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EPA Superfund
Record of Decision:

INTERMOUNTAIN WASTE OIL REFINERY
EPA ID: UT0001277359
OU 01
BOUNTIFUL, UT
11/26/2002

RECORD OF DECISION

INTERMOUNTAIN WASTE OIL REFINERY (IWOR)
OPERABLE UNIT 1
SUPERFUND SITE
BOUNTIFUL, UTAH

November 2002

U.S. Environmental Protection Agency
999 18th Street, Suite 300
Denver, Colorado 80202

RECORD OF DECISION

INTERMOUNTAIN WASTE OIL REFINERY (IWOR) OPERABLE UNIT 1 SUPERFUND SITE, BOUNTIFUL, UTAH

The U.S. Environmental Protection Agency (EPA), with the concurrence of the Utah Department of Environmental Quality (UDEQ), presents this Record of Decision (ROD) for the Intermountain Waste Oil Refinery (IWOR) Operable Unit 1 (OU1) Superfund Site in Bountiful, Utah. The ROD is based on the Administrative Record for IWOR OU1 including the Remedial Investigation/Feasibility Study (RI/FS), the Proposed Plan, the public comments received, and EPA's responses. The ROD presents a brief summary of the RI/FS, actual and potential risks to human health and the environment, and the Selected Remedy. EPA followed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, the National Contingency Plan (NCP), and EPA guidance in preparation of the ROD. The three purposes of the ROD are to:

1. Certify that the remedy selection process was carried out in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9601 *et seq*., as amended, and, to the extent practicable, the NCP;

2. Outline remediation requirements of the Selected Remedy; and

3. Provide the public with a consolidated source of information about the history, characteristics, and risk posed by the conditions at IWOR OU1, as well as a summary of the cleanup alternatives considered, their evaluation, the rationale behind the Selected Remedy, and the Agency's consideration of, and responses to, the comments received.

The ROD is organized into three distinct sections:

1. The **Declaration** section functions as an abstract and data certification sheet for the key information contained in the ROD and is the section of the ROD signed by EPA's Assistant Regional Administrator for Ecosystems Protection and Remediation.

2. The **Decision Summary** section provides an overview of the IWOR site investigation, the alternatives evaluated, and the analysis of those options. The Decision Summary also identifies the Selected Remedy and explains how the remedy fulfills statutory and regulatory requirements; and

3. The **Responsiveness Summary** section addresses public comments received on the Proposed Plan, the RI/FS, and other information in the Administrative Record.

DECLARATION
for the
RECORD OF DECISION

INTERMOUNTAIN WASTE OIL REFINERY (IWOR)
OPERABLE UNIT 1
SUPERFUND SITE
BOUNTIFUL, UTAH

November 2002

DECLARATION

SITE NAME AND LOCATION

Intermountain Waste Oil Refinery (IWOR)
Operable Unit 1 Superfund Site
Bountiful, Utah
CERCLIS # UT0001277359

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for Intermountain Waste Oil Refinery (IWOR) Superfund Site Operable Unit 1 (OU1) in Bountiful, Utah. EPA selected the remedy in accordance with CERCLA, as amended, and to the extent practicable, the NCP.

This decision is based on the Administrative Record for IWOR OU1. Copies of key documents are available for review at the Davis County Library South Branch located at 725 S. Main; Bountiful, Utah. The entire Administrative Record may also be reviewed at the EPA Superfund Record Center, located at 999 18th Street, 5th Floor, North Terrace; Denver, Colorado.

The State of Utah, as represented by the Utah Department of Environmental Quality (UDEQ), concurs with the Selected Remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from IWOR OU1, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for addressing the IWOR OU1 will be a Land Use Control, which was identified as Alternative 2 in the Proposed Plan. In addition to the Land Use Control, the remedy includes the removal of an Underground Storage Tank (UST) that was discovered during the investigation and is a potential source of groundwater contamination.

OU1 covers contaminants found in soils, subsurface soils, and tanks or containers. A second Operable Unit (OU2) will address groundwater contamination. The Remedial Investigation (RI) for OU2 is ongoing.

The OU1 Feasibility Study (FS) used a comparative analysis to evaluate four alternatives and identify the advantages and disadvantages of each alternative. The first component of the Selected Remedy for IWOR OU1, Land Use Controls, constitutes establishing a building requirement for the property. The control will require that any building constructed on the property provide measures to eliminate the potential for contaminated soil vapors from entering the building. The second component of the selected remedy is removing and properly disposing of the underground storage tank (UST) and any residual contamination under the tank.

The Land Use Control will apply to the parcel of the. site that was formerly the Intermountain Oil Company (IOC). In addition, the Land Use Control will apply to the Kemar parcel if it is developed in conjunction with the IOC parcel (i.e., a building constructed over both properties will need to meet the requirement for a system to prevent soil vapors from entering the building). The Land Use Control will also require that soil excavated during the building or other construction activities be managed appropriately. Compliance with the remedy will be evaluated through five-year reviews conducted by EPA and/or UDEQ.

The Selected Remedy is protective of human health and the environment because it requires the elimination of the pathway that could cause potential human health risk and removes a potential contamination source.

STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. The remedy for OU1 does not satisfy the statutory preference for treatment as a principal element of the remedy for the following reasons: (1) the risk relates to the potential future use [development] of the property; (2) treatment was not cost effective; (3) the selected remedy requires the elimination of the pathway of exposure; (4) removes a potential source of groundwater contamination (the UST); and (5) the selected remedy provides an additional beneficial protection by requiring a system that eliminates exposure to other hazardous soil gases, such as radon.

Because this remedy will result in. hazardous substances, pollutants, or contaminants remaining onsite above health-based levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of remedial action to ensure that the remedy is protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record for this site.

- Contaminants of concern and their respective concentrations.
- Baseline risk represented by the contaminants of concern.
- Cleanup levels established for chemicals of concern and the basis for these levels.
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessments and ROD and the potential land use that will be available at the site as a result of the Selected Remedy.
- Estimated capital costs, annual operation and maintenance costs, total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- Key factors that led to selecting the remedy.

Max H. Dodson
Assistant Regional Administrator
Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

Date: 11/26/02

The following authorized official at the State of Utah approves the selected remedy as described in this Record of Decision.

Dianne R. Nielson
Executive Director
Utah Department of Environmental Quality

Date: 12/9/02

DECISION SUMMARY
for the
RECORD OF DECISION

INTERMOUNTAIN WASTE OIL REFINERY (IWOR)
OPERABLE UNIT 1
SUPERFUND SITE
BOUNTIFUL, UTAH

November 2002

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
ASVE	Active Soil Vapor Extraction
BTEX	benzene, toluene, ethylbenzene, xylene
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CTE	Central Tendency Exposure
COPCs	Chemicals of Potential Concern
DERR	Department of Environmental Response and Remediation
DSHW	Department of Solid and Hazardous Waste
EPA	Environmental Protection Agency
EPC	exposure point concentration
ERA	Ecological Risk Assessment
ESI	Expanded Site Investigation
FS	Feasibility Study ft feet
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
in	inch or inches
IOC	Intermountain Oil Company
IRIS	Integrated Risk Information System
IWOR	Intermountain Waste Oil Refinery Superfund Site
m	meter (m^3 = cubic meters)
msl	mean sea level
mg/kg	milligrams per kilogram
NPL	National Priorities List
NCP	National Contingency Plan
O&M	Operations and Maintenance
OU1	Operable Unit 1
OU2	Operable Unit 2
PA	Preliminary Assessment
PAH	polyaromatic hydrocarbons
PCB	polychlorinated biphenyl
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
PSVE	Passive Soil Vapor Extraction
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision

SF	Slope Factor
SVOC	semi-volatile organic compound
TPH	Total Petroleum Hydrocarbons
TRV	Toxicity Reference Value
UCL	upper confidence limit
UDEQ	Utah Department of Environmental Quality
UST	Underground Storage Tank
VOC	Volatile Organic Compound

GLOSSARY

Active Soil Vapor Extraction (ASVE): A technology in which air extraction wells are placed in contaminated zones and air is then vacuumed from the soil.

Administrative Record: The body of documents EPA uses to form the basis for selection of a remedy.

Alternative: An option for reducing site risk by cleaning up or otherwise limiting exposure to contamination.

Applicable or Relevant and Appropriate Requirements (ARAR): Federal and State requirements for cleanup, control, and environmental protection that a selected remedy for a site will meet.

Baseline Human Health Risk Assessment: A study conducted as part of the RI that determines and evaluates risk that site contamination poses to human health in the absence of cleanup.

Capital Costs: Expenses related to the labor, and equipment and material costs of construction.

cis-1,2-Dichloroethene: A form of 1,2-dichloroethene. It is a colorless liquid often used as a solvent.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A Federal law passed in 1980 and modified in 1986 and 2001. It sets up a program to identify sites where hazardous substances have been, or might be, released into the environment and to ensure they are cleaned up. Most of these sites are abandoned or are no longer active.

Feasibility Study (FS): The FS identifies and evaluates the most appropriate technical approaches to address contamination problems at a Superfund site.

Hexane: A chemical made from crude oil.

Invertebrates: Animals that lack a spinal column, e.g. worms.

Land Use Controls: Frequently called institutional controls. A non-engineered or non-constructed mechanism that minimizes the potential human exposure to contamination. An example would be a deed restriction that places requirements on future development.

Naphthalene: A white solid that is found naturally in fossil fuels.

National Contingency Plan (NCP): The EPA's regulations governing all cleanups under the Superfund program.

National Priorities List (NPL): EPA's list of the potentially most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response.

Operable Unit: A division of a site to more efficiently address investigation and cleanup. Sites are often divided into operable units by media (soil and groundwater), or, for large sites, by location of contamination.

Operation and Maintenance Cost: The cost of operation, maintenance, materials, energy, waste disposal, and administrative activities of the remedy.

Passive Soil Vapor Extraction (PSVE): Also called barometric pumping. This technology relies on changes in air pressure between the ground surface and subsurface to reduce the contaminated vapors coming from the soil.

30-Year Present Worth Cost: An analysis of the current value of all costs. Also known as Net Present Worth, the Present Worth Cost is calculated based on a 30-year time period and a predetermined interest rate (5% for this ROD).

Proposed Plan: A document requesting public input on a proposed remedial alternative.

Record of Decision (ROD): A document that is a consolidated source of information about the site, the remedy selection process, and the selected remedy for a cleanup under CERCLA.

Remedial Investigation (RI): A study conducted to identify the types, amounts, and locations of contamination at a facility. It also evaluates possible risk to public health and the environment from exposure to contamination.

Removal Action: The cleanup or removal of released hazardous substances from the environment.

Solvent: A liquid that can dissolve some other substances, often used for cleaning greasy or oily industrial parts.

Superfund Site: The commonly used term for a site addressed under CERCLA.

1,2,4-Trimethylbenzene: Also known as pseudocumene. It is a colorless liquid that is a constituent of petroleum-based fuels. It is used in the manufacture of other products and used as a solvent.

1,3,5-Trimethylbenzene: Also known as mesitylene. It is a colorless liquid that is a constituent of petroleum-based fuels. It is used in the manufacture of other products and used as a solvent.

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Intermountain Waste Oil Refinery (IWOR)
Operable Unit 1 Superfund Site
Bountiful, Utah
CERCLIS #UT0001277359

The Site is located in Davis County, in the City of Bountiful, Utah at 995 South 500 West. The IWOR property covers approximately 2 acres in Section 30, Township 2 North, Range 1 East. The Site is located in a residential/commercial area of Bountiful. Most land use within a one-mile radius is residential. Elevations at the Site and in the study area are about 4,280 feet above mean sea level (msl). Figure 1 A & B show the Site location in Bountiful, Utah.

The IWOR Superfund Site has been organized into two Operable Units (OU). Operable Unit 1 (OU1) addresses soils, subsurface soils, and potential onsite contaminant sources including tanks, drums, and containers. Operable Unit 2 covers groundwater. The U.S. Environmental Protection Agency (EPA) is the lead agency for the Site and Utah Department of Environmental Quality (UDEQ) is the support agency. The investigation has been conducted using funding from the Superfund Trust Fund.

The Site (Figure 2) includes a front parking area (western 1/3 of Site) and a fenced process area (eastern 2/3 of Site) with access through a locked gate. These two areas or parcels are deeded independently and separated by a fence along the west side of the garage. Two buildings, are located on the Site: a two-bay garage/warehouse, hereinafter referred to as the "garage"; and a laboratory/office space, hereinafter referred to as the laboratory. Site conditions observed at the start of the RI included: soil piles and abandoned equipment and materials; oil-encrusted soil within a bermed area where several tanks were previously located; a concrete sump adjacent to the laboratory; gravel throughout most of the property; two trailer tanks located near the eastern boundary of the property; piles of abandoned equipment, pipes, and debris located in the vicinity of the tanks; a sump sitting above ground near the southeast portion of the Site; numerous drums in the garage; many containers of different sizes located in the garage; equipment and numerous containers of chemicals located in the laboratory; and an attic located above the laboratory containing what appeared to be discarded lab equipment, containers, and correspondence.

2.0 OPERABLE UNIT HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Historical Operations

A number of different reported operations have occurred at the Site. The Site was originally part of a brick manufacturing facility. The brick manufacturing facility encompassed about 20 acres. In the 1950s, an asphalt business was operated at the Site. Handling and refining of waste oil began in 1957 and continued for approximately 35 years as the Intermountain Oil Company. The Intermountain Oil Company (IOC) operation was originally a trucking business that hauled various petroleum products to customers from the Site. Oil blending commenced in the 1970s.

At the start of the oil blending business, green bottoms (a fraction of crude oil) were blended with diesel fuel and sold for dust control at coal mines. Over subsequent years, used oil replaced the green bottoms and the end product was sold to cement kilns for use as fuel. The used oil was collected from facilities in Utah, Nevada, Idaho, and Wyoming. Waste sludge was reportedly disposed in an offsite landfill, and wastewater that may have remained after the treatment process was boiled off at the Site. Above ground tanks used by IOC were located in an unpaved area surrounded by a soil berm.

The Site owners ceased operations and began dismantling the equipment in 1993. Some of the waste and soil where contaminants had been spilled were consolidated into a waste pile of approximately 100 cubic yards, located on the east portion of the Site. The remainder of the Site was covered with several inches of gravel.

2.2 EPA and UDEQ Investigations

A soil and groundwater study was conducted by Enviro Search on May 20, 1992. A sampling event by the UDEQ Department of Solid and Hazardous Waste (DSHW) was performed on January 9, 1995. A Preliminary Assessment (PA) Report produced by the UDEQ Division of Environmental Response and Remediation (DERR) was issued on March 13, 1996. An Analytical Results report was generated by the UDEQ on September 30, 1997, based on results from samples taken on April 9-10, 1996 and May 20, 1996.

In 1998, EPA conducted an Expanded Site Investigation (ESI). In this investigation, several solvents (bromochloromethane, 1,1-dichloroethane, and 1,1,1-trichloroethane) were identified in the sump located east of the laboratory, and groundwater samples collected from an onsite monitoring well contained solvents (1,2-dichlorethane, 1,2-dichloroemene, and trichloroethene).

The Site was placed on the Superfund National Priorities List (NPL) on May 11, 2000. EPA also began the Remedial Investigation (RI) in 2000. The Site was divided into two operable units for the purposes of the investigation and cleanup.

In August 2001, using Superfund removal authorities, EPA removed and disposed of numerous containers and their contents. The removal included: all the chemicals located in the laboratory building, 21 55-gallon drums and numerous 5-gallon containers holding various chemical or oily mixtures, two trailer tanks and their contents, the contents of an underground storage tank discovered during the investigation, and contents of the sump stored above ground in the southeast portion of the Site. In addition, in order to adequately complete the investigation and soil sampling, debris located in various portions of the Site was removed. Removal of the debris allowed for unrestricted sampling of the soil. The debris removal included: miscellaneous piping located at various areas around the Site, scrap equipment, and empty tanks.

2.3 Enforcement Activities

During the period of operations at the Site, the Utah Division of Solid and Hazardous Waste and the Utah Attorney General's Office issued numerous Notices of Violation and Orders for failure to remediate contamination resulting from years of spillage. Earlier violations were issued by Davis County Health Department. The Site had its permit revoked on several occasions due to its waste management practices.

EPA began a search for Potentially Responsible Parties (PRPs) in 2000. The search for viable PRPs is ongoing. Numerous information request letters have been issued to various parties to help determine PRPs who might be responsible for investigation and cleanup costs incurred at the Site. EPA issued a combined General Notice and Information Request letter to Intermountain Oil Company on February 10, 2000. On March 9th and April 3rd, 2000, EPA issued Information Request letters to nine suspected transporters to obtain information regarding their actions and the generators of the wastes that were transported to the Site. On October 10, 2000, EPA filed a lien on the former Intermountain Oil Company property (eastern 2/3 of the Site).

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public participation is required by CERCLA Sections 113 and 117. EPA has conducted the required community participation activities through the presentation of the RI/FS and the Proposed Plan, a 30-day public comment period, a formal public meeting, and the presentation of the Selected Remedy in this ROD. In addition, several fact sheets were completed during the RI.

Interviews with potentially impacted community members and public officials were conducted in the summer of 2000. Based on the results of these interviews and statutory requirements, a Community Involvement Plan was developed. In March 2001 and July 2001 EPA issued fact sheets that summarized the investigation status and described future investigative plans. The EPA also maintains a web page through the EPA Superfund web site that describes activities at the Site.

The Proposed Plan for IWOR OU1 was issued on August 15, 2002. The RI/FS documents and the Proposed Plan were made available to the public in the Administrative Record located at the EPA Superfund Records Center in Denver, and the Davis County Library, South Branch at 725 South Main; Bountiful, Utah. Notices of availability of these documents were published on August 15, 2002, in the *Davis County Clipper*, and August 18, 2002, in the *Salt Lake Tribune* and *Deseret News.* A public comment period was held from August 19 to September 17, 2002.

