1,2-Dichloroethene	4.00E-03	1.02E-05	9.00E-03	1.13E-03	4.35E-06	--	NA
Hexane	1.00E-03	7.78E-05	6.00E-02	1.30E-03	3.33E-05	--	NA
Trichloroethene	2.12E-03	1.10E-05	--	NA	4.69E-06	7.30E-02	3.43E-07
			TOTAL	3.46E+00		TOTAL	9.99E-06

Table VI-1.29. Risk Characterization for Inhalation of Volatiles (groundwater): Future Land Use - Off-site Resident (Adult) Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Aluminum	1.38E+01	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	6.63E-02	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Barium	2.31E-01	0.00E+00	1.43E-04	NA	0.00E+00	--	NA
Beryllium	5.40E-04	0.00E+00	--	NA	0.00E+00	8.40E+00	NA
Bismuth	2.84E-01	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	4.50E-04	0.00E+00	--	NA	0.00E+00	--	NA
Chromium	3.09E-01	0.00E+00	--	NA	0.00E+00	4.10E+01	NA
Cobalt	2.07E-02	0.00E+00	--	NA	0.00E+00	--	NA
Copper	7.81E-02	0.00E+00	--	NA	0.00E+00	--	NA
Lead	2.73E-02	0.00E+00	--	NA	0.00E+00	--	NA
Lithium	5.10E-02	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	7.00E+00	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	1.10E-04	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Molybdenum	3.26E-02	0.00E+00	--	NA	0.00E+00	--	NA
Nickel	3.94E-01	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	9.64E-02	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	1.14E+00	0.00E+00	--	NA	0.00E+00	--	NA
2,4,6-Trinitrotoluene	7.60E-04	1.56E-05	--	NA	6.69E-06	--	NA
1,2-Dichloroethene	4.00E-03	8.22E-05	--	NA	3.52E-05	--	NA
Hexane	1.00E-03	2.05E-05	5.71E-02	3.60E-04	8.81E-06	--	NA
Trichloroethene	2.12E-03	4.36E-05	--	NA	1.87E-05	6.00E-03	1.12E-07
			TOTAL	3.60E-04		TOTAL	1.12E-07

Table VI-1.30. Risk Characterization for Groundwater Ingestion:
Future Land Use - Off-site Resident (Child)
Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Oral Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Aluminum	1.38E+01	8.82E-01	--	NA	7.56E-02	--	NA
Arsenic	6.63E-02	4.24E-03	3.00E-04	1.41E+01	3.63E-04	1.50E+00	5.45E-04
Barium	2.31E-01	1.48E-02	7.00E-02	2.11E-01	1.27E-03	--	NA
Beryllium	5.40E-04	3.45E-05	5.00E-03	6.90E-03	2.96E-06	4.30E+00	1.27E-05
Bismuth	2.84E-01	1.82E-02	--	NA	1.56E-03	--	NA
Cadmium	4.50E-04	2.88E-05	5.00E-04	5.75E-02	2.47E-06	--	NA
Chromium	3.09E-01	1.98E-02	5.00E-03	3.95E+00	1.69E-03	--	NA
Cobalt	2.07E-02	1.32E-03	--	NA	1.13E-04	--	NA
Copper	7.81E-02	4.99E-03	3.70E-02	1.35E-01	4.28E-04	--	NA
Lead	2.73E-02	1.75E-03	--	NA	1.50E-04	--	NA
Lithium	5.10E-02	3.26E-03	--	NA	2.79E-04	--	NA
Manganese	7.00E+00	4.47E-01	5.00E-03	8.95E+01	3.84E-02	--	NA
Mercury	1.10E-04	7.03E-06	3.00E-04	2.34E-02	6.03E-07	--	NA
Molybdenum	3.26E-02	2.08E-03	5.00E-03	4.17E-01	1.79E-04	--	NA
Nickel	3.94E-01	2.52E-02	2.00E-02	1.26E+00	2.16E-03	--	NA
Vanadium	9.64E-02	6.16E-03	7.00E-03	8.80E-01	5.28E-04	--	NA
Zinc	1.14E+00	7.29E-02	3.00E-01	2.43E-01	6.25E-03	--	NA
2,4,6-Trinitrotoluene	7.60E-04	4.86E-05	5.00E-04	9.72E-02	4.16E-06	3.00E-02	1.25E-07
1,2-Dichloroethene	4.00E-03	2.56E-04	3.00E-03	8.52E-02	2.19E-05	--	NA
Hexane	1.00E-03	6.39E-05	6.00E-02	1.07E-03	5.48E-06	--	NA
Trichloroethene	2.12E-03	1.36E-04	--	NA	1.16E-05	1.10E-02	1.28E-07
			TOTAL	1.11E+02		TOTAL	5.58E-04

Table VI-1.30 (continued). Risk Characterization for Groundwater Ingestion: Future Land Use - Off-site Resident (Child) Mound New Property

Radionuclide	Exposure Concentration in GW (pCi/L)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF): Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Americium 241	4.70E-01	9.87E+02	2.40E-10	2.37E-07
Plutonium 239/240	8.00E-02	1.68E+02	2.30E-10	3.86E-08
Radium 226	8.80E-01	1.85E+03	1.20E-10	2.22E-07
Thorium 228	6.90E-01	1.45E+03	1.10E-11	1.59E-08
Thorium 230	7.00E-01	1.47E+03	1.30E-11	1.91E-08
Thorium 232	3.30E-01	6.93E+02	1.20E-11	8.32E-09
Tritium	1.34E+03	2.81E+06	7.15E-14	2.01E-07
Uranium 234	1.07E+00	2.25E+03	1.60E-11	3.60E-08
Uranium 235	1.60E-01	3.36E+02	1.60E-11	5.38E-09
Uranium 238	9.50E-01	2.00E+03	1.60E-11	3.19E-08
			TOTAL	8.15E-07

Table VI-1.31. Risk Characterization for Dermal Contact with Groundwater:
Future Land Use - Off-site Resident (Child)
Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Absorbed Dose (CAD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (CAD/RfD)	Chronic Absorbed Dose (CAD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Dermal Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CAD x CSF)
Aluminum	1.38E+01	1.68E-03	--	NA	1.44E-04	--	NA
Arsenic	6.63E-02	8.05E-06	1.23E-04	6.55E-02	6.90E-07	4.27E+00	2.95E-06
Barium	2.31E-01	2.81E-05	4.30E-03	6.53E-03	2.40E-06	--	NA
Beryllium	5.40E-04	6.56E-08	5.05E-05	1.30E-03	5.62E-09	4.30E+00	2.42E-08
Bismuth	2.84E-01	3.45E-05	--	NA	2.96E-06	--	NA
Cadmium	4.50E-04	5.47E-08	5.00E-04	1.09E-04	4.68E-09	--	NA
Chromium	3.09E-01	3.75E-05	1.00E-04	3.75E-01	3.22E-06	--	NA
Cobalt	2.07E-02	1.01E-06	--	NA	8.62E-08	--	NA
Copper	7.81E-02	9.49E-06	1.11E-02	8.55E-04	8.13E-07	--	NA
Lead	2.73E-02	3.32E-06	--	NA	2.84E-07	--	NA
Lithium	5.10E-02	6.19E-06	--	NA	5.31E-07	--	NA
Manganese	7.00E+00	8.50E-04	2.00E-04	4.25E+00	7.29E-05	--	NA
Mercury	1.10E-04	1.34E-08	3.00E-08	4.45E-01	1.15E-09	--	NA
Molybdenum	3.26E-02	3.96E-06	1.90E-03	2.08E-03	3.39E-07	--	NA
Nickel	3.94E-01	4.79E-05	5.40E-03	8.86E-03	4.10E-06	--	NA
Vanadium	9.64E-02	1.17E-05	7.00E-05	1.67E-01	1.00E-06	--	NA
Zinc	1.14E+00	1.38E-04	6.00E-02	2.31E-03	1.19E-05	--	NA
2,4,6-Trinitrotoluene	7.60E-04	2.31E-06	5.00E-04	4.61E-03	1.98E-07	3.00E-02	5.93E-09
1,2-Dichloroethene	4.00E-03	1.57E-05	9.00E-03	1.74E-03	1.34E-06	--	NA
Hexane	1.00E-03	1.20E-04	6.00E-02	2.00E-03	1.03E-05	--	NA
Trichloroethene	2.12E-03	1.69E-05	--	NA	1.45E-06	7.30E-02	1.06E-07
			TOTAL	5.33E+00		TOTAL	3.08E-06

Table VI-1.32. Risk Characterization for Inhalation of Volatiles (groundwater): Future Land Use - Off-site Resident (Child) Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Aluminum	1.38E+01	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	6.63E-02	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Barium	2.31E-01	0.00E+00	1.43E-04	NA	0.00E+00	--	NA
Beryllium	5.40E-04	0.00E+00	--	NA	0.00E+00	8.40E+00	NA
Bismuth	2.84E-01	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	4.50E-04	0.00E+00	--	NA	0.00E+00	--	NA
Chromium	3.09E-01	0.00E+00	--	NA	0.00E+00	4.10E+01	NA
Cobalt	2.07E-02	0.00E+00	--	NA	0.00E+00	--	NA
Copper	7.81E-02	0.00E+00	--	NA	0.00E+00	--	NA
Lead	2.73E-02	0.00E+00	--	NA	0.00E+00	--	NA
Lithium	5.10E-02	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	7.00E+00	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	1.10E-04	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Molybdenum	3.26E-02	0.00E+00	--	NA	0.00E+00	--	NA
Nickel	3.94E-01	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	9.64E-02	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	1.14E+00	0.00E+00	--	NA	0.00E+00	--	NA
2,4,6-Trinitrotoluene	7.60E-04	7.29E-05	--	NA	6.25E-06	--	NA
1,2-Dichloroethene	4.00E-03	3.84E-04	--	NA	3.29E-05	--	NA
Hexane	1.00E-03	9.59E-05	5.71E-02	1.68E-03	8.22E-06	--	NA
Trichloroethene	2.12E-03	2.03E-04	--	NA	1.74E-05	6.00E-03	1.05E-07
			TOTAL	1.68E-03		TOTAL	1.05E-07

