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Environmental Restoration Program

B BUILDING SOLVENT STORAGE SHED REMOVAL

ACTION MEMORANDUM

MOUND PLANT
MIAMISBURG, OHIO

February 25, 1994

FINAL

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies

FOR CIRCULATION

22-09-10-01-07
9407200003

RESPONSIVENESS SUMMARY

TO PUBLIC COMMENTS

June 22, 1994

Comment 1a: Page 7-1, 1st Paragraph

The purpose of this document is stated here. "This Action Memorandum serves as the primary decision document that substantiates the need for a removal action..." Relegate to INTRODUCTION. Then state the goal of the remedial action (to protect groundwater). State the importance of this document. Is this the only document that is needed before clean-up begins?

Response: DOE believes the "Introduction" sufficiently states the purpose of the document and does not need to be modified. Since part of the objective of this document is to develop the remedial action goals, stating the remedial action goal in the introduction would be premature. DOE believes that Section 3.5 clearly states the goal of the remedial action. Rather than republish this document, we will ensure objectives are clearly stated in the beginning of the future documents.

Comment 1b: Create a Summary Section at the Beginning of the Document

Include a succinct review of the existing environmental data that was collected for the storage shed. I had to read the document several times before I realized that very little data exists on the extent of contamination caused by the storage shed. State what studies were completed specifically to address the storage shed contamination and what prior studies were used in understanding the shed contamination issue. Summarize strengths and weakness of the current knowledge on the shed related contamination. What needs to be done to complete the data gaps? In the summary briefly review the elected remediation alternative and state what the Preliminary Remediation Goals are (by medium) for each chemical currently detected. State what is the next step.

Response: You are correct in the understanding of the facts, there is little information. The DOE program, Streamlined Approach to Environmental Remediation (SAFER) was used to initiate an interim remedial action. The SAFER program was developed following the EPA Superfund Accelerated Cleanup Model (SACM). Under these programs, data are collected during the remediation to fill data gaps and help modify the remedial design and to help develop the preliminary remedial goals.

It was clear that sufficiently high levels of Freon 113 were present to take action based on qualitative results of soil gas discussed in Section 2.3.2.

Section 2.3 clearly reviews the extent of previous investigations and the data collected. The document was not intended as a data evaluation report and therefore, a review of the data gaps was not performed. The document was intended to provide a decision document on the proper interim remedial action based on the data as it existed at the time of the document.

Data will be gathered as described in the Design Work Plan in the Reading Room to ensure the system is performing the required cleanup.

Comment 2: Table III.5

Table III.5 needs help! The calculation of noncancer toxicity information is confusing. For example, for dermal contact, is this for gas/vapor, particulate emissions, or soil/skin contact? The noncancer toxicity values for soil and vapor exposure to VOCs need to be calculated (dermal, ingestion and inhalation). Please show equations and provide RfDs. Trichloroethylene is a B2 carcinogen, thus the cancer risks need to be addressed, either qualitatively or quantitatively. I know the slope factor is not on IRIS.

Response: We apologize for any lack of clarity. The purpose was to compare the results to indicate if they are high or low. This document was not intended to be a formal report on risk assessment. The values presented in Table III.5 were developed using the existing data to provide a relative justification for the need for an interim remedial action. Since the cancer toxicity values indicate a risk based on the exposure to most of the compounds present in the soil, there was no real need to provide non cancer toxicity values. DOE believes that providing equations and RfDs would be confusing and is not necessary as the document is not a risk assessment report. The provisional slope factor for Trichloroethylene was obtained from the EPA Environmental Criteria and Assessment Office and is the value published in the EPA Region 3 Risk Based Concentration Tables. Dermal contact values are for soil/skin contact. If you would like to discuss the concentrations, feel free to call Jolene Walker at 865-4140 and we will set up a meeting.

Comment 3:

Provide references for risk-based cleanup standards (direct contact and leaching) from Michigan and Texas. The reader should be able to obtain the documents based on the citation.

Response: We regret any inconvenience the lack of complete reference caused. The Michigan criteria were obtained from the Michigan Environmental Response Act 307, Operational Memorandum 8. The guidelines for developing the criteria are defined in the Michigan Uniform Code 299, Part 7.

The Texas criteria were obtained from the Texas Natural Resource Conservation Code, Subchapter 5, parts 335.551 to 335.599.

Comment 4:

Provide clean-up levels of soil used by other states (page 3-17, 2nd sentence. What has been used in Ohio?

Response: Table III.6 provides risk based cleanup standards for two states. Using the standards from these two states provides the reader a representation of the range of standards found in the other states. It was never intended to use these standards as the preliminary remedial goals. The intention was to use

these standards to decide if remediation is warranted. Ohio does not have an established cleanup standard and standards are developed on a site-specific basis.

We did not intend to do an exhaustive search of what cleanup levels have been used elsewhere, but rather to give some idea what is an acceptable range. Certainly more work spent on researching would find both higher and lower cleanup levels.

Under the SAFER program, preliminary remedial goals are developed during the remediation process. These preliminary remedial goals are currently being developed. However, prior to remediation the Texas and Michigan cleanup standards were compared to the theoretical soil values to decide if remediation is warranted. One of the advantages of the chosen method is that it has the flexibility to operate in a wide range and can achieve lower levels by operating longer or adding more vents.

Comment 5:

Use Risk Assessment Guidance for Superfund Volume 1 - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remedial Goals) rather than RCRA guidance for deriving clean-up levels.

Response: Since this document became part of the public record, remediation of the soil has started. Preliminary Remedial Goals are being developed using several methods including the one suggested in this comment. DOE is evaluating a conservative approach that uses the median value of the different concentrations. The memorandum describing the development of the preliminary remedial goals is still being prepared at this time.

Comment 6:

DO NOT use the residential future scenario (child) for establishing clean-up levels. This just contributes to undermining the creditability of the risk assessment process.

Response: DOE agrees that using a residential future scenario (child) contributes to undermining of the risk assessment process. The use of this scenario in the document did not contribute to the final preliminary remedial goals. This scenario was only used to provide a frame work for an interim remedial action by being unrealistically conservative, however, both regulatory agencies request similar scenarios that includes this one. We can in the future propose more realistic scenarios.

Comment 7:

It seems that more information is needed before the clean-up is initiated? Please address this issue. Is more data going to be collected before clean-up begins?

Response: No data will be gathered prior to implementing. The DOE SAFER program was used to initiate an interim remedial action. This program was developed following the EPA SACM program. Under the SAFER program, data are collected during the remediation to modify remedial design. This approach saves considerable time and money achieving the cleanup. DOE has proceeded with a remediation using soil vapor extraction. We believe remediation will be completed at a cost that is less than the cost of an investigation to collect the additional data suggested.

If your comment is to suggest that this area does not require any clean up, please inform us as it may allow us to reduce the time required to operate.

Preliminary results indicate there are higher levels of contamination than predicted from the soil gas values. These preliminary results appear to justify the remediation.

Comment 8:

Site specific TCLP testing for VOCs may be useful for developing more realistic clean-up goals. Have theoretical calculations on leachability been conducted?

Response: While TCLP testing does not seem appropriate, comparing concentrations to the allowable TCLP criteria is valuable. Theoretically, leachability values have been calculated and a memorandum is being prepared on the development of preliminary remedial goals that uses these values as one method to develop the preliminary remedial goals.

ENVIRONMENTAL RESTORATION PROGRAM

B BUILDING SOLVENT STORAGE SHED REMOVAL ACTION MEMORANDUM

MOUND PLANT
MIAMISBURG, OHIO

FEBRUARY 25, 1994

FINAL

DEPARTMENT OF ENERGY
ALBUQUERQUE FIELD OFFICE

ENVIRONMENTAL RESTORATION PROGRAM
EG&G MOUND APPLIED TECHNOLOGIES

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LIST OF ACRONYMS
MOUND PLANT, ER PROGRAM

ARAR	Applicable or relevant and appropriate requirements
BDAT	Best demonstrated technology
BNA	Base-neutral acid
CAA	Clean Air Act
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CR	Criteria Ranking Value
CWA	Clean Water Act
DAO	Dayton Area Office
DCE	Dichloroethene
DOE	U.S. Department of Energy
DOE AL	U.S. Department of Energy, Albuquerque Operations Office
DOT	U.S. Department of Transportation
EE/CA	Engineering Evaluation/Cost Analysis
EG&G	EG&G Mound Applied Technologies
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration (Program)
ERA	Expedited response action
FIDLER	Field instrument for the detection of low-energy radiation
FS	Feasibility Study
HSWA	Hazardous and Solid Waste Amendments of 1984
ICF KE	ICF Kaiser Engineers, Inc.
IRA	Interim Remedial Action
LDL	Lower detection limit
LDR	Land Disposal Restrictions
MCL	Maximum contaminant level
MCLG	Maximum contaminant level goal
NA	Not applicable
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
OEPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
OU	Operable unit

PCBs	Polychlorinated biphenyl
PCE	Perchloroethylene or tetrachloroethene
POTW	Publicly owned treatment works
QA/QC	Quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
RPM	Remedial project manager
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SVOC	Semi-volatile organic compound
TBC	To be considered
TCA	Trichloroethane
TCE	Trichloroethane
TPH	Total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSD	Treatment, storage, or disposal facility
VOC	Volatile organic compound
WF	Weighting Factor
WV	Weighted Criteria Value

1. INTRODUCTION

This Action Memorandum presents and evaluates potential interim remedial action (IRA) alternatives for the B Building solvent storage shed area. The purpose of the Action Memorandum is to select the most cost-effective removal action that satisfies the IRA objectives, as developed in Section 3 of this document.

1.1. REGULATORY BASIS OF INTERIM REMEDIAL ACTION

Section VII.D of the 1990 Federal Facilities Agreement (FFA) indicates that nothing in the FFA shall alter the Department of Energy's (DOE) authority with respect to removal actions conducted pursuant to Section 104 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA). Section 104.(a)(1) of CERCLA as amended grants the following response authorities:

> Whenever (A) any hazardous substances is released or there is a substantial threat of such a release into the environment, or (B) there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare, the President is authorized to act, consistent with the national contingency plan, to remove or arrange for the removal of, and provide for remedial action relating to such hazardous substance, pollutant, or contaminant at any time (including its removal from any contaminated natural resource), or take any other response measure consistent with the national contingency plan which the President deems necessary to protect the public health or welfare or the environment.

Executive Order 12580 delegates to the DOE authority to conduct emergency and non-emergency removal actions with respect to releases or threatened releases from DOE facilities; thus, wherever CERCLA refers to the President's authority, that authority has been delegated to the Secretary of Energy for DOE facilities.

1.1.1. Removal Actions and Interim Remedial Actions

Section 104.(a)(2) of CERCLA, as amended, states that "any removal action undertaken by the President under this subsection (or by any other person referred to in section 122) should, to the extent the President deems practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or threatened release concerned."

In the FFA, DOE agreed to conduct IRAs. Section VI.J of the FFA defines IRAs as follows:

> "Interim Remedial Actions" or "IRA" shall mean all discrete response actions implemented prior to a final remedial action which are consistent with the final remedial action and which are taken to prevent or minimize the release of hazardous substance, pollutants or contaminants so that they do not migrate or endanger public health, welfare or the environment.

Both removal actions and IRAs are response actions implemented prior to a final remedial action, and both must be consistent with the final remedial action. Accordingly, removal actions undertaken by DOE under the authority granted by Section 1049(a)(1) of CERCLA, as amended, and Executive Order 12580; and performed according to 40 CFR 300.415, shall be referred to as IRAs throughout the remainder of this report.

1.2. REGULATORY BASIS OF IRA AT B BUILDING SOLVENT STORAGE SHED AREA

Subpart E of the National Contingency Plan (NCP) establishes methods and criteria for determining the appropriate extent of response authorized by CERCLA when there is a release of a hazardous substance into the environment or there is a release into the environment of any pollutant or contaminant that may present an imminent and substantial danger to the public health or welfare (40 CFR 300.400(a)). Limitations on appropriate responses are established by 40 CFR 300.400(b):

> Unless the lead agency determines that a release constitutes a public health or environmental emergency and no other person with the authority and capability to respond will do so in a timely manner, a removal or remedial action under Section 10 of CERCLA shall not be undertaken in response to a release:
>
> (1) Of a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found;
>
> (2) From products that are part of the structure, and result in exposure within, residential buildings or business or community structures; or
>
> (3) Into public or private drinking water supplies due to deterioration of the system through ordinary use.

On April 20, 1993, ICF Kaiser Engineers (ICF KE) submitted an IRA Technical Memorandum to EG&G Mound Applied Technologies (EG&G) and the Dayton Area Office (DAO) of DOE. The purpose of the technical memorandum was to:

- Identify and document justification for implementation of an IRA at the B Building solvent storage shed area;

- Present the necessary steps required to properly plan and implement the IRA and provide an initial estimate of associated costs; and,

- Provide EG&G and DOE sufficient information pertaining to estimated costs and schedule for funding purposes.

Based on existing site information pertaining to past waste management practices and previous investigations, the technical memorandum showed that a release of a hazardous substance had occurred in the B Building solvent storage shed area, and that the CERCLA response limitations outlined above did not apply, therefore, DOE was justified in proceeding with a removal site evaluation. The technical memorandum was similar in content and served the function of an EE/CA approval memorandum and served as the Removal Site Evaluation under 40 CFR 300.410.

The technical memorandum evaluated the following factors that should be considered when determining the appropriateness of a removal action as outlined by 40 CFR 300.415(b)(2):

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems.

(iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release.

(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface which may migrate.

(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

(vi) Threat of fire or explosion.

(vii) The availability of other appropriate federal or state response mechanisms to respond to the release.

(viii) Other situations or factors that may pose threats to public health or welfare or the environment.

The presence of soil containing elevated volatile organic compound concentrations in the area of the B Building solvent storage shed may, at a minimum, satisfy factors i and iv; thus, implementation of a removal action or IRA is appropriate. The overall objective of the IRA is to mitigate the migration of organic chemicals into the groundwater. As indicated in 40 CFR 300.415(b)(4), whenever a planning period of at least six months exists before on-site activities must be initiated, and the lead agency determines, based on a site evaluation, that a removal action is appropriate, the lead agency shall conduct an EE/CA.

At Mound facility, DOE is the lead agency, and DAO is its authorized representative. ICF KE was authorized by DAO to prepare the B Building Solvent Storage Shed EE/CA Report on August 10, 1993. The Draft (Revision 1) EE/CA Report was delivered to the respective agencies on October 22, 1993. DAO's response to USEPA comments were transmitted to both USEPA and OEPA on January 7, 1994. At that time DAO informed USEPA and OEPA that the removal has had less than a six month planning period and was being continued as a Time-Critical Removal Action. The EE/CA processes ended at that time. This Action Memorandum provides a written record of the decision to select Soil Vapor Extraction as the preferred IRA alternative for the B Building solvent storage shed area.

2. SITE BACKGROUND

2.1. SITE DESCRIPTION

Mound Plant occupies 306 acres within the southern city limits of Miamisburg, Ohio (Figure 2.1). The northern boundary of Mound Plant is approximately 0.13 mile south of Mound Avenue in Miamisburg. Mound Avenue curves south, becomes Mound Road, and runs southward along the eastern boundary of the plant. Benner Road forms the southern boundary of Mound Plant, and the Conrail Railroad, formerly the Penn-Central, roughly parallels the western boundary at distances of about 50 to 200 feet (MRC 1985). 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 Operable Unit 9 (OU-9) Site Scoping Report: Volume 4 - Engineering Map Series, Final (Revision 0) (DOE 1992).

There are currently more than 100 buildings on the site, and the total floor space exceeds 925,000 square feet (MRC 1985). Most of the buildings are located on the northwest high area known as Main Hill. Usages of the buildings are described in the Mound Site Development Plan (MRC 1985).

Mound Plant uses a wide variety of chemicals and generates approximately 20,000 gallons of hazardous wastes per year, including organic solvents, waste oils, corrosives, spent plating bath solutions, explosive wastes, and laboratory wastes. Mound Plant has a system of underground piping used, or formerly used, to transmit a variety of wastewaters, including low-level alpha radiation waste, low-level beta radiation waste, sanitary sewage, and storm sewage. The past activities at Mound Plant are described in the OU-9 RI/FS Work Plan, Volumes 1 and 2, Final (DOE 1992).

2.2. B BUILDING SOLVENT STORAGE SHED AND TEMPORARY DRUM STORAGE AREA

The B Building solvent storage shed and temporary drum staging area are shown on Figure 2.2. The description of past operations in the B Building, the B Building solvent storage shed, and the B Building temporary drum staging area, are discussed in this section.

2.2.1. B Building Processing Operations

Biological studies of polonium were conducted in B Building. A general description of the scale and periods of the polonium processing program is provided in OU-9 Site Scoping Report: Volume 3 - Radiological Site Survey, Draft Final (Revision 1) (DOE 1992). Additional information on the generation, treatment, and disposal activities is provided in OU-9 Site Scoping Report: Volume 7 - Waste Management, Draft (Revision 0) (DOE 1991d).

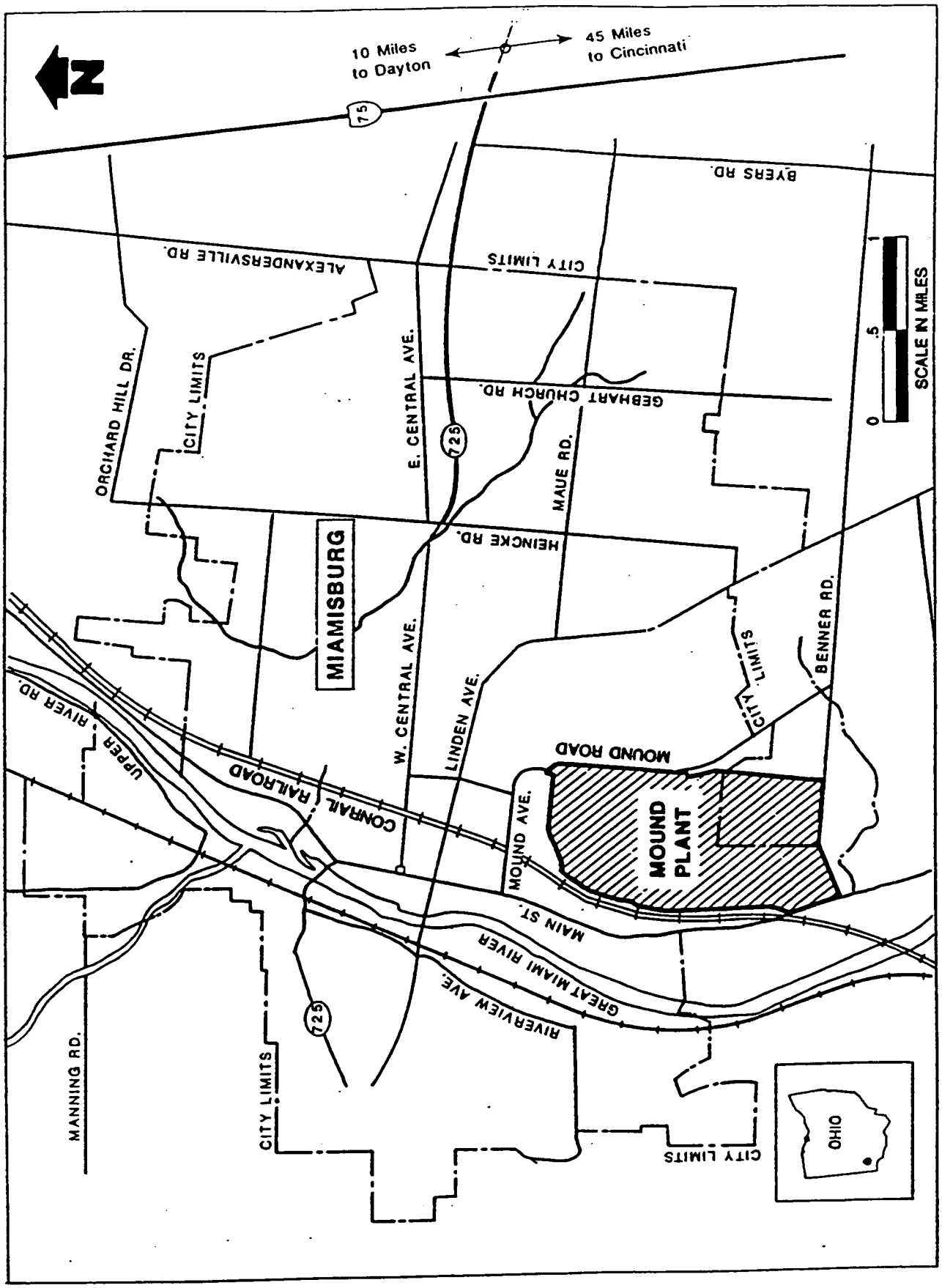


Figure 2.1. Site Location Map

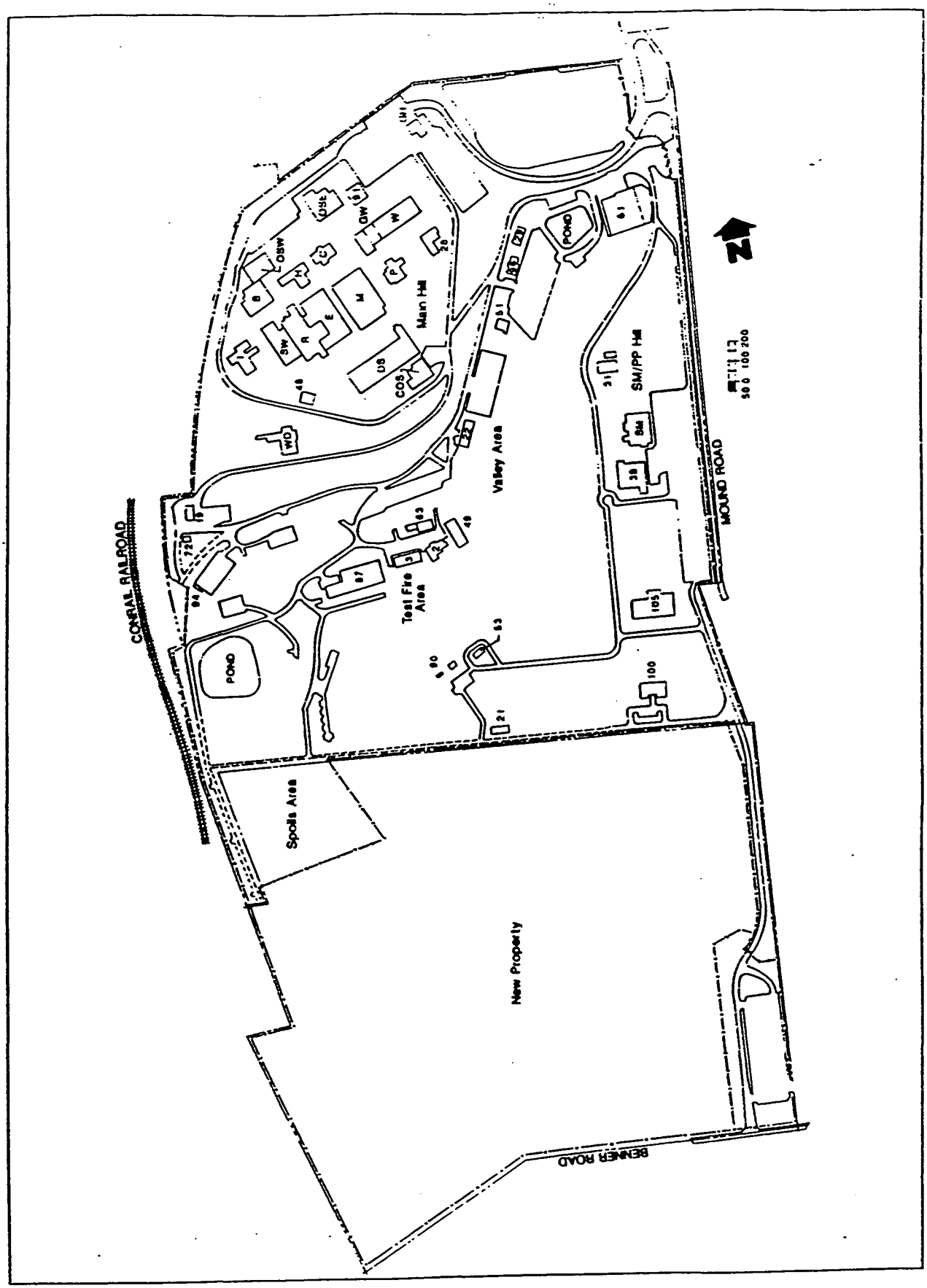


Figure 2.2. Main Hill areas and buildings at Mound Plant

2.2.2. B Building Solvent Storage Shed

The B Building solvent storage shed is a fully enclosed structure located on the east side of B Building. The shed is approximately 20 feet by 10 feet with a 12-foot ceiling. The shed is still in operation and the exact date of start-up is not known. The shed is fully enclosed, and the concrete floor is curbed and covered with a metal grate. Curb structures were installed in 1987-1988. A floor drain, formerly connected to the plant sewer system, has been sealed (RFA 1988).

The B Building solvent storage shed receives waste solvent from B Building and also contains product-grade solvents to be used in the building. Waste solvent is automatically pumped from B Building into sealed 55-gallon drums in the storage shed through above ground discharge hoses equipped with automatic shutoff devices. Before the shed was built, solvents were stored within the building, typically in 5-gallon cans. These cans were picked up and delivered manually, and the automatic system now in use was not installed until the late 1970s.

Solvents routinely stored in the shed include methyl and isopropyl alcohol, acetone, dichloromethane, and toluene. Drummed wastes are placed outside the shed only as a temporary measure during unloading and pickup. Drummed wastes are transferred weekly to the hazardous waste storage area in Building 72 near the western edge of the Mound boundary. Approximately 1,300 gallons of waste solvents were generated from the B Building solvent storage shed in 1989.

No releases were documented and no evidence of spills was observed during the 1988 site visit performed by Weston. A drain connected to the plant's storm sewer was sealed prior to 1988. Old, unused, above ground lines, running to and from the storage shed were dismantled during the 1970s. Three of the unused lines contained chemicals, one contained alcohol, and two contained trichloroethene.

During a site visit performed by Weston in 1990, the B Building solvent storage shed contained the following solvents: three drums of waste flammable liquid; four drums of trichlorofluoromethane; two 5-gallon drums of clean oil; two drums of ethyl alcohol; and two drums of trichloroethene. The following drums were stored outside of the solvent storage shed: one DTE heavy oil medium; one drum of empty flammable NOS; three drums of flammable NOS; one drum of flammable NOS (D001, F002, F003); one drum of hydraulic oil; and one drum of sunthene 410 (Sunoco). A total of 13 drums were stored inside the B Building solvent storage shed, and eight drums were stored outside.

2.2.3. B Building Temporary Drum Storage Area

The B Building temporary drum storage area is an outdoor unit located adjacent to the B Building solvent storage shed. Storage began in this area in 1988. It was intended for temporary storage and is no longer used. The area is approximately 15 feet on each side and had contained approximately twenty-six 55-gallon drums in 1990 during a site visit. The drums stored in this unit contain a variety of waste solvents, waste oils, and trash from E and B Buildings. The area is an open concrete pad without curbing and all drums in the area are close topped (RFA 1988).

2.3. PREVIOUS INVESTIGATIONS NEAR THE B BUILDING SOLVENT STORAGE SHED

2.3.1. Radiological Survey: 1982-85

The Mound Site Survey Project collected and analyzed soil samples from 1982 to 1985. This project was initiated by Mound Plant to conduct a systematic radiological survey of exposed land areas. The objectives of the survey were to:

- Further characterize the 19 sites previously identified as having known levels of contamination.
- Identify and characterize by quantities and types of radionuclides any additional major sites having levels of contamination exceeding 10 pCi/g (for plutonium-238) in soil.
- Estimate the volume of contaminated soil.
- Estimate the cost of stabilizing or removing the contaminated soil.

Although contaminated areas at Mound Plant had been previously identified during facility activities and by historical records, no comprehensive, quantitative studies had been performed. During the Site Survey Project, this was accomplished by systematically surveying undeveloped areas at Mound Plant using gamma measurements and soil sampling. More than 16,000 individual gamma measurements were recorded and 2,000 soil samples were collected and analyzed. The locations of the surface samples were estimated by Mound Plant from field notes and have an accuracy of ± 25 feet. The core locations were surveyed by a licensed surveyor.