On August 22, 2002, the EPA hosted a public meeting to present the Proposed Plan and receive comments. The meeting was held at 7: 00 p. m. at the Bountiful City Hall, Bountiful, Utah. At this meeting, representatives of EPA and UDEQ presented information about Site investigations and findings, the risk assessment, the Feasibility Study (FS), removal of the UST, and the Preferred Alternative, and answered questions about the Site and remedial (cleanup) alternatives. EPA also accepted comments about the Site and proposed alternative at this meeting. Responses to public comments received during the meeting and the public comment period are included in the Responsiveness Summary, which is part of this Record of Decision (ROD).

4.0 SCOPE AND ROLE OF OPERABLE UNIT

For the purposes of efficient Site investigation and cleanup, the Site was divided into two operable units:

- Operable Unit 1 (OU1) - the focus of this ROD; covers soils, tanks, containers, and other potential contamination sources; and

- Operable Unit 2 (OU2) - groundwater; the OU2 investigation into groundwater contamination is continuing.

In addition, in August 2001, a removal occurred under authorities provided in Section 300.415(b)(2) of the NCP. The removal addressed conditions that presented an imminent and substantial endangerment to human health and the environment, including removal and disposal of numerous containers and their contents as detailed in Section 2.2. The removal action addressed many of the sources that might have presented unacceptable risk if left onsite.

This ROD makes no determination on whether or not groundwater requires cleanup. The decision on groundwater will be presented in a ROD after completion of the OU2 RI/FS and Proposed Plan.

5.0 SUMMARY OF SITE CHARACTERISTICS

The Site is located in Davis County, in the City of Bountiful, Utah, approximately 12 miles north of Salt Lake City. The IWOR property covers approximately 2 acres in Section 30, Township 2 North, Range 1 East. The Site is located in a residential and commercial area of Bountiful; however, most land use within a one-mile radius is residential. Two buildings exist onsite and most of the property is fenced (Figure 2).

5.1 Climate, Geology, and Hydrogeology

The Site has mostly a desert climate with temperature fluctuations of up to 100˚ F between summer and winter months. The City of Bountiful is bounded by the Wasatch Mountains on the east, Interstate Highway 15 (I-15) to the west, the city of North Salt Lake to the south, and Centerville to the north. Wind patterns for the Salt Lake area lie in a north-northwest to south-southeast line, parallel to the Wasatch Range, with roughly equal frequencies from both directions.

The average annual precipitation is 13 to 15 inches with a 24-hour maximum rainfall of 2.28 inches. The land surface at the Site dips slightly to the northwest. Elevations in the Bountiful area are about 4,280 feet (ft) above msl, and the Site is located above the 500-year flood plain. Runoff leaving the Site enters the storm sewer, located northwest of the Site. The storm sewers flow northward approximately 1,500 ft and drain into Mill Creek. Mill Creek travels approximately seven miles to the west to the Farmington Bay Water Fowl Management Area in the Great Salt Lake.

The Site is within the Basin and Range Physiographic Province and is comprised of basin-fill deposits composed of alluvial and lacustrine deposits. The boring logs produced from the monitoring well installations during the August and December 2001 field efforts indicate that the Site is underlain by gravelly sand with varying amounts of silts and clays that are interbedded with sandy gravels. Additionally, clay lenses (3 to 5 ft thick) were noted at approximately 5 ft and 10 ft below ground surface.

The Site is located on the west side of Bountiful, Utah, on the southern portion of the East Shore Aquifer. In the Bountiful Area, all wells greater than 100 ft in depth are considered to be completed in the East Shore Aquifer system. The East Shore Aquifer system is primarily confined, consisting of saturated alluvial deposits between the Wasatch Mountain Range and the Great Salt Lake.

In the vicinity of the IWOR Site, the aquifer system is composed primarily of sediments consisting of alternating layers of gravel, sand, and clay. The primary recharge area is along the base of the Wasatch Range and is underlain by permeable sands and gravel that enhance the recharge water movement. Shallow and deep aquifers most likely grade into a single aquifer at the recharge area, which lies approximately 1/2 mile east of the Site.

The shallow aquifer is currently not used as a drinking water source, but historically has been used for industrial applications and irrigation purposes in the area. Artesian aquifers located below the shallow aquifer are hydraulically connected with one another. Seven different public water systems have wells, surface water intakes, and/or purchase water from a well located within a four-mile target radius. There are no known private potable water wells within the four-mile radius. The ESI Report identified the nearest public potable well as the Weber Basin Water Conservancy District well, located approximately 0.21 miles south of the Site.

5.2 Remedial Investigation (RI)

Two investigation phases (Phase I and Phase II) were conducted in March and August of 2001, respectively. Phase I field activities included a Site reconnaissance, passive soil gas survey, and drum and tank sampling. Phase II field activities included: monitoring well installation; hydrogeologic testing to determine local groundwater parameters; sampling of tank and piping insulation; sump material; surface, near-surface, and vadose zone soil; residual contaminant source sampling (Bias and Waste Piles); and groundwater sampling. Additional drum and tank sampling was conducted during the Phase II investigation. Additional monitoring well installations were performed in December 2001. For Phase II soil sampling and risk assessment purposes, a sampling grid was established at the Site, dividing it into ten lots approximating the size of adjacent residential properties. The locations of the lots and soil gas, soil, and groundwater samples taken onsite are shown in Figure 3.

The ROD presents the data for the surface and subsurface soils, and Underground Storage Tank (UST) contents. Since the drums, containers, sump, and above ground tank contents were removed prior to the completion of the RI and risk assessment, the information on their chemical contents is not detailed in this ROD. Many of the drums and tanks contained oily sludge that included hydrocarbon and solvent constituents. Most of the 5-gallon containers held paints. Groundwater results are not discussed since the groundwater investigation is ongoing. Although the UST contents were removed, the tank with residue remains and is a potential contamination source and is included in the information presented in this ROD.

5.2.1 Phase I Investigation

As part of the Phase I sampling event in March 2001, a passive soil gas survey of the Site and adjacent surrounding properties was performed to identify and characterize spatial patterns of volatile organic chemicals (VOCs) in shallow soils. The results were interpreted to indicate approximate locations of soil sources or groundwater contamination. At two onsite locations, BTEX compounds (benzene, toluene, ethyl benzene, xylenes), naphthalene, and chlorinated hydrocarbons were detected.

Tank and drum sampling identified many petroleum-related polyaromatic hydrocarbons that were subsequently found in surface, near-surface, and vadose zone soil, as well as the bias (areas of suspected contamination) and waste pile samples.

5.2.2 Phase II Investigation

Tables 1 through 4 summarize the compounds found in soils at the Site. Soil sampling conducted during the Phase II investigation included five-point composite samples collected at three depth intervals at each lot. The three depth intervals were surface (0-2 inches (in.)) and two near-surface (3-12 in. and 13-24 in.; Tables 1 & 2). In addition, vadose zone samples were collected from investigative boreholes, waste piles, and areas of suspected contamination (bias samples; Tables 3 & 4). Soil samples at the saturated zone interface were taken from piezometer and monitoring well borings.

Soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), TPH-fractionation, metals, and polychlorinated biphenyls (PCBs). In general, metal concentrations were not significantly high compared to background samples and residential soil screening levels.

Total Potential Hydrocarbons (TPH)

High concentrations of TPH were found at all three composite soil sample depth intervals at all lots. The surface soil samples showed TPH concentrations ranging across the Site from 670 mg/kg (Lot 10) to 3800 mg/kg (Lot 8) with the highest concentrations found in the six lots central to the Site (Lots 2, 3,4, 7, 8, and 9). At the 3-12 in. near-surface soil depth interval, TPH concentrations ranged from 57 mg/kg (Lot 1) to 30,000 mg/kg (Lot 4 duplicate). The highest TPH concentrations at this soil depth interval were found in Lots 3,4, and 5, along the northeast section of the Site that encompassed the former processing area. TPH concentrations in the 13-24 inch near-surface soil interval ranged across the Site from non-detect (Lots 7 and 8) to 15,000 mg/kg (Lot 3). The highest TPH concentrations were found at Lots 2, 3, and 4.

Volatile and Semi-volatile Compounds

Of the surface soil composite samples, Lot 9 showed the highest concentrations of organic compounds (volatile and semi-volatile compounds). These were high molecular weight polyaromatic hydrocarbons (PAHs). The highest concentration organic compound detected was pyrene at 1.5 mg/kg. No appreciable concentrations of VOCs or PCBs were detected in any of the surface soil samples.

At the 3-12 in. sample interval, only three compounds were detected at concentrations greater than 1 mg/kg, and these were found in Lots 4 and 5. The compounds were 2-methylnaphthalene (Lots 4 and 5), phenanthrene (Lots 4 and 5), and pyrene (Lot 4). The highest constituent concentration was 2-methylnaphthalene at 13 mg/kg (Lot 5).

The highest organic compound concentrations in the surface and near-surface grid soil sampling were found at the 13-24 in. depth interval at Lot 4. The highest concentration VOCs detected were 1,2,4-trimethylbenzene and naphthalene at 8.8 mg/kg and 13 mg/kg, respectively. The highest concentration SVOC detected was 2-methylnaphthalene at 14 mg/kg.

The highest organic contaminant concentrations found in a borehole were 2-methylnaphthalene (12 mg/kg), 1,2,4-trimethylbenzene (8.6 mg/kg), and phenanthrene (5.7 mg/kg) at the 7 foot depth of borehole 2 (BH-02).

No contamination was detected in the saturated zone interface soil samples (102 ft-109 ft below ground surface).

Under Ground Storage Tank

The contents of the UST were observed to be primarily aqueous with a thin floating oil layer and were removed during the Phase II field activities. The aqueous and oil phases were separately analyzed; however, as a result of the sample quantity, the VOC and SVOC analysis could not be performed on the oil phase.

The analytical results of UST contents are shown in Table 5. The majority of organic constituents detected were PAHs, similar to those detected in the containers found on the Site. Low concentrations of many chlorinated compounds were detected: bis(2-chloroethyl) ether; chloroform; 1,2-dichlorobenzene; 1,1-dichloroethane; and trichloroethene in the aqueous (water) sample. Likewise, only trace quantities of metal constituents were detected in the aqueous phase. With the exception of chloroform and trichloroethene, all of these chlorinated compounds concentrations are qualified as being detected at less than their respective reporting limits. If adequate sample volume had been available for the oil phase, it is likely that the chlorinated compounds would have been found in higher concentrations. Some of the chlorinated compounds detected in the UST sample are the same as those detected in historical and current Site groundwater samples.

5.3 Contaminant Characteristics and Potential Routes of Contaminant Migration

The mobility and toxicity of contaminants are dependent on a number of factors including location, concentration, and physical and chemical properties of the environment (e.g. soil characteristics and amount of precipitation). The RI provides details about contaminant characteristics.

In general, based on the Site and contaminant locations, concentrations, and characteristics, there is currently a low potential for soil contaminants to move into the groundwater. Many of the contaminants are more likely to volatize and move as vapors towards the ground surface. A number of the petroleum related hydrocarbons found on the Site can also be subject to dissolution and biodegradation.

A number of the contaminants onsite can cause health effects dependent on the level of contaminant exposure and duration of exposure. Short-term non-cancer effects from inhaling vapors of chemicals such as 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene, naphthalene, hexane, and cis-l, 2-dichloroethene may include irritation of the nose, throat, and respiratory tract, as well as headaches, nausea, drowsiness, and weakness. More serious illness, such as liver damage, could be seen with longer term exposures at certain concentrations. Naphthalene, a contaminant of potential concern (COPC), is a possible human carcinogen.

Figure 4 is the Site Conceptual Model that illustrates potential routes of contaminant migration and exposure pathways. Section 7, Summary of Site Risk, provides more information about exposure pathways and the risk from exposure to the contaminants found onsite.

6.0 CURRENT AND POTENTIAL FUTURE LAND USE

Land surrounding the IWOR Site is commercial and residential. The Site is currently zoned for commercial/light industrial use. The property is currently not being actively used although there are items stored in the garage. The caretaker and owner of these items visits the Site periodically.

Residential properties surround the Site to the north and east. The property to the south of the Site and fronting 500 West is a partially developed commercial property. Between the Site and 500 West lies a commercial property and one residence.

The Site investigation included two parcels of land. The western one third of the Site is owned by Kemar Corporation. The eastern two thirds of the Site is owned by the Intermountain Oil Company, which is no longer an operating company.

Since the surrounding area is residential, the residential scenario was considered as a potential future land use in the Baseline Risk Assessment.

7.0 SUMMARY OF SITE RISKS

A Baseline Risk Assessment (BRA) characterizes the potential human health and ecological risks at a site based on current conditions. Remedial action is driven in part by the potential for human health or ecological risk; the BRA indicates the media and exposure pathways that need to be addressed. Human health and screening level ecological risk assessments were conducted for OU1.

The risk related to groundwater contamination based on only two sampling events was included in the human health BRA but since it will be updated once all the groundwater data are collected, it is not presented in this ROD. Since the risk assessments were conducted after the removal of the tanks, containers, and other material, the risks associated with these materials were not calculated.

7.1 Human Health Risks

7.1.1 Chemicals of Potential Concern

Figure 4 is a Site conceptual model that summarizes how humans might be exposed to chemical contaminants associated with the Site. As shown below, the principal populations likely to come into contact with Site-related chemicals and the exposure pathways that are likely to be of greatest potential concern, are as follows:

Exposure Scenarios Evaluated Quantitatively

Exposed Population	Contaminated Medium	Exposure Pathways
Current or future onsite workers and Hypothetical future onsite residents	Soil	Ingestion
	Indoor air	Inhalation of volatile organic chemicals
	Groundwater	Ingestion

Other exposure pathways were determined to be sufficiently minor and quantitative evaluation was not completed.

The risk associated with ingestion of groundwater or inhalation of vapors from groundwater based on two groundwater sampling events was determined. These pathways did not show any unacceptable risk based on this preliminary data. Since the groundwater investigation is ongoing and the risk from these pathways will be re-evaluated once all the data is collected, further discussion of groundwater is not included in this ROD. However, the risk from all pathways presented in Section 7.1.4 includes calculated groundwater pathways. The ROD for OU2 will discuss the groundwater exposure pathways in more detail.

Chemicals of potential concern (COPCs) are chemicals that exist in the environment at concentrations that might be of potential health concern to exposed humans. COPCs were defined as any chemical that meets the following criteria: a) was not an essential nutrient, b) was detected in 5% or more of onsite samples, c) occurred in Site samples at a concentration higher than in background locations, and d) the maximum detected concentration exceeded a conservative risk-based concentration (RBC). Table 6 summarizes the chemicals that were identified and retained for quantitative evaluation as COPCs for ingestion of soil or groundwater, or inhalation of indoor air. Note that there were no volatile organic compounds (VOCs) identified as COPCs for intrusion from groundwater into indoor air, so this pathway was not evaluated further in the risk assessment.

7.1.2 Exposure Assessment

For soil ingestion, it is considered likely that most current or future workers would be randomly exposed across the entire Site. However, it is plausible that some workers might tend to be preferentially exposed at a specific area of the Site. Thus, the Site was divided into 10 lots, and exposure to soil was evaluated at each of the 10 lots as well as the entire Site. These 10 lots were also used to evaluate exposure of hypothetical future residents. This same approach was followed for inhalation exposure to contaminated vapor intrusion from soil.

For soil, the exposure point concentration was based on the samples taken within the 0-1 foot depth interval. The exposure point concentration (EPC) was the 95% upper confidence limit (UCL) of the mean or the maximum value (whichever is lower). The 95% UCL was calculated from the data based on the assumption the data were distributed log-normally.

For indoor air, concentrations of volatile organic compounds (VOCs) attributable to release from subsurface soil were estimated by modeling, using the soil gas model developed by Johnson and Ettinger (1991). Two alternative building construction scenarios were evaluated: the slab-on grade scenario and the basement scenario.

The BRA considers two exposure scenarios for each exposure pathway. The first is the average exposure which is referred to as Central Tendency Exposure (CTE). The second scenario is the maximum exposure which is referred to as Reasonable Maximum Exposure (RME). These two values account for the wide range of intakes between members of an exposed population due to differing body weights, intake rates, exposure frequencies, and exposure durations.

7.1.3. Toxicity Assessment

Both non-cancer and cancer effects are considered in the BRA. Non-cancer health effects may include short-term health impacts such as nose and throat irritations and headaches and long-term impacts such as general toxicity, decreased body weight, and liver damage. The non-cancer effects of a chemical are characterized by identifying a dose (called the Reference Dose, or RfD) or a concentration (the reference concentration or RfC) that does not pose a risk of adverse noncancer effects in exposed humans.

The cancer risks of a chemical are characterized by an oral or inhalation Slope Factor (SF). The chemical- and route-specific toxicity values used in this risk assessment are all based on values that have been developed by EPA and are available in the Integrated Risk Information System (IRIS), the Health Effects Assessment Summary Tables (HEAST), or are available from EPA's Superfund Technical Assistance Center.

7.1.4 Risk Characterization

Basic Methods for Risk Characterization - Non-cancer Effects

The potential for adverse non-cancer effects from exposure to a chemical is evaluated by comparing the estimated chronic daily intake (GDI) of the chemical by the RfD for that chemical. This comparison results in a non-cancer Hazard Quotient (HQ):

$$HQ = GDI / RfD$$

If the HQ for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If an HQ exceeds one, there is some possibility that non-cancer effects may occur. The sum of the HQs is the Hazard Index or HI.

Basic Methods for Risk Characterization - Cancer Effects

The risk of cancer from exposure to a chemical is described in terms of the probability that an exposed individual will develop cancer by age 70 because of that exposure. For each chemical of concern, this value is calculated from the lifetime average chronic daily intake (GDI) of the chemical from the Site and the slope factor (SF) for the chemical, as follows:

$$\text{Cancer Risk} = 1 - (-GDI \times SF), \text{ or}$$

$$\text{Cancer Risk} = 1 - \exp(-CDI \times SF) \text{ when the } SF \times GDI > 0.01$$

Cancer risks are summed across all chemicals of concern and all exposure pathways that contribute to exposure of an individual in a given population.

The level of total cancer risk that is of concern is a matter of personal, community and regulatory judgement. In general, the EPA considers cancer risks that are below about 1 in one million (0.000001) to be so small as to be negligible, and risks above 1 in ten thousand (100 per million, or 0.0001) to be sufficiently large that some sort of remediation is desirable. Cancer risks that range between these two values are evaluated on a case by case basis.