Table VI-1.33. Background Risk Characterization for Soil Ingestion:
Current Land Use - Trespasser (Adolescent)
Mound New Property

Chemical	Background Concentration in Soil (mg/kg)	Noncarcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	Noncarcinogens: HQ Effects (CDI/RfD)	Carcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Oral Route $(mg/kg\text{-}day)^{-1}$	Carcinogens: Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	4.50E-01	1.28E-07	4.00E-04	3.21E-04	1.47E-08	- -	NA
Arsenic	8.60E+00	2.45E-06	3.00E-04	8.17E-03	2.80E-07	1.75E+00	4.90E-07
Bismuth	3.90E+01	1.11E-05	- -	NA	1.27E-06	- -	NA
Cadmium	2.10E+00	5.98E-07	1.00E-03	5.98E-04	6.84E-08	- -	NA
Cerium	0.00E+00	0.00E+00	- -	NA	0.00E+00	- -	NA
Lead	4.80E+01	1.37E-05	- -	NA	1.56E-06	- -	NA
Manganese	1.40E+03	3.99E-04	1.40E-01	2.85E-03	4.56E-05	- -	NA
Mercury	1.50E-01	4.27E-08	3.00E-04	1.42E-04	4.88E-09	- -	NA
Neodymium	0.00E+00	0.00E+00	- -	NA	0.00E+00	- -	NA
Selenium	5.90E-01	1.68E-07	5.00E-03	3.36E-05	1.92E-08	- -	NA
Thallium	4.60E-01	1.31E-07	8.00E-05	1.64E-03	1.50E-08	- -	NA
Tin	2.00E+01	5.70E-06	- -	NA	6.51E-07	- -	NA
Vanadium	2.50E+01	7.12E-06	7.00E-03	1.02E-03	8.14E-07	- -	NA
Zinc	1.40E+02	3.99E-05	3.00E-01	1.33E-04	4.56E-06	- -	NA
alpha-Chlordane	1.90E-03	5.41E-10	- -	NA	6.19E-11	- -	NA
Acenaphthylene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	- -	NA
Anthracene	0.00E+00	0.00E+00	3.00E-01	NA	0.00E+00	- -	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	- -	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-02	NA
Benzoic Acid	0.00E+00	0.00E+00	4.00E+00	NA	0.00E+00	- -	NA
Carbazole	0.00E+00	0.00E+00	- -	NA	0.00E+00	2.00E-02	NA
Chrysene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-03	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	- -	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Fluoranthene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	- -	NA
Fluorene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	- -	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Phenanthrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	- -	NA
Pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	- -	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	2.00E-02	NA	0.00E+00	1.40E-02	NA
Acetone	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	- -	NA
Methylene Chloride	0.00E+00	0.00E+00	6.00E-02	NA	0.00E+00	7.50E-03	NA
			TOTAL	1.49E-02		TOTAL	4.90E-07

Table VI-1.33 (continued). Background Risk Characterization for Soil Ingestion: Current Land Use - Trespasser (Adolescent) Mound New Property

Radionuclide	Background Concentration in Soil (pCi/g)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	1.30E-01	5.41E+00	2.20E-10	1.19E-09
Radium 226	2.00E+00	8.32E+01	1.20E-10	9.98E-09
Thorium 228	1.50E+00	6.24E+01	1.10E-11	6.86E-10
Thorium 230	1.90E+00	7.90E+01	1.30E-11	1.03E-09
Thorium 232	1.40E+00	5.82E+01	1.20E-11	6.99E-10
Uranium 235	1.10E-01	4.58E+00	1.60E-11	7.32E-11
			TOTAL	1.37E-08

Table VI-1.34. Background Risk Characterization for Dermal Contact with Soil: Current Land Use - Trespasser (Adolescent) Mound New Property

Chemical	Background Concentration in Soil (mg/kg)	Noncarcinogens: Absorbed Dose (AD) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	Noncarcinogens: HQ Effects (AD/RfD)	Carcinogens: Absorbed Dose (AD) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Dermal Route (mg/kg-day)-1	Carcinogens: Excess Lifetime Cancer Risk (AD x CSF)
Antimony	4.50E-01	5.90E-08	8.00E-06	7.37E-03	6.74E-09	--	NA
Arsenic	8.60E+00	1.13E-06	1.23E-04	9.16E-03	1.29E-07	4.27E+00	5.50E-07
Bismuth	3.90E+01	5.11E-06	--	NA	5.84E-07	--	NA
Cadmium	2.10E+00	2.75E-07	1.00E-05	2.75E-02	3.15E-08	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	4.80E+01	6.29E-06	--	NA	7.19E-07	--	NA
Manganese	1.40E+03	1.83E-04	1.40E-01	1.31E-03	2.10E-05	--	NA
Mercury	1.50E-01	1.97E-08	3.00E-08	6.55E-01	2.25E-09	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	5.90E-01	7.73E-08	2.20E-03	3.52E-05	8.84E-09	--	NA
Thallium	4.60E-01	6.03E-08	1.20E-05	5.02E-03	6.89E-09	--	NA
Tin	2.00E+01	2.62E-06	--	NA	3.00E-07	--	NA
Vanadium	2.50E+01	3.28E-06	7.00E-05	4.68E-02	3.74E-07	--	NA
Zinc	1.40E+02	1.83E-05	6.00E-02	3.06E-04	2.10E-06	--	NA
alpha-Chlordane	1.90E-03	2.49E-09	--	NA	2.85E-10	--	NA
Acenaphthylene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	2.28E-01	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+01	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+00	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E-01	NA
Benzoic Acid	0.00E+00	0.00E+00	4.00E+00	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	2.00E-02	NA
Chrysene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E-02	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Fluoranthene	0.00E+00	0.00E+00	1.24E-02	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+00	NA
Phenanthrene	0.00E+00	0.00E+00	2.19E-02	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	3.80E-03	NA	0.00E+00	7.37E-02	NA
Acetone	0.00E+00	0.00E+00	8.30E-02	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	5.70E-02	NA	0.00E+00	7.89E-03	NA
			TOTAL	7.53E-01		TOTAL	5.50E-07

Table VI-1.35. Background Risk Characterization for Inhalation of Dust:
Current Land Use - Trespasser (Adolescent)
Mound New Property

Chemical	Background Concentration in Air (mg/m^3)	Noncarcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	Noncarcinogens: HQ Effects (CDI/RfD)	Carcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Carcinogens: Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	9.72E-11	9.19E-13	--	NA	1.05E-13	--	NA
Arsenic	1.86E-09	1.76E-11	--	NA	2.01E-12	5.00E+01	1.00E-10
Bismuth	8.42E-09	7.97E-11	--	NA	9.11E-12	--	NA
Cadmium	4.54E-10	4.29E-12	--	NA	4.90E-13	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	1.04E-08	9.81E-11	--	NA	1.12E-11	--	NA
Manganese	3.02E-07	2.86E-09	1.43E-05	2.00E-04	3.27E-10	--	NA
Mercury	3.24E-11	3.06E-13	8.57E-05	3.58E-09	3.50E-14	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	1.27E-10	1.21E-12	--	NA	1.38E-13	--	NA
Thallium	9.94E-11	9.40E-13	--	NA	1.07E-13	--	NA
Tin	4.32E-09	4.09E-11	--	NA	4.67E-12	--	NA
Vanadium	5.40E-09	5.11E-11	--	NA	5.84E-12	--	NA
Zinc	3.02E-08	2.86E-10	--	NA	3.27E-11	--	NA
alpha-Chlordane	4.10E-13	3.88E-15	--	NA	4.44E-16	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	8.57E-01	NA	0.00E+00	--	NA
			TOTAL	2.00E-04		TOTAL	1.00E-10

Table VI-1.35 (continued). Background Risk Characterization for Inhalation of Dust: Current Land Use - Trespasser (Adolescent) Mound New Property

Radionuclide	Background Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	2.81E-08	3.88E-05	3.90E-08	1.51E-12
Radium 226	4.32E-07	5.97E-04	3.00E-09	1.79E-12
Thorium 228	3.24E-07	4.47E-04	7.70E-08	3.45E-11
Thorium 230	4.10E-07	5 67E-04	2.90E-08	1.64E-11
Thorium 232	3.02E-07	4.18E-04	2.80E-08	1.17E-11
Uranium 235	2.38E-08	3.28E-05	2.50E-08	8.20E-13
			TOTAL	6.67E-11

Table VI-1.36. Background Risk Characterization for Inhalation of Vapors
Current Land Use - Trespasser (Adolescent)
Mound New Property