The Site Survey Project began this comprehensive investigation by screening for radiological activity using a field instrument for the detection of low-energy radiation (FIDLER) in order to identify areas of suspected contamination. Where areas of elevated gamma activity were identified, additional characterization was then performed using one or more of the following activities: surface soil sampling; core sampling; liquid

scintillation counting of soil samples for tritium; gamma spectroscopy; and *in situ* gamma spectroscopy. No sampling or additional screening was performed in the areas where gamma activities were not greater than instrument background levels determined by field calibration.

All of the soil samples were pulverized and screened for plutonium-238 using a FIDLER to identify samples with plutonium-238 activity greater than 25 pCi/g and thorium activity greater than 2 pCi/g. All of the soil samples were then radiochemically analyzed for plutonium-238, and samples with greater than 2 pCi/g thorium by FIDLER screening were radiochemically analyzed for thorium.

Gamma spectroscopy was performed on select samples for several reasons:

- To quantify contaminants, such as cesium-137 or cobalt-60, in areas where additional gamma-emitting radionuclides were suspected.
- To characterize samples for which screening indicated gamma activity, but for which no excess plutonium or thorium was found during radiochemical analysis.
- To verify that no polonium-210 remained at any of the areas at Mound Plant.

Liquid scintillation was performed on approximately five percent of the soil samples collected to determine tritium content.

The results of the survey included discussions of background levels of radionuclides, potential cleanup levels, and the relative proportion of soils at the plant contaminated with plutonium-238, thorium (all isotopes), cobalt-60, actinium-227, or cesium-137. The normal background levels of plutonium-238 in this area of Ohio, primarily resulting from weapons testing and the burn-up of the SNAP-9A heat source, were approximately 0.0002 pCi/g of soil. Most surface soil on the Mound Plant site has a baseline level of approximately 0.01 pCi/g as a consequence of Mound Plant's 30 years of operations involving this isotope.

The normal background levels of thorium (all isotopes) in the area (recognizing that this level can change significantly with geographic location) were approximately 2 pCi/g of soil. Five plant areas with soil samples exceeding this value were identified. Soil samples collected near the B Building solvent storage shed area did not exceed background levels.

The survey concluded that most of the soil at Mound Plant held such low levels of radioactive contamination that minimal remedial action was expected to be needed.

- Levels of plutonium-238 at or above baseline for Mound Plant soils (0.01 pCi/g) were detected in most of the 1,077 surface soil samples analyzed, except for a few isolated locations. However, these levels were very low, as demonstrated by the fact that 92 percent of the 1,077 samples analyzed contained less than 10 pCi/g of plutonium-238.

- Levels of thorium above background (approximately 2 pCi/g) were detected in only 255 (13 percent) of the soil samples analyzed. Thus, the extent of thorium contamination was limited, and, except for isolated locations, the levels were low, similar to the findings for plutonium-238.

Surface soil samples were taken at Mound Plant as part of the Site Survey Project during 1983 and 1984. Five surface samples were taken in each of the 300 ft by 380 ft grid blocks. The number of samples was chosen arbitrarily based on cost considerations, and the locations were chosen arbitrarily by the field team. Approximately 1,100 surface soil samples were taken: 1,000 on the original Mound Plant property; and 100 on the new (south) property. Fewer samples were taken on the new property, which was purchased in 1981, because the gamma survey did not show significantly elevated levels in this area, and Mound Plant has not developed the area.

The positions of the surface sample locations were estimated by the field team relative to the established grid system. Because the locations were not surveyed, the accuracy of the positions shown in Figure 2.3 has been estimated by Mound Plant to be ± 25 feet. No samples were taken inside buildings or at paved areas, resulting in sampling within a limited space in many of the grid blocks. Surface locations shown in Figure 2.3 inside buildings or on roads are incorrect and probably result from errors by the field team in estimating positions and the assignment of digital coordinates.

The surface samples were collected using a sample collection tool capable of extracting a soil plug with a depth of two inches and a diameter of 3.5 inches. Two plugs were collected at each location, resulting in a total surface sample depth of approximately 4 inches. A hammer was used to facilitate driving the sample collection tool when necessary. The sample was then placed in an EPA sample dish with a four-inch diameter and a depth of 2.5 inches. Large rocks, twigs, and other non-earth matter were removed. Each dish was at least 80 percent full in order to obtain sufficient soil for analysis. The sampling tool was screened with an alpha scintillometer (zinc sulfide) detector after use, and excess soil was brushed out; however, no standard decontamination was performed.

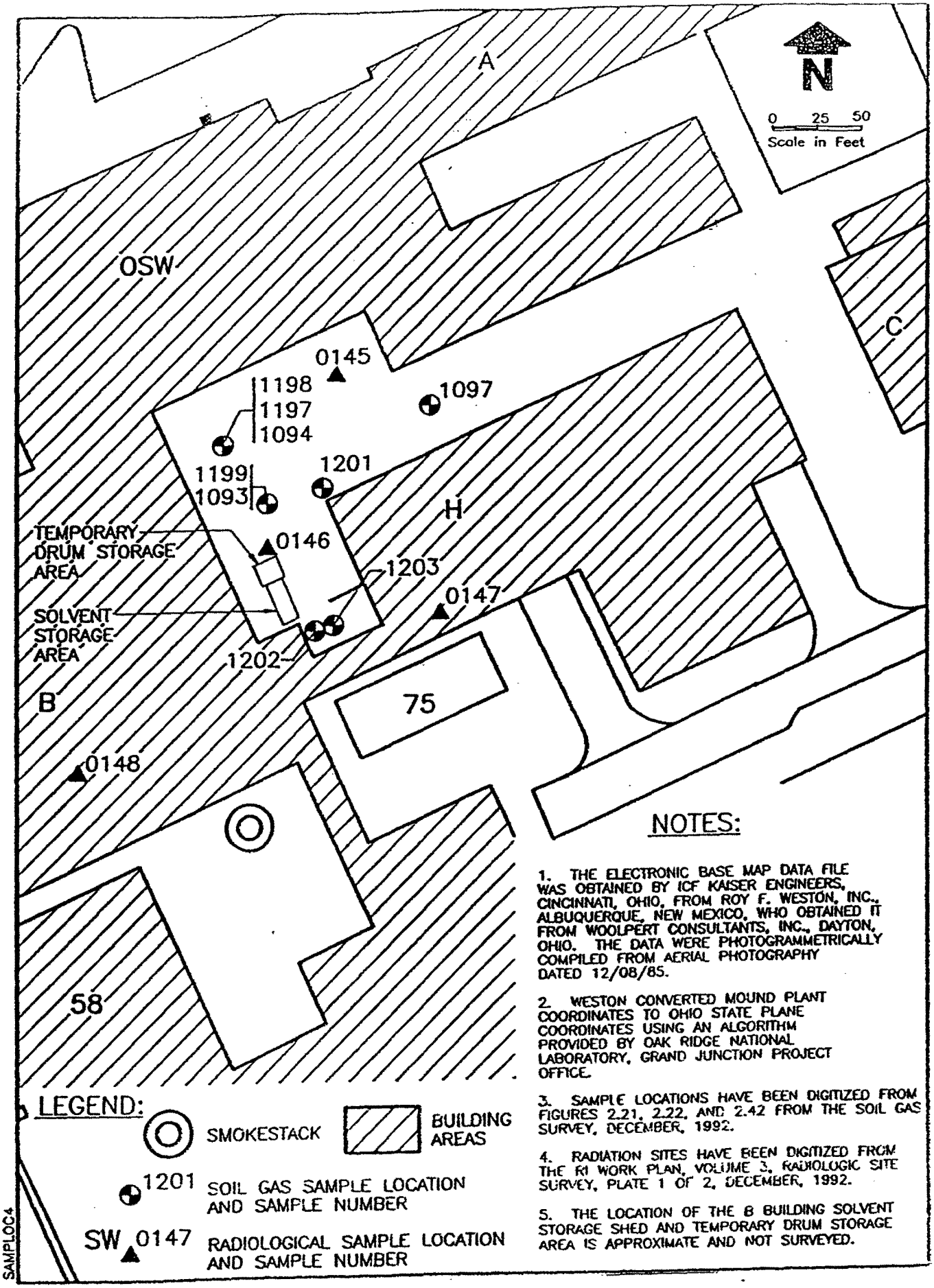


Figure 2.3. Radiological and Soil Gas Sample Locations near the B Building solvent storage shed

The results of the radiological samples collected near the B Building solvent storage shed are presented below:

SAMPLE LOCATION	SAMPLE DATE	PLUTONIUM-238	THORIUM
S0145	08-84	0.02 pCi/g	< 2 pCi/g
S0146	08-84	0.64 pCi/g	< 2 pCi/g
S0147	10-83	0.02 pCi/g	< 2 pCi/g
S0148	10-83	0.20 pCi/g	< 2 pCi/g

These results are all well below the current site remediation standards of 100 pCi/g for plutonium-238 and 5 pCi/g for thorium; thus, it does not appear that there is a radiological contamination problem in the local vicinity of the B Building solvent storage shed.

2.3.2. Soil-Gas Survey: 1992

As part of the soil gas survey, more than 200 investigative samples were collected and analyzed. All were soil gas samples except for five groundwater samples. Groundwater samples were collected at locations where water entered the soil gas sampling probe. Of the sample locations, 188 were sampled at the planned locations described in the work plan, and 45 were sampled at discretionary locations during the final week of the field effort. Most of the soil gas investigation was performed within OU-2 (Main Hill Seeps) and OU-5 (Radioactively Contaminated Soils, recently renamed South Property).

The soil gas investigation involved the sampling of soil gas at Mound Plant from four primary areas: the Main Hill, Area 7, Building 51, and Area J. The sample locations on the Main Hill were chosen based on accessibility from roadways, locations of underground utilities, proximity of buildings where solvents have been or are currently being used, and a systematic sampling approach along the roadway. Contingency locations were also sampled from areas within the Main Parking Lot and southwest of the Main Hill. The soil gas data were collected from August 27 to September 29, 1992.

A previous soil gas sampling investigation was performed in 1987 primarily as a scoping effort to help define the locations of new monitoring wells. Soil gas samples from 58 locations were collected southwest of the Main Hill (DOE, 1989c, Remedial Investigation Plan Task AL-MD-1). The main objective was to provide sufficient data to enhance the planning of site characterization activities. Specifically, the soil gas survey was performed to identify areas of the site containing VOC contamination within the subsurface soils. An assessment of the apparent lateral and vertical contamination, and the potential release site responsible for the contamination can then be made.

The soil gas samples collected from the Main Hill, Area 7, Building 51, and Area J at Mound Plant were initially collected for the analysis of six target compounds, including trichloroethene, trans- and cis-1,2-dichloroethene, 1,1,1-trichloroethane, toluene, and trichlorofluoromethane (Freon 11). These compounds were targeted based on the results of previous contaminant characterization efforts, including the analysis of groundwater seeps and the study of underground storage tanks at the site. All soil vapor and groundwater samples were analyzed in an on-site mobile laboratory for VOCs using U.S. EPA Method 8021. Peaks on the gas chromatograph curves showed the presence of additional solvent-type VOCs. Following the completion of the first 10-day field shift, the target compound list was expanded to include 1,1,2-trichloro-1,2,2-fluoroethane (Freon 113) and tetrachloroethene which were the most prevalent of the additional VOCs detected based on interpretations made by the field laboratory chemist.

All soil gas was performed by driving five-foot sections of drill rod and steel points into the subsurface and drawing soil vapor to a gas collection system mounted on a soil gas collection rig. A vacuum pump draws soil vapors through the sampling apparatus at a flow rate of 100 ml/min. After at least three purge volumes have been vacuumed, a sample cartridge containing a three-layer carbon sorption tube is attached and used to collect the soil gas sample.

During this investigation, most soil gas probes were installed using a truck-mounted hydraulic hammer. A few locations required manual hammering due to rig access difficulty; however, all sample collection activities were consistent and utilized the truck-mounted soil gas collection rig. Soil gas sampling depths varied according either to planned objectives or to probe penetration refusal which was frequently caused by shallow bedrock or the presence of buried rock/debris.

All sampling equipment was decontaminated between locations using the procedures described in the work plan. Following the collection of each sample, the probes were pulled from the ground and the open hole backfilled with bentonite pellets.

Quality control samples were collected and analyzed throughout the field effort to monitor VOC interference, check data accuracy and instrument calibrations, and evaluate purging efficiencies. Prior to each day's soil gas sampling, field blanks of the entire sampling apparatus were taken and analyzed to check background contamination in the sampling system and cartridges. Duplicate soil gas samples were collected from each sampling location. Duplicate analyses were performed on at least 10% of the samples collected. For trip blanks, an unused sample cartridge was transported into the field with the sampling equipment. The trip blank cartridge was handled in the same manner as a sample, but a sample was not collected through this cartridge. The trip blank was returned to the laboratory with the other samples and analyzed. For ambient blanks, a randomly selected sampling cartridge was analyzed at the first daily location to detail interference from cartridges or the analytical system.

The results of the soil gas samples collected near the B Building solvent storage shed are presented below. TCE concentrations are shown on Figure 2.4. Soil gas sample locations are indicated on Figure 2.3.

Sample Location Number	Freon 113 (ppb)	Trans-12DCE (ppb)	Cis-12DCE (ppb)	111TCA (ppb)	TCE (ppb)	Toluene (ppb)
Proposed RCRA Subparts Action Levels for Soil[3]	—	—	—	7,000,000	60,000	20,000,000
1093-0005	131,000	247	40,800	—	34,780	53
1094-0005	83	13	485	—	978	—
1097-0002	—	—	—	—	6	8
1197-0002	—	—	—	—	23	5
1198-0006	24	13	518	33	474	5
1199-0002	10,218	—	120	—	479	—
1201-0007	4,716	13	811	—	130	48
1201-1007[1]	5,895	—	612	—	117	43
1202-0002	6,419	66	2,499	9	1,921	3
1202-1002[2]	9,301	41	1,706	—	1,737	—
1203-0002	1,475	—	334	—	45	192

NOTES:
1. Duplicate of sample 1201-0007
2. Duplicate of sample 1202-0002
3. Federal Register Vol. 55, No. 145. Friday, July 27, 1990
   40 CFR Section 264.521(a)(2)(i-iv) Appendix A.

Although it is difficult to correlate soil gas concentrations to actual concentrations of contaminants in the soil, these results generally indicate the presence of VOCs in the soils near the B Building solvent storage shed. Because soil gas can migrate significant distances, particularly in this case since a large percentage of the surface is covered by relatively impermeable buildings and roadways, the actual source of the VOCs may not be the open area near the solvent storage shed. It is possible that the source of the VOCs may be present below the B Building, and the soil gas has migrated into the sample area. Based on the historical use of the solvent storage shed, however, it is likely that the storage shed is a source of the VOCs.

2.4. MONITORING PITS AND GROUNDWATER CAPTURE SYSTEM (Interceptor Trench)

A test pit excavation program was conducted on the Main Hill to characterize the shallow subsurface hydrogeologic environment. Ten test pits were excavated using a backhoe from October 1986 to March 1987. The average depth of the pits was approximately 20 ft. Geologic mapping was performed in each pit; special care was taken to observe the relationship between bedrock lithology and zones of groundwater seepage. Findings of the test pit program are presented in a report by Terran Corporation (1987).

The longest test pit was located on the north side of the Main Hill, between the OSE Building and the guardhouse. The pit was 650 ft long by 4 ft wide by 23 ft deep. The average surface elevation over the length of the pit is 872 ft above sea level. Groundwater seeps in the trench were only located on the south face, where flow occurred at the interface between weathered limestone beds and unweathered shale beds (Terran 1987). The largest sustained flow from a discrete seep was estimated to be less than 500 milliliters (ml/minute).

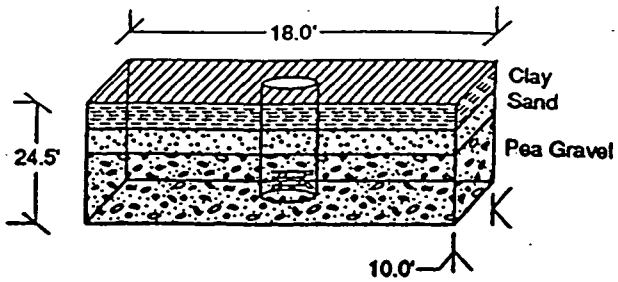
The excavated trench was completed to intercept shallow groundwater flow to the north of the Main Hill. A collector drain and flow-recording equipment were installed in the 650-ft-long trench before it was backfilled with gravel and capped with clay in the top several feet. The interceptor trench is shown on Figure 2.5 as location 0712. Periodic measurements indicate that the average flow captured by the trench is approximately 54 gallons per day over its entire 650-ft length (Terran 1987). Pumpage from the interceptor trench is monitored by Mound Plant personnel. Recent pumpage data were not available for this report. Groundwater samples collected from the trench were analyzed for tritium, uranium, and inorganic constituents. Presentation and discussion of these results can be found in Section 3.2.29.1 of the OU-2 Work Plan (Draft Final, Revision 0, September 1993).

Several of the pits excavated for geologic mapping were backfilled with pea gravel surrounding a vertical section of polyvinyl chloride pipe to serve as sumps for collection of groundwater samples. The groundwater monitoring pits are shown on Figure 2.5 as 0712, 0713, 0714, 0721, 0722, 0723, 0724, 0725, 0726 and 0727. As-built diagrams for monitoring pits 0712, 0722, 0723, and 0724 are illustrated in Figure 2.6

The soil that was contaminated with tritium below the SW building (see Section 3.2.25.3 of the OU-2 Work Plan) was suspected of being a source for tritium contamination in groundwater. Therefore, a groundwater capture system was installed on the west side of the SW building. Figure 2.7 presents areal and profile views of the groundwater capture system associated with the SW Building. Sample location

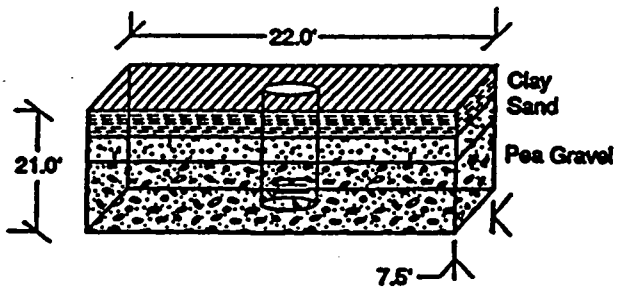
PIT 12 (0722)

Surface Area: 1,372 ft^2
Volume: 4,410 ft^3
Well Diameter: 4 inches
Screen Slot Size: 0.01
Back Fill Material: Pea Gravel



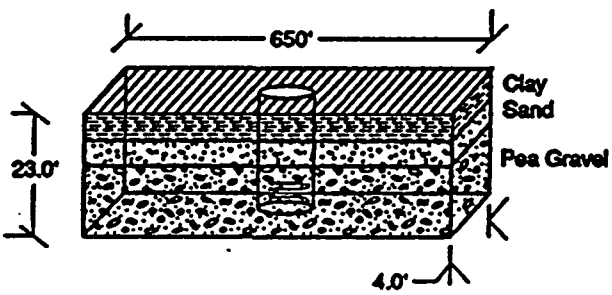
PIT 6 (0723)
(PIT 48)

Surface Area: 1,239 ft^2
Volume: 3,465 ft^3
Well Diameter: 4 inches
Screen Slot Size: 0.01
Back Fill Material: Pea Gravel



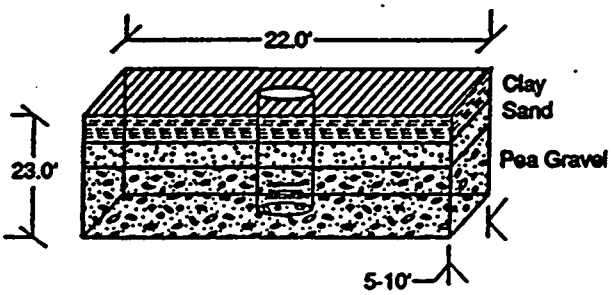
PIT 1 (0712)
(North Trench)

Surface Area: 30,084 ft^2
Volume: 59,800 ft^3
Well Diameter: 4 inches
Screen Slot Size: 0.01
Back Fill Material: Pea Gravel



PIT 7 (0724)
(PIT 45)

Surface Area: 1,242-1,472 ft^2
Volume: 2,530-5,060 ft^3
Well Diameter: 4 inches
Screen Slot Size: 0.01
Back Fill Material: Pea Gravel

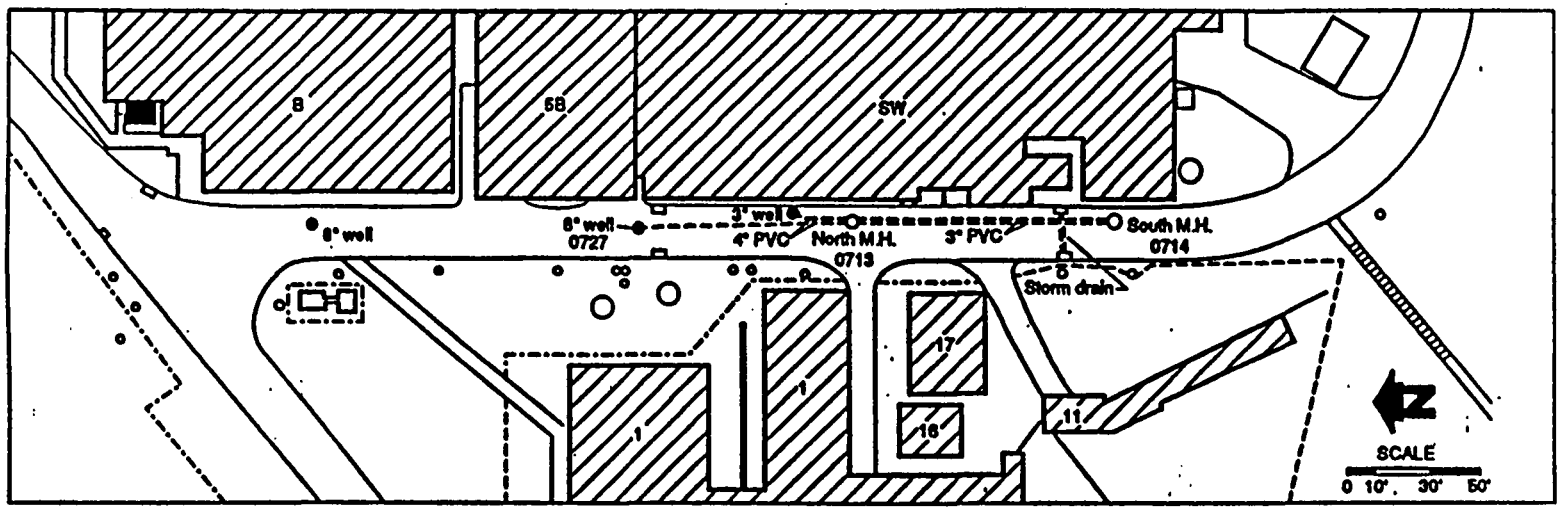


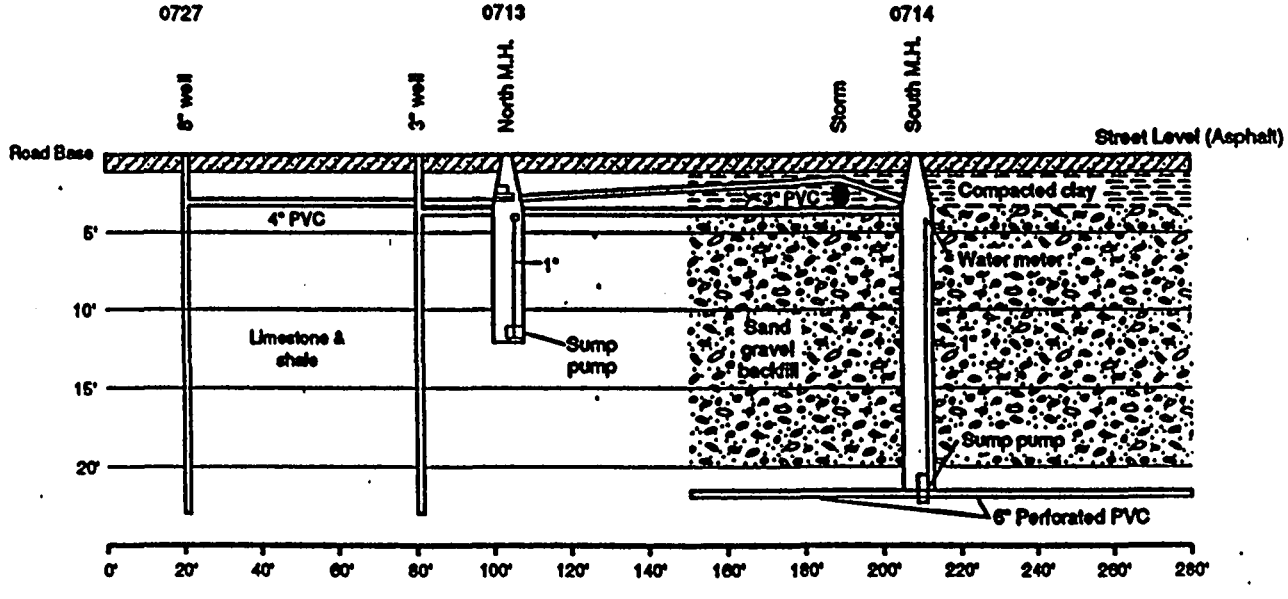
As numbered on pit logs in the report titled "Groundwater Occurence and Movement in Consolidated Bedrock at the DOE Mound Laboratory," March 19, 1987 (Terran 1987).

MND OU2/AsDiag 8-6-91

Reference: Operable Unit 2, Technical Memorandum 1: Preinvestigation Evaluation of Remedial Action Technologies (PERAT), August 1991

Figure 2.6. Schematic Diagrams of test pits on the Main Hill of Mound Plant





Reference: Operable Unit 2, Technical Memorandum 1: Preinvestigation Evaluation of Remedial Action Technologies (PERAT), August 1991

Figure 2.7. Aerial and Profile Views of the Capture System Associated with SW Building

0727 is for the 8-inch capture well, sample location 0713 is for the collector sump, and sample location 0714 is for the sump that collects groundwater from the capture trench. The sample locations are also shown on Figure 2.5. The SW Building groundwater capture system and the 0712 interceptor trench were put into operation in October 1987.

2.5. ACTIONS TO DATE

No actions have been taken to define, remove, or contain the source of volatile organic chemicals in the B Building solvent storage shed area. The construction of berms around the flooring of the shed and more efficient handling of both raw product and waste solvents have reduced the potential of additional releases.

3. DEVELOPMENT OF INTERIM REMEDIAL ACTION OBJECTIVES

Remedial action objectives are the site-specific goals to be achieved during activities at the site. Identifying IRA objectives is a critical step in the alternative selection process and in the performance of the IRA. Site-specific objectives are developed by evaluating the following:

- Statutory limits on IRAs.
- Chemical-, location-, and action-specific Applicable or Relevant and Appropriate Requirements (ARARs) identified for the site.
- Site-specific risk assessments.
- Physical constraints of the site.
- Schedule constraints.

Remedial action objectives should clearly state the site-specific goals to be achieved. Each alternative is evaluated to gauge its ability to satisfy these site-specific goals. The remedial action objectives are used throughout the remainder of the Action Memorandum to develop an estimate of the impacted area and volume of soil, to identify and screen potential alternatives, and to evaluate alternatives on their ability to satisfy the intent of the objectives.

3.1. STATUTORY LIMITS ON IRAS

Under paragraph (b)(3) of Section 300.65 of the NCP, the cost and duration of fund-financed interim remedial actions must be limited to less than $2 million and 12 months. All fund-financed interim remedial actions must satisfy these requirements. Although the IRA at the B Building solvent storage shed area is not financed by Superfund, the intent of the IRA is the same; to quickly mitigate potential risks and continued chemical migration in a cost-efficient manner. These financial and temporal constraints will be used as guidelines and screening tools for evaluating potential remedial action alternatives at the site.

There are two types of exemptions on these limitations: the emergency waiver, and the consistency waiver. The emergency waiver provides for additional funding for an emergency response action. The consistency waiver provides for additional funding to implement a removal action which exceeds the $2,000,000 limit, but would be consistent with final remedial actions. It is estimated that the B Building solvent storage shed IRA can be implemented within the stipulated budget and duration limitations, and that neither exemption will be required.