Risks from Ingestion of Soil

Table 7 summarizes the estimated risks to workers and hypothetical future residents from ingestion exposure to onsite soils for both the average (shown as CTE) and maximum (shown as RME) exposure scenarios. As seen, non-cancer risks are below a level of concern in all cases (i.e., $HI < 1$), even if exposure were to occur preferentially at the waste piles of contaminated soil. Likewise, cancer risks are all within or below the EPA risk range (1 per million to 100 per million). These results indicate that direct ingestion of soil is not likely to be of significant concern to either workers or hypothetical future onsite residents.

Risks from Inhalation of Contaminated Vapors (from VOCs) Intruding into Indoor Air from Soil

Table 8 summarizes the estimated risks to workers and hypothetical future residents from inhalation of contaminated vapors intruding from soil into indoor air. The evaluation of this exposure pathway considered two alternative building construction scenarios: slab-on-grade and basement. Additionally, for each of the building construction scenarios, two alternative building sizes were assessed: (1) a large building that covers most of the lot (evaluated by using the average soil concentration for the lot; shown as average (avg) CTE and RME), and (2) a small building (evaluated by using the maximum concentration for the lot; shown as maximum (max) CTE and RME). The latter scenario assures that the risk is considered for a case where a small building might be built over an area of maximum soil contamination.

As shown in Table 8, cancer risks are within or below EPA's acceptable risk range in all lots for all scenarios. Non-cancer risks are below a level of concern (HI ≤ 1) except for lots 3, 4, 5, and 8. At these lots, non-cancer risks may enter a range of potential concern for both workers and residents, with HI values ranging from 2 to 20. The majority of the risk is due to 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene, with smaller contributions from naphthalene, hexane, and cis-l, 2-dichloroethylene.

Combined Risks from All Exposure Pathways

Table 9 presents a summary of the risk that might occur if the same worker or future resident were exposed by all of the primary exposure pathways at a lot. The pathways that are considered in this summary are soil ingestion, groundwater ingestion, inhalation of contaminated soil vapors intruding into indoor air from soil, and inhalation of contaminated vapors released to indoor air from indoor water. Since risks from intrusion of contaminated soil vapors depend on the type of building (slab vs. basement) and on the size of the building (large vs small), the totals are presented separately for the minimum and the maximum contribution from the soil vapor. The minimum is based on the smallest contribution of soil vapor from either building scenario. The maximum includes the greatest contribution of soil vapor.

When all exposure pathways are combined, excess cancer risks still fall within EPA's risk range (1 to 100 per million) for both residents and workers. For non-cancer risks, screening level HI values exceed a value of one (1) in Lots 1, 3,4, 5, and 8. This risk is mainly attributable to VOC contaminated vapor intrusion from soil.

7.1.5 Uncertainties

Quantitative evaluation of the risks to humans from environmental contamination is frequently limited by uncertainty (lack of precise knowledge) regarding a number of important exposure and toxicity factors. Thus, exposure and risk calculations are usually derived using a number of values that are estimated from the best information that is available. The BRA details the uncertainties in calculating the risk for this Site.

7.1.6 Conclusion

Risks could exist from inhalation exposure to contaminated vapors that intrude from soil into indoor air. At this Site, available data indicate that risks to humans are not of concern from ingestion of soil. Figure 5 depicts how soil vapor could enter a building.

7.2 Ecological Risk

7.2.1 Ecological Setting

Currently, two buildings exist onsite, and most of the property is fenced. There are no surface water bodies on or near the Site. Because the Site is relatively small and is located near a major highway in an urban setting, and because many of the onsite soils are heavily disturbed by grading or covering with gravel, much of the Site is not currently suitable as habitat for ecological receptors. Peripheral areas of the Site are vegetated with weeds, shrubs, and trees that may be adequate habitat for urban wildlife such as birds and small mammals.

7.2.2 Ecological Site Conceptual Model

The primary medium of ecological concern at the Site is contaminated soil. Offsite migration of contaminated soil is not a significant pathway and there are no significant pathways for exposure of ecological receptors to contaminated groundwater. Thus, the potential for adverse ecological impacts is restricted mainly to urban wildlife species such as song birds and small mammals that might feed at the Site, as well as plants and soil invertebrates that are exposed directly to contaminated Site soil.

Of these potential onsite receptors, attention in this risk assessment is focused on plants and soil invertebrates. Because these groups of receptors reside directly in Site soils, they are likely to be more impacted by the soil contamination than avian and mammalian urban wildlife species that would be exposed only indirectly and intermittently through the food chain.

7.2.3 Assessment and Measurement Endpoints

The assessment endpoint selected for this Site is the growth and survival of plant and soil invertebrates. The measurement endpoint used to evaluate the assessment endpoint is the concentration of chemical contaminants in onsite soils.

7.2.4 Chemicals of Potential Concern

Chemicals detected in onsite soils were identified as chemicals of potential concern (COPCs) and retained for quantitative evaluation if: a) the chemical occurred at higher concentrations in Site soil than in background soil, b) the chemical was detected in 5% or more of the onsite soil samples, and c) the maximum detected concentration in Site soil was higher than a conservative estimate of the toxic level for plants and soil invertebrates. Based on these criteria, a total of 17 chemicals were identified as quantitative COPCs. These are listed in Table 10. Other chemicals were either eliminated on the basis of no concern or were evaluated qualitatively.

7.2.5 Exposure Assessment

Exposure of plants and soil invertebrates to COPCs was assessed on a sample-by-sample basis, using all reliable data for soil samples collected from the 0-2 foot depth interval. This approach was used because plants and soil invertebrates are essentially non-mobile, and exposure of individual organisms occurs at fixed locations. For convenience in assessing spatial patterns of contamination, the Site was divided into 10 lots of approximately 75 feet by 100 feet each. The distributions of concentration values were grouped according to lot.

7.2.6 Toxicity Assessment

Soil screening benchmarks for the protection of soil invertebrates and plants have been developed by several different groups, including Oak Ridge National Laboratory, the Netherlands National Institute of Public Health and the Environment, and EPA Region 5. The values recommended by these groups were used as the basis for the Toxicity Reference Values (TRVs) employed in this risk assessment. These TRVs are non-site specific estimates of the concentration of a chemical in soil that will not cause unacceptable adverse effects on growth or survival of plants and soil invertebrates. When more than one TRV was available for a COPC, the geometric mean value was used.

7.2.7 Risk Characterization

The potential for effects on growth or survival of plants and soil invertebrates at a specific location was characterized using the Hazard Quotient (HQ) approach. The HQ is defined as the ratio of the concentration of the COPC at a location compared to the TRV for that COPC. If the HQ for a chemical is equal to or less than one, it is believed that no unacceptable effects will occur in the exposed receptor. If an HQ exceeds one, there is a possibility that adverse effects may occur, although an HQ above one does not indicate an effect will definitely occur, nor does it provide a quantitative indication of the severity or significance of any effect which does occur. However, the larger the HQ value, the more likely it is that an adverse effect may occur.

The mean HQ values for each COPC in each lot are summarized in Table 11. For convenience, HQ values greater than one are shaded. As seen, average HQ values at onsite lots are above a level of potential concern (i.e., HQ > one) for eight of the 17 COPCs, including 2-methylnaphthalene, 4,4-DDT, benzo(a) pyrene, bis(2-ethylhexyl) phthalate, cyclohexane, endrin aldehyde, methoxychlor, and naphthalene. In the case of methoxychlor, the HQ values onsite are similar to background, suggesting that levels of this COPC are probably not site-related. The highest frequency of exceeding HQ= 1 and the highest HQ values tend to occur in lots 3, 4, 5 and 8, with the highest HQ values occurring for naphthalene.

These results indicate that chemical contaminants in shallow Site soil (0-2 feet) may interfere with the growth and survival of plants and soil invertebrates at some locations onsite, mainly in lots 3, 4, 5, and 8.

7.2.8 Uncertainties

Quantitative evaluation of the risks to plants and soil invertebrates from onsite contamination is limited by uncertainty regarding a number of exposure and toxicity factors. These uncertainties relate to: variable contaminant concentrations across the Site, TRV ranges, and lack of toxicity data on plants or animals for some chemicals.

7.2.9 Conclusions

The screening ecological risk assessment results indicate that chemical contaminants in shallow Site soil (0-2 feet) may interfere with the growth and survival of plants and soil invertebrates at some locations on the Site. These locations are generally the same lots of concern to human health that are noted in the preceding section.

Any redevelopment of the Site would likely involve changes to the shallow Site soil by placement of building structures, sod and grass, concrete, or asphalt. For this reason, plus the small size of the contaminated area, a lack of quality habitat, and the urban nature of the Site, cleanup to address the potential impacts to Site plants and soil invertebrates is not considered in this ROD.

8.0 REMEDIAL ACTION OBJECTIVES AND PRELIMINARY REMEDIATION GOALS (PRGS)

8.1 Remedial Action Objectives

The remedy outlined in this ROD is intended to be the final remedial action for IWOR OU1. The overall remedial action objective (RAO) for IWOR OU1 is to protect human health. Workers and future residents are assumed to be the primary populations exposed to contaminated soil under current and anticipated future land uses. The risk assessment identifies VOCs as COPCs. Cancer risks are within or below EPA's risk range for all scenarios. Non-cancer risks exceed a level of concern (HQ > 1) in soils in several areas of the Site. Risks are primarily due to inhalation of vapors from 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene, with smaller contributions from naphthalene, hexane, and cis-1,2-dichloroethene in some locations. Therefore, the primary RAO addresses VOC contaminated vapors.

In addition, OU1 addressed potential sources of contamination. Most of the potential contamination sources, such as laboratory chemicals, tanks, drums, and sump contents, were removed during the investigation. One remaining potential source of soil and groundwater contamination is the UST and any residual material it holds.

Based on this information, the RAOs for IWOR are:

- Prevent exposure of workers and future residents from inhalation of contaminated vapors intruding from soil to indoor air. Non-cancer risks should be reduced to within or below a level of concern (HQ< 1); and

- Remove potential sources of soil and/or groundwater contamination.

The effectiveness of the remedial action alternatives were evaluated with respect to this RAO.

8.2 Preliminary Remediation Goals (PRGS)

In addition to the RAO, preliminary remediation goals (PRGs) or clean up levels for the soil vapor were developed. PRGs were determined two different ways. These goals were used to evaluate each alternative, including effectiveness and cost.

PRGs Method l

The Site risk is associated with inhalation of indoor air. Since a slab-on-grade building used for residential purposes yielded the highest risk, this scenario was used to determine the PRGs. More than one chemical is present in soil so to be within an acceptable risk, the sum of the risks of all the chemicals cannot exceed the target (HI = 1). There are many different ways that the individual chemical concentrations can be reduced to achieve this goal. One common way is to assume that remedial action will cause the concentrations of all chemicals to be reduced by the same relative amount (i.e., the chemicals will remain in constant proportion). Based on this assumption, the PRG for each chemical at each Lot were calculated simply by dividing the soil concentration at each location by the HI value for the location:

Soil PRG (ppm) = Soil Concentration (ppm) / HI

Because the relative concentrations of the different COPCs vary from location to location, the PRGs also depend on location. The results for Lots 3,4, 5 and 8 are shown in Table 12A for the average and maximum contaminant concentrations. This is the concentration of each chemical, averaged over the entire soil column, needed to meet a target HI of 1 at that location.

PRGs Method 2

An alternative approach to achieving acceptable levels of contaminated soil vapors in indoor air is to remove contaminated soil vapors to a depth that the remaining source material does not contribute to unacceptable indoor air. In this approach, the "PRG" defines a depth to which soil must be remediated (e.g., by excavation or by soil vapor extraction) rather than a concentration value in soil.

Starting soil concentration levels of contaminated soil vapor were assumed to be uniform from the surface down to the groundwater (a depth of about 30 meters). Likewise, soil type was assumed to be uniform (sandy loam) from the surface to groundwater. Concentrations in remediated soil were assumed to be zero. Figure 6, which was calculated using the Johnson and Ettinger model, shows how the concentration of soil vapors in indoor air decreases as a function of soil depth that is remediated. The pattern varies from chemical to chemical based on the physical properties of the chemical. However, the reduction in indoor air is proportional to the fraction of the source material excavated. The following equation can be used to estimate the depth of remediaton needed to achieve a reduction from the starting HI to the target HI of one:

Depth of Remediaton $\geq$ Total depth - (total depth ÷ HI)

A more accurate determination of the depth of remediation can be made using Figure 6. Using the fractional reduction in indoor air concentration equal to a value of I/HI (the value on the y-axis) and the average of the chemical-specific curves, the necessary depth can be determined (the x-axis). For instance, if the calculated HI is 2.7 the reduction needed to get the HI to one is 1 + 2.7 or 0.37 (y -axis). Using the average chemical curve, the depth needed for soil remediation is 25 feet (x-axis).

Table 12B summarizes the results based on this approach, showing the approximate depth (m) and volume (m^3) of soil that would have to be remediated in order to reduce indoor air concentrations to an acceptable level (HI = 1).

9.0 DESCRIPTION OF ALTERNATIVES

EPA considered a range of cleanup options in the Feasibility Study (FS). The alternatives considered would prevent exposure or eliminate the vapors that create the potential unacceptable health risk. Cleanup goals, presented in Section 8.2, would need to be met for cleanup to be considered complete.

The FS identified six alternatives, including the No Action Alternative for evaluation. A detailed evaluation was completed on four alternatives. The alternatives retained for detailed analysis were presented in the Proposed Plan and are discussed below. Other alternatives were eliminated during screening because they would not effectively address contamination, could not be implemented, or would have had excessive costs compared to other alternatives.

All of the alternatives, except for No Action, have two common remedy components: (1) the establishment of a land use control; (2) the removal of the UST discovered during the RI. Two of the alternatives, Passive and Active Soil Vapor Extraction, have common remedy components. The common features of these alternatives are highlighted in the Detailed Comparison of Alternatives.

In order to adequately compare costs, a discount rate of 5% was applied to a 30-year remedial action period. The resulting present worth cost provides the cost of the remedies in current year dollars for comparison purposes.

These costs are the same as presented in the Proposed Plan. No additional cost were added for removal of the UST tank. Administrative cost, or the cost of EPA and UDEQ time to work on the alternative, is normally not part of the cost of an alternative, but was incorrectly cited as such in the Proposed Plan cost for Alternative 2. Under the other alternatives, the tank removal represents a small portion of the overall cost of the alternatives and falls within the allowance of estimated costs suggested in guidance.

Alternative 1: No Action

Capital Cost	$0
Time to Implement	Immediate
Annual Operation and Maintenance Cost	$0
30-Year Present Worth Cost	$0

No remedial action is considered under this alternative. The No Action alternative provides a baseline for comparing other alternatives and is required to be evaluated by the NCP. Under the No Action alternative, if a building were built on the property, vapors from contaminated soil could accumulate in the building and cause risk to human health. The UST would remain and could release contamination into the soil.

The no-action alternative does not achieve the RAO at IWOR. This alternative is not compliant with Applicable or Relevant and Appropriate Requirements (ARARs). This alternative does not address the source of contamination and does not serve to minimize exposure. Reduction of toxicity, mobility, or volume through treatment is not addressed by the No Action alternative since treatment is not proposed. No remedial action would be implemented under this alternative; therefore, the remedy is easy to implement. Capital costs and operations and maintenance (O&M) costs are estimated to be zero, as no action would be taken.

Alternative 2: Land Use Controls

Capital Cost	$20,000
Time to Implement	about 6 months
Annual Operation and Maintenance Cost	zero
30-year Present Worth Cost	$20,000

Using a Land Use Control, this alternative enables safe future development by establishing a building requirement for the property. The Land Use Control would require that any building constructed on the property include measures to eliminate the potential for contaminated soil vapors from entering the building.

The Land Use Control for this alternative would be established in cooperation with local governments. Under this alternative, future buildings would be constructed with a subfoundation ventilation system such as commonly used to eliminate exposure to radon gas. This type of system prevents contaminated vapors released from the soil from entering the building.

The Land Use Control will require buildings constructed on the property to be constructed to prevent exposures to inhalation of contaminated soil vapors and, therefore, would achieve the RAO. This alternative would comply with ARARs. The Land Use Control will be established to run with the land and therefore will be long-term effective. The Land Use Control does not reduce the toxicity, mobility, or volume of the contaminants. It could be implemented in a short time period.

A sub-foundation ventilation system that would be required by this alternative is effective and has been used at other Superfund sites to prevent contaminated vapor exposures in buildings. The implementation of Land Use Controls, often called institutional controls, has been used effectively at Superfund sites across the country.

The cost to establish the Land Use Control is mostly administrative. Administrative costs include the time required by EPA and UDEQ personnel to research and develop the restriction, and coordinate with local governments. The cost to construct a building required by the Land Use Control is not considered in the alternative costs and therefore, not presented in this ROD. The cost of the ventilation system would vary dependent on the size of the building. However, materials used are typically low cost, and the incorporation of a system in the design and construction of a new building adds minimal cost.

This ROD also clarifies that the ventilation system is required for buildings built solely on the property that was formerly the Intermountain Oil Company, or for any building(s) that cover a portion of the Intermountain Oil Company parcel. Further explanation of this distinction is provided in the Selected Remedy section of this ROD.

In addition to the Land Use Control, the UST discovered during the RI would be removed. The tank contents were removed when the removal of other material was completed in August 2001. Any residue in the tank could still be a source of groundwater contamination. The removal of the tank is also required to meet ARARs.

Alternative 3: Passive Soil Vapor Extraction (PSVE) or Barometric Pumping.

Capital Cost	$290,000
Time to Implement	30 years
Annual Operation and Maintenance Cost	$14,166
30-year Present Worth Cost	$523,000

This treatment alternative relies on changes in air pressure between the ground surface and subsurface to reduce the contamination levels in the soil.

Under this alternative, passive soil vapor extraction wells would be installed in the areas showing unacceptable risk. No mechanical pumping systems would be required. When atmospheric pressure is higher than the subsurface pressure, air is induced to flow through the wells into the subsurface. Conversely, when atmospheric pressure is less than subsurface pressure, airflow out of the well will result in the removal of contaminated vapors from the soil.