Chemical	Background Concentration in Air (mg/m^3)	Noncarcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	Noncarcinogens: HQ Effects (CDI/RfD)	Carcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Carcinogens: Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	0.00E+00	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Bismuth	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	0.00E+00	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	0.00E+00	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Thallium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Tin	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
alpha-Chlordane	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	8.57E-01	NA	0.00E+00	--	NA
			TOTAL	0.00E+00		TOTAL	0.00E+00

Table VI-1.37. Background Risk Characterization for Direct Radiation from Soils: Current Land Use - Trespasser (Adolescent) Mound New Property

Radionuclide	Background Concentration in Soil (pCi/g)	Chronic Absorbed dose (CAD) (pCi/g of soil/yr)	Toxicity Criteria Slope Factor (CSF) External Radiation (Risk/yr per pCi/g soil)	Excess Lifetime Cancer Risk (CAD x CSF)
Plutonium 238	1.30E-01	1.73E-01	2.80E-11	4.85E-12
Radium 226	2.00E+00	2.67E+00	1.20E-08	3.20E-08
Thorium 228	1.50E+00	2.00E+00	5.50E-10	1.10E-09
Thorium 230	1.90E+00	2.53E+00	5.40E-10	1.37E-09
Thorium 232	1.40E+00	1.87E+00	2.60E-11	4.85E-11
Uranium 235	1.10E-01	1.47E-01	2.40E-07	3.52E-08
			TOTAL	6.97E-08

Table VI-1.38. Background Risk Characterization for Inhalation of Radon: Current Land Use - Trespasser (Adolescent) Mound New Property

Radionuclide	Background Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Radon 222+daughters	2.50E-01	3.45E+02	7.70E-12	2.66E-09
			TOTAL	2.66E-09

Table VI-1.39. Background Risk Characterization for Dermal Contact with Surface Water (Seeps):
Current Land Use - Trespasser (Adolescent)
Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Absorbed Dose (CAD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (CAD/RfD)	Chronic Absorbed Dose (CAD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Dermal Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CAD x CSF)
Aluminum	1.22E-01	3.07E-07	--	NA	3.51E-08	--	NA
Cobalt	2.16E-03	5.44E-09	--	NA	6.22E-10	--	NA
Copper	3.42E-03	8.62E-09	1.11E-02	7.77E-07	9.85E-10	--	NA
Silver	7.90E-04	1.99E-09	9.00E-04	2.21E-06	2.28E-10	--	NA
Vanadium	1.81E-02	4.57E-08	7.00E-05	6.53E-04	5.22E-09	--	NA
1,3,5-Trinitrobenzene	6.50E-04	3.47E-09	5.00E-05	6.95E-05	3.97E-10	--	NA
1,3-Dinitrobenzene	1.60E-04	7.13E-09	1.00E-04	7.13E-05	8.15E-10	--	NA
PETN	5.00E-04	0.00E+00	--	NA	0.00E+00	--	NA
Trichloroethene	6.00E-04	4.96E-08	--	NA	5.67E-09	7.30E-02	4.14E-10
			TOTAL	7.97E-04		TOTAL	4.14E-10

Table VI-1.40. Background Risk Characterization for Soil Ingestion:
Future Land Use - Commercial/Industrial Worker
Mound New Property

Chemical	Background Concentration in Soil (mg/kg)	Noncarcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogens: Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	Noncarcinogens: HQ Effects (CDI/RfD)	Carcinogens: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogens: Toxicity Criteria Slope Factor (CSF) Oral Route $(mg/kg\text{-}day)^{-1}$	Carcinogens: Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	4.50E-01	2.20E-07	4.00E-04	5.50E-04	7.86E-08	--	NA
Arsenic	8.60E+00	4.21E-06	3.00E-04	1.40E-02	1.50E-06	1.75E+00	2.63E-06
Bismuth	3.90E+01	1.91E-05	--	NA	6.81E-06	--	NA
Cadmium	2.10E+00	1.03E-06	1.00E-03	1.03E-03	3.67E-07	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	4.80E+01	2.35E-05	--	NA	8.39E-06	--	NA
Manganese	1.40E+03	6.85E-04	1.40E-01	4.89E-03	2.45E-04	--	NA
Mercury	1.50E-01	7.34E-08	3.00E-04	2.45E-04	2.62E-08	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	5.90E-01	2.89E-07	5.00E-03	5.77E-05	1.03E-07	--	NA
Thallium	4.60E-01	2.25E-07	8.00E-05	2.81E-03	8.04E-08	--	NA
Tin	2.00E+01	9.78E-06	--	NA	3.49E-06	--	NA
Vanadium	2.50E+01	1.22E-05	7.00E-03	1.75E-03	4.37E-06	--	NA
Zinc	1.40E+02	6.85E-05	3.00E-01	2.28E-04	2.45E-05	--	NA
alpha-Chlordane	1.90E-03	9.30E-10	--	NA	3.32E-10	--	NA
Acenaphthylene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	3.00E-01	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-02	NA
Benzoic Acid	0.00E+00	0.00E+00	4.00E+00	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	2.00E-02	NA
Chrysene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-03	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Fluoranthene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Phenanthrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	2.00E-02	NA	0.00E+00	1.40E-02	NA
Acetone	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	6.00E-02	NA	0.00E+00	7.50E-03	NA
			TOTAL	2.56E-02		TOTAL	2.63E-06

Table VI-1.40 (continued). Background Risk Characterization for Soil Ingestion:
Future Land Use - Commercial/Industrial Worker
Mound New Property

Radionuclide	Background Concentration in Soil (pCi/g)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	1.30E-01	4.06E+01	2.20E-10	8.94E-09
Radium 226	2.00E+00	6.25E+02	1.20E-10	7.50E-08
Thorium 228	1.50E+00	4.69E+02	1.10E-11	5.16E-09
Thorium 230	1.90E+00	5.94E+02	1.30E-11	7.72E-09
Thorium 232	1.40E+00	4.38E+02	1.20E-11	5.25E-09
Uranium 235	1.10E-01	3.44E+01	1.60E-11	5.50E-10
			TOTAL	1.03E-07

Table VI-1.41. Background Risk Characterization for Dermal Contact with Soil:
Future Land Use - Commercial/Industrial Worker
Mound New Property

Chemical	Background Concentration in Soil (mg/kg)	Noncarcinogens			Carcinogens		
		Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (AD/RfD)	Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Dermal Route (mg/kg-day)-1	Excess Lifetime Cancer Risk (AD x CSF)
Antimony	4.50E-01	2.55E-07	8.00E-06	3.19E-02	9.12E-08	- -	NA
Arsenic	8.60E+00	4.88E-06	1.23E-04	3.97E-02	1.74E-06	4.27E+00	7.44E-06
Bismuth	3.90E+01	2.21E-05	- -	NA	7.90E-06	- -	NA
Cadmium	2.10E+00	1.19E-06	1.00E-05	1.19E-01	4.26E-07	- -	NA
Cerium	0.00E+00	0.00E+00	- -	NA	0.00E+00	- -	NA
Lead	4.80E+01	2.72E-05	- -	NA	9.73E-06	- -	NA
Manganese	1.40E+03	7.95E-04	1.40E-01	5.68E-03	2.84E-04	- -	NA
Mercury	1.50E-01	8.51E-08	3.00E-08	2.84E+00	3.04E-08	- -	NA
Neodymium	0.00E+00	0.00E+00	- -	NA	0.00E+00	- -	NA
Selenium	5.90E-01	3.35E-07	2.20E-03	1.52E-04	1.20E-07	- -	NA
Thallium	4.60E-01	2.61E-07	1.20E-05	2.18E-02	9.32E-08	- -	NA
Tin	2.00E+01	1.14E-05	- -	NA	4.05E-06	- -	NA
Vanadium	2.50E+01	1.42E-05	7.00E-05	2.03E-01	5.07E-06	- -	NA
Zinc	1.40E+02	7.95E-05	6.00E-02	1.32E-03	2.84E-05	- -	NA
alpha-Chlordane	1.90E-03	1.08E-08	- -	NA	3.85E-09	- -	NA
Acenaphthylene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	- -	NA
Anthracene	0.00E+00	0.00E+00	2.28E-01	NA	0.00E+00	- -	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+01	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+00	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	- -	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E-01	NA
Benzoic Acid	0.00E+00	0.00E+00	4.00E+00	NA	0.00E+00	- -	NA
Carbazole	0.00E+00	0.00E+00	- -	NA	0.00E+00	2.00E-02	NA
Chrysene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E-02	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	- -	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Fluoranthene	0.00E+00	0.00E+00	1.24E-02	NA	0.00E+00	- -	NA
Fluorene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	- -	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+00	NA
Phenanthrene	0.00E+00	0.00E+00	2.19E-02	NA	0.00E+00	- -	NA
Pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	- -	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	3.80E-03	NA	0.00E+00	7.37E-02	NA
Acetone	0.00E+00	0.00E+00	8.30E-02	NA	0.00E+00	- -	NA
Methylene Chloride	0.00E+00	0.00E+00	5.70E-02	NA	0.00E+00	7.89E-03	NA
			TOTAL	3.26E+00		TOTAL	7.44E-06

