Health Consultation

WARDEN OIL

CITY OF MINNEAPOLIS, HENNEPIN COUNTY, MINNESOTA

EPA FACILITY ID: MND006211692

DECEMBER 2, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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Prepared by:

The Minnesota Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

FOREWORD

This document summarizes public health concerns at a hazardous waste site in Minnesota. It is based on a formal site evaluation prepared by the Minnesota Department of Health (MDH). A number of steps are necessary to do such an evaluation:

- Evaluating exposure: MDH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it's found on the site, and how people might be exposed to it. Usually, MDH does not collect its own environmental sampling data. We rely on information provided by the Minnesota Pollution Control Agency (MPCA), the U.S. Environmental Protection Agency (EPA), and other government agencies, businesses, and the general public.

- Evaluating health effects: If there is evidence that people are being exposed - or could be exposed - to hazardous substances, MDH scientists will take steps to determine whether that exposure could be harmful to human health. The report focuses on public health - the health impact on the community as a whole - and is based on existing scientific information.

- Developing recommendations: In the evaluation report, MDH outlines its conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of MDH in dealing with hazardous waste sites is primarily advisory. For that reason, the evaluation report will typically recommend actions to be taken by other agencies including EPA and MPCA. However, if there is an immediate health threat, MDH will issue a public health advisory warning people of the danger, and will work to resolve the problem.

- Soliciting community input: The evaluation process is interactive. MDH starts by soliciting and evaluating information from various government agencies, the organizations responsible for cleaning up the site, and the community surrounding the site. Any conclusions about the site are shared with the groups and organizations that provided the information. Once an evaluation report has been prepared, MDH seeks feedback from the public. *If you have questions or concerns about this report, we encourage you to contact us.*

Please write to: Community Relations Coordinator
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Introduction

This health consultation documents the air monitoring plan implemented at the Warden Oil State Superfund site. The Minnesota Pollution Control Agency (MPCA) asked for the Minnesota Department of Health (MDH) to assist in the implementation of the air monitoring plan which helped minimize resident inhalation exposure to site soil contaminants during remedial activities. The site was remediated without incident.

Site Background and History

Warden Oil operated a waste oil recycling facility located at 187 Humboldt Avenue North on the "near north side" in Minneapolis. The facility was in operation from 1927 until 1992, and processed approximately 2 million gallons of waste oil each year. The site occupies the city block bounded by Currie Avenue West to the north, Humboldt Avenue North to the east, Irving Avenue to the west, and Canadian Pacific Railway property to the south (Figures 1 & 2). The site is located in the southeast ¼ of the southwest ¼ of Section 21, Township 29 North, Range 24 West in Minneapolis, Hennepin County, Minnesota. The site is located about 200 feet north of Bassett Creek. The area immediately surrounding the property is comprised of commercial, trucking, and heavy industrial properties. The nearest housing is approximately one half a block north on Humboldt Ave, and one city block west on Currie Ave. Bassett Creek is located approximately 200 feet south-southeast of the southern site boundary. Prior to the re-routing of Bassett Creek in 1993, large portions of the site were affected by flooding.

Warden Oil re-refined waste lubricating oil and transmission fluid; stored and blended oil; and packaged re-refined oil for sale. Waste oils being re-refined were stored in outdoor above-ground storage tanks (ASTs). After the re-refining processes were completed, the various oils were stored in indoor ASTs, and were later repackaged and sold. MDH completed two Health Consultations (1995, 1997) on Warden Oil and associated site (Chemart Oil). These documents describe the need for more on and off-site characterization data. Both documents recommended sampling environmental media for Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs), Polychlorinated Biphenyls (PCBs), and Metals.

In November 1999, a group of potentially responsible parties (PRPs) for the Warden Oil site were accepted into the Voluntary Investigation and Cleanup (VIC) Program of the MPCA. The PRPs submitted a remedial investigation (RI) work plan. This plan was approved in December 1999 and the RI fieldwork was completed between August 2000 and February 2001.

In September 2002 the PRPs recommended a cleanup remedy involving increased capping of the site and improved drainage. The MPCA did not approve this remedy because the PRPS were unwilling to consider any soil removal with off-site disposal. As a result, in January 2003, the site was transferred from the VIC Program to the State Superfund Program.

MDH and PCA attended public meetings in the fall of 2003 to inform residents what to expect during soil removal remedial activities, describe the air monitoring plan, and answer questions. Site demolition activities were conducted in early 2004. Sludge removal and stabilization occurred in March 2004. Tank cleaning and removal was conducted in April and May 2004. Demolition of six buildings (B-1 to B-4, B-6, and B-7) was conducted in May 2004 (Figure 3). During the demolition activities, several underground structures were discovered: a cistern, a sub-grade room, a dead-ended storm sewer, and a concrete block tank.

For remediation purposes and based on its physical layout, the site has been divided into two operable units (OUs) as shown on Figure 3 and discussed as follows:

• OU-1 covers a majority of the property and consists of the former storage and processing areas.

OU-1(a) comprises the central and southeastern portions of the site where petroleum products were historically stored in aboveground storage tanks.

OU-1(b) comprises the northeast portion of the property, including the location of the former service building (B-2) and blending and processing building (B-3).

• OU-2 includes the remainder of the site, where limited storage and handling had historically taken place.

OU-2 (a) comprises the northwest portion of the property, including the location of former warehouses B-1 and B-4.
OU-2(b) comprises the southwest portion of the property, including the location of former warehouse B-7.