Testing would determine if treatment of the vapors collected in the wells would be necessary. Additional sampling would help optimize the well location. A Land Use Control would need to be established to ensure human health protection until clean up goals are achieved.

This alternative would reduce the volume of contaminants over time by extracting the vapors from the soil. The alternative would comply with ARARs. This remedy involves a design and construction phase so it would take longer to implement than Alternative 2.

This technology uses conventional materials and methods; therefore, it is considered to be easily implementable. The cost of obtaining design data from additional investigation would be incurred. The largest potential cost impact is the frequency and duration of the monitoring period.

In addition to the PSVE, the UST discovered during the RI would be removed. The tank contents were removed when the removal of other material was completed in August 2001. Any residue in the tank could still be a source of groundwater contamination. The removal of the tank is also required to meet ARARs.

<u>Alternative 4: Active Soil Vapor Extraction (ASVE)</u>

Capital Cost	$775,000
Time to Implement	30 years
Annual Operation and Maintenance Cost (average)	$12,833
30-year Present Worth Cost	$1,018,000

Under this alternative, air extraction wells are placed in contaminated zones. Air is then vacuumed from the soil. Although it is assumed the vapors collected in the wells would not need treatment, testing would be conducted to verify that no treatment is necessary.

A short-term pilot study would likely be completed to help optimize the design and placement of the wells. After about two years of operation, the effectiveness of the active system would likely decline and it would be converted to a passive soil vapor extraction system.

The alternative would comply with ARARs. This alternative aggressively removes vapor phase concentrations from the vadose zone. The greatest reduction in contaminated soil vapor would be realized within two years of operation. A Land Use Control would need to be established to ensure human health protection until clean up goals are achieved.

System installation is easily achieved with pre-packaged, skid-mounted equipment. Operation and maintenance require minimal skills. The cost of obtaining design data from an additional investigation would be incurred. Annual O&M costs are estimated at $20,000 for each of the first two years of operation and then reduce when converted to a passive system. The majority of the costs estimated for this alternative would be incurred in the first two to three years of implementation.

In addition to the ASVE, the UST discovered during the RI would be removed. The tank contents were removed when the removal of other material was completed in August 2001. Any residue in the tank could still be a source of groundwater contamination. The removal of the tank is also required to meet ARARs.

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 300.430(e)(9) of the NCP requires that the EPA evaluate and compare the remedial cleanup alternatives based on the nine criteria listed below. The first two criteria, (1) overall protection of human health and the environment and (2) compliance with applicable or relevant and appropriate requirements (ARAR), are threshold criteria that must be met for the Selected Remedy. The Selected Remedy must then represent the best balance of the remaining primary balancing and modifying criteria.

10.1 NCP Evaluation and Comparison Criteria

The following sections describe the NCP evaluation and comparison criteria. The first two criteria are threshold criteria.

1. Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how potential risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or Land Use Controls.

2. Compliance with ARARs addresses whether or not a remedy will comply with identified federal and state environmental laws and regulations.

The next five criteria are balancing criteria. These are:

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time.

4. Reduction of toxicity, mobility, and volume through treatment refers to the degree that the remedy reduces toxicity, mobility, and volume of the contamination.

5. Short-term effectiveness addresses the period of time needed to complete the remedy and any adverse impact on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. Implementability refers to the technical and administrative feasability of a remedy, including the availability of materials and services needed to carry out a particular option.

7. Cost evaluates the capital costs, operation and maintenance (O&M) costs, and present worth costs of each alternative.

The last two criteria are modifying criteria and are:

8. State acceptance indicates whether the State (UDEQ), based on its review of the information, concurs with, opposes, or has no comment on the preferred alternative.

9. Community acceptance is based on whether community concerns are addressed by the Selected Remedy and whether or not the community has a preference for a remedy.

10.2 Summary of Comparative Analysis of Alternatives

This section summarizes the comparison of alternatives for IWOR OUI. The following subsections are a brief summary of the evaluation and comparison of the IWOR OUI alternatives against each criteria. Additional details of the evaluation of the alternatives are presented in the FS. Table 13 provides a comparison of the remedial action alternatives with respect to the first seven NCP criteria.

10.2.1 Overall Protection of Human Health and the Environment

This criterion is based on the level of protection of human health and the environment afforded by each alternative. All of the alternatives, except Alternative 1 (No Action), would provide adequate protection of human health and the environment.

By removing the soil vapors or the exposure pathway, Alternatives 2, 3, and 4 would provide significantly more protection from Site risks than Alternative 1 (No Action). Alternative 1, No Action is not considered further in this analysis as an option for this Site because it is not protective of human health and the environment.

10.2.2 Compliance with Applicable or Relevant and Appropriate Requirements

This criterion is based on compliance with the ARARs presented in FS. All three alternatives comply with ARARs. ARARs for all three alternatives include air quality emissions requirements, corrective action and closure standards for USTs, and staging of remediation wastes.

10.2.3 Long-term Effectiveness and Permanence

Alternatives 2, 3, and 4 would provide good long-term effectiveness and permanence. Alternatives 3 and 4 involve the removal of the source of the risk over time, thereby providing maximum effectiveness and permanence.

10.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 2 does not employ treatment techniques or reduce toxicity or volume of soil vapors other than the reduction of vapors that will naturally occur. Alternatives 3 and 4 provide reduction of the volume by removing the vapors which create the potential risk. The UST removal under all three alternative removes a potential source of soil and groundwater contamination thereby reducing potential mobility of contaminants.

10.2.5 Short-term Effectiveness

The Land Use Control in Alternative 2 should be relatively quick to implement, thereby assuring protection of human health for future property development. Alternatives 3 and 4 would take longer to implement and would also require a Land Use Control to assure human health protection until clean up goals are met. When compared to Alternative 3, Alternative 4, active soil vapor extraction system, provides greater initial reduction in vapors within the first few years of operation. The UST removal construction activities are not expected to adversely affect nearby residents and businesses.

10.2.6 Implementability

This criterion is based on the ability to perform construction and implement administrative actions. Alternative 2 is easily implemented and does not require any design or construction efforts. Alternatives 3 and 4 use technologies that are commonly used and are easy to implement. However, both Alternatives 3 and 4 require design, including additional testing to optimize the design, and construction. These factors make these two remedies more complicated to implement compared to Alternative 2.

10.2.7 Cost

The Land Use Control is relatively inexpensive. The Passive Soil Vapor Extraction is about one half the cost of Active Soil Vapor Extraction. Much of the difference in the cost of the latter two alternatives is due to the capital costs.

10.2.8 State Acceptance

The State has been consulted throughout this process and concurs with EPA's selected remedy.

10.2.9 Community Acceptance

Public comment on the RI/FS and Proposed Plan was solicited during a formal public comment period extending from August 19 through September 17, 2002. Only one written public comment was received. Oral comments were received at the public meeting held on August 22, 2002, in Bountiful. Most comments were in the form of clarifying questions. Few comments either supporting or opposing the Preferred Alternative were received. Comments and EPA responses are presented in the Responsiveness Summary.

11.0 PRINCIPAL THREAT WASTES

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by the Site wherever practicable (NCP § 300.430(a)(l)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk, hi general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threat wastes are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

The EPA removal conducted in 2001 addressed many of the sources that could potentially have created a principal threat. The remaining source materials at IWOR do not constitute principal threat wastes; hence, they are considered non-principal threat wastes. Elimination of the exposure pathway to the source material (soil contamination) and removal of the UST is a reliable remedy.

12.0 SELECTED REMEDY

12.1 Rationale for Selected Remedy

Based upon consideration of CERCLA requirements, the detailed analysis of alternatives, and public comments, EPA has determined that the Land Use Control alternative presented in the Proposed Plan, with slight modifications, is the appropriate remedy for the IWOR OU1. This alternative, identified as Alternative 2, enables safe future development by establishing a building requirement for the property. The Land Use Control will require that any building constructed on the property provide measures to eliminate the potential for contaminated soil vapors from entering buildings. The Land Use Control will also require that soil excavated during the building or other construction activities be managed appropriately.

In addition, the UST tank will be removed eliminating a potential groundwater contamination source and fulfilling ARAR requirements.

This Selected Remedy:

- meets the threshold cleanup evaluation criteria (overall protection of human health and the environment, and compliance with ARARs);

- addresses the future potential risk in a cost-efficient manner;

- is readily implementable;

- eliminates the pathway of potential exposure to contaminated soil vapors;

- provides long-term effectiveness and permanence for future uses of the property;

- provides an added benefit - when the control is implemented, it will also eliminate exposure to other soil gases, such as radon gas, that can cause health problems; and

- addresses a remaining potential contamination source through the removal of an old underground tank.

The Selected Remedy best meets the entire range of selection criteria and achieves, in EPA's determination, the appropriate balance considering site-specific conditions and criteria identified in CERCLA and the NCP, as provided in Section 13.0, Statutory Determinations.

12.2 Description of Selected Remedy

Alternative 2: Land Use Control with UST removal

This alternative includes two components: (1) the establishment of a Land Use Control; (2) removal of an underground storage tank (UST) which was discovered during the investigation.

Land Use Control

The Land Use Control enables safe future development by establishing a building requirement for the property. The Land Use Control will require that any building constructed on the property provide measures to eliminate the potential for contaminated soil vapors from entering the building. The Land Use Control will also require that soil excavated during the building or other construction activities will be managed appropriately.

A Land Use Control will be established for both parcels of the Site: the eastern two-thirds that comprised the Intermountain Oil Company operations; and the western one-third that is owned by Kemar Corporation. However, the Land Use Control will differ between these two parcels as explained below.

The Land Use Control will require any building constructed on the property that was once the Intermountain Oil Company operations to include the vapor ventilation system. A building built completely on the parcel of the Site owned by Kemar Corporation would not be required to have a ventilation system. There is no soil contamination that contributed to the risk on this parcel of the Site. However, if the development of the Site includes both parcels and a building is constructed so it covers any portion of the Intermountain Oil Company parcel, as well as part of the Kemar parcel, the building is required to include the vapor ventilation system.

The requirements for this alternative will be established in cooperation with local governments. Under this alternative, any Site buildings constructed on the Site will be required to include a sub-foundation vapor ventilation system such as commonly used to eliminate exposure to radon gas. This type of system prevents contaminated vapors released from the soil from entering the building. Figure 7 shows the general components of a building constructed with vapor ventilation system.

UST

The UST will also be removed. The tank contents were removed during the August 2001 removal of other material from the Site. However, the residue in the tank continues to present a potential source for ground water contamination. The removal of the tank was reported at the Proposed Plan public meeting. The tank will be excavated and disposed of according to Utah State requirements.

12.3 Estimated Remedy Costs

Most all of the cost associated with the Land Use Control is administrative. This is the cost associated with the time and materials spent by EPA and UDEQ to research, develop, coordinate with the local governments, and establish the control. The cost for removing the UST is estimated to be about $20,000.

12.4 Expected Outcome of the Selected Remedy

The Selected Remedy for IWOR will allow for safe future development of the Site for all uses, including residential. The Land Use Control assures the elimination of the exposure pathway and thus the potential risk. When any buildings are constructed on the Site under the Land Use Control, the exposure to the contaminated soil vapors will be prevented. In addition, exposure to naturally occurring radon gas, which is common in the Rocky Mountain Region, will also be prevented. The Selected Remedy will also remove the UST, which could be a source of groundwater contamination.

While the continuation of the OU2 groundwater investigation does not prohibit development of the Site, development will require coordination with EPA. Site investigative-derived waste and wells may still be located on the property during the ongoing OU2 investigation.

13.0 STATUTORY DETERMINATIONS

Under CERCLA Section 121, EPA must select a remedy that is protective of human health and the environment; that complies with ARARs; is cost effective; and utilizes permanent solutions, alternative treatment technologies, or resource recovery technologies to the maximum extent practicable. In addition, CERCLA stresses a preference for remedies that include treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. In narrowing the focus of the FS, treatment or removal of soils at Intermountain Waste Oil was determined to be economically impracticable. The Selected Remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

The UST removal portion of the Selected Remedy provides a permanent solution to this potential problem.

13.1 Protection of Human Health and the Environment

The Selected Remedy protects human health and the environment through the prevention of direct contact with contaminants at the Site. The Selected Remedy uses a Land Use Control that requires a vapor ventilation system to eliminate the potential exposure pathway. The selected remedy also removes a potential source of groundwater contamination.

13.2 Compliance with ARARs

Table 14 list the ARARS identified for the Selected Remedy. The Selected Remedy will comply with all ARARs. No waiver of ARARs will be necessary.

13.3 Cost Effectiveness

EPA has determined that the Selected Remedy is cost effective in mitigating the risks posed by contaminated soil. Section 300.430(f)(ii)(D) of the NCP requires evaluation of cost effectiveness. Overall effectiveness is determined by the following three balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost effective. The Selected Remedy provides for overall effectiveness in proportion to its cost.

13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (Or Resource Recovery Technologies) to the Maximum Extent Possible

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions can be utilized in a cost effective manner for IWOR OU1.

Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy for the I WOR GUI provides the best balance in terms of long-term effectiveness and permanence, treatment, implementability, cost, and state and community acceptance.

While the Land Use Control does not utilize treatment, it uses an administrative control that is long-term effective, requires a system to prevent exposure to contaminated soils, and reduces risk. The UST component uses a permanent solution by removing a potential contamination source.

13.5 Preference for Treatment as a Principal Element

The Land Use Control required by the Selected Remedy does not meet the statutory preference for treatment as a principal element. However, removal or elimination of the potential exposure pathway at the Site through the Land Use Control has the same impact as a treatment option would have. The UST closure required by the Selected Remedy will meet the treatment preference if any waste requires treatment prior to disposal.

13.6 Five-year Review Requirements

Because the hazardous substances will remain onsite above levels that allow for unrestricted use, a five-year review, under Section 121©) of CERCLA and Section 300.430(f)(4)(ii) of the NCP, is required. The five-year review will evaluate how well the Selected Remedy is achieving the RAOs.

14.0 REFERENCES

1. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. PB89-184626. October.

2. Johnson, C. P. and Ettinger, R. A., 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings. Environ. Sci. Technol. 25:1445-1452.

3. Syracuse Research Corporation, 2002. Memorandum to Lisa Lloyd, USEPA Region VIII, *PRGs for VOCs in Soil at IWOR Site.* June 17, 2002.

4. URS Operating Services, Inc., 1998. Site Inspection Report for Expanded Site Inspection, Intermountain Waste Oil Refinery, Bountiful, Utah.

5. U.S. Environmental Protection Agency, Region III, 1996. Risk-Based Screening Level Concentrations.

6. U.S. Environmental Protection Agency, 1999. A Guide for Preparing Superfund Proposed Plans, Records of Decisions, and Other Remedy Selection Decision Documents.

7. U.S. Environmental Protection Agency, Region VIII, 2002. Baseline Human Health Risk Assessment for the Intermountain Waste Oil Refinery Site, Bountiful, Utah.

8. U.S. Environmental Protection Agency, Region VIII, 2002. Screening Level Ecological Risk Assessment for the Intermountain Waste Oil Refinery Site, Bountiful, Utah.

9. Utah Department of Environmental Quality (UDEQ), Division of Environmental Response and Remediation, 1997. Analytical Results Report, Intermountain Waste Oil Refinery, UT0001277359, Salt Lake County, Utah.

10. U.S. Environmental Protection Agency, Region VIII, August 2002. Feasibility Study Report, Intermountain Waste Oil Refinery Site, Bountiful, Utah.

11. U.S. Environmental Protection Agency, Region VIII, July 2002. Remedial Investigation Report, Intermountain Waste Oil Refinery Site, Bountiful, Utah.