Table VI-1.42. Background Risk Characterization for Inhalation of Dust:
Future Land Use - Commercial/Industrial Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Background Concentration in Air (mg/m^3)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	9.72E-11	6.31E-12	--	NA	2.26E-12	--	NA
Arsenic	1.86E-09	1.21E-10	--	NA	4.31E-11	5.00E+01	2.15E-09
Bismuth	8.42E-09	5.47E-10	--	NA	1.95E-10	--	NA
Cadmium	4.54E-10	2.95E-11	--	NA	1.05E-11	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	1.04E-08	6.74E-10	--	NA	2.41E-10	--	NA
Manganese	3.02E-07	1.96E-08	1.43E-05	1.38E-03	7.02E-09	--	NA
Mercury	3.24E-11	2.10E-12	8.57E-05	2.46E-08	7.52E-13	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	1.27E-10	8.28E-12	--	NA	2.96E-12	--	NA
Thallium	9.94E-11	6.45E-12	--	NA	2.31E-12	--	NA
Tin	4.32E-09	2.81E-10	--	NA	1.00E-10	--	NA
Vanadium	5.40E-09	3.51E-10	--	NA	1.25E-10	--	NA
Zinc	3.02E-08	1.96E-09	--	NA	7.02E-10	--	NA
alpha-Chlordane	4.10E-13	2.67E-14	--	NA	9.52E-15	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	8.57E-01	NA	0.00E+00	--	NA
			TOTAL	1.38E-03		TOTAL	2.15E-09

Table VI-1.42 (continued). Background Risk Characterization for Inhalation of Dust: Future Land Use - Commercial/Industrial Worker Mound New Property

Radionuclide	Background Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	2.81E-08	1.17E-03	3.90E-08	4.54E-11
Radium 226	4.32E-07	1.79E-02	3.00E-09	5.38E-11
Thorium 228	3.24E-07	1.34E-02	7.70E-08	1.04E-09
Thorium 230	4.10E-07	1.70E-02	2.90E-08	4.94E-10
Thorium 232	3.02E-07	1.25E-02	2.80E-08	3.51E-10
Uranium 235	2.38E-08	9.86E-04	2.50E-08	2.46E-11
			TOTAL	2.00E-09

Table VI-1.43. Background Risk Characterization for Inhalation of Vapors
Future Land Use - Commercial/Industrial Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Background Concentration in Air (mg/m^3)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	0.00E+00	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Bismuth	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	0.00E+00	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	0.00E+00	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Thallium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Tin	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
alpha-Chlordane	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	8.57E-01	NA	0.00E+00	--	NA
			TOTAL	0.00E+00		TOTAL	0.00E+00

Table VI-1.44. Background Risk Characterization for Direct Radiation from Soils: Future Land Use - Commercial/Industrial Worker Mound New Property

Radionuclide	Background Concentration in Soil (pCi/g)	Chronic Absorbed dose (CAD) (pCi/g of soil/yr)	Toxicity Criteria Slope Factor (CSF) External Radiation (Risk/yr per pCi/g soil)	Excess Lifetime Cancer Risk (CAD x CSF)
Plutonium 238	1.30E-01	1.08E+00	2.80E-11	3.03E-11
Radium 226	2.00E+00	1.67E+01	1.20E-08	2.00E-07
Thorium 228	1.50E+00	1.25E+01	5.50E-10	6.88E-09
Thorium 230	1.90E+00	1.58E+01	5.40E-10	8.55E-09
Thorium 232	1.40E+00	1.17E+01	2.60E-11	3.03E-10
Uranium 235	1.10E-01	9.17E-01	2.40E-07	2.20E-07
			TOTAL	4.36E-07

Table VI-1.45. Background Risk Characterization for Inhalation of Radon: Future Land Use - Commercial/Industrial Worker Mound New Property

Radionuclide	Background Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Radon 222+daughters	2.50E-01	1.04E+04	7.70E-12	7.99E-08
			TOTAL	7.99E-08

Table VI-1.46. Background Risk Characterization for Soil Ingestion:
Future Land Use - Construction/Excavation Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Background Concentration in Soil (mg/kg)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Oral Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	4.50E-01	2.11E-06	4.00E-04	5.27E-03	1.51E-08	--	NA
Arsenic	8.60E+00	4.03E-05	3.00E-04	1.34E-01	2.89E-07	1.75E+00	5.05E-07
Bismuth	3.90E+01	1.83E-04	--	NA	1.31E-06	--	NA
Cadmium	2.10E+00	9.84E-06	1.00E-03	9.84E-03	7.05E-08	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	4.80E+01	2.25E-04	--	NA	1.61E-06	--	NA
Manganese	1.40E+03	6.56E-03	1.40E-01	4.68E-02	4.70E-05	--	NA
Mercury	1.50E-01	7.03E-07	3.00E-04	2.34E-03	5.03E-09	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	5.90E-01	2.76E-06	5.00E-03	5.53E-04	1.98E-08	--	NA
Thallium	4.60E-01	2.15E-06	8.00E-05	2.69E-02	1.54E-08	--	NA
Tin	2.00E+01	9.37E-05	--	NA	6.71E-07	--	NA
Vanadium	2.50E+01	1.17E-04	7.00E-03	1.67E-02	8.39E-07	--	NA
Zinc	1.40E+02	6.56E-04	3.00E-01	2.19E-03	4.70E-06	--	NA
Acenaphthylene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	3.00E-01	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-02	NA
Benzoic Acid	0.00E+00	0.00E+00	4.00E+00	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	2.00E-02	NA
Chrysene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-03	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Fluoranthene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Phenanthrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	2.00E-02	NA	0.00E+00	1.40E-02	NA
Acetone	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	6.00E-02	NA	0.00E+00	7.50E-03	NA
			TOTAL	2.45E-01		TOTAL	5.05E-07

Table VI-1.46 (continued). Background Risk Characterization for Soil Ingestion: Future Land Use - Construction/Excavation Worker Mound New Property

Radionuclide	Background Concentration in Soil (pCi/g)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	1.30E-01	7.80E+00	2.20E-10	1.72E-09
Radium 226	2.00E+00	1.20E+02	1.20E-10	1.44E-08
Thorium 228	1.50E+00	9.00E+01	1.10E-11	9.90E-10
Thorium 230	1.90E+00	1.14E+02	1.30E-11	1.48E-09
Thorium 232	1.40E+00	8.40E+01	1.20E-11	1.01E-09
Uranium 235	1.10E-01	6.60E+00	1.60E-11	1.06E-10
			TOTAL	1.97E-08

Table VI-1.47. Background Risk Characterization for Dermal Contact with Soil: Future Land Use - Construction/Excavation Worker Mound New Property

Chemical	Background Concentration in Soil (mg/kg)	Noncarcinogens			Carcinogens		
		Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (AD/RfD)	Absorbed Dose (AD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Dermal Route (mg/kg-day)-1	Excess Lifetime Cancer Risk (AD x CSF)
Antimony	4.50E-01	2.55E-07	8.00E-06	3.18E-02	1.82E-09	- -	NA
Arsenic	8.60E+00	4.87E-06	1.23E-04	3.96E-02	3.49E-08	4.27E+00	1.49E-07
Bismuth	3.90E+01	2.21E-05	- -	NA	1.58E-07	- -	NA
Cadmium	2.10E+00	1.19E-06	1.00E-05	1.19E-01	8.51E-09	- -	NA
Cerium	0.00E+00	0.00E+00	- -	NA	0.00E+00	- -	NA
Lead	4.80E+01	2.72E-05	- -	NA	1.95E-07	- -	NA
Manganese	1.40E+03	7.92E-04	1.40E-01	5.66E-03	5.68E-06	- -	NA
Mercury	1.50E-01	8.49E-08	3.00E-08	2.83E+00	6.08E-10	- -	NA
Neodymium	0.00E+00	0.00E+00	- -	NA	0.00E+00	- -	NA
Selenium	5.90E-01	3.34E-07	2.20E-03	1.52E-04	2.39E-09	- -	NA
Thallium	4.60E-01	2.60E-07	1.20E-05	2.17E-02	1.86E-09	- -	NA
Tin	2.00E+01	1.13E-05	- -	NA	8.11E-08	- -	NA
Vanadium	2.50E+01	1.41E-05	7.00E-05	2.02E-01	1.01E-07	- -	NA
Zinc	1.40E+02	7.92E-05	6.00E-02	1.32E-03	5.68E-07	- -	NA
Acenaphthylene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	- -	NA
Anthracene	0.00E+00	0.00E+00	2.28E-01	NA	0.00E+00	- -	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E-01	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+01	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+00	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	- -	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E-01	NA
Benzoic Acid	0.00E+00	0.00E+00	4.00E+00	NA	0.00E+00	- -	NA
Carbazole	0.00E+00	0.00E+00	- -	NA	0.00E+00	2.00E-02	NA
Chrysene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E-02	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	1.00E-01	NA	0.00E+00	- -	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	3.00E-02	NA	0.00E+00	7.30E+00	NA
Fluoranthene	0.00E+00	0.00E+00	1.24E-02	NA	0.00E+00	- -	NA
Fluorene	0.00E+00	0.00E+00	4.00E-02	NA	0.00E+00	- -	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	2.35E+00	NA
Phenanthrene	0.00E+00	0.00E+00	2.19E-02	NA	0.00E+00	- -	NA
Pyrene	0.00E+00	0.00E+00	9.30E-03	NA	0.00E+00	- -	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	3.80E-03	NA	0.00E+00	7.37E-02	NA
Acetone	0.00E+00	0.00E+00	8.30E-02	NA	0.00E+00	- -	NA
Methylene Chloride	0.00E+00	0.00E+00	5.70E-02	NA	0.00E+00	7.89E-03	NA
			TOTAL	3.25E+00		TOTAL	1.49E-07