3.2. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

The NCP and Section 121 of the Superfund Amendment and Reauthorization Act (SARA) require that, upon completion, remedial actions attain federal ARARs, unless specified waivers are granted. State ARARs must also be attained under Section 121(d) of SARA if they are legally enforceable and consistently applied state-wide. IRAs should meet ARARs to the greatest extent practical. Potential ARARs and other guidance to be considered (TBCs) are identified at this time to aid in development of interim remedial action objectives and in the establishment of required cleanup levels.

ARARs and TBCs are used to 1) develop remedial action objectives and determine the appropriate extent of cleanup, 2) scope and formulate remedial action alternatives, and 3) govern implementation and operation of the selected remedial action alternative. According to SARA, ARARs may be waived under certain conditions, provided that protection of human health and the environment is still assured. These waiver conditions are as follows:

- The selected remedial action is an interim remedy or portion of a total remedy which will attain standards when complete.
- Compliance with such requirements will result in greater risk to human health and the environment than alternative options.
- Compliance with requirements is technically impractical from an engineering perspective.
- The selected remedial action will provide an equivalent standard of performance using another approach.
- The requirement is a state requirement that has been inconsistently applied.
- The alternative will not provide a balance between public health and environmental welfare and the availability of funds to respond to existing or potential threats at other sites, taking into account the relative immediacy of the threats.

ARARs are classified as either applicable or relevant and appropriate requirements. Other guidance and regulations may be classified as TBCs.

- Applicable Requirements - Applicable requirements refer to those federal and state requirements that would be legally enforceable. An example of an applicable requirement would be the Safe Drinking Water Act's Maximum Contaminant Levels (MCLs) for a site that causes contamination of a public water supply.

- Relevant and Appropriate Requirements - Relevant and appropriate requirements are federal or state standards, criteria, or guidelines that are not legally enforceable at the site, but which address problems so similar to those on-site that their application is appropriate. For example, while Resource Conservation and Recovery Act (RCRA) regulations are not applicable to closing undisturbed hazardous waste in place, the RCRA regulations for closure by capping may be deemed relevant and appropriate. During the EE/CA process, relevant and appropriate requirements are intended to have the same weight and consideration as applicable requirements.

- To Be Considered - Other federal and state guidance documents or criteria that are not generally enforceable, but are advisory, are "to be considered" during the FS process. For example, where no specific ARARs exist for a chemical or situation, or where such ARARs are not sufficient to be protective, guidance documents or advisories may be considered in determining the necessary level of cleanup for protection of public health and the environment.

ARARs and TBCs are further categorized as either chemical-specific, location-specific, or action-specific; they are discussed in the following sub-sections:

3.2.1. Chemical-Specific ARARs

Chemical-specific requirements define acceptable exposure levels for specific hazardous waste and therefore may be used as a basis for establishing preliminary remediation goals and cleanup levels for chemicals of concern in the designated media. Chemical-specific ARARs and TBCs are also used to determine treatment and disposal requirements that may occur in a remedial activity. In the event a chemical has more than one requirement, the more stringent of the requirements will govern.

Chemical-specific ARARs are generally used to derive cleanup levels; however, very few regulations have been promulgated addressing soil action levels. Most chemical-specific ARARs address allowable chemical concentrations in groundwater. Groundwater will not be directly addressed by the IRA at the B Building solvent storage shed area; however, mitigation of chemicals leaching to groundwater will be addressed. Tables III.1 and III.2 list federal and state chemical-specific ARARs, respectively, that have been identified for the site.

3.2.2. Location-Specific ARARs

Location-specific requirements set restrictions on the types of remedial activities that can be performed based on site-specific characteristics or location. Remedial actions may be restricted or precluded based on federal and state laws for hazardous waste facilities and proximity to wetlands, floodplains, or man-made features such as existing landfills, disposal areas, and local historic landmarks or buildings.

Table III.1. Potential Federal Chemical-Specific ARARs for Mound Plant

Regulatory Citation	ARARs	TBC Requirements
Clean Water Act (CWA)	Acute CWA freshwater toxicity criterion (CWS §304).	Health advisories from the EPA Office of Water.
	Chronic CWA freshwater toxicity criterion (CWA §304).	
	EPA ambient water quality criteria (WQC) for protection of human health aquatic organisms, and drinking water standards (CWS §304).	
	EPA ambient for human health (WQC); adjusted for drinking water only (CWA §304).	
	Pre-treatment standards for NPDES permitted discharges.	
Safe Drinking Water Act (SDWA)	MCLs (40 CFR §141.11 to 141.16)	SDWA proposed MCLs (draft proposed values as of July 1988) (AWWA 1988).
	MCLGs (40 CFR §141.50	SDWA proposed MCLGs (draft proposed values as of July 1988) (AWWA 1988).
Resource Conservation and Recovery Act (RCRA)	RCRA MCLs (40 CFR §264.94)	Draft RCRA corrective action proposed media protection standards for carcinogens in soil, water, and air (draft proposed values as of April 1988 in 40 CFR §264, Subpart S) (Aspen Publishers 1988).
	RCRA land disposal restrictions and treatment standards (40 CFR §268).	
	RCRA toxic characteristic leaching procedure (TCLP) for defining hazardous waste (40 CFR §261 Appendix ii).	
	RCRA Solid Waste (40 CFR §240-157); sets standards applicable to solid waste treatment, storage, and disposal.	
Clean Air Act (CAA)	National primary and secondary ambient air quality standards (40 CFR §50).	
	National emission standards for hazardous air pollutants (40 CFR §50).	
	National emission standards for hazardous air pollutants (40 CFR §61, Subparts H and Q).	

Table III.1. (Continued)

Regulatory Citation	ARARs	TBC Requirements
Environmental Radiation Protection Standards	Environmental standards for radiation doses received by members of the public as a result of the management and storage of spent nuclear fuel, high-level, or transuranic wastes at a DOE facility (40 CFR §191, Subpart A). Environmental standards for disposal of radioactive materials released to the accessible environment as a result of the disposal of spent nuclear, high-level, or transuranic wastes (40 CFR §191, Subpart B).	
Toxic Substances Control Act (TSCA)	Polychlorinated biphenyls (PCBs cleanup levels (40 CFR §761).[1]	TSCA chemical advisories and health data. Also, Agency for Toxic Substances and Disease Registry toxicological profiles.
Nuclear Regulatory Commission (NRC)	Concentration limits for radioactive material in water above natural background on-plant and off-plant (10 CFR §20).	NRC Branch Technical Position paper on the disposal or on-plant storage of thorium or uranium wastes from past operations (Federal Register, Volume 46, No. 205, 10/23/81).
	Concentration limits for radioactive material in air above natural background on-plant and off-plant (10 CFR §20).	
	NRC licensing requirements for land disposal of radioactive waste (10 CFR §61).	
DOE		Concentration limits for radioactive material in water above natural background on-plant and off-plant (DOE Order 5400.5 (DOE 1990a).
		Concentration limits for radioactive material in air above natural background on-plant and off-plant (DOE Order 5400.4 (DOE 1990a).
		Residual radioactivity guidelines (DOE guidance) (Gilbert et al. 1985).
		Hazardous and radioactive mixed waste programs at DOE facilities (DOE Order 5400.3) (DOE 1989a).

Table III.1. (Continued)

Regulatory Citation	ARARs	TBC Requirements
Occupational Safety and Health Administration (OSHA)	Permissible exposure limits (PEL) and short-term exposure limits (STEL) for workers involved in hazardous waste operations.	
	General industry standards (29 CFR §1910).	
Uranium Mill Trailings Radiation Control Act (UMTRCA)		Applicable to cleanup of radioactively contaminated land for unrestricted use (40 CFR §192).
Federal criteria, advisories, and procedures		Health Effects Assessments (HEAs) and Proposed HEAs.
		RFD - "Verified Reference Doses of USEPA" (EPA 1986a).
		Carcinogen Potency Factors (CPFs) - Table 11, "Health Assessment Document for Tetrachloroethylene (Perchloroethylene)," (EPA 1985a)
		"Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites" (EPA 1988e)
		Superfund risk assessment guidance (EPA 1986b, 1989).
		Radiation Protection Guidance on Dose Limits (EPA 1977).
		Guidance on Remedial Actions for Superfund Sites with PCB Contamination (EPA 1990b).

Notes:

1 Regulation, guidance, or criteria not likely to effect development, design, or implementation of IRA alternatives identified for this removal.

Table III.2. Potential State Chemical-Specific ARARs for Mound Plant

Regulatory Citation	ARARs	TBC Requirements
Ohio Hazardous Waste Management Regulations	Identification and listing of hazardous waste (Ohio Administrative code, Title 3745, 3745-51-01 to -07, -10, -11, -20 to -24, -30 to -33).	
	MCLs (Ohio Administrative Code, Title 2745, 3745-59-94).	
	Drinking water rules; establishes MCLs for gross alpha, beta, radium-226 and radium-228 (Ohio Administrative Code 3745-81).	
	Establishes requirements for wastewater treatment facilities (Ohio Administrative Code 3745-31).[1]	
Ohio General Radiation Protection Standards	Maximum permissible concentrations in air and water. Also includes naturally occurring radioactive materials (NORM). [Rule #3701-38-13, Section D].	
Ohio Rules and Regulations for Public	Established standards for public water systems; maximum contaminant levels, sampling and analytical requirements (Ohio Administrative Code, Title 3745, 3745-81).	
Ohio Water Quality Standards	Establishes general water quality standards for surface waters [Ohio Administrative Code 3745-1-32(c)(9)].	
Ohio General Provisions on Air Pollution Control	General standards for air emissions, contaminants, and pollution (Ohio Administrative Code, Title 3745, 3745-15-01 to-09).	
	Organic material emission control requiring BAT (Ohio Administrative Code 3745-21-07).	

NOTES:

1 Regulation, guidance, or criteria not likely to effect development, design, or implementation of IRA alternatives identified for this removal.

Federal and state location-specific ARARs that were identified and evaluated for the IRA are presented in Tables III.3 and III.4, respectively. It does not appear that any of the identified ARARs will significantly affect either the selection or the conduct of an appropriate interim remedial action at the site.

3.2.3 Action-Specific ARARs

Action-specific requirements set controls or restrictions on the design, implementation, and performance of waste management actions. They are triggered by the particular types of treatment or remedial actions that are selected to accomplish the cleanup. After remedial alternatives are developed, action-specific ARARs that specify performance levels, as well as levels for discharges or residual chemicals, provide a basis for assessing the feasibility and effectiveness of the remedial actions.

As an action-specific ARAR, RCRA often has a significant impact on the selection and performance of remedial actions. RCRA defines hazardous waste and regulates its treatment, storage, and disposal. The soil gas survey performed at the site indicates that the site soils have been impacted by releases from the solvent storage shed, which is known to have contained both raw and used solvents. The contaminated soil is a listed hazardous waste based on the RCRA derived from rule. The used solvents are classified as either F001 or F002 wastes. As a F001/F002 waste, excavated soils must meet the criteria established in 40 CFR 268 (Land Disposal Restrictions) prior to disposal in a RCRA-permitted landfill. Land disposal restrictions (LDR) specify the following non-wastewater, TCLP criteria for the volatile chemicals detected in the B Building solvent storage shed area during the soil gas sampling program:

Chemical	LDR TCLP Criteria (µg/l) (ppb)
Trichloroethene	91
Toluene	330
1,1,1-Trichloroethane	410
cis-1,2-Dichloroethene	Not Specified
trans-1,2-Dichloroethene	Not Specified
Freon 113	960

LDR specifies incineration as the Best Demonstrated Available Technology (BDAT) to achieve these criteria; however, other technologies may be utilized as long as the TCLP criteria are satisfied. Unexcavated material is not subject to the LDR as soil is not considered a RCRA waste until it is removed from its original location; thus *in situ* treatment processes will not have to meet RCRA requirements. In addition, EPA recently promulgated RCRA corrective action regulations (40 CFR 264 Subpart S) for corrective action management units (CAMUs). The new rules allow replacement of hazardous wastes from corrective actions into a CAMU at the site without triggering LDR requirements. CAMU corrective action

Table III.3. Potential Federal Location-Specific ARARs for Mound Plant

Regulatory Citation	ARARs	TBC Requirements
Resource Conservation and Recovery Act (RCRA)	Fault zones [40 CFR §264.18(a)]	
	Flood plains [40 CFR §264.18(b)][1]	
	Salt dome formations, salt bed formations, underground mines or caves [40 CFR 18(c)].[1]	
Endangered Species Act	Action to conserve endangered species or threatened species and preserve their habitat (50 CFR §200, 402)[1]	
National Historic Preservation Act (NHPA)	Action to take into account effects on properties included in or eligible for the National Register of Historic Places and to minimize harm to National Historic Landmarks (7 CFR §650). Also includes archaeological resources uniform regulations.[1]	
Flood Plain Management and Wetlands Central	Executive orders 11988 (Flood Plain Management) and 11990 (Protection of Wetlands) (40 CFR §, Appendix A).[1]	
Wilderness Act	Establishes non-degradation, maximum restoration, and protection of wilderness areas as primary management principles (16 USC 1131).[1]	
Fish and Wildlife Coordination Act (16 USC 661), Fish and Wildlife Improvement Act (16 USC 742), and Fish and Wildlife conservation Act (16 USC 2901)	Habitat protection standards and addressed inputs to wetlands.	
	Regulations of activities affecting waters of the U.S. (33 CFR §320 to 329).	

NOTES:

1 Regulation, guidance, or criteria not likely to effect development, design, or implementation of IRA alternatives identified for this removal.

Table III.4. Potential State Location-Specific ARARs for Mound Plant

Regulatory Citation	ARARs	TBC Requirements
Ohio Waste Management Regulations	Seismic considerations [Ohio Administrative Code, Title 3645, 3745-54-18(a)].	
	Flood plains [Ohio Administrative Code, Title 3745, 3745-54-18(b)].[1]	
Ohio Solid Waste Regulations	Regulates solid waste landfills above sole source aquifer (Ohio Administrative code 3745-27-07).[1]	
Ohio Water Quality Standards	Provides water use designation criteria for the Great Miami River Basin (Ohio Administrative Code, Title 3745, 3745-1-21).	

NOTES:

1 Regulation, guidance, or criteria not likely to effect development, design, or implementation of IRA alternatives identified for this removal.

requirements are considered ARARs under CERCLA because the RCRA process is designed to be consistent with the current CERCLA process. Based on these ARARs, on-site treatment alternatives that return the treated soil to the excavation will not be required to meet LDR.

The applicability of action-specific ARARs is dependent upon the selected alternative. Action-specific ARARs are identified during the detailed analysis of alternatives in Section 5.

3.3. SITE-SPECIFIC RISK ASSESSMENT

A quantitative site-specific risk assessment has not yet been performed for any portion of the Mound facility. Risk assessments identify chemicals of concern and potential exposure pathways, then calculate health risks potentially associated with them. In order for an exposure to occur, a complete exposure pathway must be present. A complete exposure pathway consists of five elements. Each of these elements must be present, or the exposure pathway is considered incomplete and there is no risk associated with it. The five elements of a complete exposure pathway are:

- Source;
- Ability for chemical to leave source and enter transport mechanism;
- Transport mechanism;
- Ability for chemical to leave transport mechanism and enter receptor; and,
- Receptor.

For example, if the VOC impacted soil is the source, wind is the transport mechanism, and a human is the receptor, the residue must be small enough to become suspended and transported by the wind, and must be the right size to be inhaled and absorbed by the human to complete the inhalation exposure pathway. If all five of the required elements are present, the exposure pathway is considered complete and the magnitude of the associated risk can then be calculated.

Although a site-specific risk assessment has not been completed, the following exposure pathways may exist at the B Building solvent storage shed area:

- Inhalation of VOCs volatilized from site soils;
- Direct contact, ingestion, and/or inhalation of surface soil particulates containing VOCs;
- Migration of VOCs from surface soil in precipitation runoff; and,
- Migration of leachate containing VOCs from surface and subsurface soil to groundwater.

The results of the soil gas sample taken near the B Building solvent storage shed in 1992 are presented in Table III.5. Soil gas sample locations are shown on Figure 3.1. Preliminary calculations attempt to identify relative toxicity values for the ingestion and dermal contact exposure rates are also provided in Table III.5.

3.4. PHYSICAL AND SCHEDULE CONSTRAINTS

Physical constraints are site-specific traits that will influence the selection and implementation of an appropriate IRA. Physical constraints that must be considered when developing and screening IRA alternatives include:

- The proximity of the buildings surrounding the area.
- Underground utilities passing through the area.
- The frequency with which the area is utilized and importance of the area to operation of the facility.
- The depth to bedrock.
- The type of overburden present in the area.
- Overhead obstructions that may limit access capability for larger equipment.
- Existing cover material at the site, i.e. concrete, gravel, grass.
- Available working space for soil stockpiles and treatment system implementation.

The known physical constraints that require consideration for the B Building solvent storage shed are depth to bedrock, underground utilities, the tight proximity of adjacent buildings and the frequency and volume of pedestrian traffic. Current information presenting underground utilities and building locations is provided on Figure 3.2. Bedrock is estimated to be as shallow as 10 feet in some areas near the shed. Records of pedestrian traffic will be established during the initial phase of the removal and the operations plan will be modified accordingly.

There are currently no identified schedule constraints. If schedule constraints are identified, they will be addressed during design of the IRA.

Table III.5. Soil Gas Sample Results and Health-Based Screening Level Soil Remediation Targets

Sample Location Number	Freon 113[d] (ppb)	Trans-12DCE (ppb)	Cis-12DCE (ppb)	111TCA (ppb)	TCE (ppb)	Toluene (ppb)
Proposed RCRA Subparts Action Levels for Soil[c]	—	—	—	7,000,000	60,000	20,000,000
1093-0005	131,000	247	40,800	—	34,780	53
1094-0005	83	13	485	—	978	—
1097-0002	—	—	—	—	6	8
1197-0002	—	—	—	—	23	5
1198-0006	24	13	518	33	474	5
1199-0002	10,218	—	120	—	479	—
1201-0007	4,716	13	811	—	130	48
1201-1007[a]	5,895	—	612	—	117	43
1202-0002	6,419	66	2,499	9	1,921	3
1202-1002[b]	9,301	41	1,706	—	1,737	—
1203-0002	1,475	—	334	—	45	192
Ingestion of soil (mg/kg)	2.19×10^7 (adult) 2.35×10^6 (child)	1.46×10^4 (adult) 1.56×10^3 (child)	7.3×10^3 (adult) 7.8×10^2 (child)	6.57×10^4 (adult) 7.04×10^3 (child)	4.38×10^3 (adult) 4.70×10^2 (child)	1.46×10^5 (adult) 1.56×10^4 (child)
Dermal contact with soil (mg/kg)	8.27×10^6 (adult) 2.23×10^6 (child)	5.51×10^3 (adult) 1.49×10^3 (child)	2.76×10^3 (adult) 7.43×10^2 (child)	2.48×10^4 (adult) 6.70×10^3 (child)	1.65×10^3 (adult) 4.50×10^2 (child)	5.5×10^4 (adult) 1.49×10^4 (child)

NOTES:

a Duplicate of sample 1201-0007

b Duplicate of sample 1202-0002

c Federal Register Vol. 55, No. 145. Friday, July 27, 1990, 40 CFR Section 264.521(a)(2)(i-iv) Appendix A.

d 1,1,2-Trichloro-1,2,2-trifluoroethane.

Receptors are assumed to be residential adult and child.

Dose calculations are based on USEPA (1989) Risk Assessment Guidance for Superfund, Vol.I: Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. EPA/540/1-89-002.

Reference doses were obtained from USEPA (1994) Integrated Risk Information System [On-line] and USEPA (1993) Human Health Assessment Summary Tables. EPA 540-R-93-058.

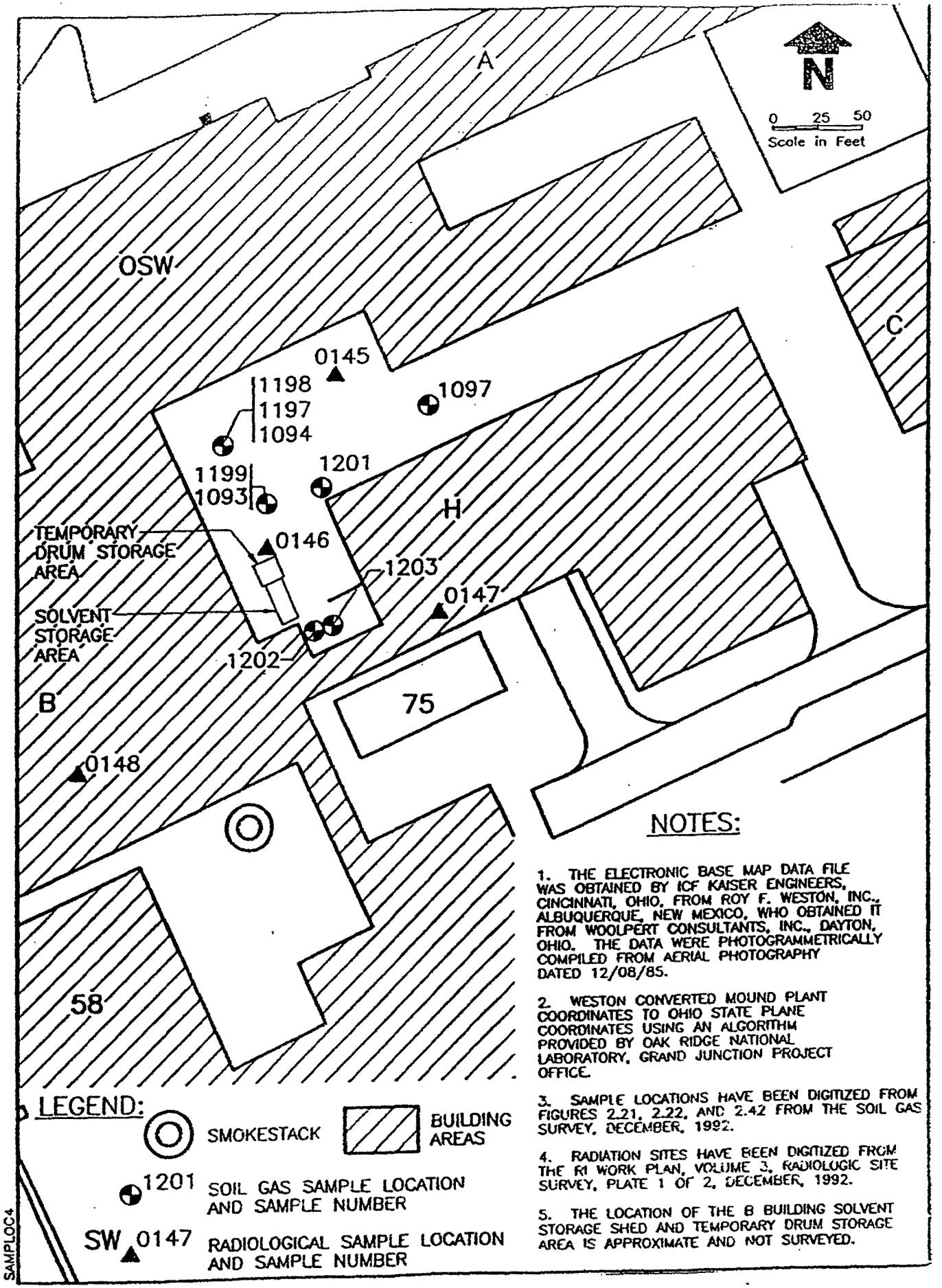


Figure 3.1. Radiological and Soil Gas Sample Locations Near the B Building Solvent Storage Shed

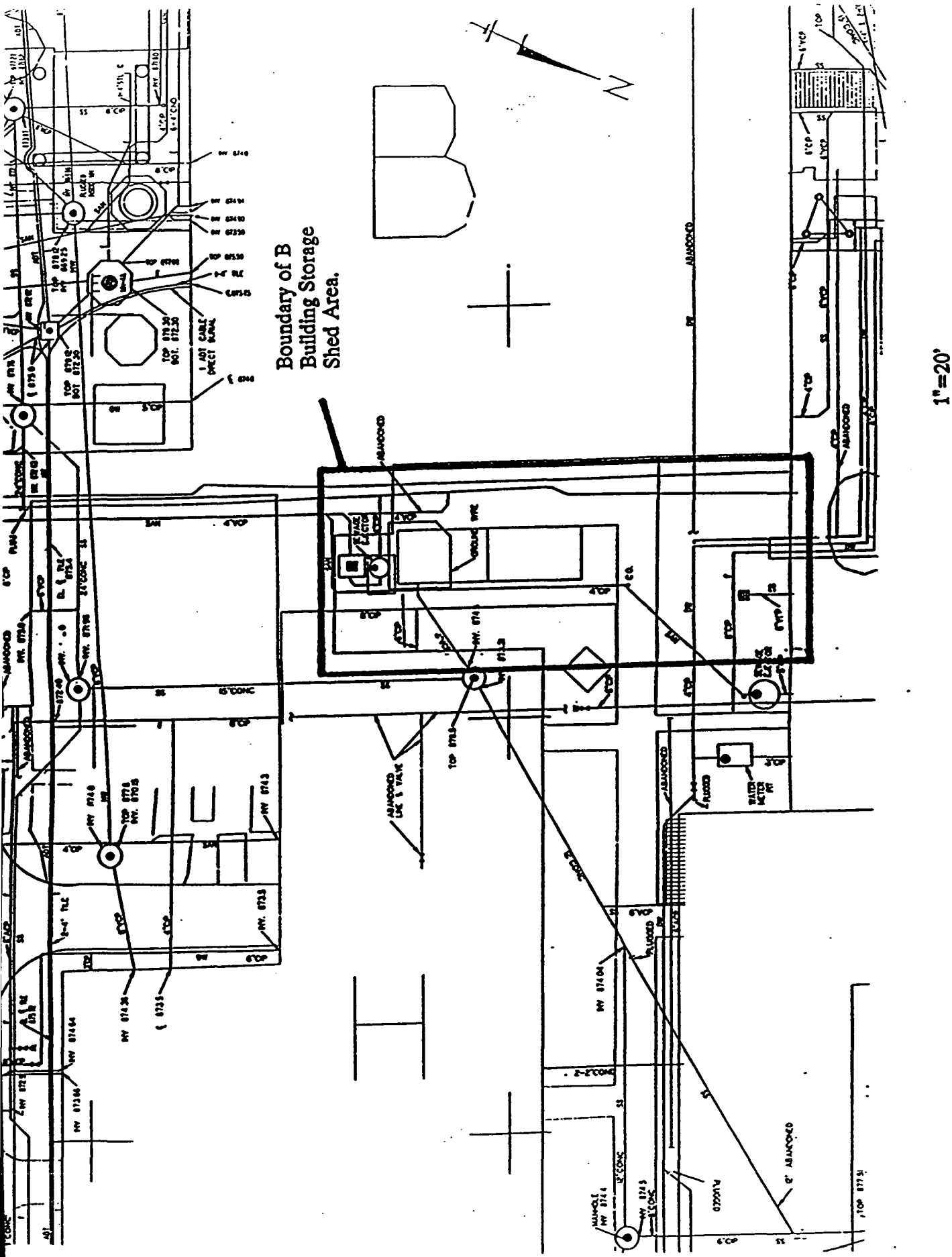


Figure 3.2. Underground Utilities Map of B Building Area

3.5. INTERIM REMEDIAL ACTION OBJECTIVES

The overall objective of the IRA is to mitigate the migration of organic chemicals into the groundwater. Based upon the B Building solvent storage shed area database and overall site physical and temporal constraints, as well as a review of potential ARARs, the following IRA objectives have been identified for the B Building solvent storage shed area:

1. The selected interim remedial action shall mitigate potential routes of human health and environmental exposure to soils impacted by volatile organic compounds.

2. The selected alternative will satisfy the remedial action levels dictated by the Land Disposal Restrictions for F001/F002 wastes (40 CFR 268) prior to disposal at a permitted off-site landfill of alternative residuals.

3. The selected interim remedial actions are expected to satisfy the conditions that IRAs take less than 12 months to complete at a cost of less than $2 million.

4. The selected interim remedial actions will satisfy ARARs to the greatest extent practical. Where an ARAR cannot be met, the reason for non-attainment will be thoroughly documented.

5. The selected interim remedial actions will minimize disruption of standard facility operations to the greatest extent practical.