FIGURES

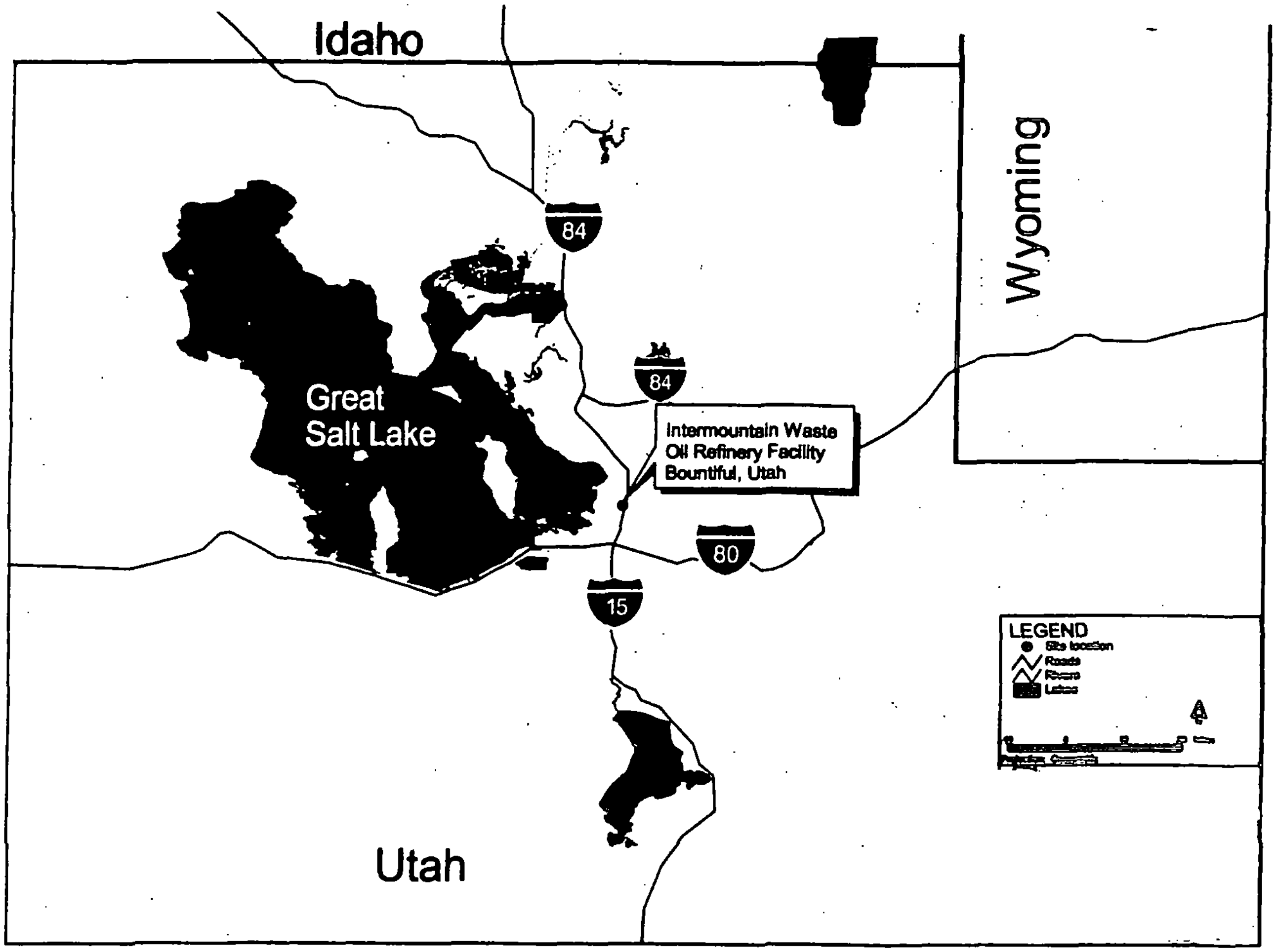


Figure 1A: Site Location Map
Intermountain Waste Oil Refinery Superfund Site, Bountiful, Utah

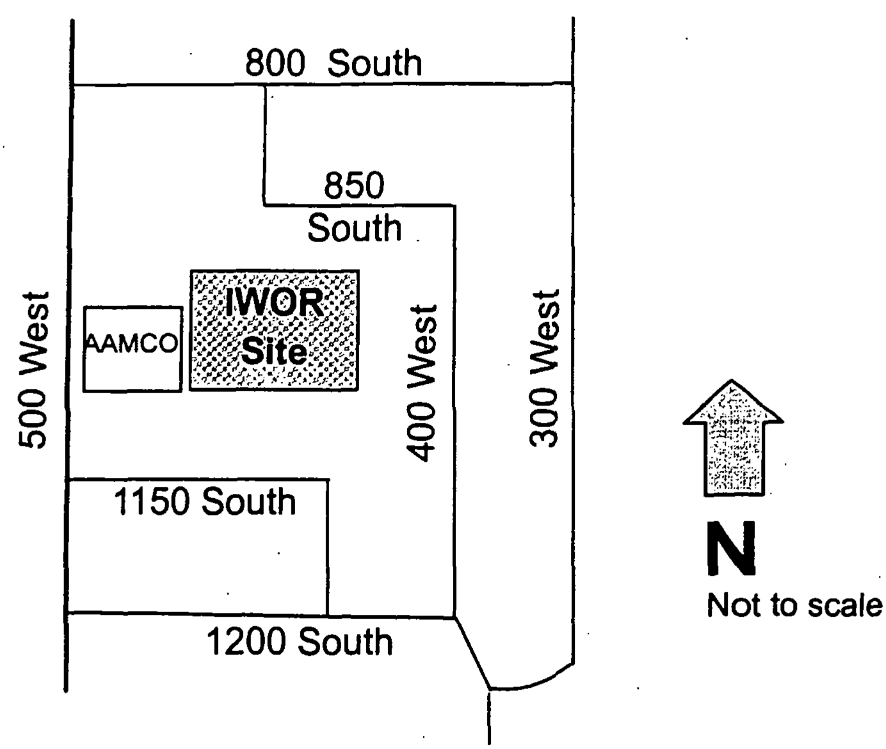


Figure 1B: Location of Intermountain Waste Oil Refinery (IWOR) Superfund Site, Bountiful, Utah

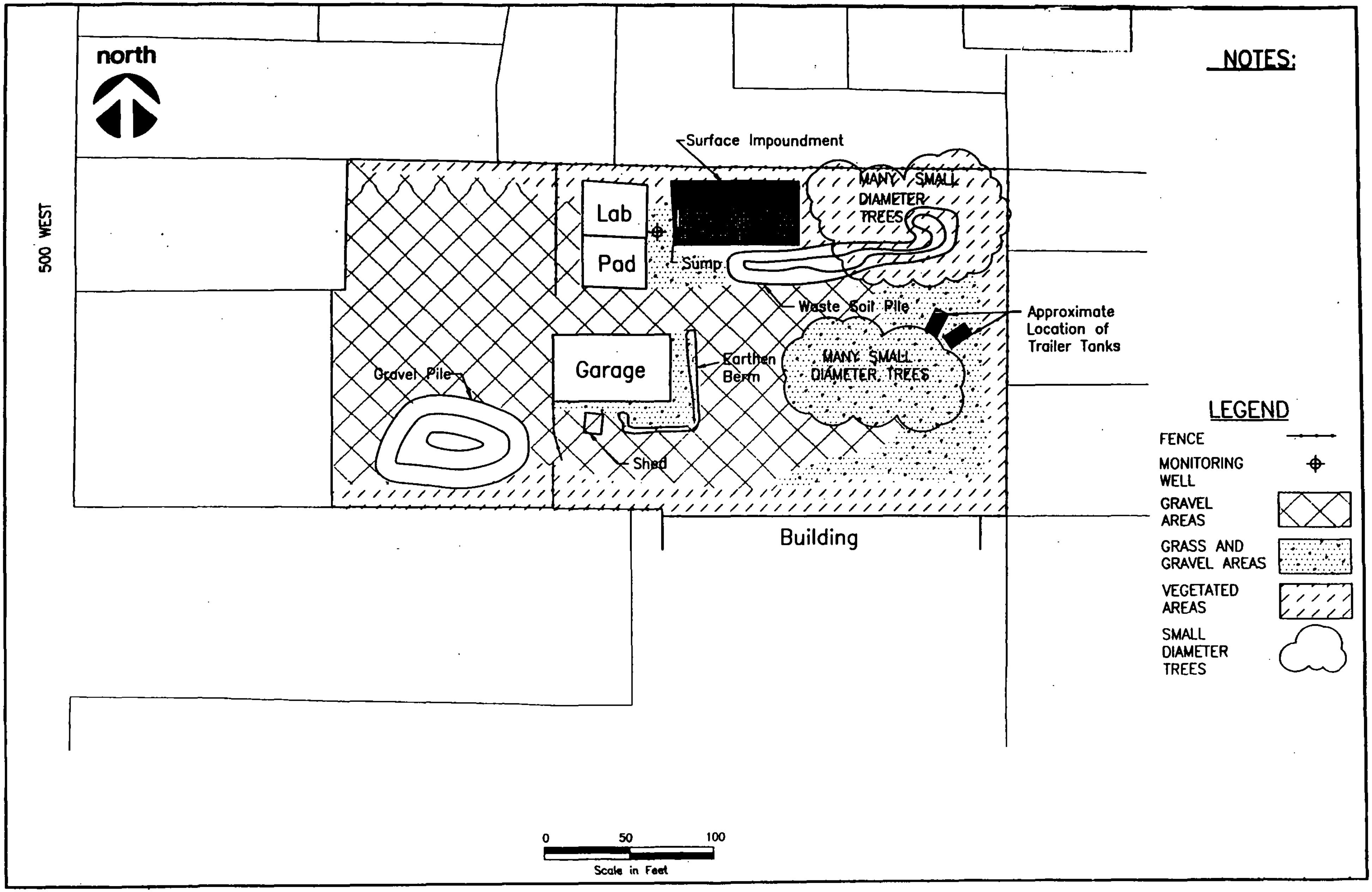


Figure 2: Surface Features of IWOR at the Start of the Remedial Investigation Intermountain Waste Oil Refinery

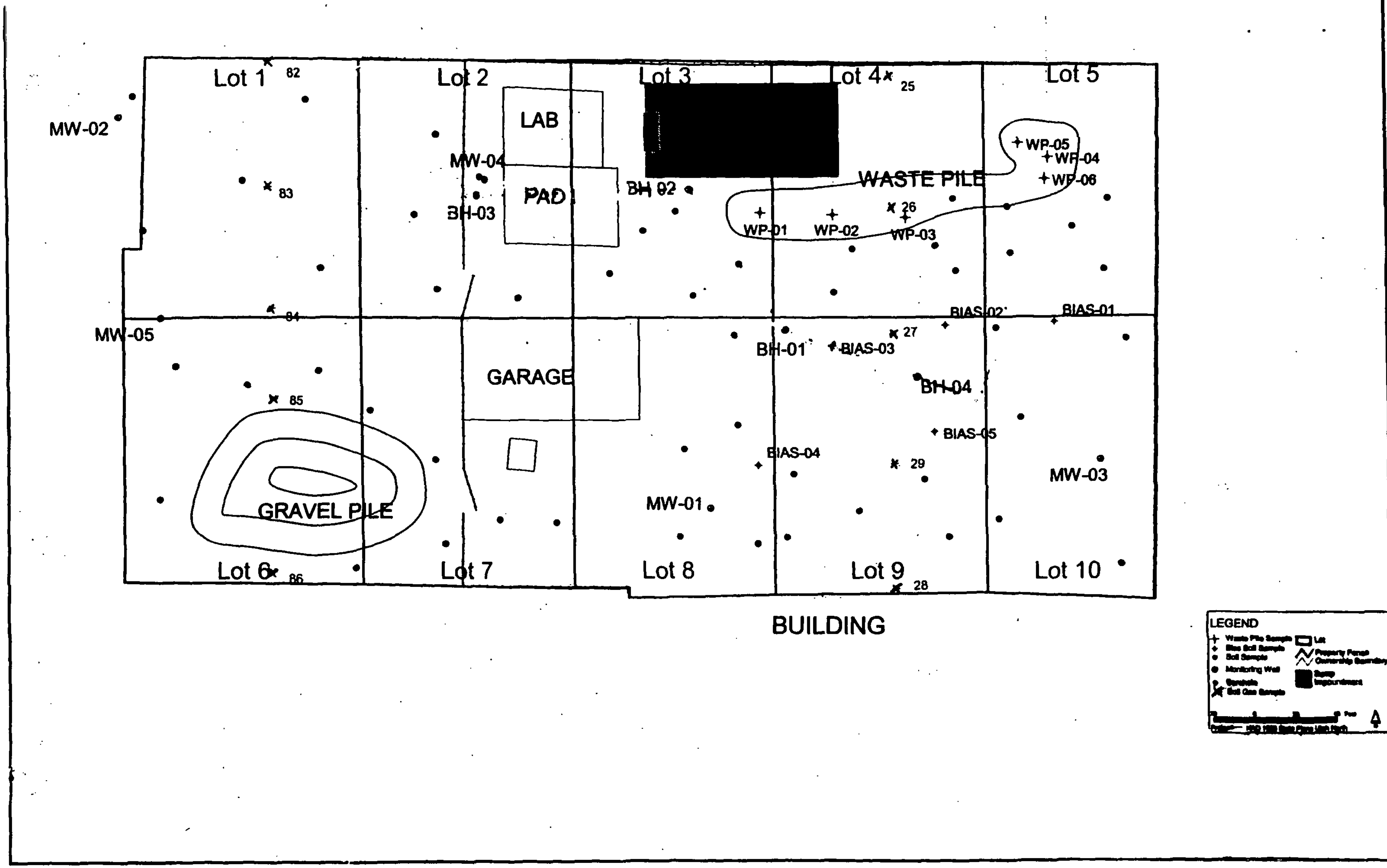
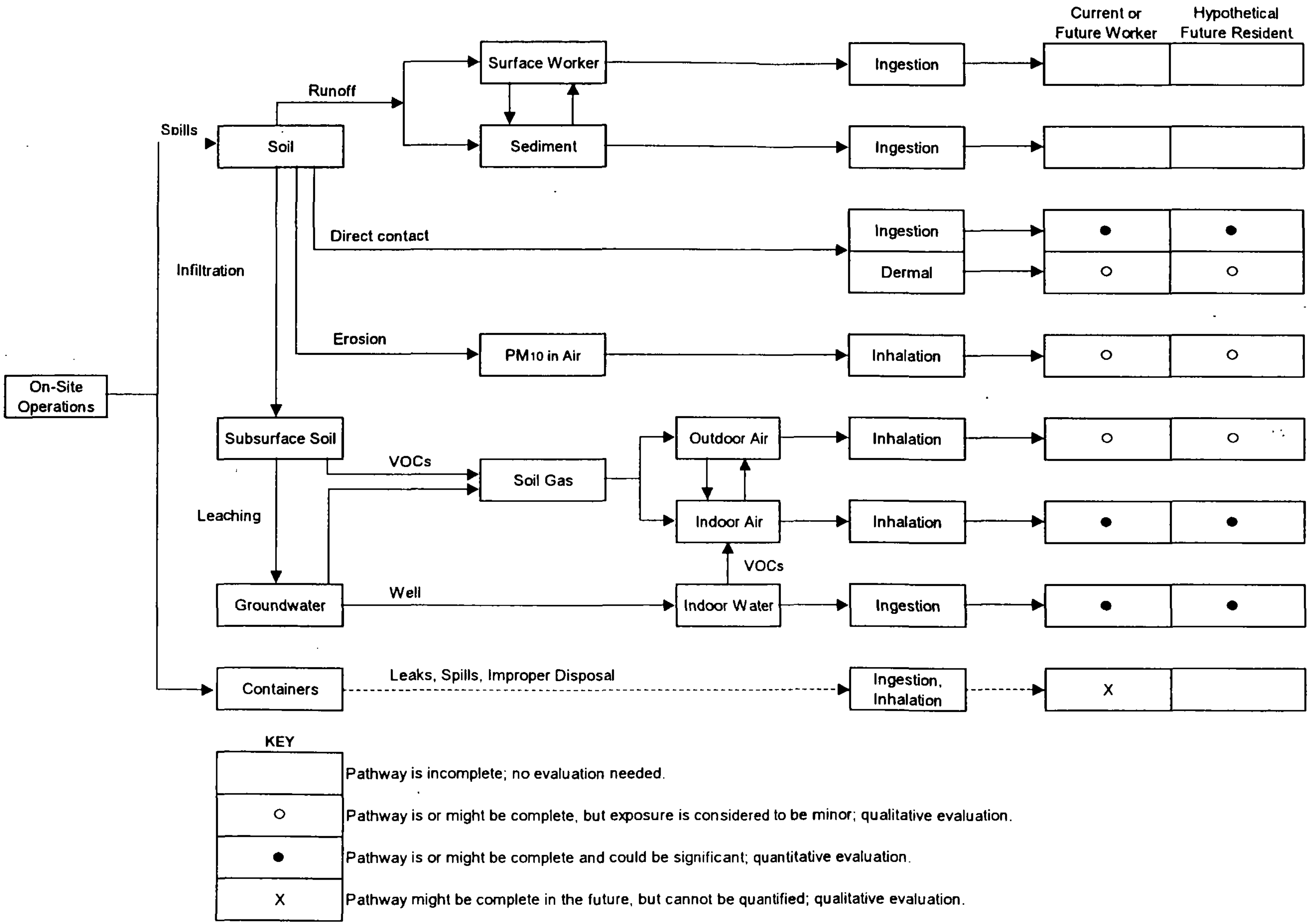


Figure 3: Remedial Investigation Sample Location Map
Intermountain Waste Oil Refinery



Note: reproduced from *Baseline Human Health Risk Assessment for the Intermountain Waste Oil Refinery Site, Bountiful, Utah,* SRC May 2002

Figure 4: Intermountain Waste Oil Refinery (IWOR) Site Conceptual Model for Human Exposure