Table VI-1.48. Background Risk Characterization for Inhalation of Dust:
Future Land Use - Construction/Excavation Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Background Concentration in Air (mg/m^3)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	1.80E-07	1.17E-08	--	NA	8.35E-11	--	NA
Arsenic	3.44E-06	2.23E-07	--	NA	1.60E-09	5.00E+01	7.98E-08
Bismuth	1.56E-05	1.01E-06	--	NA	7.24E-09	--	NA
Cadmium	8.40E-07	5.44E-08	--	NA	3.90E-10	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	1.92E-05	1.24E-06	--	NA	8.91E-09	--	NA
Manganese	5.60E-04	3.63E-05	1.43E-05	2.54E+00	2.60E-07	--	NA
Mercury	6.00E-08	3.89E-09	8.57E-05	4.54E-05	2.78E-11	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	2.36E-07	1.53E-08	--	NA	1.10E-10	--	NA
Thallium	1.84E-07	1.19E-08	--	NA	8.54E-11	--	NA
Tin	8.00E-06	5.18E-07	--	NA	3.71E-09	--	NA
Vanadium	1.00E-05	6.48E-07	--	NA	4.64E-09	--	NA
Zinc	5.60E-05	3.63E-06	--	NA	2.60E-08	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	8.57E-01	NA	0.00E+00	--	NA
			TOTAL	2.54E+00		TOTAL	7.98E-08

Table VI-1.48 (continued). Background Risk Characterization for Inhalation of Dust: Future Land Use - Construction/Excavation Worker Mound New Property

Radionuclide	Background Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Plutonium 238	5.20E-05	4.32E-02	3.90E-08	1.68E-09
Radium 226	8.00E-04	6.64E-01	3.00E-09	1.99E-09
Thorium 228	6.00E-04	4.98E-01	7.70E-08	3.83E-08
Thorium 230	7.60E-04	6.31E-01	2.90E-08	1.83E-08
Thorium 232	5.60E-04	4.65E-01	2.80E-08	1.30E-08
Uranium 235	4.40E-05	3.65E-02	2.50E-08	9.13E-10
			TOTAL	7.42E-08

Table VI-1.49. Background Risk Characterization for Inhalation of Vapors
Future Land Use - Construction/Excavation Worker
Mound New Property

		Noncarcinogens			Carcinogens		
Chemical	Background Concentration in Air (mg/m^3)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF) Inhalation Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Antimony	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	0.00E+00	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Bismuth	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Cerium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Lead	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	0.00E+00	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	0.00E+00	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Neodymium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Selenium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Thallium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Tin	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acenaphthylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(a)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(b)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzo(k)fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Benzoic Acid	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Carbazole	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Chrysene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Di-n-butylphthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluoranthene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Fluorene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Indeno(1,2,3-c,d)pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Phenanthrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Pyrene	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Bis(2-Ethylhexyl)phthalate	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Acetone	0.00E+00	0.00E+00	--	NA	0.00E+00	--	NA
Methylene Chloride	0.00E+00	0.00E+00	8.57E-01	NA	0.00E+00	--	NA
			TOTAL	0.00E+00		TOTAL	0.00E+00

Table VI-1.50. Background Risk Characterization for Direct Radiation from Soils: Future Land Use - Construction/Excavation Worker Mound New Property

Radionuclide	Background Concentration in Soil (pCi/g)	Chronic Absorbed dose (CAD) (pCi/g of soil/yr)	Toxicity Criteria Slope Factor (CSF) External Radiation (Risk/yr per pCi/g soil)	Excess Lifetime Cancer Risk (CAD x CSF)
Plutonium 238	1.30E-01	2.17E-02	2.80E-11	6.07E-13
Radium 226	2.00E+00	3.33E-01	1.20E-08	4.00E-09
Thorium 228	1.50E+00	2.50E-01	5.50E-10	1.38E-10
Thorium 230	1.90E+00	3.17E-01	5.40E-10	1.71E-10
Thorium 232	1.40E+00	2.33E-01	2.60E-11	6.07E-12
Uranium 235	1.10E-01	1.83E-02	2.40E-07	4.40E-09
			TOTAL	8.72E-09

Table VI-1.51. Background Risk Characterization for Inhalation of Radon: Future Land Use - Construction/Excavation Worker Mound New Property

Radionuclide	Background Concentration in Air (pCi/m^3)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF) Inhalation Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Radon 222+daughters	2.50E-01	2.08E+02	7.70E-12	1.60E-09
			TOTAL	1.60E-09

Table VI-1.52. Background Risk Characterization for Groundwater Ingestion:
Future Land Use - Off-site Resident (Adult)
Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	HQ Effects (CDI/RfD)	Chronic Daily Intake (CDI) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Oral Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CDI x CSF)
Aluminum	1.22E-01	3.34E-03	--	NA	1.43E-03	--	NA
Arsenic	2.82E-02	7.72E-04	3.00E-04	2.57E+00	3.31E-04	1.50E+00	4.96E-04
Barium	3.15E-01	8.63E-03	7.00E-02	1.23E-01	3.70E-03	--	NA
Beryllium	2.40E-04	6.58E-06	5.00E-03	1.32E-03	2.82E-06	4.30E+00	1.21E-05
Bismuth	1.64E-02	4.50E-04	--	NA	1.93E-04	--	NA
Cadmium	5.50E-04	1.51E-05	5.00E-04	3.01E-02	6.46E-06	--	NA
Chromium	1.36E-01	3.72E-03	5.00E-03	7.45E-01	1.60E-03	--	NA
Cobalt	2.16E-03	5.92E-05	--	NA	2.54E-05	--	NA
Copper	3.42E-03	9.37E-05	3.70E-02	2.53E-03	4.02E-05	--	NA
Lead	1.44E-03	3.95E-05	--	NA	1.69E-05	--	NA
Lithium	5.03E-02	1.38E-03	--	NA	5.90E-04	--	NA
Manganese	2.14E-01	5.87E-03	5.00E-03	1.17E+00	2.51E-03	--	NA
Mercury	5.00E-05	1.37E-06	3.00E-04	4.57E-03	5.87E-07	--	NA
Molybdenum	6.36E-03	1.74E-04	5.00E-03	3.48E-02	7.47E-05	--	NA
Nickel	1.52E-01	4.18E-03	2.00E-02	2.09E-01	1.79E-03	--	NA
Vanadium	1.81E-02	4.97E-04	7.00E-03	7.10E-02	2.13E-04	--	NA
Zinc	1.00E-01	2.74E-03	3.00E-01	9.15E-03	1.18E-03	--	NA
2,4,6-Trinitrotoluene	6.50E-04	1.78E-05	5.00E-04	3.56E-02	7.63E-06	3.00E-02	2.29E-07
1,2-Dichloroethene	5.00E-04	1.37E-05	3.00E-03	4.57E-03	5.87E-06	--	NA
Hexane	0.00E+00	0.00E+00	6.00E-02	0.00E+00	0.00E+00	--	NA
Trichloroethene	6.00E-04	1.64E-05	--	NA	7.05E-06	1.10E-02	7.75E-08
			TOTAL	5.02E+00		TOTAL	5.09E-04

Table VI-1.52 (continued). Background Risk Characterization for Groundwater Ingestion: Future Land Use - Off-site Resident (Adult) Mound New Property

Radionuclide	Background Concentration in GW (pCi/L)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF): Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Americium 241	1.20E-01	2.52E+03	2.40E-10	6.05E-07
Plutonium 239/240	6.00E-02	1.26E+03	2.30E-10	2.90E-07
Radium 226	1.02E+00	2.14E+04	1.20E-10	2.57E-06
Thorium 228	8.00E-01	1.68E+04	1.10E-11	1.85E-07
Thorium 230	2.80E-01	5.88E+03	1.30E-11	7.64E-08
Thorium 232	2.30E-01	4.83E+03	1.20E-11	5.80E-08
Tritium	1.38E+03	2.90E+07	7.15E-14	2.07E-06
Uranium 234	7.70E-01	1.62E+04	1.60E-11	2.59E-07
Uranium 235	4.00E-02	8.40E+02	1.60E-11	1.34E-08
Uranium 238	6.80E-01	1.43E+04	1.60E-11	2.28E-07
			TOTAL	6.36E-06

Table VI-1.53. Background Risk Characterization for Dermal Contact with Groundwater: Future Land Use - Off-site Resident (Adult) Mound New Property