The selected alternative will include demolishing the shed. The storage of solvents will be transferred to the departments that actually use them and solvents will be purchased in smaller containers to ease the storage problem.

3.5.1. Site-Specific Cleanup Criteria

Based on the existing information, the soil in the vicinity of the B Building solvent storage shed is impacted by volatile organic chemicals. Samples collected and analyzed for radiological parameters indicated concentrations well below site action levels established for plutonium-238 and thorium at 100 pCi/g and 5 pCi/g, respectively (OU-9 Site Scoping Report - Volume 3, Radiologic Site Survey, 1992). The remainder of this report will assume that the study area does not contain radioactive materials and will focus on VOC-impacted soil.

There are no federal or Ohio regulations specifying cleanup requirements for chemically impacted soils, nor has a site-specific risk assessment been performed to calculate such action levels. Review of regulatory soil action levels utilized in other states indicate a wide range of potential action levels. Prior to preparation of the final design and implementation of an IRA, development of site-specific action criteria will be required.

For informational purposes, risk-based cleanup standards for Michigan and Texas determined to be adequate to reduce risks associated with direct contact and leaching to groundwater for those chemicals detected in the soil gas sampling are compared to the 1992 soil gas survey results in Table III.6.

3.6. AREA AND VOLUME ESTIMATES

Typically, the area and volume of impacted soil are calculated based upon the chemical concentrations present in the soil and the remedial action levels developed from ARARs and/or a site-specific risk assessment. Soil samples have not been collected from the B Building solvent storage shed area, a quantitative risk assessment has not been performed, and remedial action levels have not yet been determined. Therefore, it is impossible to accurately determine the vertical or horizontal extent of VOC impacted soil.

For the purposes of this Action Memorandum the maximum area of impacted soil will be assumed to be bounded by B Building to the southwest, Building H to the northeast, the connecting passage between buildings B and H to the southeast, and Building OSW to the northwest (Figure 3.3). This area is approximately 4,000 square feet.

Based upon the soil-gas sampling and soil borings from around the general vicinity of the B Building, the B Building solvent storage shed area appears to be very close to the edge of a bedrock plateau. The soil gas and soil boring programs encountered bedrock as shallow as two feet below grade just to the east of the B Building solvent storage shed area, yet found overburden as thick as 20 feet just west of B Building. The depth to bedrock in the B Building solvent storage shed area appears to range from two to five feet.

For purposes of the Action Memorandum, it will be assumed that all material down to bedrock exceeds the action levels developed for remediation of VOC in soil, and the depth to bedrock in the B Building solvent storage shed area is assumed to be five feet below grade. Utilizing the assumed area and depth of chemically impacted soils, the estimated volume of material is 750 cubic yards.

Table III.6. Soil Gas Sample Results

Sample Location Number	Freon 113 (ppb)	Trans-12DCE (ppb)	Cis-12DCE (ppb)	111TCA (ppb)	TCE (ppb)	Toluene (ppb)
Proposed RCRA Subparts Action Levels for Soil[3]	—	—	—	7,000,000	60,000	20,000,000
1093-0005	131,000	247	40,800	—	34,780	53
1094-0005	83	13	485	—	978	—
1097-0002	—	—	—	—	6	8
1197-0002	—	—	—	—	23	5
1198-0006	24	13	518	33	474	5
1199-0002	10,218	—	120	—	479	—
1201-0007	4,716	13	811	—	130	48
1201-1007[1]	5,895	—	612	—	117	43
1202-0002	6,419	66	2,499	9	1,921	3
1202-1002[2]	9,301	41	1,706	—	1,737	—
1203-0002	1,475	—	334	—	45	192
Michigan Direct Contact Type B Criteria (µg/kg)	Soil Saturation	1,300,000	860,000	2,200,000	24,000	17,000,000
Michigan Leaching to Groundwater Type B Criteria[4] (µg/kg)	3,800,000	2,400	1,500	4,000	44	16,000
Texas Direct Contact Industrial Site (µg/kg)	NA	256,000	108,000	14,000,000	2,850	3,630,000
Texas Leaching to Groundwater Industrial Site[5] (µg/kg)	NA	10,000	7,000	20,000	500	100,000

NOTES:
1. Duplicate of sample 1201-0007
2. Duplicate of sample 1202-0002
3. Federal Register Vol. 55, No. 145. Friday, July 27, 1990
   40 CFR Section 264.521(a)(2)(i-iv) Appendix A.
4. Leaching to groundwater criteria based on 20 times the groundwater cleanup criteria.
5. Leaching to groundwater criteria based on synthetic precipitation leaching procedure.

NA No criteria given in current regulations.

The areas and volumes assumed above will be used throughout the remainder of the Action Memorandum to develop cost estimates for each of the IRA alternatives evaluated. Because cost estimates for each of the alternatives will utilize the same assumed area and volume, the alternative costs will be accurate relative to each other. Thus, the assumed volume and area should not influence the selection of the most cost-effective IRA alternative. The assumed volume is anticipated to be conservative; therefore, alternative cost estimates may be on the upper end of the +50/-30% accuracy range typically required for feasibility studies and applied during the Action Memorandum costing process. The actual implementation cost of any remedial alternative is dependent upon several important factors in addition to volume, including the bidders' response and the state of the remediation market at the time of the bid solicitation.

4. IDENTIFICATION AND SCREENING OF INTERIM REMEDIAL ACTION ALTERNATIVES

This section identifies and screens alternatives and technologies that are appropriate for addressing the interim remedial action objectives developed in Section 3.

4.1. ALTERNATIVE IDENTIFICATION AND SCREENING CRITERIA

Potential IRA alternatives identified for the B Building solvent storage shed area include no action, containment, removal, treatment, and disposal response actions. Identification of potential technologies relied upon several information sources including EPA's Superfund Innovative Technology Evaluation (SITE) program, various EPA guidance documents, and literature supplied by remediation contractors and technology suppliers. Technologies were identified as potentially applicable if they are considered commercially available and have been utilized previously at sites with soils containing VOCs. Twelve potential IRA alternatives have been identified. All alternatives with the exception of the No-Action alternative assume that the B Building solvent storage shed above-grade will be demolished and disposed off-site as construction debris. Foundations and floors will be included in the material volume to be addressed by each alternative.

Each alternative was screened to gauge its ability to satisfy the IRA objectives established in Section 3. Specific screening criteria included:

- Effectiveness - Ability to reduce potential risks or eliminate exposure pathways associated with VOCs to acceptable levels.
- Implementability - Ability to construct or effectively implement and utilize the technologies comprising the alternative given the site-specific physical and spatial constraints.
- Timeliness - Ability to satisfy the goal of 12 months from the date the removal action has begun onsite to the point when the IRA objectives have been met.
- ARARs - Ability to satisfy ARARs to the greatest extent possible.
- Consistency - Impact IRA alternative may have upon future remedial activities at the site; alternatives that do not reduce options or flexibility of potential future remedial actions are preferred.

The purpose of the screening process was to eliminate alternatives which did not meet the IRA objectives. Alternatives which did not pass the screening were not carried through the detailed analysis presented in Section 5. The screening process provides justification for retaining or rejecting alternatives for further consideration.

4.2. POTENTIAL ALTERNATIVE IDENTIFICATION AND SCREENING

4.2.1. Alternative 1: No Action

The No-Action alternative will be maintained through screening to serve as a baseline for measuring the effectiveness of other alternatives. Under this alternative, no monitoring, control, or treatment of the site soils is performed. The alternative will not mitigate threats to the public health or the environment. The No-Action alternative does not have technical or time constraints. No-action may continue to allow the VOCs present in the B Building solvent storage shed area to potentially migrate, increasing the scope and costs of future remedial activities at the site.

4.2.2. Alternative 2: Concrete Cap

This alternative consists of construction of a concrete cover over the potentially impacted area. A portion of this area is already covered by concrete drives and walkways. Those areas that are not covered would be contained with a concrete cap that would be tied in with the existing concrete to form a single layer covering the impacted soils. The concrete cap would require long-term maintenance to ensure its integrity.

This alternative will mitigate threats to the public health and the environment by reducing direct contact risks and reducing infiltration of rain water that may transport VOCs to the groundwater. Capping is effective for reduction of chemical migration from impacted soils; however, it does not reduce VOC concentrations present in the soil. Long-term maintenance of the cap is required in order to ensure its integrity. Failure of the cap would renew current exposure pathways and associated risks. Leaking underground sewers or water pipes in the area would reduce the overall efficiency of the cap as water leaking from the pipes may still mobilize and transport chemicals.

Construction of the cap is not anticipated to be technically difficult; however, access requirements to underground utilities may require periodic removal and replacement of portions of the cap. A concrete cap can be constructed within the stipulated 12-month time period.

A concrete cap will not meet the specifications of a RCRA-approved cap, nor will it satisfy CERCLA's and DOE's preference for treatment. It can be designed and implemented to meet all other ARARs and is suitable as a temporary IRA to control chemical migration.

If the final remedy selected for the site includes excavation of site soils, future removal and disposal of the concrete cap will add additional costs to the overall remediation activities.

Capping with a concrete cover will be maintained as a representative containment alternative.

4.2.3. Alternative 3: RCRA Cap

This alternative consists of covering the site with a RCRA-approved, multi layered cap consisting of compacted clay, synthetic liner, sand drainage layer, and topsoil. A typical RCRA-approved cap may be over three feet thick. Future property use would be restricted by fencing and deed restrictions.

Similar to the concrete cap, the RCRA cap will mitigate threats to the public health and the environment by reducing direct contact risks and reducing infiltration of rain water that may transport VOCs to the groundwater. The cap would contain impacted soils, but VOC concentrations would not be reduced. Long-term maintenance of the cap is required in order to ensure its integrity. Failure of the cap would renew current exposure pathways and associated risks. Leaking underground utilities in the area would reduce the overall effectiveness of the cap.

Construction of the cap is technically feasible; however, the presence of a RCRA cap will limit future use of the area. Covering the B Building solvent storage shed area with three feet of material will interfere with access to doors, manholes, and roadways. The area would be off-limits to future use because the cap area must not be disturbed.

A RCRA cap can be constructed at the site in less than one year. The RCRA cap would satisfy all ARARs, but CERCLA's and DOE's preference for treatment could not be met.

This alternative will be eliminated from further consideration due to implementation concerns and future site use limitations.

4.2.4. Alternative 4: Soil Vapor Extraction

Soil vapor extraction removes volatile chemicals from the soil by placing a vacuum on screened wells installed in the vadose zone. Air may be forced into the soil through other wells to increase pressure and air circulation, thus reducing the time required for treatment. Soil gas removed from the soil is collected and would be treated by vapor-phase carbon adsorption.

Soil vapor extraction removes VOCs from the impacted soil; therefore, the alternative provides long-term mitigation of threats to public health and the environment. Strategic placement of the extraction wells allows migration of the VOCs to be controlled and directed toward the low pressure areas created by the vacuum pumps. VOCs that have migrated below buildings and foundations -- areas that are not easily

accessible by standard excavation techniques -- may be removed by soil vapor extraction, further reducing potential future risks associated with the presence of VOCs.

Soil vapor extraction systems are comprised of basic off-the-shelf items. Installation of the wells utilize standard drilling and well construction techniques. The vapor treatment system has been proven to remove VOCs from air streams. The process has often been used to remove VOCs from soils, but the shallow depth of the overburden and the anticipated low permeabilities of the soils may adversely affect the efficiency of the system by limiting the extraction well radius of influence.

Based on existing information, it cannot be determined if soil vapor extraction will be completed in less than one year. Information needed to determine the implementation time includes soil permeability, average and maximum VOC concentrations, chemical desorption rates, and final acceptable remediation concentrations. Based on the high soil gas concentrations detected in the B Building solvent storage shed area, as well as the area just to the west of the B Building, and the anticipated low permeability and high clay content of the overburden, it is possible that soil vapor extraction will require longer than 12 months to achieve the target remediation levels. The chemicals detected during the soil gas survey, however, are highly volatile and, under most conditions, could be removed by a vapor extraction system. The system is implemented *in situ*, and has an advantage over off-site treatment and disposal options because excavation and transportation off-site will trigger RCRA land disposal restriction regulations. Other institutional requirements to be considered include compliance with the Clean Air Act for discharge of treated gases generated during remediation activities. The alternative can be designed and implemented in compliance with all ARARs.

Soil vapor extraction does not reduce the flexibility of potential future remedial action. It will not impede future activities and will remove VOCs from impacted areas beyond the IRA boundaries.

This alternative will be maintained for further evaluation as a potential *in situ* treatment technology due to its ability to extract VOCs with minimal soil disturbance in a congested area.

4.2.5. Alternative 5: *In Situ* Stabilization

This alternative involves the injection of stabilization additives to the soil to form a low permeability matrix that is relatively impervious to leaching. Several *in situ* stabilization techniques exist including grout injection and hollow stem auger shallow soil mixing.

In situ stabilization is not typically used for control of VOCs because the soil mixing involved may release uncontrolled emissions and VOCs may continue to leach from solidified material. Solidification of the site

soils may significantly reduce the migration potential of the VOCs; however, the long-term integrity of the solidified mass is questionable. Cracking and disintegration of the solidified material may release VOCs in the future.

In situ solidification may be implemented at the site, but it is not considered efficient for the shallow depths of overburden anticipated at the site. Additionally, the presence of underground utilities and building foundations would complicate implementation of the *in situ* stabilization process.

This alternative can be implemented in less than 12 months. Long-term monitoring of the solidified mass would be required to ensure that VOCs were not leaching from the material. It may be difficult to satisfy all ARARs because the process does not control VOC emissions from disturbed soils. Excessive release of VOCs may exceed requirements of the CAA.

The alternative is not consistent with overall site remedial objectives. The presence of a large, solidified mass in the B Building solvent storage shed area will adversely impact the ability to implement further actions at the site.

This alternative is eliminated from further consideration due to reliability and implementation concerns as well as future use complications associated with a stabilized monolith.

4.2.6. Alternative 6: *In Situ* Vitrification

In situ vitrification utilizes electricity and soils natural resistivity to create heat that melts the soil. Organic chemicals are volatilized or thermally destructed. Inorganic and radiological compounds are trapped in the glassified mass of soil when it cools. Organic gases volatilized during the melt are passed through air pollution control devices prior to release to the atmosphere.

In situ vitrification would reduce potential risks to public health and the environment by removal and/or destruction of VOCs in the site soils. VOCs would be thermally vaporized by the process, and would subsequently be collected and treated via carbon adsorption. *In situ* vitrification would be capable of achieving chemical-specific cleanup objectives.

In situ vitrification has not been demonstrated on full-scale hazardous waste projects. It has been pilot-tested and has proven most effective in sandy soils; however, it may not be as effective in the clayey soil types anticipated at the site. Underground utilities and building foundations throughout the areas would complicate implementation as operation of the process would damage them. Space constraints

may make it difficult to set up and move the vapor collection and treatment systems required in conjunction with the melt unit.

Due to its innovative nature, and the probable necessity for time consuming bench and pilot testing, it is not likely that *in situ* vitrification can be implemented and completed in less than 12 months. The system can be designed to satisfy all ARARs including CAA. *In situ* vitrification would remove or destroy VOCs in the implementation area; however, the presence of a monolithic vitrified mass may hamper potential future remediation work or hamper reuse of the area.

In situ vitrification is eliminated from further consideration as it is unproven in similar conditions and would be difficult to implement given the proximity of buildings and underground utilities.

4.2.7. Alternative 7: Soil Washing

Soil washing utilizes water and/or solvents to extract chemicals of concern from the soil. The process is derived from standard mining practices and utilizes a combination of density and particle size differences to segregate materials. The majority of organic chemicals tend to accumulate on the finer particles. Oversize material (> two inches) is segregated using standard screening. Smaller particles are scrubbed in the soil washing unit. Sand is separated from smaller clay and silt particles, scrubbed and placed back on the site. The small clay and silt particles containing the majority of the organic chemicals, are separated from the water and disposed off-site. Wash water can be treated and recycled through the system, discharged, or disposed off-site.

Soil washing will provide long-term mitigation of threats to human health and the environment by removal and treatment of impacted soils. A bench-scale treatability study will be required to determine if the process can reduce VOC concentrations below remedial action cleanup criteria. Because a typical soil washing system is not set up to control VOC emissions, the process may require modification to allow collection and treatment of VOCs vaporized during the screening, segregation, and soil agitation functions.

Soil washing may be implemented at the site. Due to space constraints, soil washing equipment could not be set up adjacent to the excavation, but will require dedicated space elsewhere on Mound Plant property. The overburden material is anticipated to have a high clay content, thus the soil washing system may produce a large volume of fine materials and sludge with concentrated chemical levels. This material would require further treatment and disposal off-site. The clean, coarse fraction would be replaced in the excavation.

Soil washing, including a bench-scale treatability study, could be implemented in less than 12 months. It can be designed to meet all ARARs. Material transport off-site would have to satisfy LDR criteria. Emission of VOCs from the excavation and treatment activities would be closely monitored to ensure compliance with CAA.

Implementation of this alternative would not reduce the flexibility of potential future remedial actions. Impacted soil would be removed and treated prior to replacement in the excavation. The process would not adversely impact potential future activities in the area.

This alternative will be maintained for further consideration as a viable alternative to treatment by the BDAT.

4.2.8. Alternative 8: Thermal Desorption

Thermal desorption is an *ex situ* process that uses either direct or indirect heat exchange to vaporize organic compounds from soil. Thermal desorption systems are physical separation processes and are not specifically designed to provide organic decomposition. Thermal desorption uses low temperatures, relative to incineration, to vaporize the VOCs without destroying the geotechnical properties of the soil. Gases generated from the thermal treatment are passed through air pollution control equipment prior to release to the atmosphere. Treated soils may be backfilled or disposed off-site. If material is disposed off-site, clean fill will be required to return the area to its existing grade.

Thermal desorption will provide long-term mitigation of threats to the public health, welfare, and the environment by removal and treatment of VOC-impacted soils. Thermal desorption is expected to reduce VOC concentrations in treated soil to meet the site cleanup criteria. Vaporized compounds can be effectively removed from the air stream by various air pollution control devices including carbon adsorption.

Operation of a thermal desorption system is not anticipated to be difficult; however, space constraints near the excavation may force the treatment system to be staged at a dedicated point elsewhere on the property. Thermal desorption units were developed and designed to treat soils impacted by VOCs; however, some materials handling problems may occur due to the clayey soil types anticipated at the site.

This alternative can be implemented in less than 12 months. It can be designated and implemented in compliance with all ARARs including CAA for air emissions and LDR for any oversize residual material that may be disposed off-site. By removal and treatment of the impacted soil, the alternative is consistent with

the overall, long-term remediation goals of the site and will not adversely impact potential future remedial actions that may potentially impacted.

This alternative is maintained for further consideration as a viable alternative to treatment by the BDAT.

4.2.9. Alternative 9: On-Site Incineration

Impacted soil would be excavated and treated utilizing an on-site incinerator. Incinerated material would not be suitable for backfilling at the site because ash from soil incineration does not maintain the geotechnical characteristics of the untreated soil. Incinerator residuals would be transported and disposed off-site at a permitted landfill.

On-site incineration will provide long-term mitigation of threats to the public health, welfare, and environment. VOCs will be destroyed and residuals will be disposed off-site. Incineration is proven to be effective for treating VOCs and is the BDAT for F001/F002 RCRA wastes.

Incineration is a complicated process technology. Effluent from the incinerator stack may contain trace chemicals and radioactive materials. Implementation of on-site incineration would be difficult due to space constraints at the site and the complexity of mobile incinerator operation. Assuming a permitted transportable incinerator is available, the impacted soils can be treated in less than 12 months; however, bench-scale testing, equipment staging, and test burns may push the overall remediation time beyond one year.

This alternative can be designed and implemented in compliance with all ARARs, but it is anticipated to have a negative public perception. On-site incineration would not reduce the flexibility of potential future remedial actions. The process would not adversely impact implementation of future remedial actions in the vicinity of the B Building solvent storage shed.

This alternative is eliminated from further consideration due to its implementability, timing, and institutional considerations.

4.2.10. Alternative 10: Off-Site Incineration

Impacted soil would be excavated and transported to a permitted incineration facility for treatment and disposal. The excavation would then be backfilled with clean material.

Transport of impacted material to an existing permitted incinerator will provide long-term mitigation of threats to the local public health, welfare, and environment. The option is technically feasible and may be implemented in less than 12 months. Incineration is the BDAT for F001/F002 wastes, and land disposal restriction ARARs would be satisfied. Institutional concerns may involve transport of the material through urban areas. This alternative will not adversely impact potential future work at the site.

This alternative is maintained for detailed analysis as the BDAT for F001/F002 RCRA wastes.

4.2.11. Alternative 11: On-Site Landfill

This alternative involves construction of a RCRA-compliant landfill on-site. A multi layered liner would be constructed including a leachate detection system. The impacted soil would be excavated, placed in the landfill, and covered with a multi layered RCRA cap. Long-term monitoring and maintenance would be required, as well as implementation of all applicable deed restrictions. Excavated soil would have to satisfy the land disposal restrictions criteria for F001/F002 wastes prior to placement in the landfill. Treatment may be required to satisfy those criteria. The excavation would be backfilled with clean material.

RCRA corrective action rules allow replacement of treated material into the excavation without triggering land ban. Construction of an on-site landfill for excavated material would trigger LDR, thus soil would require treatment prior to placement into the landfill. If the soil is treated, however, it can be placed directly back into the excavation, and an on-site RCRA landfill is not required.

This alternative is eliminated from further consideration due to relatively small volume of material and ability to replace treated material in the excavation.

4.2.12. Alternative 12: Off-Site Landfill

Impacted soil would be excavated and transported to a RCRA-permitted landfill facility for treatment and disposal. The excavation would be backfilled with clean fill. Land disposal restriction criteria must be satisfied prior to placement in the landfill, and treatment may be required. Many landfill facilities have pretreatment capabilities on-site, and the required treatment may be performed after transporting the impacted material to the permitted facility.

Placement of the impacted soil in a permitted off-site disposal facility will mitigate current on-site risks. This alternative is feasible and can be implemented in less than 12 months. Disposal of F001/F002 RCRA wastes is restricted. Assuming the soil fails the TCLP criteria established by the land disposal restriction

regulations, the material would require treatment prior to disposal. This alternative would not reduce the flexibility of potential future remedial actions.

This alternative assumes soil satisfies LDR TCLP criteria and is maintained for detailed analysis.

4.3 SUMMARY OF ALTERNATIVE SCREENING

Table IV.1 summarizes the alternative identification and screening. Twelve alternatives were identified, and seven will be carried forward for detailed alternative analysis.

Table IV.1. Summary of Alternative Identification and Screening

IRA Alternative	General Response Action	Major Implementation Items/Issues	Status
1. No Action	No Action	■ Required by NCP	Maintained as baseline for comparison of alternative's effectiveness.
2. Concrete Cap	Containment	■ Concrete cap constructed and tied to existing concrete areas ■ Reduce risks associated with direct contact and inhalation ■ May not effectively reduce leaching to groundwater if water, sewer, and storm water piping in area leaks ■ Easily constructed within time limitations ■ Does not meet EPA preference for treatment. ■ May impact ability to implement future remedial actions.	Maintained as potential containment alternative.
3. RCRA-Approved Cap	Containment	■ RCRA-approved cap including synthetic liner and drainage layer constructed over site. ■ Precludes future use of site. ■ Adversely impacts use of existing doors and roadways, and access to area utilities due to thickness of cap.	Eliminated due to implementation concerns.

Table IV.1. (Continued)

IRA Alternative	General Response Action	Major Implementation Items/Issues	Status
4. Soil Vapor Extraction	*In Situ* Removal/Treatment	■ Removes VOCs from soil using vacuum pressured extraction wells. VOCs treated through air pollution control devices. ■ VOCs removed and treated with minimal intrusive work. ■ VOCs under buildings and concrete slabs may be removed. ■ Cannot accurately estimate time required for treatment with existing data. Assume alternative meets time limitation. ■ Will satisfy all ARARs.	Maintained as potential *in situ* alternative.
5. *In Situ* Solidification	*In Situ* Containment	■ Soil is solidified *in situ*, trapping chemicals in a low permeability monolith. ■ Reliability with VOCs is not well documented. *In situ* work may create an uncontrolled release of volatile chemicals to the atmosphere. ■ Shallow depth to bedrock create implementability and efficiency concerns. Buried utilities make it difficult to implement and address all impacted soils.	Eliminated due to concerns about reliability and implementation.

Table IV.1. (Continued)

IRA Alternative	General Response Action	Major Implementation Items/Issues	Status
6. *In Situ* Vitrification	*In Situ* Treatment	■ Electrical current is passed through soils causing soil to heat up and melt. Organic compounds are volatilized, collected and treated. Inorganic compounds are trapped in glassified matrix. ■ Not proven on full-scale hazardous waste sites. ■ Difficult to implement near buildings and buried utilities due to potential damage. All utilities in area would require rerouting to avoid melt damage. ■ May not meet time limitations due to required treatability testing. ■ Would have adverse impact on future actions in vicinity.	Eliminated due to unproven nature of alternative, and concerns about ability to implement near buildings and underground utilities.
7. Soil Washing	*Ex Situ* Treatment	■ Excavated material is segregated into gravel, sand, and clay sized particles. Gravel and sand are scrubbed and returned to the site as backfill. Smaller clay particles, containing the majority of the chemicals, require further treatment and/or disposal. ■ Existing process units may require modifications to control VOC emissions. ■ Residual clay portion requiring further treatment may be significant volume. ■ Excavation and off-site disposal trigger RCRA land disposal restrictions treatment criteria for F001/F002 wastes. ■ Can satisfy all ARARs, will be completed in less than 12 months, and will be consistent with overall site remediation goals.	Maintained as potential alternative to treatment by BDAT.

Table IV.1. (Continued)

IRA Alternative	General Response Action	Major Implementation Items/Issues	Status
8. Thermal Desorption	*Ex Situ* Treatment	■ Excavated material is heated in a mobile unit to vaporize volatile chemicals. Vapors are collected and passed through air pollution control devices prior to discharge. Treated soil is placed back in excavation. ■ Process is feasible and can be completed in less than 12 months. ■ Emissions must be carefully controlled and monitored. ■ Can satisfy all ARARs and is consistent with overall site remediation goals.	Maintained as potential alternative to treatment by BDAT
9. On Site Incineration	*Ex Situ* Treatment	■ Excavated material is treated on site using a transportable incinerator. ■ Implementation concerns may cause treatment time to exceed 12 months. ■ Siting concerns, long-term liability, and public perception are potential problems adversely impacting implementability and schedule.	Eliminated due to implementability, timing, and institutional considerations.
10. Off Site Incineration	*Ex Situ* Treatment	■ Excavated material is treated off site at a RCRA permitted incineration facility. ■ Incineration is BDAT for F001/F002 RCRA wastes satisfies all ARARs. ■ Can be implemented in less than 12 months. ■ Is consistent with overall site remediation goals.	Maintained as BDAT for F001/F002 RCRA wastes.

Table IV.1. (Continued)

IRA Alternative	General Response Action	Major Implementation Items/Issues	Status
11. On Site Landfill	Disposal	■ An on site landfill is constructed for disposal of the excavated soil. ■ Siting concerns, long-term liability, and public perception are potential problems adversely impacting schedule and implementability. ■ Placement of material in an on-site landfill would trigger LDR criteria, however, treated soil can be replaced directly into the excavation, making the landfill redundant.	Eliminated based on anticipated small volume of material. Ability to replace treated soil in excavation eliminate need for on-site landfill.
12. Off Site Landfill	Disposal	■ Excavated material is disposed off site at a RCRA permitted landfill facility. Material assumed not to require treatment prior to disposal due to land disposal restrictions. ■ Can be implemented in less than 12 months. ■ Can satisfy all ARARs and is consistent with overall site remediation goals. ■ Does not satisfy EPAs preference for treatment.	Maintained as viable alternative.

- Protective of Public Health - This criterion discusses the ability of the alternative to achieve cleanup levels consistent with the overall site remediation program. This evaluation is particularly important when the IRA is the only planned action at the site.

5.1.2. Implementability

Evaluation of implementability considers technical feasibility, administrative feasibility, and the availability of key personnel and equipment. Each of these criteria are discussed below.

Technical Feasibility

- Constructability - This criterion addresses the ability to implement the alternative given the site-specific physical and schedule constraints.