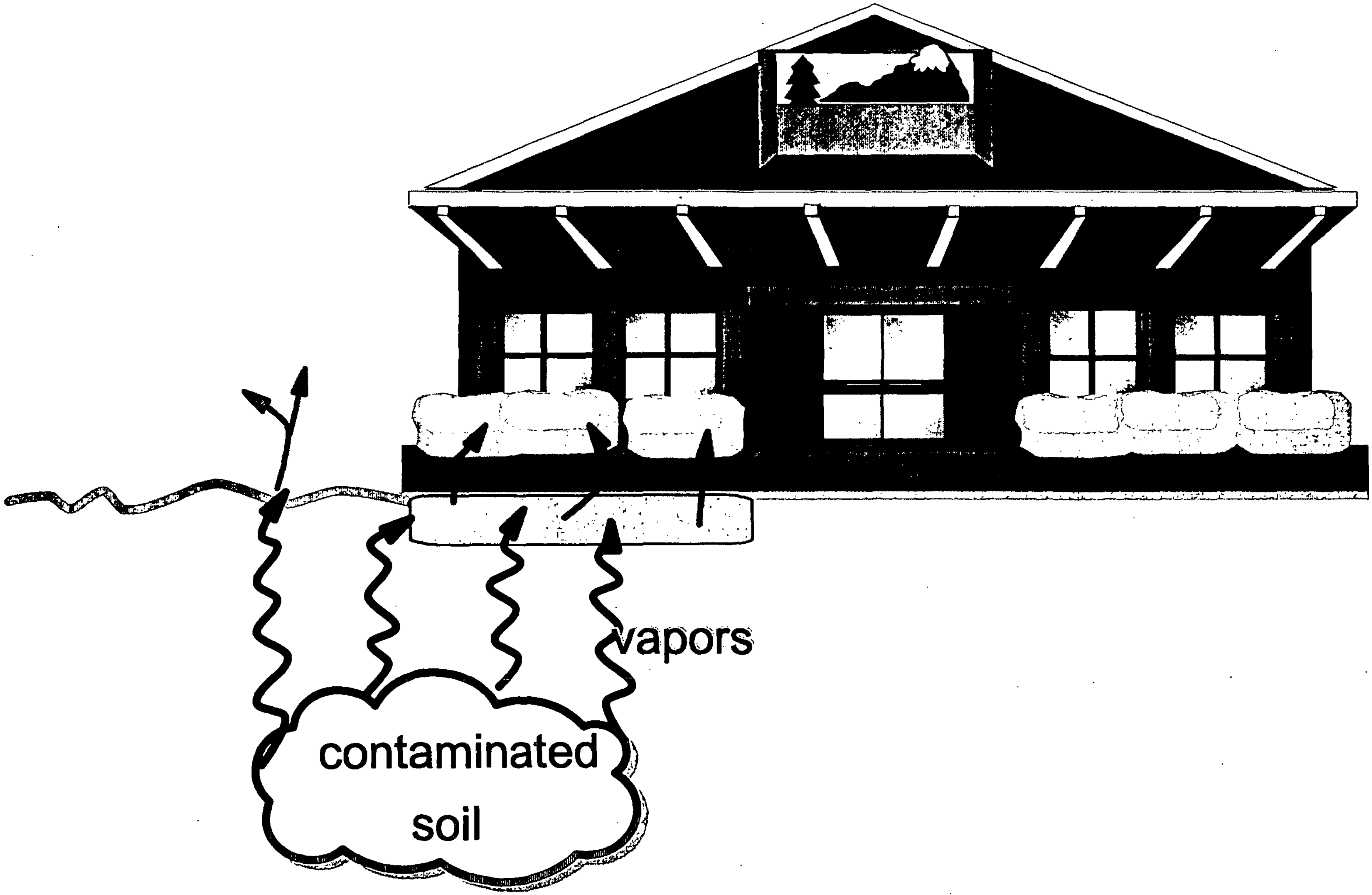
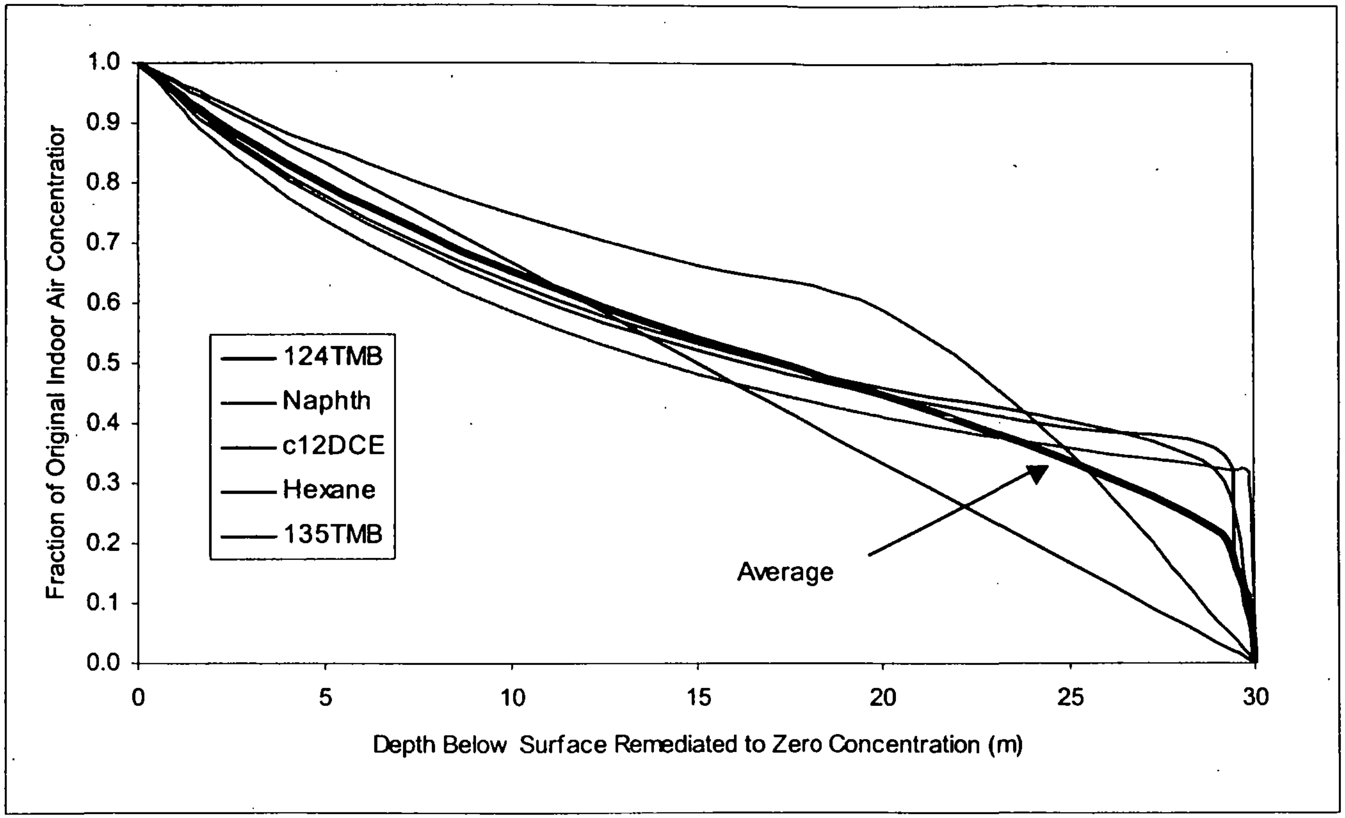


Figure 5: Diagram Depicting How Contaminated Soil Vapors Enter Buildings



1/HI = Fraction of Indoor Air Concentration

Figure 6: Depth of Soil Remediation Needed Based on Target Indoor Air Concentrations

Vapor-Resistant Building Features

The techniques may vary for different foundations and site requirements, but the basic elements are:

A. Gas Permeable Layer
This layer is placed beneath the slab or flooring system to allow the soil gas to move freely underneath the house. In many cases, the material used is a 4-inch layer of clean gravel.

B. Plastic Sheeting
Plastic sheeting is placed on top of the gas permeable layer and under the slab to help prevent the soil gas from entering the home. In crawlspaces, the sheeting is placed over the crawlspace floor.

C. Sealing and Caulking
All openings in the concrete foundation floor are sealed to reduce soil gas entry into the home.

D. Vent Pipe
A 3- or 4-inch gas-tight or PVC pipe (commonly used for plumbing) runs from the gas permeable layer through the house to the roof to safely vent radon and other soil gases above the house.

E. Junction Box
An electrical junction box is installed in case an electric venting fan is needed later.

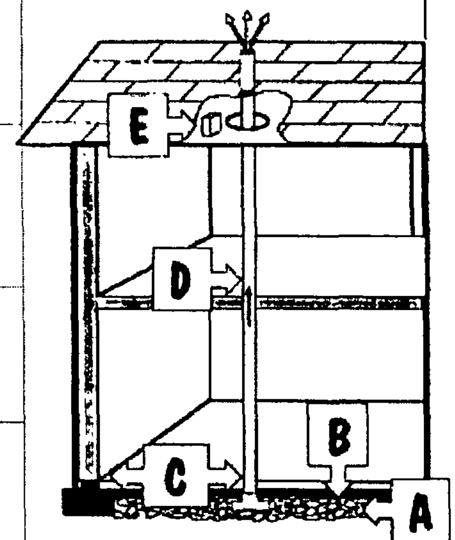


Figure 7: General Components of Vapor Resistant Buildings

TABLES

Table 1: Contaminant Profile for Surface & Near-Surface Soil Sample Groups Sampled Using a Grid in All Lots - Detected Organic Compounds (IWOR OU1)

Parameter	SAMPLE GROUP	0"-2" Surface Soil Samples (10) Profile		3"-12" Near-Surface Soil Samples (10) Profile		13"-24" Near-Surface Soil Samples (10) Profile	
	RBC (mg/Kg)	Concentration Range (mg/Kg)	Fre-quency	Concentration Range (mg/Kg)	Fre-quency	Concentration Range (mg/Kg)	Fre-quency
1,2,4-Trimethylbenzene	3900	0.001	1	0.001 - 0.120	9	0.002 - 8.800	5
1,3,5-Trimethylbenzene	3900	nd	0	0.003 - 0.051	6	0.003 - 2.900	4
2-Methylnaphthalene	1600	nd	0	0.120 - 13.00	4	0.470 - 14.00	3
bis(2-ethylhexyl)phthalate	46	0.078 - 0.440	7	0.160 - 0.940	3	0.073 - 0.560	5
Ethylbenzene	7800	0.001 - 0.007	4	0.001 - 0.008	10	0.001 - 0.730	8
Fluorene	3100	nd	0	nd	0	1.700	1
Isopropylbenzene	7800	nd	0	0.003	1	0.230 - 0.260	2
m&p-Xylenes	160000	0.004 - 0.010	3	0.006 - 0.039	10	0.002 - 4.100	10
Methylene Chloride	85	0.069	1	nd	0	nd	0
Naphthalene	1600	nd	0	0.003 - 0.410	5	0.011 - 13.0	5
n-Butylbenzene	3100	nd	0	0.002	1	nd	0
n-Propylbenzene	3100	nd	0	0.001 - 0.009	6	0.002 - 0.730	2
o-Xylene	160000	0.001 - 0.004	2	0.003 - 0.019	10	0.001 - 1.700	10
Phenanthrene	NA	0.440	1	0.074 - 7.100	5	0.110 - 7.300	3
p-Isopropyltoluene	NA	nd	0	0.001	2	0.812 - 1.100	2
sec-Butylbenzene	3100	nd	0	0.005	1	0.001 - 0.550	2
tert-Butylbenzene	3100	nd	0	nd	0	0.110	1
Toluene	16000	0.001 - 0.017	7	0.001 - 0.019	10	0.002 - 1.100	8
Acetone	7800	0.005 - 0.120	3	0.160 - 0.270	3	0.029	1
Chloroform	100	0.002	3	0.001 - 0.004	6	0.003	1
Chrysene	87	1.2	1	0.034 - 0.620	3	0.140 - 0.900	4
Hexane	NA	0.003 - 0.008	2	0.001 - 0.006	6	0.001 - 0.083	4
Pyrene	2300	1.5	1	0.066 - 1.100	2	0.250 - 2.300	3
4-Methyl-2-Pentanone	6300	0.003 - 0.0004	2	0.002	2	nd	0
Benzo(a)anthracene	0.87	0.630	1	nd	0	0.130	1
Benzo(a)pyrene	0.087	* 0.680	1	nd	0	*0.210 - 0.520	2
Benzo(b)fluoranthene	0.87	* 1.300	1	nd	0	0.220	1
Benzo(ghi)perylene	0.087	nd	0	*0.069- 0.190	3	* 0.220	2
Benzo(k)fluoranthene	8.7	0.770	1	nd	0	0.170	1
Fluoranthene	3100	1.100	1	nd	0	0.140	1
Anthracene	23000	nd	0	nd	0	0.075 - 0.860	2
Cyclohexane	NA	0.003 - 0.004	3	nd	0	0.300 - 0.320	2
1,2-Dichlorobenzene	7000	nd	0	0.036 - 0.067	2	0.006 - 0.110	2
1,2-Dichloroethane	7	nd	0	nd	0	0.002	1
4-Chloroaniline	310	0.085	1	nd	0	nd	0
Acenaphthene	4700	nd	0	nd	0	0.960	1
cis-1,2-Dichloroethene	780	nd	0	nd	0	0.003	1
Dibenzofuran	310	nd	0	nd	0	1.0	2
Indeno(1,2,3-cd)pyrene	0.87	nd	0	nd	0	0.210	1
Isobutyl Alcohol	23000	0.048	1	nd	0	nd	0
Isopropyl Alcohol	NA	0.180	1	nd	0	nd	0
Methyl Ethyl Ketone	47000	0.005 - 0.008	2	nd	0	nd	0
Methylcyclohexane	NA	0.006	1	nd	0	nd	0
TPH		670 - 3,800	10	57 - 30,000	10	nd - 15,000	8

Notes:

(n) - Number of samples in sample group

RBC - EPA Region III risk-based concentrations for residential soils

- Compound also found in onsite containers or drums

- Compound also found in areas of suspected contamination

* - result exceeds EPA Region III RBC for residential soils

NA - not applicable

nd - not detected

frequency - number of times detected

Table 2: Contaminant Profile for Surface & Near-Surface Soil Sample Groups Sampled Using a Grid in All Lots - Detected Metals (IWOR OU1)

	SAMPLE GROUP	0"-2" Surface Soil Samples (10) Profile		3"-12" Surface Soil Samples (10) † Profile		13"-24" Surface Soil Samples (10)† Profile	
Parameter	RBC (mg/Kg)	Concentration Range (mg/Kg)	Frequency	Concentration Range (mg/Kg)	Frequency	Concentration Range (mg/Kg)	Frequency
Aluminum	78000	3530 - 14400	10	7320	1	6640	1
Antimony	31	0.40 - 0.61	6	nd	0	nd	0
Arsenic	0.43	* 3.30 - 13.4	10	* 3.3 - 9.1	10	* 4.5 - 30.1	10
Barium	5475	0.90 - 188	10	68.5 - 125.0	10	71.1 - 139.0	10
Beryllium	156	0.23 - 0.94	10	0.47	1	0.5	1
Cadmium	78	0.036 - 0.92	10	0.063 -0.63	3	0.16 - 2.10	3
Calcium	NA	21500 - 63500	10	33500	1	29600	1
Chromium	78	8.0 - 34.0	10	14.1 - 26.3	10	12.3 - 26.9	10
Cobalt	4693	2.6 - 8.3	10	6.2	1	5.8	1
Copper	3129	20.6 - 40.8	10	26.5	1	23.3	1
Iron	23464	6380 - 20400	10	13200	1	12600	1
Lead	NA	41.2 - 147.0	10	24 - 71.5	10	21 - 166	10
Magnesium	NA	4430 - 17900	10	7150	1	5720	1
Manganese	1564	170 - 474	10	253	1	225	1
Mercury	NA	0.05 - 0.140	5	0.065 - 0.26	5	0.055 - 0.10	7
Nickel	1564	6.7 - 23.2	10	15	1	14	1
Potassium	NA	1050 - 5310	10	2340	1	2080	1
Selenium	391	0.56 - 0.76	2	0.79	1	0.68	1
Silver	391	0.10 - 0.11	2	0.16	1	0.095 - 0.20	2
Sodium	NA	293 - 414	10	441	1	389	1
Vanadium	548	10.0 - 31.3	10	20.1	1	18.6	1
Zinc	23464	57 - 304	10	77	1	80.4	1

Notes:
(n) - Number of samples in sample group
RBC - EPA Region III risk-based concentrations for residential soils
† - All CLP metals analyzed for Lot 10 sample only; other lot samples analyzed for RCRA
nd - not detected
NA - not applicable
nt - not tested
[shaded] - result exceeds Region III RBC for residential soils
frequency - number of times detected

Table 3: Constituent Profiles for Samples From Suspected Contamination Areas, the Waste Pile, and Boreholes - Detected Organic Compounds (1WOR OU1)

	SAMPLE GROUP	Bias Soil Samples (15) Profile		Waste Soil Pile (18) Samples Profile		Investigative Borehole Soil Samples (9) Profile	
Parameter	RBC (mg/Kg)	Concentration Range (mg/Kg)	Frequency	Concentration Range (mg/Kg)	Frequency	Concentration Range (mg/Kg)	Frequency
1,2,4-Trimethylbenzene	3900	0.001 - 2.800	6	0.001 - 0.006	3	0.002 - 8.600	5
1,3,5-Trimethylbenzene	3900	0.026 - 0.840	4	0.002	1	0.019 - 4.400	4
2-Methylnaphthalene	1600	6.600 - 12.00	3	nd	0	2.500 - 12.00	3
bis(2-ethylhexyl)phthalate	46	1.300 - 1.400	2	* 0.740 - 90.00	3	0.039 - 0.069	2
Ethylbenzene	7800	0.002 - 1.300	5	0.004 - 0.011	2	0.014 - 0.800	4
Fluorene	3100	1.400	1	2.600	1	0.170 - 1.400	3
Isopropylbenzene	7800	0.290 - 0.550	2	nd	0	0.016 - 0.530	3
m&p-Xylenes	160000	0.001 - 1.300	9	0.015 - 0.037	2	0.002 - 3.300	5
Methylene Chloride	85	0.011 - 0.031	7	nd	0	0.008 - 0.032	2
Naphthalene	1600	0.004 - 3.300	5	nd	0	0.010 - 3.500	5
n-Butylbenzene	3100	1.700 - 3.000	2	nd	0	0.030	1
n-Propylbenzene	3100	3.400 - 7.400	2	nd	0	0.035 - 1.100	4
o-Xylene	160000	0.001 - 0.900	7	0.003 - 0.016	3	0.008 - 0.300	4
Phenanthrene	NA	0.400 - 6.300	5	4.600	1	0.065 - 5.700	4
p-Isopropyltoluene	NA	0.005 - 2.300	3	nd	0	0.012 - 1.500	3
sec-Butylbenzene	3100	0.270 - 0.420	2	nd	0	0.007 - 0.059	2
Toluene	16000	0.001 - 0.560	11	0.001	1	0.011 - 0.600	4
Acetone	7800	0.011 - 0.180	9	0.005 - 0.380	2	0.032 - 0.370	2
Benzene	12	0.008	1	0.002	1	nd	0
Chloroform	100	0.001 - 0.002	2	0.002 - 0.005	4	0.001	1
Chrysene	87	0.280 - 4.600	3	1.000 - 1.900	2	0.046 - 2.000	4
Hexane	NA	0.004 - 0.049	2	0.002 - 0.008	2	0.001 - 0.024	3
Pyrene	2300	0.380 - 6.500	3	2.500	1	0.066 - 2.300	4
4-Methyl-2-Pentanone	6300	0.001 - 0.003	2	0.010	1	0.003	1
Benzo(a)anthracene	0.87	* 4.200	1	0.670	1	* 0.082 - 0.880	3
Benzo(a)pyrene	0.087	* 0.190 - 3.700	2	* 0.680	1	* 0.042 - 0.790	3
Benzo(b)fluoranthene	0.87	* 7.600	1	0.630	1	* 0.290 - 1.100	2
Benzo(ghi)perylene	0.087	0.072	1	* 0.260 - 0.740	10	* 0.430 - 0.500	2
Benzo(k)fluoranthene	8.7	2.500	1	0.460	1	1.000	1
Fluoranthene	3100	6.300	1	0.980	1	0.200 - 1.000	2
Anthracene	23000	0.990	1	14.00	1	0.036 - 0.350	2
Cyclohexane	NA	8.600 - 11.00	2	nd	0	0.035	1
1,2-Dichloroethane	7	nd	0	0.002 - 0.005	2	nd	0
2-Chlorotoluene	1600	0.060 - 1.100	2	nd	0	nd	0
Acenaphthene	4700	0.940	2	nd	0	0.140 - 0.610	3
cis-1,2-Dichloroethene	780	1.300 - 1.400	2	nd	0	0.019	1
Dibenzo(ah)anthracene	0.087	nd	0	nd	0	* 0.091 - 0.190	2
Dibenzofuran	310	0.580	1	nd	0	0.150 - 0.740	3
Ethyl Acetate	70000	nd	0	nd	0	0.055	1
Indeno(1,2,3-cd)pyrene	0.87	* 1.500	1	nd	0	0.450	1
Methyl Ethyl Ketone	47000	nd	0	0.011	1	nd	0
Styrene	16000	nd	0	nd	0	0.033	1
Tetrachloroethene	12	0.007 - 0.020	2	nd	0	0.029	1
Trichloroethene	58	0.008	1	nd	0	0.012	1
TPH		1000 - 20,000	13	2,700 - 1,700	12	470 - 1,500	4