		Noncarcinogen			Carcinogen		
Chemical	Exposure Concentration in GW (mg/L)	Chronic Absorbed Dose (CAD) (mg/kg-day)	Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	HQ Effects (CAD/RfD)	Chronic Absorbed Dose (CAD) (mg/kg-day)	Toxicity Criteria Slope Factor (CSF): Dermal Route $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (CAD x CSF)
Aluminum	1.22E-01	9.61E-06	--	NA	4.12E-06	--	NA
Arsenic	2.82E-02	2.22E-06	1.23E-04	1.80E-02	9.51E-07	4.27E+00	4.06E-06
Barium	3.15E-01	2.48E-05	4.30E-03	5.77E-03	1.06E-05	--	NA
Beryllium	2.40E-04	1.89E-08	5.05E-05	3.74E-04	8.10E-09	4.30E+00	3.48E-08
Bismuth	1.64E-02	1.29E-06	--	NA	5.55E-07	--	NA
Cadmium	5.50E-04	4.33E-08	5.00E-04	8.66E-05	1.86E-08	--	NA
Chromium	1.36E-01	1.07E-05	1.00E-04	1.07E-01	4.59E-06	--	NA
Cobalt	2.16E-03	6.81E-08	--	NA	2.92E-08	--	NA
Copper	3.42E-03	2.69E-07	1.11E-02	2.43E-05	1.15E-07	--	NA
Lead	1.44E-03	1.13E-07	--	NA	4.86E-08	--	NA
Lithium	5.03E-02	3.96E-06	--	NA	1.70E-06	--	NA
Manganese	2.14E-01	1.69E-05	2.00E-04	8.43E-02	7.23E-06	--	NA
Mercury	5.00E-05	3.94E-09	3.00E-08	1.31E-01	1.69E-09	--	NA
Molybdenum	6.36E-03	5.01E-07	1.90E-03	2.64E-04	2.15E-07	--	NA
Nickel	1.52E-01	1.20E-05	5.40E-03	2.22E-03	5.15E-06	--	NA
Vanadium	1.81E-02	1.43E-06	7.00E-05	2.04E-02	6.12E-07	--	NA
Zinc	1.00E-01	7.89E-06	6.00E-02	1.31E-04	3.38E-06	--	NA
2,4,6-Trinitrotoluene	6.50E-04	1.28E-06	5.00E-04	2.56E-03	5.48E-07	3.00E-02	1.64E-08
1,2-Dichloroethene	5.00E-04	1.27E-06	9.00E-03	1.41E-04	5.44E-07	--	NA
Hexane	0.00E+00	0.00E+00	6.00E-02	0.00E+00	0.00E+00	--	NA
Trichloroethene	6.00E-04	3.10E-06	--	NA	1.33E-06	7.30E-02	9.70E-08
			TOTAL	3.73E-01		TOTAL	4.21E-06

Table VI-1.54. Background Risk Characterization for Inhalation of Volatiles (groundwater): Future Land Use - Off-site Resident (Adult) Mound New Property

Chemical	Exposure Concentration in GW (mg/L)	Noncarcinogen: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogen: Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	Noncarcinogen: HQ Effects (CDI/RfD)	Carcinogen: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogen: Toxicity Criteria Slope Factor (CSF): Inhalation Route $(mg/kg\text{-}day)^{-1}$	Carcinogen: Excess Lifetime Cancer Risk (CDI x CSF)
Aluminum	1.22E-01	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	2.82E-02	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Barium	3.15E-01	0.00E+00	1.43E-04	NA	0.00E+00	--	NA
Beryllium	2.40E-04	0.00E+00	--	NA	0.00E+00	8.40E+00	NA
Bismuth	1.64E-02	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	5.50E-04	0.00E+00	--	NA	0.00E+00	--	NA
Chromium	1.36E-01	0.00E+00	--	NA	0.00E+00	4.10E+01	NA
Cobalt	2.16E-03	0.00E+00	--	NA	0.00E+00	--	NA
Copper	3.42E-03	0.00E+00	--	NA	0.00E+00	--	NA
Lead	1.44E-03	0.00E+00	--	NA	0.00E+00	--	NA
Lithium	5.03E-02	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	2.14E-01	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	5.00E-05	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Molybdenum	6.36E-03	0.00E+00	--	NA	0.00E+00	--	NA
Nickel	1.52E-01	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	1.81E-02	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	1.00E-01	0.00E+00	--	NA	0.00E+00	--	NA
2,4,6-Trinitrotoluene	6.50E-04	1.34E-05	--	NA	5.72E-06	--	NA
1,2-Dichloroethene	5.00E-04	1.03E-05	--	NA	4.40E-06	--	NA
Hexane	0.00E+00	0.00E+00	5.71E-02	NA	0.00E+00	--	NA
Trichloroethene	6.00E-04	1.23E-05	--	NA	5.28E-06	6.00E-03	3.17E-08
			TOTAL	0.00E+00		TOTAL	3.17E-08

Table VI-1.55. Background Risk Characterization for Groundwater Ingestion:
Future Land Use - Off-site Resident (Child)
Mound New Property

Chemical	Exposure Concentration in GW (mg/L)	Noncarcinogen: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogen: Toxicity Criteria RfD-C(a) Oral Route (mg/kg-day)	Noncarcinogen: HQ Effects (CDI/RfD)	Carcinogen: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogen: Toxicity Criteria Slope Factor (CSF): Oral Route $(mg/kg\text{-}day)^{-1}$	Carcinogen: Excess Lifetime Cancer Risk (CDI x CSF)
Aluminum	1.22E-01	7.80E-03	--	NA	6.68E-04	--	NA
Arsenic	2.82E-02	1.80E-03	3.00E-04	6.00E+00	1.54E-04	1.50E+00	2.32E-04
Barium	3.15E-01	2.01E-02	7.00E-02	2.88E-01	1.73E-03	--	NA
Beryllium	2.40E-04	1.53E-05	5.00E-03	3.07E-03	1.32E-06	4.30E+00	5.65E-06
Bismuth	1.64E-02	1.05E-03	--	NA	9.01E-05	--	NA
Cadmium	5.50E-04	3.52E-05	5.00E-04	7.03E-02	3.01E-06	--	NA
Chromium	1.36E-01	8.69E-03	5.00E-03	1.74E+00	7.45E-04	--	NA
Cobalt	2.16E-03	1.38E-04	--	NA	1.18E-05	--	NA
Copper	3.42E-03	2.19E-04	3.70E-02	5.91E-03	1.87E-05	--	NA
Lead	1.44E-03	9.21E-05	--	NA	7.89E-06	--	NA
Lithium	5.03E-02	3.21E-03	--	NA	2.76E-04	--	NA
Manganese	2.14E-01	1.37E-02	5.00E-03	2.74E+00	1.17E-03	--	NA
Mercury	5.00E-05	3.20E-06	3.00E-04	1.07E-02	2.74E-07	--	NA
Molybdenum	6.36E-03	4.07E-04	5.00E-03	8.13E-02	3.48E-05	--	NA
Nickel	1.52E-01	9.75E-03	2.00E-02	4.87E-01	8.35E-04	--	NA
Vanadium	1.81E-02	1.16E-03	7.00E-03	1.66E-01	9.93E-05	--	NA
Zinc	1.00E-01	6.40E-03	3.00E-01	2.13E-02	5.49E-04	--	NA
2,4,6-Trinitrotoluene	6.50E-04	4.16E-05	5.00E-04	8.31E-02	3.56E-06	3.00E-02	1.07E-07
1,2-Dichloroethene	5.00E-04	3.20E-05	3.00E-03	1.07E-02	2.74E-06	--	NA
Hexane	0.00E+00	0.00E+00	6.00E-02	0.00E+00	0.00E+00	--	NA
Trichloroethene	6.00E-04	3.84E-05	--	NA	3.29E-06	1.10E-02	3.62E-08
			TOTAL	1.17E+01		TOTAL	2.37E-04

Table VI-1.55 (continued). Background Risk Characterization for Groundwater Ingestion: Future Land Use - Off-site Resident (Child) Mound New Property