- Operational Considerations - This criterion evaluates potential operation difficulties following start-up of the alternative including complexity of equipment maintenance and the need for full-time operational staff.

- Environmental Conditions - This criterion identifies and evaluates potential environmental conditions such as terrain, temperature and local air quality that may affect both the ability to physically place the alternative and the alternative's performance.

- Contributions to Remedial Performance - This criterion addresses each alternative's consistency with long-term remedial objectives and activities planned for the site. CERCLA section 104(a)(2) states that a removal action should, to the extent practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or threatened release concerned.

Administrative Feasibility

- Time and Cost - Each alternative is evaluated for its compliance with the financial and schedule statutory goals.

- Permits and Waivers - This criterion addresses the need for permits or waivers for items including land easements, right-of-way agreements, or zoning variances.

- State and Local Acceptance - State and local concerns are considered in selecting the final IRA. These concerns are not typically addressed in the EE/CA but in the action memorandum, after the state and local public have had an opportunity to review and comment on the EE/CA report.

Availability

- Personnel and Technology Availability - This criterion addresses the availability of trained personnel and specialty equipment within the schedule allotted for the project.

- Off-Site Treatment, Storage, and Disposal - This criterion addresses the adequacy of off-site treatment, storage, and disposal capacity.

- Post-Remediation Site Control - This criteria addresses the availability of staff and equipment to perform operations and maintenance at the site following completion of the IRA.

5.1.3. Cost

Evaluation of an alternative's projected costs include estimates of direct capital costs, indirect capital costs, and annual operation and maintenance (O&M) costs. Cost estimates prepared for this Action Memorandum are based on available information and are intended to be within a +50/-30 percent accuracy range. Cost estimates may also include calculation of present worth and cost contingencies and an evaluation of cost sensitivity. Items potentially associated with each of these criteria are indicated below.

Direct Capital Costs (dollars expended in base year)

- Construction costs
- Equipment and material costs
- Land and site acquisition costs
- Buildings and services costs
- Relocation expenses
- Transport and disposal costs
- Analytical costs
- Treatment and operating costs (implementation less than 1 year)

Indirect Capital Costs

- Engineering and design expenses
- Legal fees and license or permit costs
- Start-up and shakedown costs

Annual O&M Costs (dollars expended after first year)

- Operation and maintenance costs (beyond the first year)
- Auxiliary materials and energy
- Disposal of residuals
- Monitoring costs
- Technical support costs

Contingencies

- Scope - Scope contingencies cover scope changes that may occur during final design and implementation. At this stage, the design concept is not developed fully enough to identify all the project components and ancillary costs. The scope contingency provides a reserve for change orders, unanticipated increases in unit quantities and volumes, and adjustments to technologies that may be necessary to obtain required performance on a site-specific basis. Scope contingencies are applied on a line item basis to allow a clear distinction between well defined actions and cost estimates (low scope contingency) and those actions that are likely to change during implementation (high scope contingency). Scope

contingencies may range from 10 percent to 60 percent based upon the confidence placed upon the estimated quantities and associated unit costs.

- Bid - Bid contingencies may cover unknown costs associated with construction, such as adverse weather conditions, strikes by material suppliers, geotechnical unknowns, and unfavorable market conditions. Bid contingencies are applied on the construction subtotal and typically range from 10 percent to 20 percent.

- Present Worth Calculation - Present worth analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs, usually O&M costs, to a common base year. Present worth analysis produces a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the alternative. It is unnecessary to calculate present worth for most IRA alternatives as they are intended to be completed in less than 12 months, however, any monitoring or maintenance costs that occur after the first year should be discounted to the base year to allow comparison among alternatives.

- Cost Sensitivity - In situations where no specific alternative stands out as the obvious choice, and alternative costs are relatively close, evaluation of the cost sensitivity may be required. Cost sensitivity evaluates how the costs of various alternatives are affected by changes to key assumptions such as material volume, treatment equipment throughput, and material transport and disposal unit rates.

5.2. IDENTIFICATION OF ACTION-SPECIFIC ARARS

Chemical-specific and location-specific ARARs were identified in Section 3. Following identification and screening of alternatives, federal and state action-specific ARARs were identified for each alternative. The applicability ("Y" or "N") of each potential action-specific ARAR that may apply to a particular alternative is presented in Table V.1. Alternative 1, No Action, is not included in the table because it does not include any activities that may trigger an action-specific ARAR.

5.3. ALTERNATIVE 1: NO ACTION

The No-Action alternative will not meet the remedial action objectives. If the source is not controlled, VOCs may continue to migrate to groundwater, potentially resulting in a more extensive remediation problem. No active treatment of impacted soils is performed. Over a long period of time, the concentrations of VOCs may decrease due to natural degradation processes such as dispersion and biodegradation, however, potential human health risks associated with the various exposure pathways are not mitigated in the near future. Implementability and costs analysis are not applicable to this alternative.

Table V.1. Action-Specific ARARs and TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Alternative					
			2	4	7	8	10	12
Clean Water Act: National Pollution Discharge Elimination System	40 CFR 122 and 125	Requires permits for the discharge of pollutants from any point source into waters of the United States.	Y	Y	Y	Y	N	N
Clean Water Act: National Pretreatment Standards	40 CFR 403	Sets standards to control pollutants which pass through publicly owned treatment works or which may contaminate sewage sludge	N	Y	Y	Y	N	N
Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 CFR 257	Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment and thereby constitute prohibited open dumps.	Y	Y	Y	Y	Y	Y
RCRA: Hazardous Waste Management Systems General	40 CFR 260	Establishes procedures and criteria for modification or revocation of any provision in 40 CFR Part 260 - 265.	Y	Y	Y	Y	Y	Y
RCRA: Identification and Listing of Hazardous Waste	40 CFR 261	Defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 262 - 265 and Parts 124, 270, and 271.	Y	Y	Y	Y	Y	Y
RCRA: Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Establishes standards for generators of hazardous waste.	N	Y	Y	Y	Y	Y
RCRA: Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Establishes standards which apply to persons transporting hazardous wastes within the U.S. if the transportation requires a manifest under 40 CFR Part 262.	N	Y	Y	Y	Y	Y
RCRA: Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	40 CFR 264	Establishes minimum national standards that define the acceptable management of hazardous waste for owners and operators of facilities which treat, store, or dispose of hazardous waste.	Y	Y	Y	Y	Y	Y

Table V.1. (Continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Alternative					
			2	4	7	8	10	12
RCRA: Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	40 CFR 265	Establishes minimum national standards that define the acceptable management of hazardous waste during the period of interim status and until certification of final closure, or if the facility is subject to post-closure requirements, until post-closure responsibilities are fulfilled.	N	Y	Y	Y	Y	Y
RCRA: Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities	40 CFR 267	Establishes minimum rational standards that define acceptable management of hazardous waste for new land disposal facilities.	Y	Y	Y	Y	Y	Y
RCRA: Land Disposal Restrictions	40 CFR 268	Establishes a timetable for restriction of burial of wastes and other hazardous materials.	Y	Y	Y	Y	Y	Y
Hazardous Waste Permit Program	40 CFR 270	Establishes provisions covering basic EPA permitting requirements.	Y	Y	Y	Y	Y	Y
Occupational Safety and Health Act	29 CFR 1910	Regulates worker health and safety.	Y	Y	Y	Y	Y	Y
Federal Clean Air Act	40 CFR 50 & 61	Requirements include National Ambient Air Quality Standards and new source performance standards.	N	Y	Y	Y	N	Y
Hazardous Materials Transportation Regulations	49 CFR 107 & 171-177	Regulates transportation of hazardous materials.	N	Y	Y	Y	Y	Y

Table V.1. (Continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Alternative					
			2	4	7	8	10	12
DOE Orders TBC	DOE Orders 5483.1A, 5500.1A, 5400.5, 5820.2A, 5480.3, 5480.4, 5480.11	Requirements include worker safety; emergency planning, preparedness, and response for operations; radiation protection of the public and the environment; radioactive waste management; packaging and transportation of hazardous materials, hazardous substances, and hazardous wastes; environmental protection, safety, and health protection standards; and radiation protection standards for occupational workers.	Y	Y	Y	Y	Y	Y
Ohio Hazardous Waste Management Regulations	OAC 3745-49-31 through 3745-69-30	Requirements include definition and identification and listing of hazardous waste; generation of a hazardous waste; transportation of a hazardous waste; treatment of a hazardous waste, including on-plant and off-plant incineration; treatment of contaminated groundwater; storage of a hazardous waste, which includes container and tank requirements; disposal of a hazardous waste; operation and maintenance; and surface water control.	Y	Y	Y	Y	Y	Y
Ohio Solid Waste Disposal Licenses and Regulations	OAC 3745-27-01 through 3745-37-10	Requirements include authorized solid waste disposal methods, operational requirements for solid waste disposal facilities, and closure requirements.	Y	Y	Y	Y	Y	Y
Ohio NPDES Permit Regulations	OAC 3745-33-01 through -10	Establishes permit requirements	Y	Y	Y	Y	N	N
Ohio General Provisions on Air Pollution Control	OAC 3745-15-01 through -09 and 3745-49-01 through -04	Requirements include measurement of emissions of air contaminants, scheduled maintenance, reporting, and malfunction of equipment.	N	Y	Y	Y	N	N
Ohio Particulate Matter Standards	OAC 3745-17-01 through -11	Measurement of ambient air quality and allowable emission standards.	N	Y	Y	Y	Y	Y

Table V.1. (Continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Alternative					
			2	4	7	8	10	12
Ohio Regulations for carbon monoxide, photochemically reactive materials, hydrocarbons, and related materials	OAC 3745-15-01 through -09, and 3745-35-01 through -06	Ambient air quality standards and guidelines for control of emissions of organic materials and carbon monoxide from stationary sources.	N	Y	Y	Y	N	N
Ohio Regulations for oxides of nitrogen	OAC 3745-23-01 through -06	Ambient air quality standards	N	Y	Y	Y	N	N
Ohio Regulations for Prevention of Air Pollution Emergency Episodes	OAC 3745-25-01 through -04	Episodes criteria, air pollution emergency definition, and emission reduction objectives.	N	Y	Y	Y	N	N
Ohio Regulations on Air Permits to Operate and Variances	OAC 3745-35-01 through -06	Permit requirements, variances, and operational requirements.	N	Y	Y	Y	N	N
Ohio Water Well Installation	OAC 3745-9-10	Regulates the abandonment of test holes or wells.	Y	Y	Y	Y	Y	Y

Y - Yes, the ARAR may impact design, implementation, or operation of the alternative.
N - No, the ARAR will not impact the alternative.

5.4. ALTERNATIVE 2: CONCRETE CAP

5.4.1. Description

Capping can be accomplished using a variety of materials and techniques and is implemented with proven construction materials. Caps are effective because they reduce infiltration and act as a physical barrier eliminating direct contact and inhalation exposure routes. This alternative assumes the cap will be constructed of reinforced concrete. Portions of the impacted area are already covered by concrete walks and drives. The remaining area that will require capping is approximately 2,600 square feet. Figure 5.1 indicates the area to be capped.

The capping construction activities are initiated with the excavation of soil to allow the cap to be integrated with existing concrete slabs and building foundations. Excavation is followed by the placement of a specified concrete cap bedding material, construction of the concrete cap, and application of low permeability concrete sealant. Soil excavation includes earth removal with conventional earth moving equipment. The excavated soil will be transported to a staging area, where it will be sampled and analyzed to determine the proper disposal method. Because much of the surface material is gravel, this Action Memorandum assumes that the material will be transported and disposed in a permitted off-site landfill and will not require treatment to meet LDRs. To allow proper placement of the concrete cap, it is assumed that 115 cubic yards of impacted soil will require removal. No foundation shoring will be required due to the shallow depth of excavation.

Following excavation, a base course consisting of coarse aggregate, fine aggregate, and a vapor barrier will be constructed. The cap will be constructed of a concrete slab reinforced by welded steel wire fabric. The concrete cover will be constructed to be continuous with the existing concrete slabs and building foundations. Positive drainage of the cap will be achieved by sloping the cover toward a drainage channel that will be formed in the cap. The drainage channel will be sloped toward an existing catch basin or a new catch basin will be constructed outside the perimeter of the cap. Runoff from the concrete cap will be routed from the catch basin to the existing stormwater collection system.

In order for the concrete cap to eliminate the downward migration of surface water, the cap must be continuous with existing concrete slabs and building foundations. The cap will be tied to these structures utilizing reinforcement doweling. After the cap has been constructed, the joint will be covered with a joint fabric and sealant. An epoxy coating system will be placed over the concrete cap and existing concrete slab to inhibit the penetration of rainfall through the concrete cover.

The concrete cap requires quarterly inspections to ensure that the integrity of the cap is maintained. This will include inspecting the cover for cracks caused by shrinkage and/or settlement. The expansion joints also require inspection to verify that they are not leaking and that the joint fabric is intact, and is not allowing water to seep through the joints. It is anticipated that the concrete cover can maintain its integrity with minimal maintenance for five years.

The B Building solvent storage shed would be demolished, transported off-site, and disposed as construction debris. The floor of the shed would be cleaned and tied in with the rest of the concrete cap.

5.4.2. Effectiveness

Capping is not anticipated to result in significant increased short-term risks to workers or the surrounding community. Minor increased volatilization of chemicals may occur during removal of surface soils. The final design will provide for volatilization and dust control and will specify appropriate personal protective equipment (PPE) for on-site personnel.

Capping will reduce potential human health risks due to direct contact with VOC impacted soils, and inhalation of VOCs and VOC impacted particles. Capping will also reduce infiltration, thus reducing leaching and migration of VOCs to groundwater. The effectiveness of the cap can be compromised by:

- Poor maintenance;
- Improper implementation of tie in to existing concrete structures in area; and
- Leaking underground utilities below the cap causing continued chemical leaching.

Capping would be protective of the environment as it would reduce migration of VOCs from the B Building solvent storage shed area. Capping will not reduce the concentration of VOCs present in impacted soils.

The cap would not comply with a RCRA-approved cap typically required for RCRA closures; however, it could be designed to meet 1×10^{-6} cm/s infiltration limitations. As a containment option, the cap would not achieve cleanup levels consistent with the overall site remediation program. It would, however, suffice as a temporary containment measure prior to remediation of the site on a larger scale.

5.4.3. Implementability

Construction of the concrete cap utilizes standard civil engineering techniques and equipment, and is readily implemented. Tying the cap to existing concrete in the area requires careful execution and inspection, as these joints are susceptible to failure and require the greatest degree of long-term maintenance. Access to underground utilities will be restricted by the cap. Should utility access be required, the cap will be breached and will require repair. Excavation during utilities repair will require personal protective equipment as VOCs will remain untreated in the soil.

The cap will impede further work in the B Building solvent storage shed area. Should the final remedy selected for the site include excavation of site soils impacted by VOCs, removal and disposal of the cap will constitute additional work and costs.

Construction of the concrete cap can be performed within the statutory schedule and budget limits. No special permits or waivers are anticipated to be required. Personnel and equipment required for construction and maintenance are readily available.

5.4.4. Cost

Estimated costs for Alternative 2 are presented in Table V.2. The concrete cap will not requrie any maintenance in the first 12 months. Total estimated costs including contingencies are approximately $299,000.

5.5. ALTERNATIVE 4: SOIL VAPOR EXTRACTION

5.5.1. Description

A basic soil vapor extraction system couples vapor extraction wells with blowers or vacuum pumps to remove VOC vapors from the unsaturated zone, thereby reducing the concentrations of residual VOCs in the subsurface. The vacuum developed in the extraction well boring, through a screened casing, results in air being drawn from the atmosphere, through the soil, and to the well. Above-ground equipment typically consists of control valves to adjust air flow, a pressure gauge at the wellhead, a water-liquid separator, a pressure gauge at the pump, a flowmeter and a vapor treatment unit. Vapor treatment systems such as catalytic and thermal destruction systems, activated carbon absorbers, and biological gas treatment systems are included if air treatment is required. Groundwater extraction wells are sometimes a necessary addition to the system where residual chemicals are present below the water table. No water is expected to be removed during the operation of the SVE system at the B Building

TABLE V.2
ALTERNATIVE 2: CONCRETE CAP
COST ESTIMATE

ITEM	QUANTITY	CAPITAL COST	SCOPE CONT.	CONSTRUCTION SUBTOTAL
I. PRE-MOBILIZATION ACTIVITIES				
1. Design Package	LS	$85,000	10%	$93,500
II. GENERAL ACTIONS/SITE PREPARATION				
1. Equipment Mobilization	LS	$10,000	20%	$12,000
2. Bldg. Demolition/Disposal	560 SF	$15,000	10%	$16,500
3. Decontamination Facilities	1000 SF	$6,900	10%	$7,600
4. Staging Areas/Site Layout	2000 SF	$5,000	10%	$5,500
5. Material Stockpile Area	1000 SF	$2,500	20%	$3,000
III. SOIL EXCAVATION/DISPOSAL				
1. Excavation of Soils	115 CY	$500	35%	$700
2. Hauling to Staging Area	145 CY	$700	20%	$800
3. Loading into Trucks	145 CY	$220	20%	$300
4. Transportation (9 Trips)	170 MILE	$6,100	20%	$7,300
5. Confirmatory Sampling	1 SAMP	$2,000	50%	$3,000
6. Landfilling	172 TONS	$22,400	15%	$25,800
IV. CAP CONSTRUCTION				
1. Cap Construction	2600 SF	$20,500	30%	$26,700
2. Disposal of Work Residuals	LS	$5,000	50%	$7,500
3. Equipment Demobilization	LS	$10,000	20%	$12,000
VI. CONSTRUCTION SERVICES				
1. Construction Oversight	1 MOS	$15,000	25%	$18,800
2. Health & Safety Monitoring	1 MOS	$15,000	25%	$18,800
CAPITAL COST SUBTOTAL		$222,000		
CONSTRUCTION SUBTOTAL				$260,000
BID CONTINGENCY			15%	$39,000
TOTAL ESTIMATED COST				$299,000

Note: LS = Lump Sum Estimate
The excavated soil volume was increased by 25% to allow for swelling.

solvent storage shed. The groundwater recovery well is used to depress the water table, thereby exposing previously saturated soils to vapor flow. A standard soil vapor extraction system is presented in Figure 5.2. More complex soil vapor extraction systems may incorporate trenches, air injection wells, passive wells, surface seals, multiple vapor extraction wells in single boreholes, and sophisticated unsaturated zone moisture, chemical, and temperature monitoring systems. Lateral trenching involves placement of lateral vapor extraction piping in trenches excavated across the site. The laterals are connected at a single header pipe that directs the extracted soil gas to the air treatment system. This method is often more effective than vertical extraction wells when implementing the system in shallow soils. Material excavated during trenching activities is backfilled in the trenches. Any excess material unable to be backfilled will be transported to a staging area, where it will be sampled and analyzed to determine the proper disposal method. Because much of the surface material is gravel, this Action Memorandum assumes that the material will be transported and disposed in a permitted off-site landfill and will not require treatment to meet LDRs.

Design of vapor extraction systems is often difficult due to the heterogeneous nature of soil and the non-uniform distribution of the chemicals of concern. A pilot test is usually required to determine the maximum achievable vapor flow rate and area of influence. The final system may be built on a trial and error basis, utilizing vapor and chemical response to initial extraction wells to determine the location and design rate for subsequent wells. A sampling and analysis plan to collect appropriate data to monitor the performance of the SVE system is currently being developed. To allow cost estimating to be performed in this Action Memorandum, the following design assumptions were made:

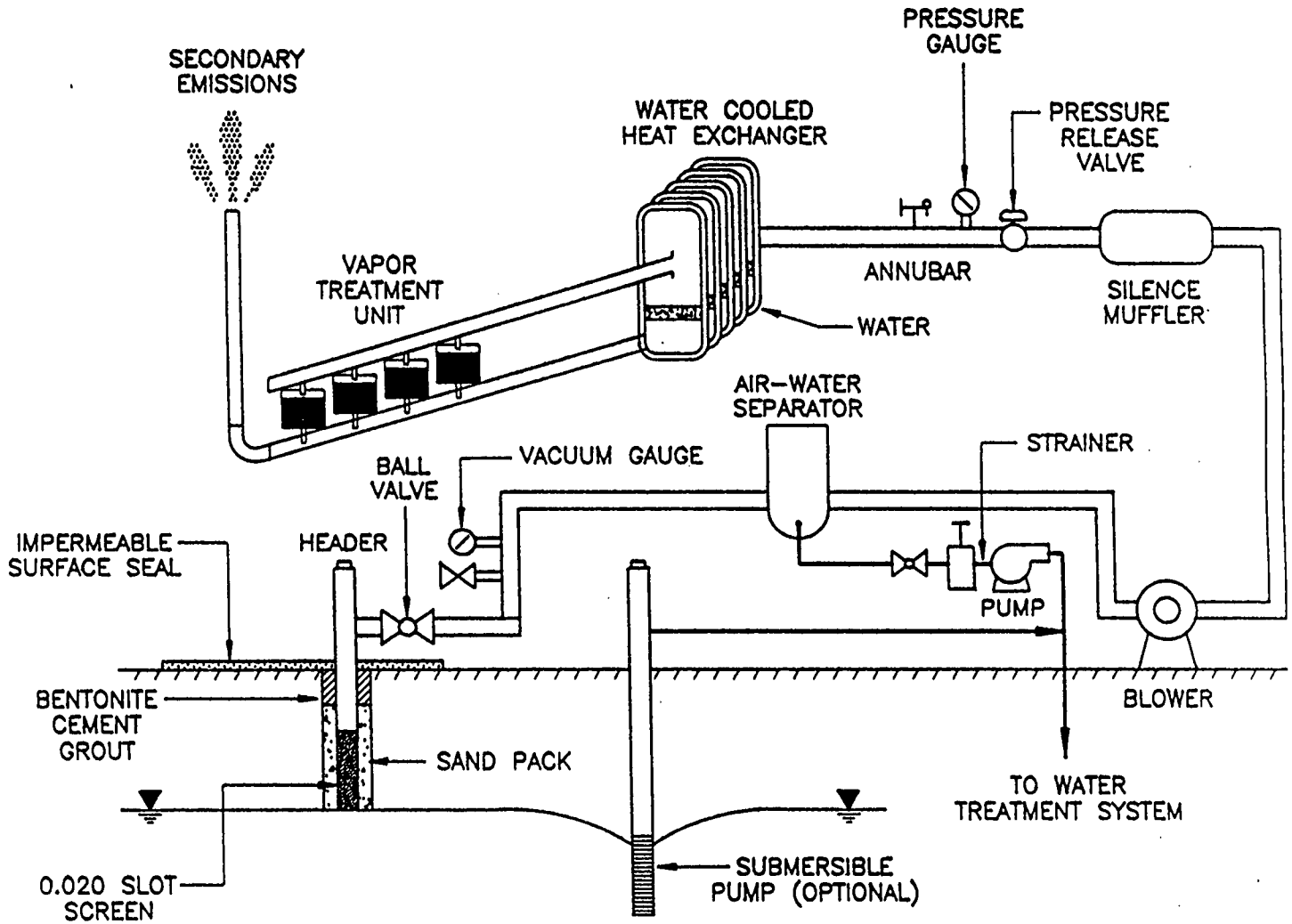
- Lateral trench piping will be utilized on 20-foot centers. This is a conservative estimate based on potentially low permeability soil and a limited area of influence for each well based on the relative shallow soils.

- A catalytic system will be utilized to treat the collected vapors prior to discharge to the atmosphere. Selection of the proper air treatment system will be carefully evaluated in the design. A catalytic system may reduce operating costs as some VOCs (trans-1,2-DCE, cis-1,2-DCE) have relatively short breakthrough times in activated carbon.

- The system will meet the remedial action objectives within 12 months.

5.5.2. Effectiveness

Soil vapor extraction will mitigate potential risks to human health by removing VOCs from the soil. Short-term risks to the surrounding community are not anticipated to increase upon implementation of this alternative. Trench excavation may increase volatilization. Equipment operators may be exposed to increased concentrations of VOCs, however, appropriate PPE will be specified in the design and utilized during implementation and operation of the system.



REFERENCE: PEDERSON AND CURTIS, 1991

FIGURE 5.2 ALTERNATIVE 4: SOIL VAPOR EXTRACTION TYPICAL SCHEMATIC

Soil vapor extraction has been shown to reduce VOC concentrations in soil to ppb levels. Soil vapor extraction has been selected as the remedial action at over 50 Superfund sites containing volatile chemicals. Further investigation of the nature of the chemicals present in the B Building area soils and possibly a soil vent test of a vapor extraction system are required to determine if this alternative will satisfy the site-specific cleanup goals. Likewise, calculation of the time required to meet those goals cannot be accurately determined with the existing data. As soon as the system is turned on, soil gas within the radius of influence will begin to migrate toward the extraction wells, thus meeting the remedial action objective of mitigating continued release of VOCs from the area to groundwater. At this point it is assumed that operation of the system for one year will adequately reduce VOC concentrations.

This system can be designed to satisfy all ARARs. Because off-site soil excavation disposal is not required, RCRA LDR criteria are not triggered. Emissions from the extraction wells or soil gas treatment system will have to comply with Clean Air Act requirements.

Should radon gas be present as a radiological daughter product of other materials, soil vapor extraction will remove it from the soils.

5.5.3. Implementability

Soil vapor extraction systems are not difficult to construct. Placement of the extraction wells utilizes standard soil boring and excavation techniques. They may be, however, difficult to design. Determination of the optimum well placement and air flow rate is complicated by soil heterogeneity, non-uniform distribution of chemicals, and structures such as foundation and paved areas that impact soil gas flow patterns. The most efficient systems have used a phased design approach. By starting the system with a few extraction wells placed in areas of high VOC concentrations, information such as maximum achievable soil gas flow rate, chemical desorption rates, and radii of influence can be determined. This information will provide critical input into the selection of additional extraction points. For the small area associated with the B Building solvent storage shed area, the initial implementation design may only require minor optimization modifications.

Operation of the soil vapor extraction system utilizes standard pumps, blowers, and equipment. Typically, the soil gas extraction rate exceeds the chemical desorption rate so the system is operated in cycles. When plotted soil gas concentrations begin to reach an asymptote, the system is turned off to allow the soil gas and the compounds adsorbed to the soil to reach equilibrium. Following equalization, the system is turned on once again. Operation in this manner reduces overall operation costs, allows down-time for equipment repair and/or replacement, and allows time to review and evaluate data on the existing systems

effectiveness so that further system operation and additional extraction wells may be operated at a greater efficiency.

The soil gas treatment unit must be carefully monitored during operation to ensure emission concentrations are within the limits established by the Clean Air Act. Monitoring of the catalytic system involves standard operating practices and is not anticipated to be problematic.

This alternative would be consistent with potential future work at the site. It will contribute to the long-term remedial action objectives as it has the potential to remove VOCs that may have migrated below B Building. Future actions may include coordination with the B Building solvent storage shed vapor extraction system by placing additional extraction wells west of B Building, and possibly introducing a forced air injection well in the B Building basement to create additional air flow through the soil covered by the B Building.

The potential for low permeability clays and the shallow depth to bedrock, combined with the proximity of building foundations and local paved areas, require that a soil vent test be performed prior to full implementation of this alternative. Shallow placement of the extraction wells due to the depth of bedrock may result in short-circuiting of the airflow. This occurs when the extraction well draws air from the atmosphere in the immediate vicinity of the well resulting in a very small radius of influence. Preferential air flow may also occur when air is drawn along a long pipe chase. Should this be a problem, possible solutions include increasing the number of extraction wells, and placement of a low permeability cap over the impacted area to force air flow to travel through the vadose zone. Implementation of either of these potential options will increase costs.

Because this is a CERCLA site, most special permits and/or waivers will not be required; however, the soil gas treatment system will be required to operate within the permit requirements of the CAA. Trained personnel and specialty equipment are available from a number of sources.

5.5.4. Cost

Estimated costs for Alternative 4 are indicated on Table V.3. Total estimated costs for the soil vapor extraction alternative, including contingencies, are approximately $415,000. The alternative is assumed to be completed in less than one year, therefore, there are no associated O&M or present worth calculations.