Notes:

- (n) - Number of samples in sample group
- RBC - EPA Region III risk-based concentrations for residential soils
- (dotted underline) - Compound also found in onsite containers or drums
- (solid underline) - Compound also found in areas of suspected contamination
- NA - not applicable
- nd - not detected
- frequency - number of times detected
- (shaded) * - result exceeds EPA Region III RBC for residential soils

Table 4: Constituent Profiles for Samples From Suspected Contamination Areas, the Waste Pile, and Boreholes - Detected Metals (IWOR OU1)

	SAMPLE GROUP	Investigative Soil Boring (15) Samples Profile		Waste Pile Samples †† (18) Profile		Bias Soil Samples † (9) Profile	
Parameter	RBC (mg/Kg)	Concentration Range (mg/Kg)	Frequency	Concentration Range (mg/Kg)	Frequency	Concentration Range (mg/Kg)	Frequency
Aluminum	78000	nt	NA	4179 - 9967	6	3456 - 4551	5
Antimony	31	nt	NA	0.56 - 0.79	6	0.35 - 0.48	3
Arsenic	0.43	* 0.97 - 18.5	8	* 1.7 - 9.6	18	* 1.4 - 12.8	15
Barium	5475	13.5 - 87.2	9	49.1 - 406	18	31.2 - 131	15
Beryllium	156	nt	NA	0.27 - 0.65	6	0.17 -0.30	5
Cadmium	78	nd	0	0.075 - 0.67	13	0.04 -0.56	7
Calcium	NA	nt	NA	20116 - 41835	6	30926 - 49935	15
Chromium	78	17.7 - 34.5	9	10.8 - 23.6	18	8.55 - 32.4	5
Cobalt	4693	nt	NA	4.2 - 8	6	2.79 - 3.94	5
Copper	3129	nt	NA	19 - 34.4	6	11.54 - 24.65	5
Iron	23464	nt	NA	8240 - 17900	6	6364 - 8598	6
Lead	NA	6.4 - 91.47	9	47.1 - 673	18	14.41 - 150.48	15
Magnesium	NA	nt	NA	4115 - 9240	6	4010 - 5370	5
Manganese	1564	nt	NA	168 - 385	6	142 - 214	5
Mercury	NA	0.055	2	0.6 - 1.60	15	nd	0
Nickel	1564	nt	NA	10.1 - 18.8	6	7.23 - 9.51	5
Potassium	NA	nt	NA	1127.9 - 3170	6	939 - 1466	5
Selenium	391	nd	0	nd	0	0.64 - 0.7	2
Silver	391	0.063	1	0.085 - 0.16	7	0.076	1
Sodium	NA	nt	NA	278 - 378	6	272.7 - 332.7	5
Vanadium	548	nt	NA	12 - 23.8	6	9.1 - 12.1	5
Zinc	23464	nt	NA	112 - 639	6	46.9 - 136.8	5

Notes: (n) - Number of samples in sample group and frequency is the number of times detected
RBC - EPA Region III risk-based concentrations for residential soils
† - All CLP metals analyzed for 9 in. depth waste pile samples (6) only; other sample depths analyzed for RCRA metals
†† All CLP metals analyzed for (5) surface (0" - 2") bias soil samples only; other sample depths analyzed for RCRA metals
nd - not detected
NA - not applicable
nt - not tested
[shaded box] - result exceeds Region III RBC for residential soils

Table 5: Underground Storage Tank Sample Results - Detected Parameters (IWOR OU1)

Method	Parameter	Units	UST-01 (oil)	UST-01 (water)
SW-846 6010B	Barium	mg/kg	226 J	na
SW-846 6010B	Barium	mg/L	na	32.3 J
SW-846 6010B	Cadmium	mg/L	na	nd
SW-846 6010B	Chromium	mg/kg	1.44 BJ	na
SW-846 6010B	Chromium	mg/L	na	0.0006 B
SW-846 6010B	Lead	mg/kg	94.3 J	na
SW-846 6010B	Lead	mg/L	na	0.28
SW-846 6010B	Silver	mg/L	na	nd
SW-846 7471A	Mercury	mg/kg	0.76	na
SW-846 7471A	Mercury	mg/L	na	0.0018 BJ
SW-846 8260B	1,1-Dichloroethane	µg/L	nt	1 J
SW-846 8260B	1,2-Dichlorobenzene	µg/L	nt	6 J
SW-846 8260B	1,2,4-Trimethylbenzene	µg/L	nt	71
SW-846 8260B	1,3,5-Trimethylbenzene	µg/L	nt	21
SW-846 8260B	4-Methyl-2-pentanone	µg/L	nt	350
SW-846 8260B	Acetone	µg/L	nt	260
SW-846 8260B	Benzene	µg/L	nt	26
SW-846 8260B	Chloroform	µg/L	nt	75
SW-846 8260B	Ethylbenzene	µg/L	nt	13
SW-846 8260B	Ethyl Ether (Diethyl Ether)	µg/L	nt	13
SW-846 8260B	Isopropyl Alcohol (2-Propanol)	µg/L	nt	780 J
SW-846 8260B	Isopropylbenzene (Cumene)	µg/L	nt	2 J
SW-846 8260B	Isopropyltoluene	µg/L	nt	2 J
SW-846 8260B	m&p-Xylenes	µg/L	nt	100
SW-846 8260B	Methyl ethyl ketone	µg/L	nt	84
SW-846 8260B	Naphthalene	µg/L	nt	210
SW-846 8260B	n-Propylbenzene	µg/L	nt	4 J
SW-846 8260B	o-Xylene	µg/L	nt	50
SW-846 8260B	Toluene	µg/L	nt	95
SW-846 8260B	Trichloroethene	µg/L	nt	13
SW-846 8270C	2-Methylnaphthalene	µg/L	nt	130
SW-846 8270C	2-Methylphenol (o-cresol)	µg/L	nt	160
SW-846 8270C	cresol)	µg/L	nt	250
SW-846 8270C	Bis(2-chloroethyl)ether	µg/L	nt	33 J
SW-846 8270C	Bis(2-ethylhexyl)phthalate	µg/L	nt	nd
SW-846 8270C	2,4-Dimethylphenol	µg/L	nt	120
SW-846 8270C	Naphthalene	µg/L	nt	58 J
SW-846 8270C	Phenanthrene	µg/L	nt	24 J
SW-846 8270C	Phenol	µg/L	nt	150
TNRCC 1005	Petroleum Hydrocarbons (>C12 To C28)	mg/kg	69000	nd
TNRCC 1005	Petroleum Hydrocarbons (>C12 To C28)	mg/L	nd	12 J
TNRCC 1005	TPH (C6 To C35)	mg/kg	69000	nd
TNRCC 1005	TPH (C6 To C35)	mg/L	nd	12 J
TNRCC 1006	>C12 To C16 Aliphatics	mg/L	nd	7.5 J
TNRCC 1006	>C16 To C21 Aliphatics	mg/L	nd	4.5 J

Notes: na - not applicable
nd - not detected
nt - not tested
m g/Kg - micrograms per kilogram
m g/L - micrograms per liter
mg/Kg - milligrams per kilogram
mg/L - milligrams per liter
J - analyte present; estimated concentration < reportable limit (RL) > method detection limit (MDL), or due to calibration or QC failures
B - (inorganic) analyte present; estimated concentration < RL > MDL

Table 6: Contaminants of Potential Concern (COPC) Summary (IWOR OU1)

Medium	Ingestion	VOC Intrusion in Indoor Air
Soil	Benzo(a)Anthracene Benzo(a)Pyrene Benzo(b)Fluoranthene Bis(2-Ethylhexyl)Phthalate	1,2,4-Trimethylbenzene 1,2-Dichloroethane 1,3,5-Trimethylbenzene Benzene cis-1,2-Dichloroethylene Ethylbenzene Hexane Isopropylbenzene Methylene Chloride Tetrachloroethylene Toluene Naphthalene Acetone
Groundwater	Manganese Bis(2-Ethylhexyl)Phthalate Acetophenone Trichloroethene	

Table 7: Summary of Risks from Soil Ingestion (IWOR OU1)

Location	Worker				Resident			
	Non-cancer Hazard Index		Cancer Risk (cases per million people)		Non-cancer Hazard Index		Cancer Risk (cases per million people)	
	CTE	RME	CTE	RME	CTE	RME	CTE	RME
Sitewide	< 0.1	< 0.1	1	10	< 0.1	< 0.1	9	60
Lot 1	< 0.1	< 0.1	< 0.1	0.5	< 0.1	< 0.1	0.4	2
Lot 2	< 0.1	< 0.1	0.1	1	< 0.1	< 0.1	1	6
Lot 3	< 0.1	< 0.1	0.1	1	< 0.1	< 0.1	1	7
Lot 4	< 0.1	< 0.1	0.2	2	< 0.1	< 0.1	2	10
Lot 5	< 0.1	< 0.1	0.3	4	< 0.1	< 0.1	3	20
Lot 6	< 0.1	< 0.1	< 0.1	0.6	< 0.1	< 0.1	0.4	2
Lot 7	< 0.1	< 0.1	0.1	1	< 0.1	< 0.1	1	7
Lot 8	< 0.1	< 0.1	0.2	3	< 0.1	< 0.1	2	10
Lot 9	< 0.1	< 0.1	0.2	2	< 0.1	< 0.1	2	9
Lot 10	< 0.1	< 0.1	0.3	4	< 0.1	< 0.1	3	20
Waste piles	< 0.1	< 0.1	0.3	3	< 0.1	< 0.1	2	10

All values shown to 1 significant figure.
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

HI < or = 1 are considered safe
Cancer Risk < or = 1 in million not of concern
Cancer Risk >1 in million and < 100 in a million are considered negligible
Cancer Risk > 100 in a million are of concern

Table 8: Summary of Risk from Contaminated Vapors Intrusion from Soil (IWOR OU1)

Basement Scenario (Soil Depth>2ft), Worker

Locations	Noncancer Hazard Index				Cancer Risk (cases per million people)			
	Avg CTE	Avg RME	Max CTE	Max RME	Avg CTE	Avg RME	Max CTE	Max RME
Lot 1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lot 2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.4	< 0.1	1
Lot 3	1	3	3	7	0.1	2	0.4	4
Lot 4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.4	< 0.1	0.6
Lot 5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 0.1	< 0.1
Lot 6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.8	< 0.1	0.8
Lot 7 *	--	--	--	--	--	--	--	--
Lot 8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.3	< 0.1	0.7
Lot 9	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.4	< 0.1	0.7
Lot 10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.1

Basement Scenario (Soil Depth>2ft), Residents

Locations	Noncancer Hazard Index				Cancer Risk (cases per million people)			
	Avg CTE	Avg RME	Max CTE	Max RME	Avg CTE	Avg RME	Max CTE	Max RME
Lot 1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.1
Lot 2	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.6	0.3	2
Lot 3	3	4	7	10	0.5	3	1	7
Lot 4	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.6	0.2	1
Lot 5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.3	< 0.1	0.4
Lot 6	< 0.1	< 0.1	< 0.1	< 0.1	0.3	1	0.3	1
Lot 7 *	--	--	--	--	--	--	--	--
Lot 8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.5	0.2	1
Lot 9	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.7	0.2	1
Lot 10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 0.1	0.2

Slab Scenario (All Soil Depths), Worker

Locations	Noncancer Hazard Index				Cancer Risk (cases per million people)			
	Avg CTE	Avg RME	Max CTE	Max RME	Avg CTE	Avg RME	Max CTE	Max RME
Lot 1	< 0.1	0.2	0.4	0.9	< 0.1	0.6	0.2	2
Lot 2	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.5	0.1	1
Lot 3	0.9	2	5	10	< 0.1	1	0.6	6
Lot 4	0.7	2	5	10	0.2	3	2	20
Lot 5	0.6	1	3	6	0.2	2	0.6	7
Lot 6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.7	0.1	1
Lot 7	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.5	0.1	1
Lot 8	0.8	2	3	6	< 0.1	0.5	0.2	2
Lot 9	< 0.1	< 0.1	< 0.1	0.2	< 0.1	0.5	0.2	2
Lot 10	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.7	0.1	1

Slab Scenario (All Soil Depths), Residents

Locations	Noncancer Hazard Index				Cancer Risk (cases per million people)			
	Avg CTE	Avg RME	Max CTE	Max RME	Avg CTE	Avg RME	Max CTE	Max RME
Lot 1	0.2	0.3	0.8	1	< 0.1	0.1	< 0.1	0.3
Lot 2	< 0.1	< 0.1	0.1	0.2	< 0.1	< 0.1	< 0.1	0.2
Lot 3	2	3	10	20	< 0.1	0.2	0.2	1
Lot 4	1	2	10	20	< 0.1	0.5	0.7	3
Lot 5	1	2	5	8	< 0.1	0.3	0.2	1
Lot 6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.2
Lot 7	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1	0.2
Lot 8	2	3	6	9	< 0.1	< 0.1	< 0.1	0.3
Lot 9	< 0.1	< 0.1	0.2	0.3	< 0.1	< 0.1	< 0.1	0.3
Lot 10	< 0.1	< 0.1	0.1	0.2	< 0.1	0.1	< 0.1	0.2

All values shown to 1 significant figure.
* No data was available for Lot 7 at depths > 2 feet
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure
Risk in shaded area is greater than acceptable level (HI > 0.1 or cancer risk > 100 per million)

Table 9: Summary of Total Risks (IWOR OU1)

Minimum Contribution for Volatile Organic Compounds

Location	Worker				Resident			
	Non-cancer Hazard Index		Cancer Risk (cases per million people)		Non-cancer Hazard Index		Cancer Risk (cases per million people)	
	CTE	RME	CTE	RME	CTE	RME	CTE	RME
Lot 1	0.3	0.6	0.6	6	1	1	3	20
Lot 2	<0.1	<0.1	0.3	3	0.2	0.3	2	9
Lot 3	0.9	2	0.2	3	2	3	1	9
Lot 4	<0.1	<0.1	0.2	3	<0.1	<0.1	2	10
Lot 5	<0.1	<0.1	0.4	4	<0.1	<0.1	3	20
Lot 6	0.2	0.3	0.5	5	0.5	1	2	10
Lot 7	<0.1	<0.1	0.2	2	<0.1	<0.1	1	7
Lot 8	<0.1	0.1	0.4	4	0.2	0	3	10
Lot 9	<0.1	<0.1	0.2	3	<0.1	<0.1	2	10
Lot 10	0.2	0.4	0.7	8	0.6	0.9	5	30

Maximum Contribution for Volatile Organic Compounds

Location	Worker				Resident			
	Non-cancer Hazard Index		Cancer Risk (cases per million people)		Non-cancer Hazard Index		Cancer Risk (cases per million people)	
	CTE	RME	CTE	RME	CTE	RME	CTE	RME
Lot 1	0.7	1	0.7	7	2	3	4	20
Lot 2	0.1	0.2	0.4	4	0.3	0.4	2	10
Lot 3	5	10	0.7	8	10	20	3	20
Lot 4	5	10	2	20	10	20	8	40
Lot 5	3	6	0.9	10	5	8	5	30
Lot 6	0.2	0.3	0.5	6	0.5	0.7	3	10
Lot 7	<0.1	<0.1	0.2	3	<0.1	0.1	1	9
Lot 8	3	6	0.5	5	6	9	3	20
Lot 9	<0.1	0.2	0.3	4	0.2	0.3	2	10
Lot 10	0.3	0.5	0.9	9	0.7	1	5	30

All values shown to 1 significant figure.
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure
Risk in shaded area is greater than acceptable level (HI > 0.1 or cancer risk > 100 per million)

Table 10: Contaminants of Potential Concern (COPCs) for Ecological Risk (IWOR OU1)

Group	COPC
Inorganic Count = 1	Antimony
Polyaromatic Hydrocarbon Count = 1	Benzo(a)Pyrene
Pesticide Count = 3	4,4-DDT Endrin Aldehyde Methoxychlor
Semi-Volatile Organic Compound Count = 8	2-Methylnaphthalene Anthracene Bis(2-Ethylhexyl)Phthalate Fluoranthene Naphthalene Phenanthrene Phenol Pyrene
Volatile Organic Compound Count = 4	Cyclohexane Ethylbenzene Tetrachloroethene Toluene

TOTAL COUNT = 17

Table 11: Summary of Average Hazard Quotient Values for the Ecological Risk Assessment (IWOR OU1)

	Bkg	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7	Lot 8	Lot 9	Lot 10
2-METHYLNAPHTHALENE	<0.1	0.8	0.2	1	2	1	<0.1	<0.1	<0.1	0.2	0.3
4,4-DDT	1	<0.1	<0.1	8	9	<0.1	<0.1	<0.1	6	<0.1	<0.1
ANTHRACENE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
ANTIMONY	0.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BENZO(A)PYRENE	<0.1	0.6	0.3	3	3	2	<0.1	0.2	0.3	0.2	0.7
BIS(2-ETHYLHEXYL)PHTHALATE	0.3	2	0.4	5	10	3	<0.1	0.2	0.7	0.6	0.9
CYCLOHEXANE	<0.1	<0.1	<0.1	<0.1	0.5	30	<0.1	<0.1	<0.1	<0.1	<0.1
ENDRIN ALDEHYDE	0.5	<0.1	<0.1	2	2	<0.1	<0.1	<0.1	4	<0.1	<0.1
ETHYLBENZENE	<0.1	<0.1	<0.1	0.2	0.3	0.7	<0.1	<0.1	1	<0.1	<0.1
FLUORANTHENE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
METHOXYCHLOR	5	<0.1	<0.1	6	4	<0.1	<0.1	<0.1	5	<0.1	<0.1
NAPHTHALENE	0.6	10	4	50	70	30	1	3	4	6	7
PHENANTHRENE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PHENOL	<0.1	<0.1	<0.1	0.4	0.4	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
PYRENE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TETRACHLOROETHYLENE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TOLUENE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

All values expressed to 1 significant figure.
Shaded cells indicate cases where the HQ values exceed one.