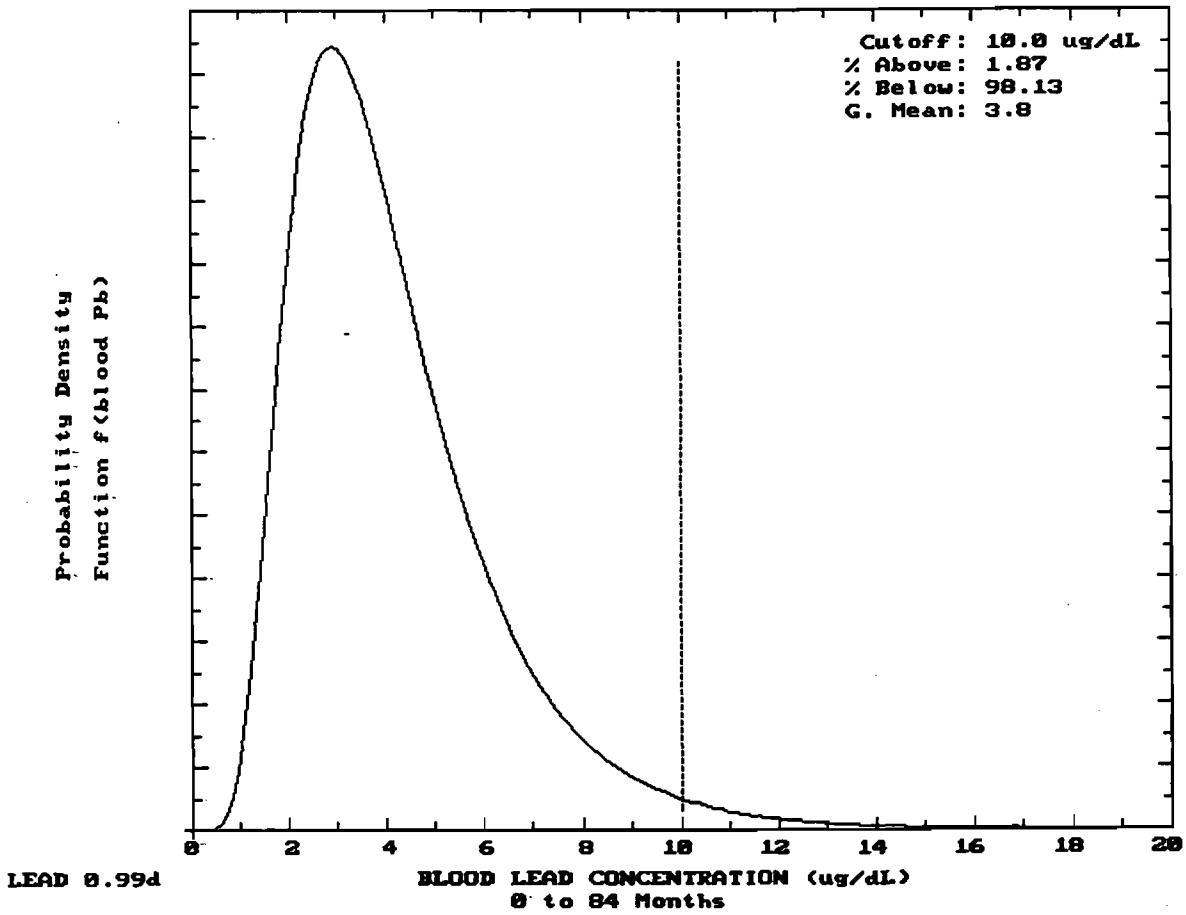
Radionuclide	Background Concentration in GW (pCi/L)	Chronic Daily Intake (CDI) (pCi)	Toxicity Criteria Slope Factor (CSF): Oral Route (Risk/pCi)	Excess Lifetime Cancer Risk (CDI x CSF)
Americium 241	1.20E-01	2.52E+02	2.40E-10	6.05E-08
Plutonium 239/240	6.00E-02	1.26E+02	2.30E-10	2.90E-08
Radium 226	1.02E+00	2.14E+03	1.20E-10	2.57E-07
Thorium 228	8.00E-01	1.68E+03	1.10E-11	1.85E-08
Thorium 230	2.80E-01	5.88E+02	1.30E-11	7.64E-09
Thorium 232	2.30E-01	4.83E+02	1.20E-11	5.80E-09
Tritium	1.38E+03	2.90E+06	7.15E-14	2.07E-07
Uranium 234	7.70E-01	1.62E+03	1.60E-11	2.59E-08
Uranium 235	4.00E-02	8.40E+01	1.60E-11	1.34E-09
Uranium 238	6.80E-01	1.43E+03	1.60E-11	2.28E-08
			TOTAL	6.36E-07

Table VI-1.56. Background Risk Characterization for Dermal Contact with Groundwater: Future Land Use - Off-site Resident (Child) Mound New Property

Chemical	Exposure Concentration in GW (mg/L)	Noncarcinogen: Chronic Absorbed Dose (CAD) (mg/kg-day)	Noncarcinogen: Toxicity Criteria RfD-C(a) Dermal Route (mg/kg-day)	Noncarcinogen: HQ Effects (CAD/RfD)	Carcinogen: Chronic Absorbed Dose (CAD) (mg/kg-day)	Carcinogen: Toxicity Criteria Slope Factor (CSF): Dermal Route $(mg/kg\text{-}day)^{-1}$	Carcinogen: Excess Lifetime Cancer Risk (CAD x CSF)
Aluminum	1.22E-01	1.48E-05	--	NA	1.27E-06	--	NA
Arsenic	2.82E-02	3.42E-06	1.23E-04	2.78E-02	2.93E-07	4.27E+00	1.25E-06
Barium	3.15E-01	3.83E-05	4.30E-03	8.90E-03	3.28E-06	--	NA
Beryllium	2.40E-04	2.92E-08	5.05E-05	5.77E-04	2.50E-09	4.30E+00	1.07E-08
Bismuth	1.64E-02	2.00E-06	--	NA	1.71E-07	--	NA
Cadmium	5.50E-04	6.68E-08	5.00E-04	1.34E-04	5.73E-09	--	NA
Chromium	1.36E-01	1.65E-05	1.00E-04	1.65E-01	1.42E-06	--	NA
Cobalt	2.16E-03	1.05E-07	--	NA	9.00E-09	--	NA
Copper	3.42E-03	4.15E-07	1.11E-02	3.74E-05	3.56E-08	--	NA
Lead	1.44E-03	1.75E-07	--	NA	1.50E-08	--	NA
Lithium	5.03E-02	6.11E-06	--	NA	5.23E-07	--	NA
Manganese	2.14E-01	2.60E-05	2.00E-04	1.30E-01	2.23E-06	--	NA
Mercury	5.00E-05	6.07E-09	3.00E-08	2.02E-01	5.21E-10	--	NA
Molybdenum	6.36E-03	7.72E-07	1.90E-03	4.07E-04	6.62E-08	--	NA
Nickel	1.52E-01	1.85E-05	5.40E-03	3.43E-03	1.59E-06	--	NA
Vanadium	1.81E-02	2.20E-06	7.00E-05	3.15E-02	1.89E-07	--	NA
Zinc	1.00E-01	1.22E-05	6.00E-02	2.03E-04	1.04E-06	--	NA
2,4,6-Trinitrotoluene	6.50E-04	1.97E-06	5.00E-04	3.94E-03	1.69E-07	3.00E-02	5.07E-09
1,2-Dichloroethene	5.00E-04	1.96E-06	9.00E-03	2.18E-04	1.68E-07	--	NA
Hexane	0.00E+00	0.00E+00	6.00E-02	0.00E+00	0.00E+00	--	NA
Trichloroethene	6.00E-04	4.78E-06	--	NA	4.10E-07	7.30E-02	2.99E-08
			TOTAL	5.75E-01		TOTAL	1.30E-06

Table VI-1.57. Background Risk Characterization for Inhalation of Volatiles (groundwater): Future Land Use - Off-site Resident (Child) Mound New Property

Chemical	Exposure Concentration in GW (mg/L)	Noncarcinogen: Chronic Daily Intake (CDI) (mg/kg-day)	Noncarcinogen: Toxicity Criteria RfD-C(a) Inhalation Route (mg/kg-day)	Noncarcinogen: HQ Effects (CDI/RfD)	Carcinogen: Chronic Daily Intake (CDI) (mg/kg-day)	Carcinogen: Toxicity Criteria Slope Factor (CSF): Inhalation Route $(mg/kg\text{-}day)^{-1}$	Carcinogen: Excess Lifetime Cancer Risk (CDI x CSF)
Aluminum	1.22E-01	0.00E+00	--	NA	0.00E+00	--	NA
Arsenic	2.82E-02	0.00E+00	--	NA	0.00E+00	5.00E+01	NA
Barium	3.15E-01	0.00E+00	1.43E-04	NA	0.00E+00	--	NA
Beryllium	2.40E-04	0.00E+00	--	NA	0.00E+00	8.40E+00	NA
Bismuth	1.64E-02	0.00E+00	--	NA	0.00E+00	--	NA
Cadmium	5.50E-04	0.00E+00	--	NA	0.00E+00	--	NA
Chromium	1.36E-01	0.00E+00	--	NA	0.00E+00	4.10E+01	NA
Cobalt	2.16E-03	0.00E+00	--	NA	0.00E+00	--	NA
Copper	3.42E-03	0.00E+00	--	NA	0.00E+00	--	NA
Lead	1.44E-03	0.00E+00	--	NA	0.00E+00	--	NA
Lithium	5.03E-02	0.00E+00	--	NA	0.00E+00	--	NA
Manganese	2.14E-01	0.00E+00	1.43E-05	NA	0.00E+00	--	NA
Mercury	5.00E-05	0.00E+00	8.57E-05	NA	0.00E+00	--	NA
Molybdenum	6.36E-03	0.00E+00	--	NA	0.00E+00	--	NA
Nickel	1.52E-01	0.00E+00	--	NA	0.00E+00	--	NA
Vanadium	1.81E-02	0.00E+00	--	NA	0.00E+00	--	NA
Zinc	1.00E-01	0.00E+00	--	NA	0.00E+00	--	NA
2,4,6-Trinitrotoluene	6.50E-04	6.23E-05	--	NA	5.34E-06	--	NA
1,2-Dichloroethene	5.00E-04	4.79E-05	--	NA	4.11E-06	--	NA
Hexane	0.00E+00	0.00E+00	5.71E-02	NA	0.00E+00	--	NA
Trichloroethene	6.00E-04	5.75E-05	--	NA	4.93E-06	6.00E-03	2.96E-08
			TOTAL	0.00E+00		TOTAL	2.96E-08



Input Values for the IEUBK Model		
Medium	**Assumption**	**Input Value**
Air	Outdoor Air Concentration	0.1 μg Pb/m^3
Drinking Water	Water Concentration	27.3 μg Pb/L
Soil/Dust	Soil/Dust Concentration	48.0 mg Pb/kg
Diet	Food Intake	Age specific defaults
Other	Alternate Sources	0.0 μg Pb/day
Maternal	Mother's Blood Pb conc at birth	2.5 μg Pb/dL

Figure 6.1.2 Input Values and Model Output for Integrated Exposure Uptake Biokinetic Model For Lead in Children, LEAD 0.99d (EPA 1994c)