TABLE V.3
ALTERNATIVE 4: SOIL VAPOR EXTRACTION
COST ESTIMATE

ITEM	QUANTITY	CAPITAL COST	SCOPE CONT.	CONSTRUCTION SUBTOTAL
I. PRE-MOBILIZATION ACTIVITIES				
1. Design Package	LS	$90,000	10%	$99,000
2. Permit	LS	$10,000	10%	$11,000
II. GENERAL ACTIONS/SITE PREPARATION				
1. Equipment Mobilization	LS	$5,000	20%	$6,000
2. Bldg. Demolition/Disposal	560 SF	$15,000	10%	$17,000
3. Decontamination Facilities	1000 SF	$7,000	10%	$8,000
4. Staging Areas/Site Layout	2000 SF	$5,000	10%	$6,000
III. SOIL VAPOR EXTRACTION SYSTEM				
1. Extraction System Installation	320 LF	$20,000	50%	$30,000
2. 3 HP, 100 CFM Blower	LS	$5,000	15%	$6,000
3. Catalytic Treatment System	LS	$40,000	50%	$60,000
4. Replacement Catalyst	LS	$2,000	50%	$3,000
5. Energy	12 MOS	$8,500	20%	$10,000
6. Disposal of Work Residuals	LS	$5,000	50%	$8,000
7. Equipment Demobilization	LS	$5,000	20%	$6,000
VI. CONSTRUCTION SERVICES				
1. Construction Oversight	1 MOS	$15,000	25%	$19,000
2. Health & Safety Monitoring	1 MOS	$15,000	25%	$19,000
3. Operation & Maintenance	12 MOS	$42,000	25%	$53,000
CAPITAL COST SUBTOTAL		$290,000		
CONSTRUCTION SUBTOTAL				$361,000
BID CONTINGENCY			15%	$54,000
TOTAL ESTIMATED COST				$415,000

Note: LS = Lump Sum Estimate

Estimating costs for the soil vapor extraction systems were complicated by the inherent phased approach to implementation and a lack of critical site data. This is reflected by the high scope contingency applied to the soil vapor extraction line items.

5.6. ALTERNATIVE 7: SOIL WASHING

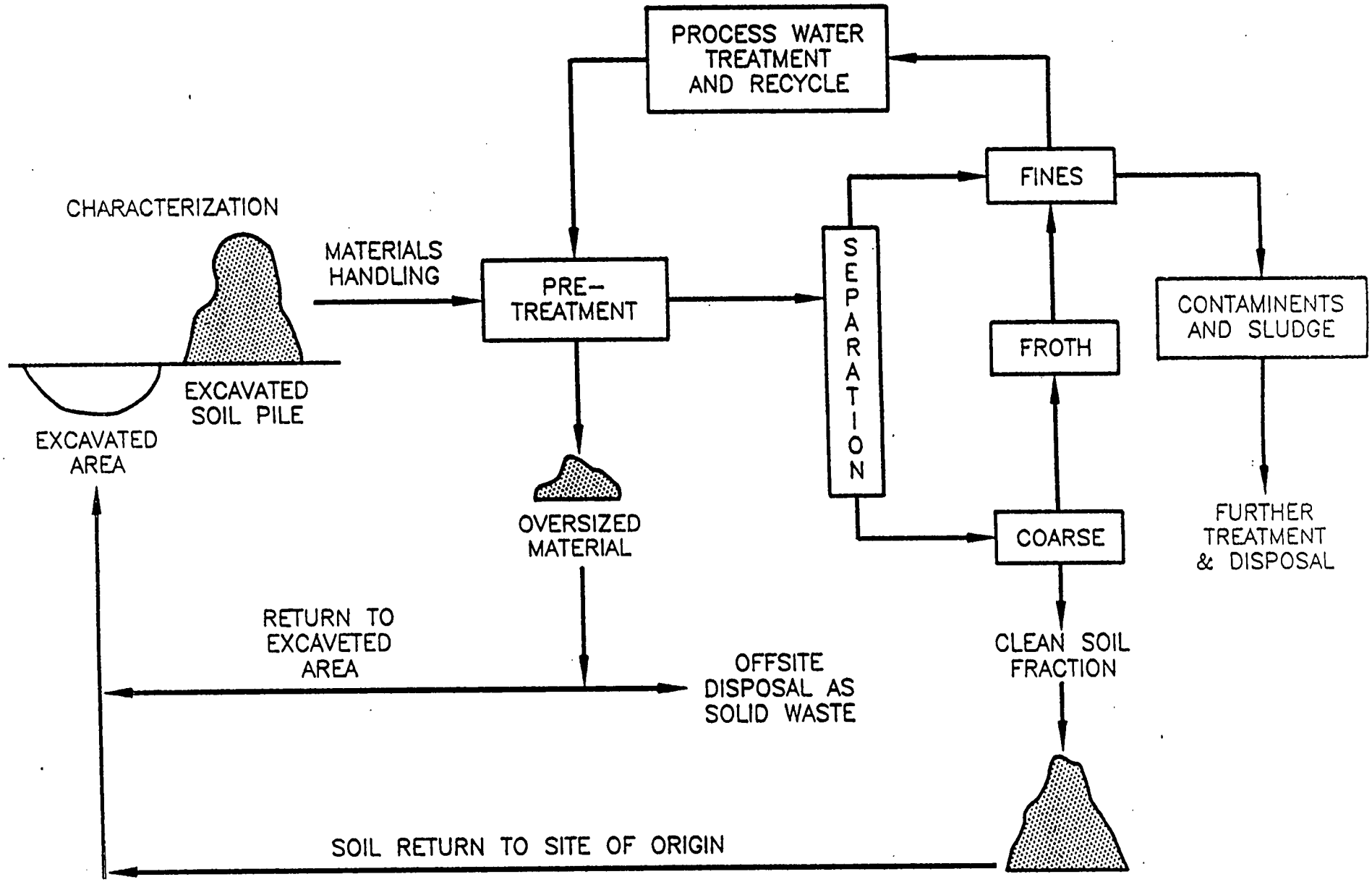
5.6.1. Description

Soil washing is an *ex situ* volume reduction and treatment system. Soil washing has been primarily used for treating soils containing elevated metals and/or non-volatile organic compounds. The standard soil washing unit is not set up to control VOC emissions that will occur during the intense soil agitation and scrubbing that is an integral part of the unit operation. This alternative assumes that the volatilization of VOCs during operations will be minimal and will not exceed CAA criteria.

A modular soil washing plant consists of four basic operations: screening; separation; froth flotation; and sludge management. Screening is used to segregate oversize material (> two inches). Due to most chemicals' affinity for fine particles, the oversize material is often clean and can be recycled as fill and replaced in the excavation. Following screening, the soil is slurried and fed to a series of hydrocyclones to separate the coarse and fine material. The coarse material (sand) proceeds to an air flotation treatment unit. A surfactant is added to the flotation unit to break the surface tension between the sand and the chemicals, allowing the compounds to be removed in the overflow froth. The clean sand is dewatered and returned to the excavation, and froth is concentrated and disposed off-site as a sludge. The fines overflow from the hydrocyclones is treated by polymer addition, sedimentation, thickening, and dewatering. The final sludge cake is combined with the sludge cake from the air flotation units, and disposed at a permitted off-site facility. Figure 5.3 presents a basic schematic of a soil washing system.

This alternative assumes that the soil washing system will reduce the volume of material requiring further treatment by 85 percent. The final 15 percent will be transported to a permitted off-site incinerator for treatment and disposal according to land disposal restriction BDAT guidelines.

As an *ex situ* treatment process, soil must first be excavated. Soil excavation involves the removal of contaminated soil by means of conventional earth moving equipment. As discussed in Section 3.5, approximately 750 cubic yards of soil will require excavation. Due to space limitations in the B Building area, the excavated soil will have to be transported to an on-site soil staging area.



REFERENCE: MANN, 1992

FIGURE 5.3 ALTERNATIVE 7: SOIL WASHING BASIC FLOW DIAGRAM

Prior to excavation, the area of concern will require site preparation. This preparation may include the construction of a truck decontamination pad, a soil staging area with containment berms, demolition of structures and concrete pads, shoring or temporary removal of the liquid nitrogen tank, and relocation of the anchoring block and support cable connected to the exhaust stack between the B and SW buildings. During excavation, underground utilities will require support shoring.

Based on the assumption that the depth to bedrock is five feet and that foundations of the B, OSW, and H buildings are all constructed on bedrock, no foundation shoring will be required for the excavation. If the excavation goes below the assumed depth to bedrock and the foundations, the complexity of excavation will greatly increase, due to foundation shoring requirements. It is also assumed that a subsurface investigation will be implemented prior to any excavation to determine the depth to bedrock and the bulk density of site soils to determine volume-weight relationships, and to identify potential difficulties during the soil excavation.

5.6.2. Effectiveness

Soil washing involves a number of intense segregation, separation, and scrubbing steps that will remove VOCs from the soil. A typical soil washing system, however, is not designed to control VOC emissions. This alternative assumes that the VOC emissions from the operation are within allowable CAA criteria. Given this assumption, implementation of the alternative is not anticipated to result in an increase in short-term risks to the surrounding community. Should this assumption be inaccurate, however, the uncontrolled release of VOCs into the atmosphere could result in an increase in short-term risks to the surrounding community as well as on-site workers. Excavation and equipment operation would be performed using the appropriate PPE.

Soil washing is likely to achieve cleanup levels specified for the site for the treated portion of the soil. Chemicals that may remain absorbed to soil particles will be concentrated in the fines. This material will require further treatment in order to achieve the TCLP concentrations specified by the RCRA land disposal restrictions. This alternative assumes that those concentrated soils will be transported off-site to a permitted incineration facility. Should radiological substances be discovered in the excavated site soils and treated, they would be segregated and concentrated in the fines, similar to other chemicals. Disposal of the fines and sludge as a mixed waste may be required dependent upon the concentrations of the radiological material.

This alternative includes soil excavation and treatment, thus the time required to mitigate potential risks is dependent upon the achievable excavation rate and treatment unit soil throughput. It is estimated that the soil washing alternative can be implemented within a 12-month period.

This alternative can be designed and implemented to comply with ARARs. It can achieve cleanup criteria consistent with the overall site strategy. All accessible material exceeding action levels will be excavated and treated. Potential human health risks are mitigated by removal and treatment of impacted soils.

5.6.3. Implementability

Excavation of the impacted soil may be difficult. The process will be complicated by the proximity of buildings, footers, underground and overhead utilities, and miscellaneous surface structures in the area. This alternative assumes that shoring will not be required to support building foundations during excavation.

Soil washing is a complex soil treatment system. Treatability studies would probably be required prior to implementation. The system will produce soil and water residuals, each requiring further treatment. Due to space requirements, the treatment system would have to be set up in an open area away from the excavation. Excavated material would be transported across the site, resulting in additional potential exposure risks to on-site workers in the unlikely event of an accidental spill. It may be necessary to extend existing water and electric utilities to the treatment area if those utilities do not already exist.

Excavation of impacted material above the specified cleanup levels is consistent with long-term remedial objectives to mitigate potential exposure routes and will not adversely impact additional potential remedial activities. It is anticipated that the alternative can be completed within the statutory financial and budgetary constraints, and will require no special permits or waivers.

Soil washing units are available from a limited number of contractors and equipment suppliers. It is unknown if uncommitted equipment and experienced operators will be available when work is scheduled to begin at the site. Adequate off-site capacity is available for the small volume of residual materials that will be generated.

5.6.4. Cost

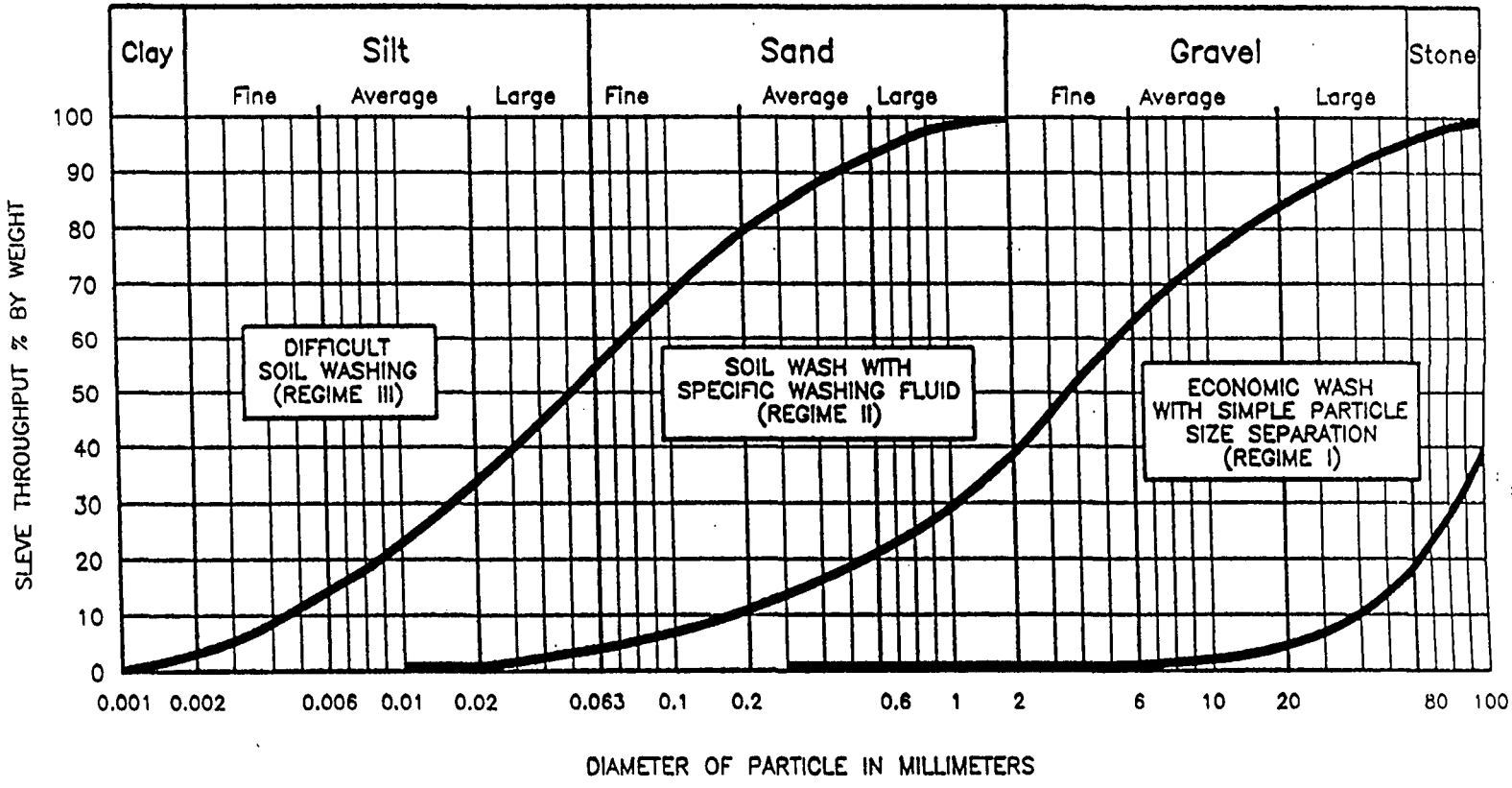
Estimated costs for Alternative 7 are indicated on Table V.4. Total estimated costs for the soil washing system, including contingencies, are approximately $1,107,000. The alternative will be completed in less than one year; therefore, there are no associated O&M or present worth calculations.

Soil washing cost estimates will be impacted by the type of soil and VOC concentrations found at the site. Material comprised of a large fraction of silts and clays (fines) will result in a larger volume of concentrated material to be disposed off-site and are more difficult to treat. Figure 5.4 presents a basic breakdown of

TABLE V.4
ALTERNATIVE 7: SOIL WASHING
COST ESTIMATE

ITEM	QUANTITY	CAPITAL COST	SCOPE CONT.	CONSTRUCTION SUBTOTAL
I. PRE-MOBILIZATION ACTIVITIES				
1. Design Package	LS	$90,000	10%	$99,000
II. GENERAL ACTIONS/SITE PREPARATION				
1. Equipment Mobilization	LS	$45,000	20%	$54,000
2. Bldg. Demolition/Disposal	560 SF	$15,000	10%	$16,500
3. Additional Demo/Disposal	1400 SF	$25,400	10%	$27,900
4. Shoring	415 SF	$2,200	50%	$3,300
5. Decontamination Facilities	3200 SF	$22,000	10%	$24,200
6. Staging Areas/Site Layout	4000 SF	$10,000	10%	$11,000
7. Material Stockpile Area	4000 SF	$10,000	20%	$12,000
8. Treatability Study	LS	$27,000	20%	$32,400
III. SOIL EXCAVATION/TREATMENT				
1. Excavation of Soils	750 CY	$5,000	35%	$6,800
2. Confirmatory Sampling	150 SAMP	$25,500	50%	$38,300
3. Hauling to Staging Area	925 CY	$5,000	20%	$6,000
4. Loading Into Soil Wash	925 CY	$1,400	20%	$1,700
5. Soil Washing	1100 TONS	$302,500	15%	$347,900
6. Loading 85% into Trucks	785 CY	$1,200	20%	$1,400
7. Hauling 85% to Excavation	785 CY	$4,000	20%	$4,800
IV. BACKFILLING AND GRADING				
1. Hauling Incl. Additional Fill	140 CY	$4,100	20%	$4,900
2. Fill Placement	925 CY	$2,900	30%	$3,800
3. Disposal of Work Residuals	LS	$10,000	50%	$15,000
4. Equipment Demobilization	LS	$45,000	20%	$54,000
V. CONCENTRATED WASTE DISPOSAL				
1. Loading 15% into Trucks	140 CY	$200	20%	$240
2. Transportation (8 Trips)	420 MILES	$13,550	15%	$15,600
3. Incineration	155 TONS	$125,550	15%	$144,400
VI. CONSTRUCTION SERVICES				
1. Construction Oversight	1 MOS	$15,000	25%	$18,800
2. Health & Safety Monitoring	1 MOS	$15,000	25%	$18,800
CAPITAL COST SUBTOTAL		$823,000		
CONSTRUCTION SUBTOTAL				$963,000
BID CONTINGENCY			15%	$144,000
TOTAL ESTIMATED COST				$1,107,000

Note: LS = Lump Sum Estimate
The excavated soil was increased by 25% to allow for swelling.



REFERENCE: MANN, 1992

FIGURE 5.4 ALTERNATIVE 7: SOIL WASHING APPLICABLE PARTICLE SIZE RANGE

the applicability of soil washing relative to the grain size of the material to be treated. If VOC emissions from the soil washing system exceed CAA criteria, the system would require modification to allow collection and treatment of vaporized VOCs. Both soil type and VOC concentrations could significantly inflate the estimated costs presented.

5.7. ALTERNATIVE 8: THERMAL DESORPTION

5.7.1. Description

Thermal desorption is an *ex situ* treatment process designed specifically to treat VOC impacted soils. The system consists of a pre-treatment step to control particle size, thermal treatment of the soil, and a post-treatment step to treat the off-gas generated from the system. Pre-treatment is required to screen out oversize materials. Rotary dryers can handle material up to 2.5 inches. Screw conveyors can handle material up to four inches in diameter. Screening is done in controlled units capable of collecting volatile emissions that may result from agitation of the soil. Additional pre-treatment is required if the moisture content exceeds 40 percent. A moisture content of 20 percent is considered ideal for most thermal desorption units. Gas post-treatment includes organic control, acid gas control, particle removal, and condensed liquid treatment. Types of organic gas treatment systems include afterburners, catalytic oxidation, and vapor phase carbon adsorption. Acid neutralization and particle removal using various air pollution control devices may also be required. Liquid condensed from the off-gas will also require treatment. Smaller volumes will be collected and disposed off-site. Larger volumes of liquid may justify on-site treatment.

Soil excavation is required to implement this alternative. Excavation will proceed as described for Alternative 7.

5.7.2. Effectiveness

Thermal desorption will reduce VOC concentrations sufficiently to comply with site-specific cleanup criteria. Treatability studies may not be required to implement the thermal desorption alternative, as the equipment was specifically designed to treat soils containing VOCs. Short-term risks to workers and the community may increase during operation due to uncontrolled release of VOCs during excavation activities. Operation of the thermal desorption unit will not increase short-term risks as long as the off-gas treatment system is working properly.

Thermal desorption has been selected as the remedial action at over 20 Superfund sites impacted by VOCs. It is also currently being used at a number of non-hazardous sites impacted by petroleum

hydrocarbons. Equipment is basically off-the-shelf industrial equipment and is considered reliable. Implementation of thermal desorption could be completed in less than 12 months.

Excavation of the impacted soils is protective of the environment as it mitigates potential future VOC releases from the B Building solvent shed area. Excavation may result in some uncontrolled VOC emissions; however, emissions and dust control will be specified in the alternative design. Emissions from the treatment unit will be controlled and treated prior to discharge to the atmosphere. Thermal desorption will not provide removal or treatment of radiological substances, should they be present in excavated material. Most material will remain present in the treated soil, however, some radiological substances may be released to the atmosphere through the treated air discharge.

This alternative can be designed and constructed in compliance with ARARs. Air emissions from the thermal treatment unit must satisfy CAA requirements. The alternative can achieve cleanup criteria consistent with the overall site strategy. All accessible material exceeding action levels will be excavated and treated. Potential human health risks are mitigated by source removal and treatment. The alternative is consistent with overall site remediation goals since all associated material is treated.

5.7.3. Implementability

Excavation of the impacted soil may be difficult. The process will be complicated by the proximity of buildings, footers, underground and overhead utilities, and miscellaneous surface structures in the area. This alternative assumes that shoring will not be required to support building foundations during excavation.

Due to space requirements, the treatment system would have to be set up in an open area away from the excavation. Excavated material would be transported across the site, resulting in additional potential exposure risks to on-site workers in the unlikely event of an accidental spill. It may be necessary to extend existing water and electric utilities to the treatment area if those utilities do not already exist.

Excavation of impacted material above the specified cleanup levels is consistent with long-term remedial objectives to mitigate potential exposure routes and will not adversely impact additional potential remedial activities. It is anticipated that the alternative can be completed within the statutory financial and budgetary constraints, and will require no special permits or waivers.

Thermal desorption units are available from a limited number of contractors and equipment suppliers. It is unknown if uncommitted equipment and experienced operators will be available when work is scheduled to begin at the site.

5.7.4. Cost

Estimated costs for Alternative 8 are indicated on Table V.5. Total estimated costs for the thermal desorption system, including contingencies, are approximately $1,044,000. The alternative will be completed in less than one year; therefore, there are no O&M or present worth calculations.

Thermal desorption cost estimates will be impacted by the type and concentration of chemicals found in the impacted soil. Chemical-specific influent soil concentrations and required effluent concentrations, and the individual vaporization characteristics of each VOC present in the soil will control the equipment throughput as less volatile compounds require a longer heating time. Both the type and concentrations of chemicals will impact the selection and operation of the air pollution control devices, often one of the most significant cost components of the treatment system. For example, large concentrations of VOCs with low carbon partition coefficients (Koc) will require large volumes of vapor phase carbon to adequately treat.

5.8. ALTERNATIVE 10: OFF-SITE INCINERATION

5.8.1. Description

Alternative 10 consists of soil excavation and thermal treatment at a permitted off-site incineration facility (BDAT for F002/F003 wastes as determined by the RCRA land disposal restrictions). Soil excavation will be performed as described in other alternatives. Excavated material will be loaded onto over-the-road trucks and transported to a RCRA permitted incineration facility. Clean fill will be purchased and placed in the excavation to return the site to grade. Concrete sidewalks, drives, and other items disturbed during excavation activities will be replaced or repaired. To be conservative, it is assumed for this alternative that all excavated material will exceed the TCLP criteria established by LDR and require treatment prior to disposal.

5.8.2. Effectiveness

Short-term risks to workers and the surrounding community may increase slightly due to the likely volatilization of some chemicals during excavation activities. The final design will provide for volatilization and dust control.

TABLE V.5
ALTERNATIVE 8: THERMAL DESORPTION
COST ESTIMATE

ITEM	QUANTITY	CAPITAL COST	SCOPE CONT.	CONSTRUCTION SUBTOTAL
I. PRE-MOBILIZATION ACTIVITIES				
1. Design Package	LS	$90,000	10%	$99,000
II. GENERAL ACTIONS/SITE PREPARATION				
1. Equipment Mobilization	LS	$180,000	20%	$216,000
2. Demolition/Disposal	560 SF	$15,000	10%	$17,000
3. Additional Demo/Disposal	1400 SF	$25,400	10%	$28,000
4. Shoring	415 SF	$2,200	50%	$3,000
5. Decontamination Facilities	3200 SF	$22,000	10%	$24,000
6. Staging Areas/Site Layout	4000 SF	$10,000	10%	$11,000
7. Material Stockpile Area	4000 SF	$10,000	20%	$12,000
III. SOIL EXCAVATION/TREATMENT				
1. Excavation of Soils	750 CY	$5,000	35%	$7,000
2. Confirmatory Sampling	150 SAMP	$25,500	50%	$38,000
3. Hauling to Staging Area	925 CY	$5,000	20%	$6,000
4. Loading into Desorption Unit	925 CY	$1,400	20%	$2,000
5. Treatment	1100 TONS	$143,000	15%	$164,000
6. Loading Into Trucks	925 CY	$1,400	20%	$2,000
7. Hauling to Excavation	925 CY	$5,000	20%	$6,000
IV. BACKFILLING AND GRADING				
1. Fill Placement	925 CY	$2,900	30%	$4,000
2. Disposal of Work Residuals	LS	$10,000	50%	$15,000
3. Equipment Demobilization	LS	$180,000	20%	$216,000
VI. CONSTRUCTION SERVICES				
1. Construction Oversight	1 MOS	$15,000	25%	$19,000
2. Health & Safety Monitoring	1 MOS	$15,000	25%	$19,000
CAPITAL COST SUBTOTAL		$764,000		
CONSTRUCTION SUBTOTAL				$908,000
BID CONTINGENCY			15%	$136,000
TOTAL ESTIMATED COST				$1,044,000

Note: LS = Lump Sum Estimate
The excavated soil was increased by 25% to allow for swelling.

This alternative will meet all remedial action objectives for accessible material. There is a possibility the VOCs have migrated below the adjacent buildings and cannot be removed by excavation prior to building demolition. VOCs may also have migrated into cracks and faults in the bedrock. Removal of bedrock material by excavation at this location is not practical.

Excavation and off-site incineration have been performed at numerous sites, and can be completed with the statutory time frame, using the assumed volumes. The alternative will have a beneficial impact on the environment because it will remove a source of VOCs from the site, thus mitigating further leaching and migration of VOCs to the groundwater.

This alternative can be implemented in compliance with all ARARs. The land disposal restrictions indicate that incineration is the BDAT for F001/F002 wastes. All excavated materials will be incinerated, and the incinerator ash residual will be properly disposed in a permitted landfill.

Potential risks to human health will be mitigated by removal of the source. Wastes exceeding cleanup levels will be removed; therefore, the alternative is consistent with overall site remediation goals.

5.8.3. Implementability

The largest implementation concern associated with this alternative is the ability to implement excavation at the site. Due to the proximity of buildings, and the presence of underground utilities, and other obstructions, excavation may be expensive and difficult. Records indicate the building foundations are approximately four to six feet deep. Based on the estimated depth to bedrock (five feet), it is assumed that the foundation of the local buildings are supported on bedrock. If this assumption is incorrect, and building foundations require shoring, excavation near the buildings may become much more complex.

Implementation of this alternative will not adversely impact the ability to perform future work at the site, and will contribute to the sites long-term remedial action goals by mitigating continued release of VOCs from the B Building solvent storage shed area soil.

This alternative can be implemented within the statutory schedule constraints. It is estimated to require approximately three months to implement and complete excavation, transport and disposal, and to backfill the site.

Special permits and/or waivers will not be required to perform this alternative. Transporters and receiving incineration facilities must be properly permitted to haul and accept RCRA hazardous materials.

Off-site incineration capacity exists for the volume of material anticipated to be removed from the site. The rate of acceptance, however, is likely to be less than the excavation rate, and a soil stockpile area will be required. Trained excavation and transportation personnel are readily available.

Because this alternative will remove all accessible material exceeding the cleanup level, there will be no need for post-remediation site control.

5.8.4. Cost

Estimated costs for Alternative 10 are indicated on Table V.6. Total estimated costs for off-site incineration, including contingencies are approximately $1,709,000. The alternative will be completed in less than one year, therefore, there are no associated O&M or present value calculations.