Table 12A: Location-Specific PRGs Based on Proportional Reduction (IWOR OU1)

VOC	Lot 3		Lot 4		Lot 5		Lot 8	
	Avg C in ppm	Max C in ppm	Avg C in ppm	Max C in ppm	Avg C in ppm	Max C in ppm	Avg C in ppm	Max C in ppm
1,2,4-Trimethylbenzene	0.49	0.51	0.47	0.52	0.21	0.17	0.63	0.35
1,3,5-Trimethylbenzene	0.30	0.26	0.15	0.17	0.067	0.050	0.23	0.13
Cis-1,2-Dichloroethene	0.0015	0.0013	0.0014	0.0013	0.010	0.0083	0.00042	0.00030
Hexane	0.0037	0.0019	0.0052	0.0046	0.011	0.077	0.0016	0.00074
Naphthalene	1.6	2.3	2.1	2.7	0.81	0.56	0.091	0.098

Table 12B: Depth of Soil Remediation Required to Achieve an Acceptable Health-Based Target (IWOR OU1)

Location	HI	Depth(m)	Volume (m^3)
Lot3	Avg C 2.7 Max C 17	25.0 30.0	2309 2771
Lot 4	Avg C 2.1 Max C 15	20.0 30.0	1847 2771
Lot 5	Avg C 1.8 Max C 8.4	15.0 29.9	1385 2757
Lot 6	Avg C 2.5 Max C 8.9	25.0 29.9	2309 2757

KEY:
Avg C = average concentration
Max C = maximum concentration
ppm = parts per million
HI = Hazard Index
PRG = Preliminary Remediation Goal
VOC = Volatile Organic Compound
m = meter
m^3 = cubic meter

TABLE 13: COMPARISON OF ALTERNATIVES FOR THE INTERMOUNTAIN WASTE OIL REFINERY OPERABLE UNIT 1

Alternative	No Action	Land Use Control	Passive Soil Vapor Extraction	Active Soil Vapor Extraction
Evaluation Criteria	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Overall Protection of Human Health and the Environment	Not protective of human health and the environment	Protective of human health and the environment by requiring elimination of potential future exposures	Protective of human health and the environment by removing contaminated soil vapors	Protective of human health and the environment by removing contaminated soil vapors
Compliance with ARARs	Does not comply with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs
Long-Term Effectiveness and Permanence	No long-term reduction of risk	Provides long-term effectiveness and permanence by requiring any future development to eliminate the exposure to the contaminated soil vapors	Provides long-term effectiveness and permanence by removing and treating, if necessary, the vapors over a period of years	Provides long-term effectiveness and permanence by removing and treating, if necessary, the vapors over a period of years
Reduction of Toxicity, Mobility, or Volume through Treatment	No reduction of toxicity, mobility, or volume	No reduction of toxicity, mobility, or volume	Reduces the toxicity and volume of the contamination by removing contaminated soil vapors	Reduces the toxicity and volume of the contamination by removing contaminated soil vapors
Short-Term Effectiveness	No short-term reduction of risk	Can be implemented quickly, providing controls on future development	Relies on natural pressure changes to remove contaminated vapors and will likely take a period of years	More quickly reduces contaminated vapors by removing them from the soil using a vacuum for the first two years
Implementability	Easy to implement since nothing needs to be done	Easy to implement	Relatively easy to implement but some design, testing, and construction is needed	Relatively easy to implement but some design, testing, and construction is needed
Present Worth Cost	$0	$20,000	$523,000	$1,018,000

Table 14: Applicable and or Relevant and Appropriate (ARARs) for the Selected Remedy, Intermountain Waste Oil Refinery Operable Unit 1

Requirement	Criteria	Prerequisite	Citation	Comments
Staging of Remediation Waste	Establishes requirements for managing remediation wastes in staging piles.	Applicable if remediation wastes are staged in piles during clean-up activities.	Resource Conservation and Recovery Act 40 CFR 264.554	These requirements are relevant and appropriate to the extent that staging of remediation wastes within the area of contamination is required for the UST closure.
Hazardous Waste Management Definitions and General Requirements for Solid and Hazardous Waste	Outlines general requirements and provides definitions for Utah Solid and Hazardous Waste rules.	General rules and definitions will be applicable to management of generated hazardous wastes.	Utah Solid and Hazardous Waste Act - Title 19 UCA Chapter 6 Part 1 UAC R315-1 and R315-2	Applicable to the extent that remediation wastes generated during the closure of the UST are hazardous waste.
Clean-Up Standard Source Control/Removal	Corrective Action Cleanup Standards Policy - CERCLA and Underground Storage Tank (UST) sites. The rule addresses cleanup requirements at CERCLA and UST sites.	The clean-up strategy must achieve compliance with the policy. The policy is an applicable requirement that sets forth criteria for establishing clean-up standards and requires source control or removal, and prevention of further degradation.	Utah Solid and Hazardous Waste Act - Title 19 UCA Chapter 6 Part 1 UAC R311-211	The requirements of this rule are applicable to the Selected Remedy. The Land Use Control and UST closure will comply with the standards of the rule.

Table 14: Applicable and or Relevant and Appropriate (ARARs) for the Selected Remedy, Intermountain Waste Oil Refinery Operable Unit 1

Requirement	Criteria	Prerequisite	Citation	Comments
Management of Remediation Wastes Onsite Closure/Post Closure	Establishes closure and post closure performance standards for TSDFs.	See remarks for 40 CFR 264.18 Where the closure and post closure standards are applicable either clean closure or landfill closure is required. Where the requirements are relevant and appropriate hybrid closures (either clean or landfill) are also possible. (Refer to RCRA ARARs: Focus on Closure Requirements, OSWER Directive 9234.2-04FS.)	Resource Conservation and Recovery Act 40 CFR 264 Subpart G	The requirements are relevant and appropriate to the Selected Remedy. The placement of Land Use Controls and removal and disposal of the UST and associate wastes constitutes a hybrid clean closure of the Site.
Hazardous Waste Management Hazardous Waste Generator Requirements	Outlines requirements for hazardous waste generators. State analog to 40 CFR Part 262.	Requirements would be applicable for hazardous waste generated as a result of clean-up activities.	Utah Solid and Hazardous Waste Act - Title 19 UCA Chapter 6 Part 1 UAC R315-5	This requirement is applicable to the extent that remediation wastes generated during closure of the UST are hazardous wastes. This includes the substantive waste accumulation requirements of 40 CFR 262.34.

Table 14: Applicable and or Relevant and Appropriate (ARARs) for the Selected Remedy, Intermountain Waste Oil Refinery Operable Unit 1

Requirement	Criteria	Prerequisite	Citation	Comments
Risk-Based Closure Clean-up Action and Risk-Based Closure Standard	This rule establishes risk-based closure standards for management of sites contaminated with hazardous waste or hazardous constituents.	The rule allows closure of facilities to risk based standards. It requires appropriate site management for facilities based on identified levels of risk. Appropriate site management may include corrective action, monitoring, post closure care, institutional controls and site security.	Utah Solid and Hazardous Waste Act - Title 19 UCA Chapter 6 Part 1 UAC R315-101	The requirements of the rule are applicable because of the presence of hazardous constituents at the Site. The Selected Remedy will comply with the site management requirements of this rule.
Davis, Salt Lake, and Utah Counties, Ogden City and Non-attainment Areas for PM10: Fugitive Emissions and Fugitive Dust	This rule establishes fugitive dust limitations.		UAC R307-309	The requirements are applicable to any fugitive emissions and fugitive dust resulting from UST closure activities.
Underground Storage Tanks: Closure and Remediation	This rule establishes standards for UST closure and remediation.		UAC R311-204	The substantive portions of the requirements would be applicable to removal and disposal of the UST and for closure of the tank site.

Table 14: Applicable and or Relevant and Appropriate (ARARs) for the Selected Remedy, Intermountain Waste Oil Refinery Operable Unit 1

Requirement	Criteria	Prerequisite	Citation	Comments
Site Assessment for UST Closure	This rule establishes standards for site assessment activities associated with UST closures.		UAC R311-205-2(b)	The substantive portions of the requirements are applicable to the UST closure portion of the Selected Remedy.
Small Source Exemptions - De Minimis Emissions	This rule exempts small sources and de minimis emissions from approval order requirements.	To qualify for this exemption the actual emissions must be less than 5 tons per year of VOCs, and also less than 500 pounds per year of any hazardous air pollutant and less than 2000 pounds per year of any combination of hazardous air pollutants.	UAC R307-413-2	The de minimis exemption of requirements for approval orders is expected to apply to the UST closure. If further evaluation of the UST site during remedial design shows that the exemption would probably not apply, then the requirements of UAC R307-410 (Emission Impact Analysis) and UAC R307-401-6 (Conditions for Issuing Approval Orders) must be met.

APPENDIX A

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
INTERMOUNTAIN WASTE OIL REFINERY
OUI SUPERFUND SITE
BOUNTIFUL, UTAH

OVERVIEW

The U.S. Environmental Protection Agency (EPA) has prepared this Responsiveness Summary to document and respond to issues and comments raised by the public regarding the Proposed Plan for the Intermountain Waste Oil Refinery Operable Unit 1 (OU1) Superfund Site (Site). EPA's preferred alternative and the remedy selected in the Record of Decision (ROD) involves establishment of Land Use Controls and removal of an underground storage tank (UST). A public meeting was held on August 22, 2002, at 7:00 p.m. at the Bountiful City Hall to present the preferred alternative to the public and receive comments. The public comment period was from August 19 through September 17, 2002.

Comments received during the public comment period and EPA's responses, are outlined in this document. By law, the EPA and the Utah Department of Environmental Quality (UDEQ) must consider public input prior to making a final decision on a cleanup remedy. Once public comment is reviewed and considered, the final decision on a cleanup remedy is documented in the ROD.

SUMMARY OF PUBLIC COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND EPA RESPONSES

Few comments were received during the public comment period that ran from August 19 through September 17, 2002. Most of the comments were in the form of questions raised during the public meeting held August 22, 2002, in Bountiful, Utah. One written comment was also received. The comments and questions have been summarized and are followed by EPA's response.

1) *Who is going to require the building owner to maintain the sub-foundation ventilation system? How is it going to be assured that the building stays safe, i.e. making sure vapor concentrations remain below levels that could cause health problems? Could an inspection process by local governments be established?*

It has not been determined if the required system will be passive (no mechanical parts) or if an electrical vent fan will be needed (refer to Figure 6 of the ROD). For a passive system, the only preventive measures needed are to make sure there is no subsequent subfoundation work, drilling in the walls where the vent piping is located, or other activities that could compromise the system. If an electrical vent fan is needed, the building owner would need to make sure it stays running. These fans are inexpensive to replace.

Since contamination above levels that allow for unlimited and unrestricted use will remain onsite, the remedy will be reviewed every five years. This 5-year review process will determine if the remedy is still protective of human health. If a building with a system is constructed on the Site, one way to make the determination that the remedy is protective is to evaluate whether the system is working properly. It may also be possible to test the indoor air at the time of a 5-year review.

It is not likely that an inspection process by the local governments could be established or whether one is even needed. When establishing the Land Use Control, EPA will discuss with the local governments their roles in assuring that the Land Use Control is established and maintained and any building that is constructed includes the required vapor ventilation system.

2) *Could contamination in the soil blow into the nearby residential gardens? Could this contamination build up in body systems over time and cause health problems [from eating the garden produce]?*

The contamination of concern is not on the surface of the ground. Thus, it will not blow into nearby residential yards or gardens and will not be taken up by plant roots. Additionally, the contaminants of concern are compounds that are volatile and move quickly into the air. Once these contaminants are near the ground surface, they move into the vapor phase and dissipate in the air. Vapors do not pose a risk in outdoor air, since they cannot accumulate to unsafe levels that could cause health problems if inhaled.

3) *A nearby resident commented that they would like to see a different remedy; the proposed remedy did not make them feel safe. The resident was concerned about who was going to require the building owner to maintain the system.*

After considering all the factors and the public comments, EPA and UDEQ believe the proposed remedy provides the best balance of the nine criteria (refer to ROD Section 10). As explained in more detail in the response to comment 1, the remedy will be reviewed every five years to determine if it is still protective of human health.

4) *Were the underground tanks and soils tested for metals? Are there contaminants like heavy metals and vinyl chloride in the area?*

There was only one underground storage tank (UST) that was discovered during the RI. Its contents have been removed. The contents were analyzed for organic compounds and metals. Several metals at relatively low levels were detected in the UST contents. Vinyl chloride was not detected. Since some of the residual contents remain in the UST, it will be removed as part of the Selected Remedy.

The Operable Unit 1 (OU1) investigation covered soils and subsurface soils and other possible contamination sources. Soil samples were collected onsite at the surface and at varying depths. The only metal identified in sampling that was above a risk-based screening level was arsenic. However, arsenic is naturally occurring in the west and is often found above the screening level. A statistical comparison with background (samples taken offsite in unaffected areas) did not indicate the arsenic was elevated at the Site. Vinyl chloride was not detected in the soils.

5) *One person was concerned that EPA was doing nothing. This person was concerned about trichloroethane and dichloroethene and whether these two chemicals could break down to vinyl chloride and cause cancer. The concern was that the Woods Cross water supply, which has already been impacted by contamination, could be further impacted.*

The OU1 ROD addresses soils, subsurface soils, and other contamination sources. The groundwater contamination is still under investigation and will be addressed in a separate ROD. EPA has not determined if there is a potential health risk related to groundwater in the IWOR area. There is no indication from current groundwater monitoring that vinyl chloride is present in groundwater at the IWOR Site. The March 2002 groundwater sampling results show the presence of cis-l, 2-dichloroethene at very low levels in one of six groundwater samples analyzed. Vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, 1,1-dichloroethane, chloroethane, or 1,1,1-trichloroethane were not detected in any of the samples.

There is no evidence to indicate that the groundwater contamination that has impacted the Woods Cross drinking water wells originated from the IWOR Site. EPA and UDEQ are in the process of collecting data and information about another Site that may be related to the contamination of the Woods Cross groundwater wells. Nevertheless, the following information is provided about the chemicals mentioned by this citizen.

Under certain environmental conditions, trichloroethane can break down into 1,1-dichloroethane and chloroethane, and to a much lesser extent, 1,1-dichloroethene. Both 1,1-dichloroethane and chloroethane are relatively resistant to further degradation. 1,1-dichloroethene, like cis-1,2,-dichloroethene and trans-1,2-dichloroethene, can break down into vinyl chloride.

Vinyl chloride can further break down into ethylene (ethene), which is highly susceptible to complete degradation in the environment by microbial processes. Vinyl chloride is a human carcinogen that is known to cause liver cancer in people. 1,1-dichloroethene is considered a possible human carcinogen. Neither cis-l, 2-dichloroethene nor trans-1,2-dichloroethene are classifiable as to their human carcinogenicity. The human health effects of long-term exposure to low concentrations of 1,2-dichloroethene are not known.

There is limited information available regarding the effects of 1,1-dichlorethane on human health. The chemical was discontinued as a surgical anesthetic when effects on the heart, such as irregular heart beats, were reported. It has been classified as a possible human carcinogen. It is not known if chloroethane causes cancer in humans. No studies in humans are available to know if there are harmful health effects associated with drinking water contaminated with 1,1,1-trichloroethane. It has not been classified in terms of its carcinogenic potential in humans.

6) *One person wanted clarification on what would be done with the soil waste piles on the Site and if the hydrocarbons in these piles were hazardous to human life?*

Beyond the Land Use Control described in the ROD, no action is planned for the soil waste piles at the Site. At the levels of contamination measured in the soil waste piles, even if exposure were to occur preferentially at the waste piles, non-cancer risks are below a level of concern (HI < 1.0). Cancer risks are also within or below EPA's acceptable risk range of 10^{-6} to 10^{-4} (1 to 100 per million). Thus, direct ingestion of soil, even from contaminated waste piles, is not likely to be of significant concern to either workers or hypothetical future onsite residents.

7) *One individual asked whether the Land Use Control would apply to all areas and properties within the Site even though only several areas showed unacceptable soil vapor risks.*

As clarified in the ROD, the Land Use Control will require any building constructed on the property that was once the Intermountain Oil Company operations to include the vapor ventilation system. A building constructed completely on the parcel of the Site owned by Kemar Corporation would not be required to have a ventilation system. There is no soil contamination that contributed to the risk on this parcel of the Site. However, if the development of the Site includes both parcels and a building is constructed so it covers any portion of the Intermountain Oil Company parcel as well as part of the Kemar parcel, the building is required to include the vapor ventilation system.

8) *One person wanted to know if there was an effort to make the owner, or others who may have contributed to the problem, pay for the clean up. Would the state be required to pay a part of the clean up cost?*

EPA is still in the process of trying to identify entities that could be responsible for portions of the investigation and cleanup cost. This process takes time for a Site that collected waste from numerous areas and states over many years. Thus, EPA believes the investigation and implementation of the remedy should not wait.

Under current Superfund law, the State of Utah must make certain assurances when the Superfund Trust Fund is accessed to pay for remedial action. One of these assurances is to pay 10 percent of the clean up costs. In this case, that is about $2,000.