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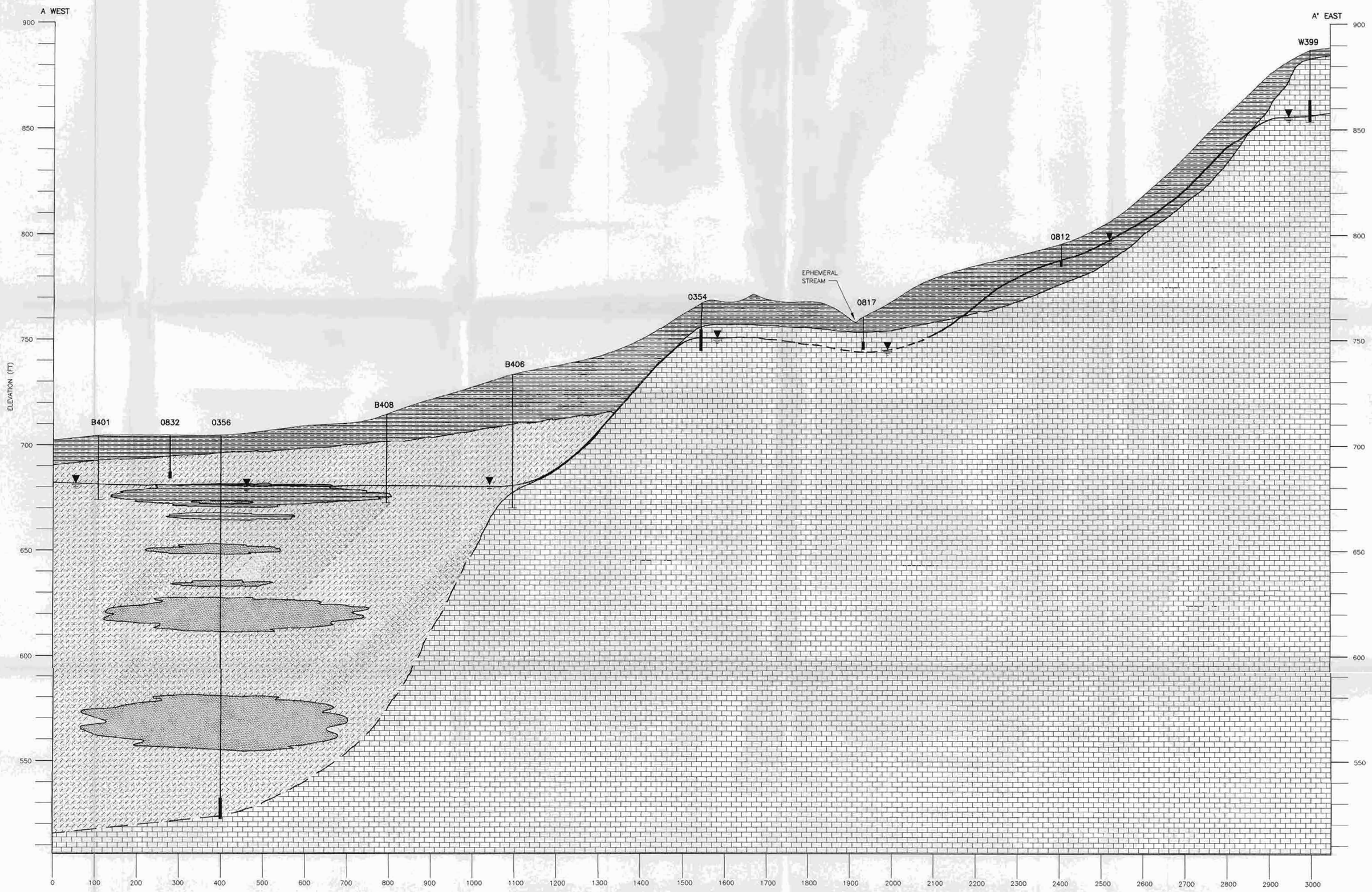
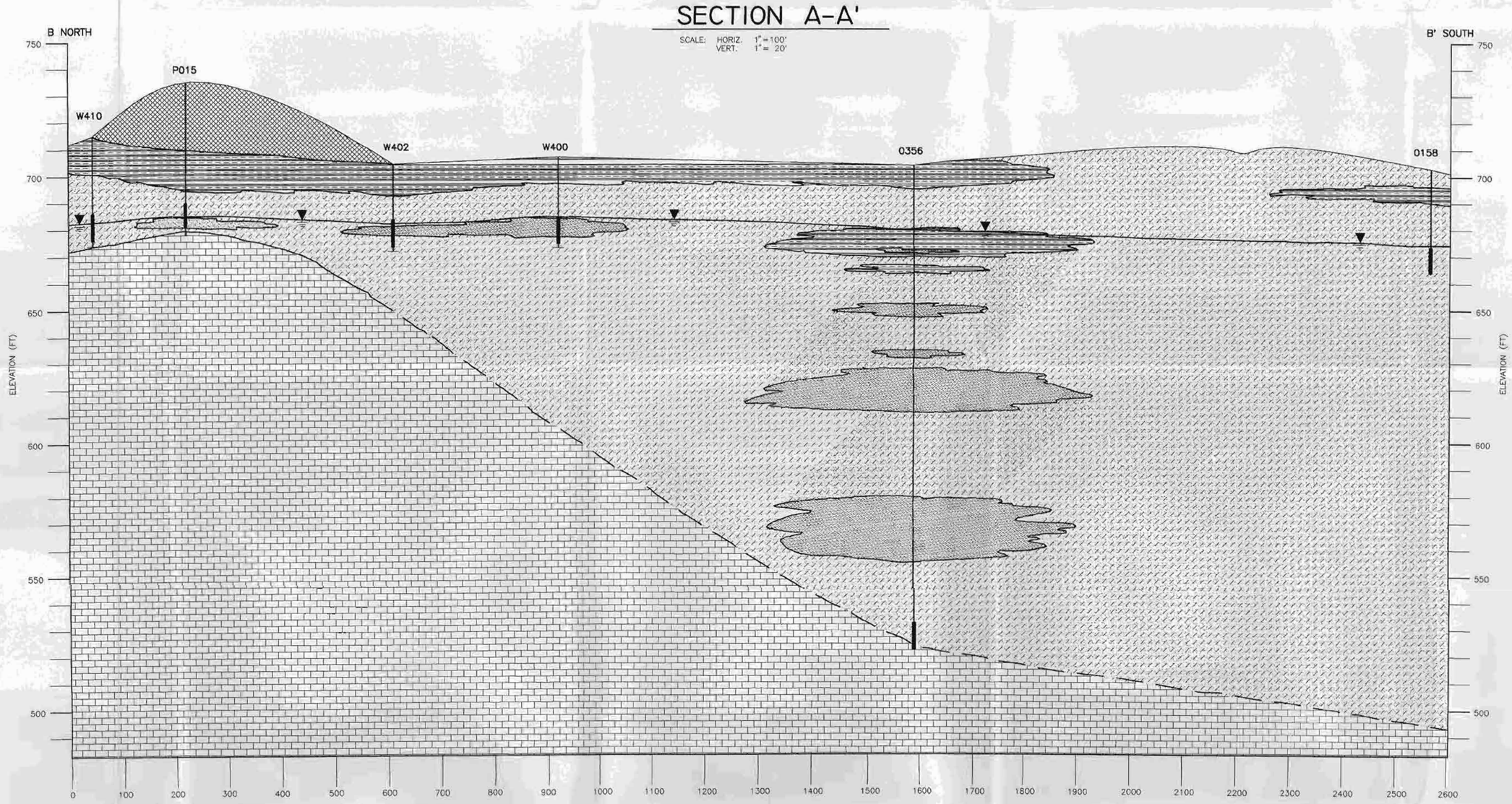


SECTION A-A'

SCALE: HORIZ. 1" = 100'
VERT. 1" = 20'



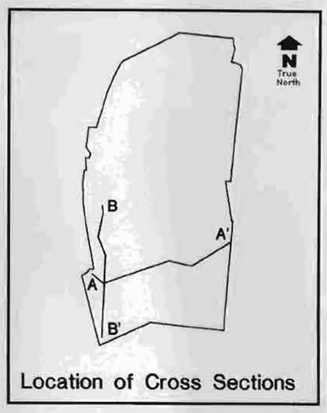
SECTION B-B'

SCALE: HORIZ. 1" = 100'
VERT. 1" = 20'

LEGEND

Recent		Artificial fill: consists of variable proportions of gravel, sand, and clay
Quaternary		Glacial till: clay containing variable porporations of gravel, sand and silt
		Glacial outwash: sand and gravel containing some silt and trace amounts of clay
		Sand in glacial outwash
Ordovician		Bedrock: undifferentiated interbedded limestone and shale

0812	Historical Monitoring Well
P015	Historical Piezometer
W399	Extended Phase Monitoring Well
B406	Extended Phase Soil Boring
	Contact
	Inferred Contact
	Water Level
	Inferred Water Level
	Monitoring Well Showing Screened Interval
	Exploratory Borehole



Location of Cross Sections

NEW PROPERTY

MOUND PLANT

Miamisburg, Ohio

PLATE 1

Geological Cross Sections A-A', B-B'

Prepared for

Operable Unit 5 - New Property
Remedial Investigations Report
March 1995

NAME: S:\MOUND\2593\AA-BB.DWG DATE: OCT 06, 1995 TIME: 11:37 AM (XREF - SHADE, SHADE1, SHADE2, SHADE4)