Off-site incineration costs are controlled by the material volume. If the volume of material exceeds the assumed volume, the capital costs for off-site incineration could exceed $2 million. If the volume is much smaller, off-site incineration becomes more cost-competitive with other remedial alternatives.

5.9. ALTERNATIVE 12: OFF-SITE LANDFILL

5.9.1. Description

Alternative 12 consists of soil excavation and disposal at a permitted off-site landfill facility. Soil excavation will be performed as described in other alternatives. Excavated material will be loaded onto over-the-road trucks and transported to a RCRA permitted landfill. Clean fill will be purchased and placed in the excavation to return the site to grade. Concrete sidewalks, drives, and other items disturbed during excavation activities will be replaced or repaired. Alternative 12 assumes that all the material excavated will exceed the cleanup levels established for the site. None of the material excavated, however, will exceed the TCLP criteria established by the land disposal restrictions, and none of the material will require treatment prior to disposal.

Effectiveness and implementability issues associated with this alternative are identical to those discussed for Alternative 10, Off-Site Incineration, and will not be repeated here.

TABLE V.6

ALTERNATIVE 10: OFF-SITE INCINERATION

COST ESTIMATE

ITEM	QUANTITY	CAPITAL COST	SCOPE CONT.	CONSTRUCTION SUBTOTAL
I. PRE-MOBILIZATION ACTIVITIES				
1. Design Package	LS	$80,000	10%	$88,000
II. GENERAL ACTIONS/SITE PREPARATION				
1. Equipment Mobilization	LS	$10,000	20%	$12,000
2. Bldg. Demolition/Disposal	560 SF	$15,000	10%	$16,500
3. Additional Demo/Disposal	1400 SF	$25,400	10%	$27,900
4. Shoring	415 SF	$2,200	50%	$3,300
5. Decontamination Facilities	3200 SF	$22,000	10%	$24,200
6. Staging Areas/Site Layout	4000 SF	$10,000	10%	$11,000
7. Material Stockpile Area	4000 SF	$10,000	20%	$12,000
III. SOIL EXCAVATION				
1. Excavation of Soils	750 CY	$5,000	35%	$6,800
2. Confirmatory Sampling	150 SAMP	$25,500	50%	$38,300
3. Hauling to Staging Area	925 CY	$5,000	20%	$6,000
IV. TRANSPORTATION/INCINERATION				
1. Loading into Trucks	925 CY	$1,400	20%	$1,700
2. Transportation (53 trips)	420 MILES	$89,000	15%	$102,400
3. Incineration	1100 TONS	$891,000	15%	$1,024,700
4. Confirmatory Sampling	3 SAMP	$6,000	50%	$9,000
V. BACKFILLING AND GRADING				
1. Hauling Including Fill	925 CY	$27,000	20%	$32,400
2. Fill Placement	925 CY	$2,900	30%	$3,800
3. Disposal of Work Residuals	LS	$10,000	60%	$16,000
4. Equipment Demobilization	LS	$10,000	20%	$12,000
VI. CONSTRUCTION SERVICES				
1. Construction Oversight	1 MOS	$15,000	25%	$18,800
2. Health & Safety Monitoring	1 MOS	$15,000	25%	$18,800
CAPITAL COST SUBTOTAL		$1,277,000		
CONSTRUCTION SUBTOTAL				$1,486,000
BID CONTINGENCY			15%	$223,000
TOTAL ESTIMATED COST				$1,709,000

Note: LS = Lump Sum Estimate
The excavated soil was increased by 25% to allow for swelling.

5.9.2. Cost

Estimated capital costs for Alternative 12 are indicated on Table V.7. Total estimated costs for the off-site landfill alternative, including contingencies, are approximately $653,000. The alternative will be complete in less than one year, therefore, there are no associated O&M or present worth costs.

Off-site landfill costs reflect the driving assumption that the excavated material will satisfy RCRA LDR criteria and not require treatment prior to disposal. Alternative costs increase for every ton of material that must be treated prior to final placement in a permitted off-site facility.

TABLE V.7
ALTERNATIVE 12: OFF-SITE LANDFILL
COST ESTIMATE

ITEM	QUANTITY	CAPITAL COST	SCOPE CONT.	CONSTRUCTION SUBTOTAL
I. PRE-MOBILIZATION ACTIVITIES				
1. Design Package	LS	$80,000	10%	$88,000
II. GENERAL ACTIONS/SITE PREPARATION				
1. Equipment Mobilization	LS	$10,000	20%	$12,000
2. Bldg. Demolition/Disposal	560 SF	$15,000	10%	$16,500
3. Additional Demo/Disposal	1400 SF	$25,400	10%	$27,900
4. Shoring	415 SF	$2,200	50%	$3,300
5. Decontamination Facilities	3200 SF	$22,000	20%	$26,400
6. Staging Areas/Site Layout	4000 SF	$10,000	20%	$12,000
7. Material Stockpile Area	4000 SF	$10,000	20%	$12,000
III. SOIL EXCAVATION				
1. Excavation of Soils	750 CY	$5,000	35%	$6,800
2. Confirmatory Sampling	150 SAMP	$25,500	50%	$38,300
3. Hauling to Staging Area	925 CY	$5,000	20%	$6,000
IV. TRANSPORTATION/DISPOSAL				
1. Loading into Trucks	925 CY	$1,400	20%	$1,700
2. Transportation (53 trips)	170 MILES	$36,000	15%	$41,400
3. Disposal	1100 TONS	$143,000	15%	$164,500
4. Confirmatory Sampling	3 SAMP	$6,000	50%	$9,000
V. BACKFILLING AND GRADING				
1. Hauling including Fill	925 CY	$27,000	20%	$32,400
2. Fill Placement	925 CY	$2,900	30%	$3,800
3. Disposal of Work Residuals	LS	$10,000	60%	$16,000
4. Equipment Demobilization	LS	$10,000	20%	$12,000
VI. CONSTRUCTION SERVICES				
1. Construction Oversight	1 MOS	$15,000	25%	$18,800
2. Health & Safety Monitoring	1 MOS	$15,000	25%	$18,800
CAPITAL COST SUBTOTAL		$476,000		
CONSTRUCTION SUBTOTAL				$568,000
BID CONTINGENCY			15%	$85,000
TOTAL ESTIMATED COST				$653,000

Note: LS = Lump Sum Estimate
The excavated soil was increased for 25% to allow for swelling.

6.0. SUMMARY AND COMPARISON OF IRA ALTERNATIVES

Table VI.1 presents a summary and overall rating of the alternatives evaluated in Section 5. The table ranks each alternative based on how well it satisfies the screening criteria. The criteria ranking (CR) value for effectiveness and implementability ranges from one to four as follows:

1 - Alternative does not meet the criteria/objectives;
2 - Alternative only minimally meets the criteria/objectives;
3 - Alternative slightly exceeds the criteria/objectives; and,
4 - Alternative meets and far exceeds the criteria/objectives.

The CR value for alternative costs also ranges from one to four as follows:

1 - Cost exceeds $2 million;
2 - Cost is within $1 million to $2 million range;
3 - Cost is within $500,000 to $1 million range; and
4 - Cost is less than $500,000.

Each of the criteria is assigned a weighting factor (WF). Those criteria that are considered more important are given higher WF values. Thus, protection of human health, protection of the environment, and ability to achieve cleanup levels are weighted heavily (high WF values). The weighted criteria value (WV) is the product of WF and CR.

Effectiveness, implementability, and cost weightings are equally divided, with a total WF of 50 for each.

6.1. EFFECTIVENESS

Criteria utilized to evaluate effectiveness were heavily weighted to judge an alternative's ability to be protective of public health and the community (WF = 12), to be protective of the environment (WF=12), and achieve an acceptable level of treatment or containment (WF = 10).

The effectiveness of the soil vapor extraction, soil washing, thermal desorption, off-site incineration, and off-site landfill alternatives were judged to be essentially equal, with weight criteria values ranging from 152 to 169. Each of these alternatives addresses potential site risks through source removal, and, given the assumptions used in developing the alternatives, are capable of satisfying the IRA objectives and chemical-specific cleanup criteria. The effectiveness of the concrete cap was much lower than the other alternatives (WV = 105) as is expected when comparing the effectiveness of containment and treatment alternatives.

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES

OBJECTIVE/ CRITERIA	WF	ALT. 1: NO ACTION			ALT. 2: CONCRETE CAP			ALT. 4: SOIL VAPOR EXTRACTION			ALT. 7: SOIL WASHING		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
EFFECTIVENESS													
PROTECTIVENESS													
Protective of public health and community	12	Does not mitigate exposure pathways. Allows continued VOC migration.	1	12	Will mitigate potential direct contact and leaching exposure pathways by controlling the transport mechanism (infiltration).	2	24	VOCs are removed from impacted soil including material inaccessible by standard excavation. Exposure pathways are mitigated by source removal.	4	48	Exposure pathways will be mitigated by source removal. Accessible material exceeding cleanup levels will be excavated and treated. Only material satisfying treatment criteria will be backfilled.	3	36
Protective of workers during implementation	5	No activities are implemented, thus, there is no worker exposure.	4	20	Minor soil removal activities may create uncontrolled release of VOCs. Appropriate PPE will be used during implementation.	3	15	VOCs will be removed in a controlled manner and treated prior to discharge. Appropriate PPE will be specified.	3	15	Excavation may create uncontrolled release of VOCs. Excavation near buildings and utilities may be physically dangerous. Treatment system must be modified to control VOC emissions.	2	10
Protective of the environment	12	VOCs will continue to migrate into the groundwater.	1	12	Will mitigate VOC migration by reducing infiltration.	2	24	VOCs are removed without disturbing site and are treated prior to discharge. Failure of the treatment system could adversely impact the local environment.	3	36	Protects environment by source removal. Uncontrolled release of VOCs during excavation and treatment could adversely impact local environment.	3	36
Complies with ARARs	5	Does not comply with ARARs	1	5	Can be designed to meet most ARARs. Does not comply with RCRA-approved cap. Is not consistent with EPAs preference for treatment.	2	10	Can be designed and implemented in compliance with all ARARs.	4	20	Can be designed and implemented in compliance with all identified ARARs.	4	20

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES (continued)

OBJECTIVE/ CRITERIA	WF	ALT. 1: NO ACTION			ALT. 2: CONCRETE CAP			ALT. 4: SOIL VAPOR EXTRACTION			ALT. 7: SOIL WASHING		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
ABILITY TO ACHIEVE REMOVAL OBJECTIVES													
Level of treatment/ containment expected to be achieved	10	Will not meet interim remedial objectives.	1	10	Does not treat impacted soils. Will reduce VOC migration to groundwater as long as cap maintains integrity.	2	20	Will meet cleanup up standards, but it may take an extended period in low permeability material.	3	30	Coarse grained material will be satisfactorily treated. Compounds will be concentrated in fines which will require additional treatment off site. VOCs removed from soil will require collection and treatment via air pollution control devices.	3	30
Residuals effects are not a concern	2	Impacted soil remains in place. VOCs are uncontrolled.	1	2	Impacted soil will remain in place, and may require treatment in the future. VOC migration is controlled.	2	4	Residuals generated will be spent carbon and a small volume of water. Both can be treated and disposed without difficulty.	3	6	Residuals will include spent carbon from off gas treatment, waste water, and segregated fines and sludge containing concentrated compounds. Sludge disposal may be complicated by concentrated nature of waste.	2	4
Will maintain control until long-term solution implemented	4	Will not control exposure pathways.	1	4	Will control potential leaching for short-term until final remedy selected. Leaking underground utilities will adversely impact reliability.	2	8	Will control exposure pathways and reduce extent of potential future remedial actions.	3	12	Exposure pathways will be mitigated by source removal.	4	16
Effectiveness Summary	50		1.3	65		2.1	105		3.3	167		3.0	152
IMPLEMENTABILITY													
TECHNICAL FEASIBILITY													
Constructability and operational considerations	4	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Standard civil engineer process. Ties to existing concrete will be critical. Operation is minimal.	4	16	Consists of off-the-shelf-equipment that is readily assembled and implemented. Operational concerns are minimal, however, careful monitoring off vapor treatment system is required to ensure compliance with CAA.	3	12	Excavation may be difficult due to underground utilities and proximity of adjacent buildings. Soil washing is a complex treatment method requiring careful monitoring and skilled operators.	2	8

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES (continued)

OBJECTIVE/ CRITERIA	WF	ALT. 1: NO ACTION			ALT. 2: CONCRETE CAP			ALT. 4: SOIL VAPOR EXTRACTION			ALT. 7: SOIL WASHING		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
Demonstrated performance/useful life	8	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Capping has been demonstrated to reduce infiltration. A concrete cap will maintain its integrity until a final remedy is implemented.	3	24	Is alternative of choice for VOCs in sandy, highly permeable material. Has not been well demonstrated in clays or shallow bedrock systems.	3	24	Soil washing has been proven effective as a treatment and volume reduction option in coarse grained materials containing metals and BNAs, however, its effectiveness for clays containing VOCs is questionable.	2	16
Adaptable to environmental conditions	2	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Implementation concerns including proximity of adjacent buildings and location of underground utilities can be solved by good engineering practices.	4	8	May be difficult and expensive to adapt to anticipated heterogeneous, low permeability materials.	2	4	It may be difficult to adapt the treatment system to material containing VOCs and a large fraction of fines.	3	6
Contributes to remedial performance	4	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Will mitigate VOC migration from area, however, may impede future work in the area if excavation is required.	2	8	Removes VOCs from soil, reducing mass available for additional migration and thus reducing the scope and costs associated with selected final site remedy. May remove VOCs from areas inaccessible by other means.	4	16	Source of VOCs is removed, thus further action in area will not be required. Cannot address impacted material that is inaccessible by standard excavation.	3	12
Can be implemented in 1 year	4	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Can be implemented in less than 1 year.	4	16	Insufficient data to determine required remediation time, however it may exceed 1 year. Alternative will remediate material.	3	12	Excavation and treatment can be implemented in less than 1 year.	4	16
Can monitor results easily	2	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Difficult to monitor effectiveness of capping due to VOCs already present in groundwater and other potential sources within OU-2.	1	2	Sampling and analysis of soil gas removed by system allows easy performance monitoring.	4	8	Results are monitored by confirmatory sampling during excavation and sampling and analysis of treated material.	4	8

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES (continued)

OBJECTIVE/ CRITERIA	WF	ALT. 1: NO ACTION			ALT. 2: CONCRETE CAP			ALT. 4: SOIL VAPOR EXTRACTION			ALT. 7: SOIL WASHING		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
AVAILABILITY													
Availability of equipment and materials	6	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Standard construction equipment and materials.	4	24	Standard equipment is readily available, however, some vapor extraction techniques have recently been patented.	3	18	Excavation equipment is readily available. Soil washing is derived from mining practice, however, only a few firms have equipment and experience with hazardous waste.	2	12
Availability of personnel and services	4	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Many construction firms capable of building cap.	4	16	Personnel and services required are readily available.	4	16	Only a few firms have experience with soil washing hazardous waste.	2	8
Availability of outside laboratory testing capacity	1	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Sampling requirements will not exceed available lab capacity.	4	4	Sampling requirements will not exceed available lab capacity.	4	4	Sampling and analysis requirements will not exceed lab capacity.	4	4
Availability of off-site treatment and disposal	4	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Off-site incineration and landfill facilities have capacity for small volume of surface soil removed from site.	3	12	Off-site facilities for disposal of spent carbon and residual water are available and have sufficient capacity.	3	12	Off-site treatment or disposal will be required for spent carbon from air treatment, waste water from system, and concentrated sludge. Disposal of sludge may be complicated by the concentrated nature of compounds.	2	8
Availability of post removal site control	2	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Post IRA control requirements are minimal.	3	6	Personnel and equipment required to continue operation of the system are available.	3	6	Post removal site control requirements are minimal.	4	8

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES (continued)

OBJECTIVE/ CRITERIA	WF	ALT. 1: NO ACTION			ALT. 2: CONCRETE CAP			ALT. 4: SOIL VAPOR EXTRACTION			ALT. 7: SOIL WASHING		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
ADMINISTRATIVE FEASIBILITY													
Permits required	2	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			No special permits are required.	4	8	No on site permits are required at CERCLA site, however, system will have to comply with intent of CAA. Permits for transportation of residual materials can be obtained.	3	6	No on-site permits are required for CERCLA sites, however, alternative will have to comply with intent of CAA. Permits for transportation and disposal of residual material including concentrated sludge.will be required.	2	4
Easements or rights-of-way required	2	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Not required.	4	8	Not required.	4	8	Easements will not be required, however, due to space constraints, system cannot be set up in excavation area. Some other portion of site will have to be dedicated as a treatment location.	2	4
Impact on adjoining property	2	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Capping will not impact adjacent properties.	3	6	Proper performance of alternative will not impact adjacent property, however, failure of the vapor treatment system will result in uncontrolled release of VOCs.	3	6	Uncontrolled release of VOCs during excavation and potentially during treatment of material may impact surrounding area.	2	4
Ability to acquire institutional controls	1	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Institutional controls are not required.	4	4	Institutional controls are not required.	4	4	Institutional controls are not required.	4	4
Likelihood to obtain waiver from statutory limits (if needed)	2	NOT APPLICABLE: No Action is intended as effectiveness baseline only.			Waiver is not necessary.	4	8	If treatment time exceeds 1 year, waiver is likely to be granted as system is removing VOCs from beyond IRA site boundaries.	3	6	Waiver is not necessary.	4	8
Implementability Summary	50					3.4	170		3.2	162		2.6	130

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES (continued)

OBJECTIVE/ CRITERIA	WF	ALT. 1: NO ACTION			ALT. 2: CONCRETE CAP			ALT. 4: SOIL VAPOR EXTRACTION			ALT. 7: SOIL WASHING		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
COST													
Capital Cost		NOT APPLICABLE:			$222000			$290,000			$ 823,000		
Contingency		No Action is intended as effectiveness baseline only.			$ 77,000			$125,000			$ 284,00		
Total Estimated Costs	50				$299,000	4	200	$415,000	4	200	$1,107,000	2	100
SUMMARY	150					3.2	475		3.5	529		2.6	382

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES (continued)

OBJECTIVE/ CRITERIA	WF	ALT. 8: THERMAL DESORPTION			ALT. 10: OFF SITE INCINERATION			ALT. 12: OFF SITE LANDFILL		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
EFFECTIVENESS										
PROTECTIVENESS										
Protective of public health and community	12	Exposure pathways will be mitigated by source removal. Accessible material exceeding cleanup levels will be excavated and treated. Only material satisfying treatment criteria will be backfilled.	3	36	Exposure pathways will be mitigated by source removal. Accessible material exceeding cleanup levels will be excavated and disposed off site. Off site transportation will pass through populated areas.	3	36	Exposure pathways will be mitigated by source removal. Accessible material exceeding cleanup levels will be excavated and disposed off site. Off site transportation will pass through populated areas.	3	36
Protective of workers during implementation	5	Excavation may create uncontrolled release of VOCs. Excavation near buildings and utilities may be physically dangerous. Treatment system is designed specifically to remove, control, and treat VOCs.	3	15	Excavation may create uncontrolled release of VOCs. Excavation near buildings and utilities may be physically dangerous. Appropriate PPE will be specified.	3	15	Excavation may create uncontrolled release of VOCs. Excavation near buildings and utilities may be physically dangerous. Appropriate PPE will be specified.	3	15
Protective of the environment	12	Protects environment by source removal. Uncontrolled release of VOCs during excavation and treatment could adversely impact local environment.	3	36	Protects environment by source removal. Uncontrolled release of VOCs during excavation could adversely impact local environment.	3	36	Protects environment by source removal. Uncontrolled release of VOCs during excavation could adversely impact local environment.	3	36
Complies with ARARs	5	Can be designed and implemented in compliance with all ARARs.	4	20	Can performed in compliance with all ARARs, however, off site incineration is not compliant with EPAs preference for on site treatment.	3	15	Assuming excavated material does not exceed land disposal TCLP restrictions, off site disposal is in compliance with all ARARs, however, it is not compliant with EPAs preference for on site treatment.	3	15
ABILITY TO ACHIEVE REMOVAL OBJECTIVES										
Level of treatment/ containment expected to be achieved	10	Can meet and exceed all cleanup levels.	4	40	Soils exceeding cleanup concentrations will be removed from the site. Excavated material will be treated by incineration, the BDAT for RCRA F001/F002 wastes.	4	40	Soils exceeding cleanup concentrations will be removed from the site. Excavated material will not be treated but will be disposed in a permitted off-site facility.	4	40
Residuals effects are not a concern	2	Residuals will include spent carbon from air treatment system, and wastewater. Both can be treated and disposed without difficulty.	3	6	There will be no on-site residuals. Residual ash from incineration will be placed in a permitted landfill.	4	8	There will be no on-site residuals.	4	8
Will maintain control until long-term solution implemented	4	Exposure pathways will be mitigated by source removal	4	16	Exposure pathways will be mitigated by source removal.	4	16	Exposure pathways will be mitigated by source removal.	4	16
Effectiveness Summary	50		3.4	169		3.3	166		3.3	166

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES (continued)

OBJECTIVE/ CRITERIA	WF	ALT. 8: THERMAL DESORPTION			ALT. 10: OFF SITE INCINERATION			ALT. 12: OFF SITE LANDFILL		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
IMPLEMENTABILITY										
TECHNICAL FEASIBILITY										
Constructability and operational considerations	4	Excavation may be difficult due to underground utilities and proximity to buildings. Thermal desorption operation may be complicated by materials handling problems typically associated with clayey material.	2	8	Excavation may be difficult due to underground utilities and proximity of adjacent buildings. Transportation and incineration of material is standard practice.	3	12	Excavation may be difficult due to underground utilities and proximity of adjacent buildings. Transportation and landfilling of material is standard practice.	3	12
Demonstrated performance/useful life	8	Thermal desorption is designed to handle soils containing VOCs. It is the selected alternative for treatment of soils containing VOCs at over 50 Superfund sites, more than 3 times as many sites as any other on site treatment option.	4	32	Incineration is proven for treatment of soils containing VOCs. It is the BDAT for solvent wastes.	4	32	Disposal of wastes in RCRA landfills is a proven technology for controlling and managing hazardous wastes, however, improper landfill management can lead to long-term waste releases.	2	16
Adaptable to environmental conditions	2	Adaptation to environmental conditions at the site is not anticipated to be problematic.	3	6	Excavation is the only on site activity. It can be adapted to resolve potential problems.	4	8	Excavation is the only on site activity. It can be adapted to resolve potential problems.	4	8
Contributes to remedial performance	4	Source of VOCs is removed, thus further action in area will not be required. Cannot address impacted material that is inaccessible by standard excavation.	3	12	Source of VOCs is removed, thus further action in area will not be required. Cannot address impacted material that is inaccessible by standard excavation techniques.	3	12	Source of VOCs is removed, thus further action in area will not be required. Cannot address impacted material that is inaccessible by standard excavation techniques.	3	12
Can be implemented in 1 year	4	Excavation and treatment can be implemented in less than 1 year.	4	16	Excavation and off-site treatment can be implemented in less than 1 year.	4	16	Excavation and off-site disposal can be implemented in less than 1 year.	4	16
Can monitor results easily	2	Results are monitored by confirmatory sampling during excavation and sampling and analysis of treated material.	4	8	Results are monitored by confirmatory sampling during excavation.	4	8	Results are monitored by confirmatory sampling during excavation.	4	8
AVAILABILITY										
Availability of equipment and materials	6	Excavation equipment is readily available. Thermal desorption equipment is available from a number of contractors, however, hazardous nature of material and small volume of material may limit bidders	3	18	Excavation equipment is readily available. There are only a few permitted incinerators in the United States and their capacity is limited.	2	12	Excavation equipment is readily available. There are only a few permitted landfills in the United States and their capacity is limited.	2	12
Availability of personnel and services	4	A number of contractors have extensive experience operating thermal desorption for treatment of petroleum spills. Fewer have hazardous waste experience.	2	8	Personnel and services required are readily available.	4	16	Personnel and services required are readily available.	4	16
Availability of outside laboratory testing capacity	1	Sampling and analysis requirements will not exceed lab capacity.	4	4	Sampling and analysis requirements will not exceed lab capacity.	4	4	Sampling and analysis requirements will not exceed lab capacity.	4	4

TABLE VI.1. SUMMARY AND COMPARATIVE ANALYSIS OF IRA ALTERNATIVES (continued)

OBJECTIVE/ CRITERIA	WF	ALT. 8: THERMAL DESORPTION			ALT. 10: OFF SITE INCINERATION			ALT. 12: OFF SITE LANDFILL		
		DESCRIPTION	CR	WV	DESCRIPTION	CR	WV	DESCRIPTION	CR	WV
Availability of off-site treatment and disposal	4	Off-site treatment and/or disposal of spent carbon and process generated wastewater is available.	3	12	There are only a few permitted commercial incinerators in the United States and their capacity is limited.	2	8	There are only a few permitted commercial landfill in the United States and their capacity is limited.	2	8
Availability of post removal site control	2	Post removal site control requirements are minimal.	4	8	Post removal site control requirements are minimal.	4	8	Post removal site control requirements are minimal.	4	8
ADMINISTRATIVE FEASIBILITY										
Permits required	2	No permits are required for CERCLA sites, however, alternative will have to comply with CAA. Permits for transportation and disposal of residuals will be required.	3	6	No permits are required for work performed on CERCLA sites, however, permits for transportation and disposal of the VOC impacted soil will be required.	3	6	No permits are required for work performed on CERCLA sites, however, permits for transportation and disposal of the VOC impacted soil will be required.	3	6
Easements or rights-of-way required	2	Easements will not be required, however, due to space constraints, system cannot be set up in excavation area. Some other portion of the site will have to be dedicated as a treatment location.	2	4	Not required	4	8	Not required	4	8
Impact on adjoining property	2	Uncontrolled release of VOCs during excavation or failure of the vapor treatment system may adversely impact surrounding area.	2	4	Uncontrolled release of VOCs during excavation could adversely impact surrounding area. Trucking accidents during transportation could impact off-site area.	3	6	Uncontrolled release of VOCs during excavation could adversely impact surrounding area. Trucking accidents during transportation could impact off-site area.	3	6
Ability to acquire institutional controls	1	Institutional controls are not required.	4	4	Institutional controls are not required.	4	4	Institutional controls are not required.	4	4
Likelihood to obtain waiver from statutory limits (if needed)	2	Waiver is not necessary.	4	8	Schedule waiver is not necessary. Costs may exceed $2,000,000 depending upon final volume of material to be remediated.	2	4	Waiver is not necessary.	4	8
Implementability Summary	50		3.2	158		3.3	164		3.0	152
COST										
Capital Cost		$ 764,000			$1,277,000			$478,000		
Contingency		$ 280,000			$ 432,000			$177,000		
Total Estimated Cost	50	$1,044,000	2	100	$1,709,000	2	100	$653,000	3	150
SUMMARY	150		2.8	427		2.8	430		3.1	468

WF - Weighting Factor
CR - Criteria Ranking: (1) Does not meet criteria/objectives; (2) Meets only minimally the criteria/objectives; (3) Slightly exceeds criteria/objectives; (4) Meets and far exceeds criteria/objectives.
WV - Weighted Value: Weighted value is the product of the WV and the CR.

Each alternative evaluated was determined to be more effective than the No Action alternative.

6.2. IMPLEMENTABILITY

Each of the alternatives evaluated have some implementation concerns; therefore, with the exception of soil washing, they each received similar scores in Table VI.1. The concrete cap (WV = 170) is the easiest alternative to construct, however, it does not contribute to the overall long-term site remedial performance, limits the ability to implement future activities, and is difficult to monitor to ensure cap integrity and effectiveness.

Soil vapor extraction (WV = 162) is constructed with readily available technologies, equipment, and materials, however, concerns about operating the process in the shallow, clayey material anticipated to be encountered at the site reduced its overall implementability score.

The soil washing, thermal desorption, off-site incineration, and off-site landfill alternatives each require excavation, which may be difficult in the congested B Building area. Soil washing and thermal desorption are complex on-site treatment alternatives requiring substantial space to implement. The off-site alternatives do not have on-site space constraints; however, impacted material must be transported through populated areas, and the availability of off-site facilities is limited. Soil washing received the lowest implementability score (WV = 130) due to the limited available equipment and the need to modify existing equipment to control potential VOC emissions.

6.3. COST

The concrete cap and soil vapor extraction alternatives are estimated to cost less than $500,000. Off-site landfilling costs (assuming the material does not require treatment to meet LDRs) are in the $500,000 to $1 million range. Soil washing, thermal desorption, and off-site incineration each will cost more than $1 million to implement and operate.

7. RECOMMENDED IRA ALTERNATIVE

DOE recommends Alternative 4 Soil Vapor Extraction as the preferred IRA alternative for the B Building solvent storage shed area. This Action Memorandum serves as the primary decision document that substantiates the need for a removal action based on the existing site information, the detailed analysis of potential IRA alternatives presented in Section 5, and the alternative summary and comparison presented in Table VI.1.

Soil vapor extraction can remove VOCs from the subsurface with minimal soil disturbance, thus there is little increased potential exposure risks to workers or the surrounding community during implementation. The soil vapor extraction system can extract VOCs from areas that would be inaccessible by standard excavation techniques. Implementation of the alternative will not adversely impact future site activities and will allow options and flexibility in developing potential future remedial actions. Soil vapor extraction is constructed with standard, available equipment and is the least expensive treatment alternative evaluated.

Containment of the impacted material may not fully satisfy the IRA objectives, is inconsistent with long-term overall site remediation goals, and limits the flexibility of potential future site actions. Alternatives 7, 8, 10, and 12 each require excavation, a potential difficult and expensive task due to the proximity of buildings, paved areas, and underground utilities. On-site treatment alternatives, soil washing, and thermal desorption are not cost-effective due to the small volume of impacted material anticipated to require treatment. The expense of off-site incineration is not warranted given the assumed nature and extent of impacted material.

Soil vapor extraction will mitigate potential risks to human health by removing VOCs from the soil. Short-term risks to the surrounding community are not anticipated to increase upon implementation of this alternative. Soil vapor extraction has been shown to reduce VOC concentrations in soil to ppb levels. Soil vapor extraction has been selected as the remedial action at over 50 Superfund sites containing volatile chemicals. Further investigation of the nature of the chemicals present in the B Building area soils and possibly a soil vent test of a vapor extraction system are required to determine if this alternative will satisfy the site-specific cleanup goals.

The SVE system can be designed to satisfy all ARARs. Because off-site soil excavation disposal is not required, RCRA LDR criteria are not triggered. Emissions from the extraction wells or soil gas treatment system will have to comply with Clean Air Act requirements. Monitoring of the system involves standard operating practices and is not anticipated to be problematic.

This alternative would be consistent with potential future work at the site. It will contribute to the long-term remedial action objectives as it has the potential to remove VOCs that may have migrated below B Building. Future actions may include coordination with the B Building solvent storage shed vapor extraction system by placing additional extraction wells west of B Building, and possibly introducing a forced air injection well in the B Building basement to create additional air flow through the soil covered by the B Building.

8. REFERENCES

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RESPONSIVENESS SUMMARY

TO PUBLIC COMMENTS

June 22, 1994

Comment 1a: Page 7-1, 1st Paragraph

The purpose of this document is stated here. "This Action Memorandum serves as the primary decision document that substantiates the need for a removal action..." Relegate to INTRODUCTION. Then state the goal of the remedial action (to protect groundwater). State the importance of this document. Is this the only document that is needed before clean-up begins?

Response: DOE believes the "Introduction" sufficiently states the purpose of the document and does not need to be modified. Since part of the objective of this document is to develop the remedial action goals, stating the remedial action goal in the introduction would be premature. DOE believes that Section 3.5 clearly states the goal of the remedial action. Rather than republish this document, we will ensure objectives are clearly stated in the beginning of the future documents.

Comment 1b: Create a Summary Section at the Beginning of the Document

Include a succinct review of the existing environmental data that was collected for the storage shed. I had to read the document several times before I realized that very little data exists on the extent of contamination caused by the storage shed. State what studies were completed specifically to address the storage shed contamination and what prior studies were used in understanding the shed contamination issue. Summarize strengths and weakness of the current knowledge on the shed related contamination. What needs to be done to complete the data gaps? In the summary briefly review the elected remediation alternative and state what the Preliminary Remediation Goals are (by medium) for each chemical currently detected. State what is the next step.

Response: You are correct in the understanding of the facts, there is little information. The DOE program, Streamlined Approach to Environmental Remediation (SAFER) was used to initiate an interim remedial action. The SAFER program was developed following the EPA Superfund Accelerated Cleanup Model (SACM). Under these programs, data are collected during the remediation to fill data gaps and help modify the remedial design and to help develop the preliminary remedial goals.

It was clear that sufficiently high levels of Freon 113 were present to take action based on qualitative results of soil gas discussed in Section 2.3.2.

Section 2.3 clearly reviews the extent of previous investigations and the data collected. The document was not intended as a data evaluation report and therefore, a review of the data gaps was not performed. The document was intended to provide a decision document on the proper interim remedial action based on the data as it existed at the time of the document.

Data will be gathered as described in the Design Work Plan in the Reading Room to ensure the system is performing the required cleanup.

Comment 2: Table III.5

Table III.5 needs help! The calculation of noncancer toxicity information is confusing. For example, for dermal contact, is this for gas/vapor, particulate emissions, or soil/skin contact? The noncancer toxicity values for soil and vapor exposure to VOCs need to be calculated (dermal, ingestion and inhalation). Please show equations and provide RfDs. Trichloroethylene is a B2 carcinogen, thus the cancer risks need to be addressed, either qualitatively or quantitatively. I know the slope factor is not on IRIS.

Response: We apologize for any lack of clarity. The purpose was to compare the results to indicate if they are high or low. This document was not intended to be a formal report on risk assessment. The values presented in Table III.5 were developed using the existing data to provide a relative justification for the need for an interim remedial action. Since the cancer toxicity values indicate a risk based on the exposure to most of the compounds present in the soil, there was no real need to provide non cancer toxicity values. DOE believes that providing equations and RfDs would be confusing and is not necessary as the document is not a risk assessment report. The provisional slope factor for Trichloroethylene was obtained from the EPA Environmental Criteria and Assessment Office and is the value published in the EPA Region 3 Risk Based Concentration Tables. Dermal contact values are for soil/skin contact. If you would like to discuss the concentrations, feel free to call Jolene Walker at 865-4140 and we will set up a meeting.

Comment 3:

Provide references for risk-based cleanup standards (direct contact and leaching) from Michigan and Texas. The reader should be able to obtain the documents based on the citation.

Response: We regret any inconvenience the lack of complete reference caused. The Michigan criteria were obtained from the Michigan Environmental Response Act 307, Operational Memorandum 8. The guidelines for developing the criteria are defined in the Michigan Uniform Code 299, Part 7.

The Texas criteria were obtained from the Texas Natural Resource Conservation Code, Subchapter 5, parts 335.551 to 335.599.

Comment 4:

Provide clean-up levels of soil used by other states (page 3-17, 2nd sentence. What has been used in Ohio?

Response: Table III.6 provides risk based cleanup standards for two states. Using the standards from these two states provides the reader a representation of the range of standards found in the other states. It was never intended to use these standards as the preliminary remedial goals. The intention was to use

these standards to decide if remediation is warranted. Ohio does not have an established cleanup standard and standards are developed on a site-specific basis.

We did not intend to do an exhaustive search of what cleanup levels have been used elsewhere, but rather to give some idea what is an acceptable range. Certainly more work spent on researching would find both higher and lower cleanup levels.

Under the SAFER program, preliminary remedial goals are developed during the remediation process. These preliminary remedial goals are currently being developed. However, prior to remediation the Texas and Michigan cleanup standards were compared to the theoretical soil values to decide if remediation is warranted. One of the advantages of the chosen method is that it has the flexibility to operate in a wide range and can achieve lower levels by operating longer or adding more vents.

Comment 5:

Use Risk Assessment Guidance for Superfund Volume 1 - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remedial Goals) rather than RCRA guidance for deriving clean-up levels.

Response: Since this document became part of the public record, remediation of the soil has started. Preliminary Remedial Goals are being developed using several methods including the one suggested in this comment. DOE is evaluating a conservative approach that uses the median value of the different concentrations. The memorandum describing the development of the preliminary remedial goals is still being prepared at this time.

Comment 6:

DO NOT use the residential future scenario (child) for establishing clean-up levels. This just contributes to undermining the creditability of the risk assessment process.

Response: DOE agrees that using a residential future scenario (child) contributes to undermining of the risk assessment process. The use of this scenario in the document did not contribute to the final preliminary remedial goals. This scenario was only used to provide a frame work for an interim remedial action by being unrealistically conservative, however, both regulatory agencies request similar scenarios that includes this one. We can in the future propose more realistic scenarios.

Comment 7:

It seems that more information is needed before the clean-up is initiated? Please address this issue. Is more data going to be collected before clean-up begins?

Response: No data will be gathered prior to implementing. The DOE SAFER program was used to initiate an interim remedial action. This program was developed following the EPA SACM program. Under the SAFER program, data are collected during the remediation to modify remedial design. This approach saves considerable time and money achieving the cleanup. DOE has proceeded with a remediation using soil vapor extraction. We believe remediation will be completed at a cost that is less than the cost of an investigation to collect the additional data suggested.

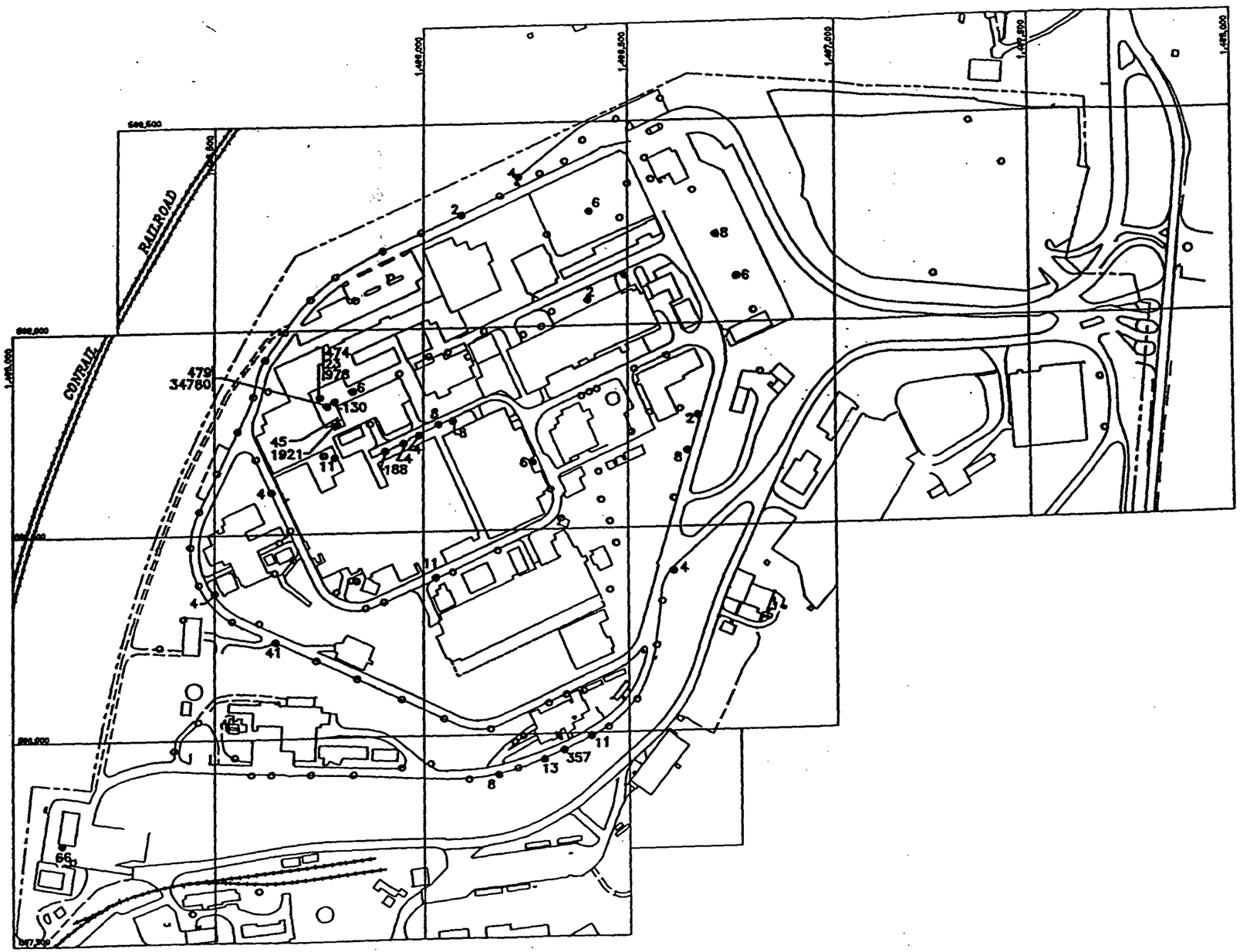
If your comment is to suggest that this area does not require any clean up, please inform us as it may allow us to reduce the time required to operate.

Preliminary results indicate there are higher levels of contamination than predicted from the soil gas values. These preliminary results appear to justify the remediation.

Comment 8:

Site specific TCLP testing for VOCs may be useful for developing more realistic clean-up goals. Have theoretical calculations on leachability been conducted?

Response: While TCLP testing does not seem appropriate, comparing concentrations to the allowable TCLP criteria is valuable. Theoretically, leachability values have been calculated and a memorandum is being prepared on the development of preliminary remedial goals that uses these values as one method to develop the preliminary remedial goals.



N

0 75 150 300
Scale in Feet

NOTES:

1. THE ELECTRONIC BASE MAP DATA FILE WAS OBTAINED BY ICF KAISER ENGINEERS, CINCINNATI, OHIO, FROM ROY F. WESTON, INC., ALBUQUERQUE, NEW MEXICO, WHO OBTAINED IT FROM WOOLPERT CONSULTANTS, INC., DAYTON, OHIO. THE DATA WERE PHOTOGRAMMETRICALLY COMPILED FROM AERIAL PHOTOGRAPHY DATED 12/08/85.

2. WESTON CONVERTED MOUND PLANT COORDINATES TO OHIO STATE PLANE COORDINATES USING AN ALGORITHM PROVIDED BY OAK RIDGE NATIONAL LABORATORY, GRAND JUNCTION PROJECT OFFICE.

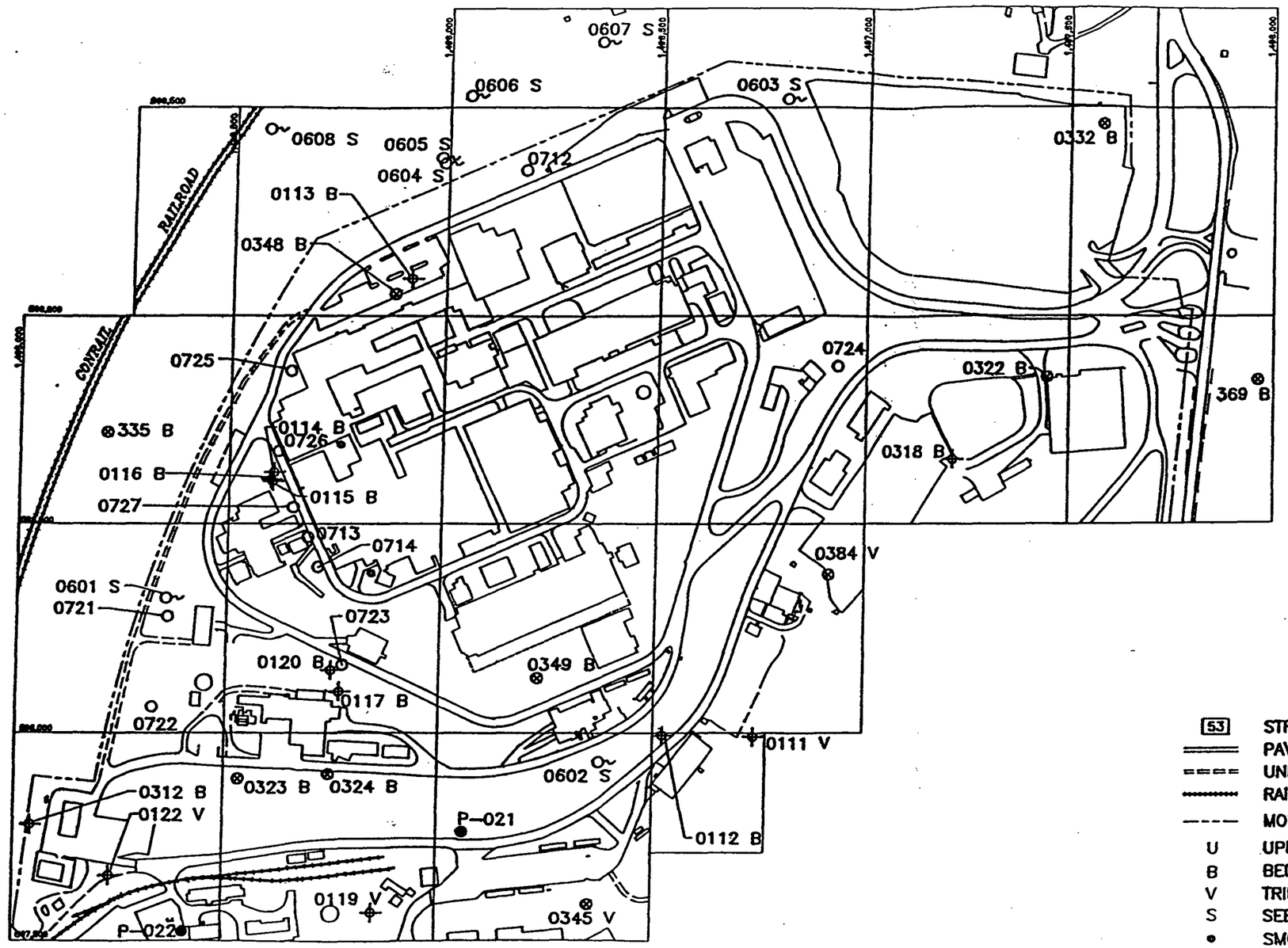
3. SAMPLE LOCATIONS HAVE BEEN DIGITIZED FROM FIGURES 2.17, 2.18, AND 2.40 FROM THE SOIL GAS SURVEY, DECEMBER, 1992.

LEGEND:

- [53] STRUCTURES
- PAVED ROADWAY
- UNPAVED ROADWAY
- MOUND PLANT BOUNDARY
- SMOKESTACK
- STORAGE TANK
- •6 TCE SAMPLE LOCATION CONCENTRATION IN PPB
- ∘ SAMPLE LOCATION – NO DETECTED CONCENTRATION

SAMPLOC3

Figure 2.4. Soil Gas Survey Concentrations - TCE



N

0 75 150 300
Scale in Feet

NOTES:

1. THE ELECTRONIC BASE MAP DATA FILE WAS OBTAINED BY ICF KAISER ENGINEERS, CINCINNATI, OHIO, FROM ROY F. WESTON, INC., ALBUQUERQUE, NEW MEXICO, WHO OBTAINED IT FROM WOOLPERT CONSULTANTS, INC., DAYTON, OHIO. THE DATA WERE PHOTOGRAMMETRICALLY COMPILED FROM AERIAL PHOTOGRAPHY DATED 12/08/85.

2. WESTON CONVERTED MOUND PLANT COORDINATES TO OHIO STATE PLANE COORDINATES USING AN ALGORITHM PROVIDED BY OAK RIDGE NATIONAL LABORATORY, GRAND JUNCTION PROJECT OFFICE.

3. LOCATIONS OF EXISTING WELLS AND SEEPS AND APPROVED PIEZOMETER AND SEEP LOCATIONS HAVE BEEN DIGITIZIED FROM FIGURES 6.29, 6.30, AND 6.31 OF THE RI/FS OU9 SITE-WIDE WORK PLAN, MAY, 1992.

4. LOCATIONS OF GROUNDWATER CAPTURE SYSTEM, TRENCH, AND PITS HAVE BEEN DIGITIZED FROM FIGURE 2.6 OF THE OU2 MAIN HILL, PERAT AUGUST, 1991.

LEGEND:

- 53 STRUCTURES
- PAVED ROADWAY
- UNPAVED ROADWAY
- RAILROAD
- MOUND PLANT BOUNDARY
- U UPPER OUTWASH
- B BEDROCK
- V TRIBUTARY VALLEY OUTWASH
- S SEEP SAMPLE
- SMOKESTACK
- STORAGE TANK
- GROUNDWATER CAPTURE SYSTEM, TRENCH, AND PITS LOCATION (APPROXIMATE)
- EXISTING MONITORING WELL LOCATION (APPROXIMATE)
- OU-9 APPROVED MONITORING WELL LOCATION (APPROXIMATE)
- GROUNDWATER SEEP LOCATION (APPROXIMATE)
- OU-9 APPROVED PIEZOMETERS LOCATION (APPROXIMATE)

WELL-PIE

Figure 2.5. Groundwater Capture System (Intercepter Trench) and Monitoring Pit locations on the Main Hill

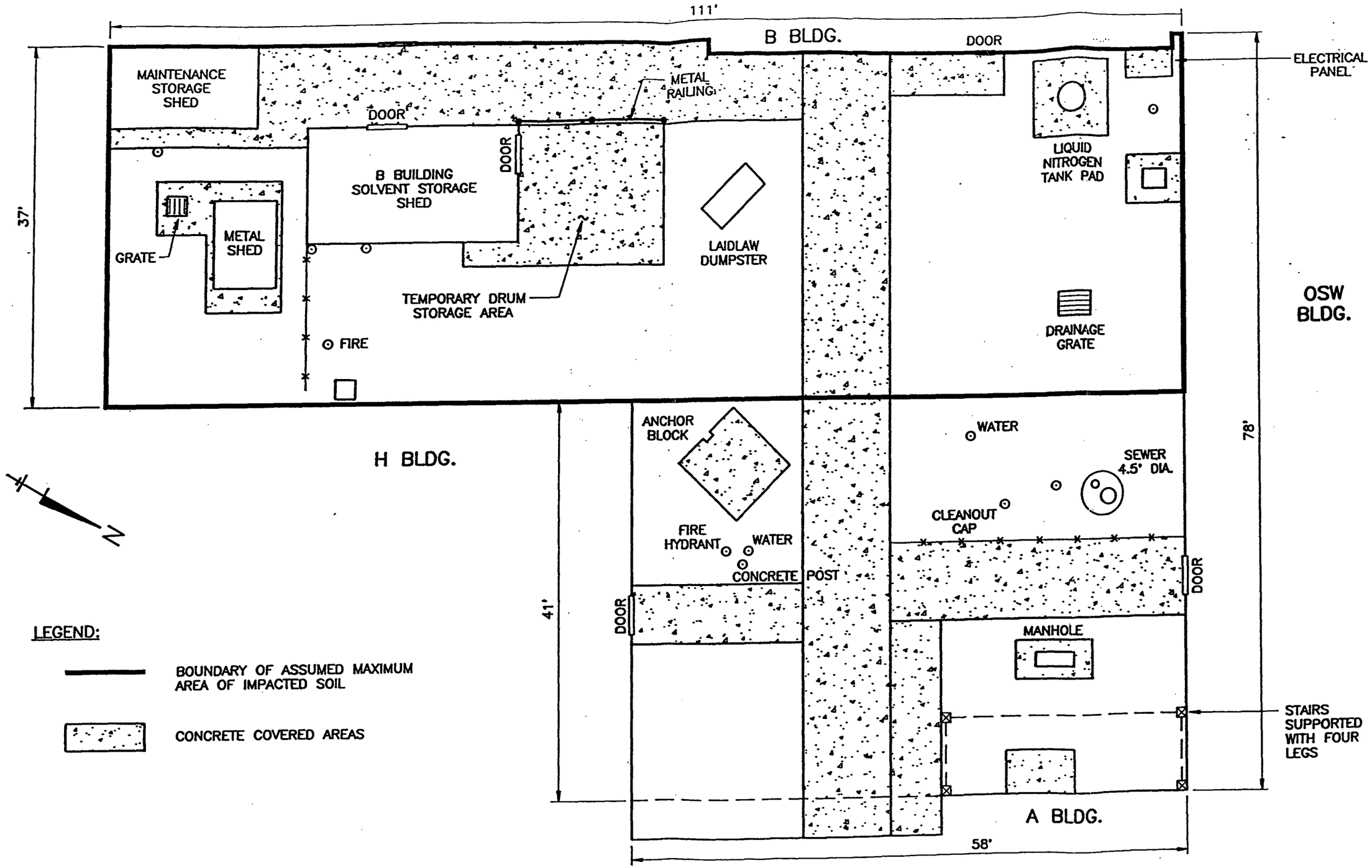


Figure 3.3. B Building Solvent Storage Shed Area

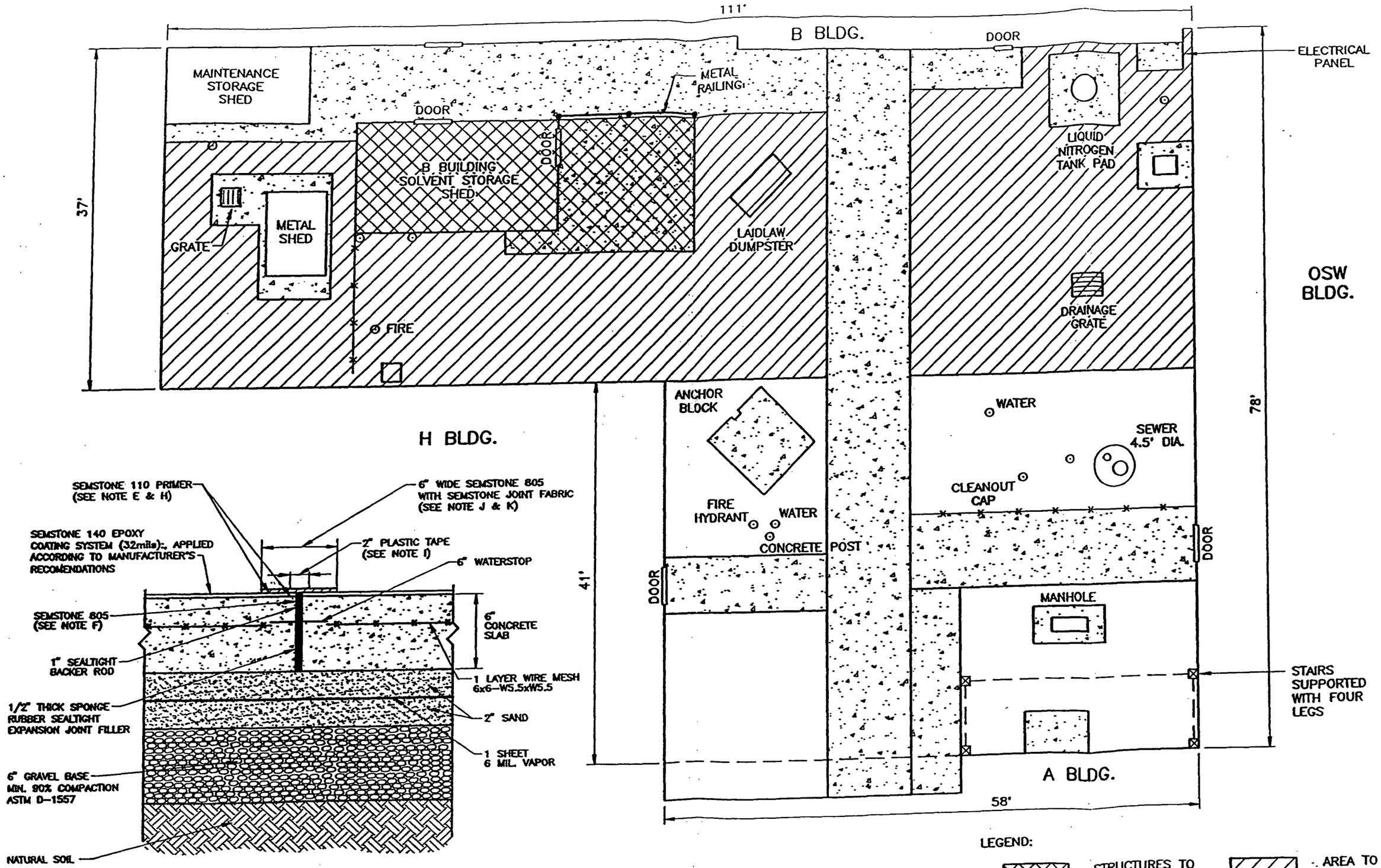


FIGURE 5.1 ALTERNATIVE 2: CONCRETE CAP AREA TO BE CAPPED