MPCA Residential Soil Reference Values (RSRVs) were used as screening criteria at the site. The RSRVs are human health-based criteria. The RSRVs for non-carcinogens are contaminant concentrations in soil that MPCA and MDH believe are safe for the general residential population. RSRVs for carcinogens correspond to an expected incremental cancer risk of no more than 1 additional case per 100,000 people exposed for a lifetime.

The chemicals of concern (COCs) identified at the site can be categorized into 5 general groups of compounds (Metals, Gasoline Range Organics (GRO), Diesel Range Organic (DRO)/Semi-volatile Organic Compounds (SVOCs), Volatile Organic Compounds (VOCs), and Polychlorinated Biphenyls (PCBs)). Each of the following chemical constituents were detected in at least one soil sample and several exceeded an RSRV:

• Metals

The soil lead concentrations were analyzed for lead at an on-site laboratory (Table 1) or were sent to Pace Analytical Labboratory for analysis of 10 other metals (Table 2). Lead, mercury, and arsenic exceeded RSRVs.

• Gasoline Range Organic (GRO) Compounds

GRO is a complex mixture of numerous compounds found in gasoline. Gasoline chemical constituents are volatile, and contain 4 to 9 carbons. The GRO compound concentrations are listed in Table 3. The RSRVs for benzene, naphthalene, 1,2,4-trimethylbenzene (1,2,4-TMB), and 1,3,5-trimethylbenzene (1,3,5-TMB), toluene, 1,2-dichlorobenzene, and total xylenes were exceeded.

• Diesel Range Organic (DRO)/Semi-volatile Organic Compounds (SVOCs)

DRO is a complex chemical mixture containing compounds found in diesel, kerosene, #2 fuel oil, and lighter weight lubricants. The DRO compounds that were identified on site are

naphthalene and benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene (see Table 4). These compounds contain 10 to 20 carbons, and are considered to be semi-volatile. Only benzo(a)pyrene exceeded its RSRV (2000 ug/kg).

• Volatile Organic Compounds (VOCs)

Site soils were analyzed for 16 VOC compounds (see Table 5). The VOCs identified in site soils were cis-1,2-dichloroethene (cis-1,2-DCE), 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 2-chlorotoluene, chlorobenzene, isopropylbenzene, sec-butylbenzene, n-butylbenzene, n-propylbenzene, p-isopropyltoluene, and trichloroethene (TCE). Only one sample exceeded its TCE RSRV (29000 ug/kg).

• Polychlorinated Biphenyls (PCBs)

All PCBs have a similar chemical structure but can vary according to the number of chlorine atoms (2-10 are possible) attached to the biphenyl ring resulting in 209 possible combinations. PCB mixtures (Aroclors) can be organized and sampled according to percent chlorine content of the mixture. For example, Aroclors (mixtures) 1254, 1260, and 1268 were detected in site soils (see Table 6), and these mixtures contain 54, 60, and 68 % chlorine by weight respectively. Only one soil sample exceeded the PCB RSRV of 1.2 mg/kg.

The excavation areas included all of OU-1 due to high lead, petroleum, and low level VOC impacts. A total of 63 soil lead samples were analyzed in an on-site laboratory and 32 samples were above the Residential lead RSRV of 400 mg/kg (see Table 1). Petroleum impacts at the site consisted of both GRO and DRO chemical constituents. Table 3 list the exceedences for the GRO chemical constituents. OU-1 soil samples consistently exceeded both 1,2,4-trimethylbenzene (1,2,4-TMB), and 1,3,5-trimethylbenzene (1,3,5-TMB) RSRVs. Although the VOC soil samples collected in OU1 did not exceed any RSRVs, there were numerous detectections of several VOCs (see Table 5). Localized areas within OU-1 were impacted with mercury and PCBs and required further testing prior to disposal (see Tables 2 and 6 for mercury and PCB soil concentrations respectively).

Several smaller areas within OU-2(a) and OU-2(b) were excavated due to high concentrations of one or more contaminants of concern.

Excavated areas were backfilled with clean fill. The table below lists the amount of soil excavated from the Warden site.

Soil Waste Excavated from the Warden Oil Site

Waste	Quantity (tons)	Disposal Location
Stabilized Lead Soil	828.57	ONYX FCR Landfill
Organic Impacted Soil	23110.79	ONYX FCR Landfill
Mercury Impacted Soil	175	ONYX Seven Mile Creek Facility

Air Monitoring Plan

The following Air Monitoring Plan (Plan) was reviewed by MDH prior to the site excavation. The purpose of the Plan was to protect health and welfare of residents and other people near the Site during

remedial activities. Air quality samples were collected predominantly at the property boundary (exclusion zone), and at the excavation boundary.

1. Initial Sampling

Before the excavation began, Delta Environmental field personnel collected background total volatile organic compound (VOC) readings with a photoionization detector (PID) at the perimeter of the exclusion zone, downwind from the proposed excavation, and in the direction of the nearest residences. At an upwind ("background") location, an air sample was collected in a Tedlar bag and immediately analyzed using the gas chromatograph (GC) in the onsite mobile laboratory for the VOC spectrum. "Background" readings from this location were subtracted from PID readings when determining total VOC levels (in parts-per-million or ppm). Similarly, "background" concentrations were subtracted from Tedlar bag sample analyses when determining specific (parameter) concentrations.

2. During Excavation

Delta personnel used a PID to continuously monitor air at the exclusion zone perimeter in the downwind direction towards the nearest residence. Delta used professional judgment and PID data to determine when Tedlar bag sampling analysis should take place. After background adjustment, if the Tedlar bag sample analysis showed any parameter concentrations exceeding 75% of an acute air Health Risk Value (HRV, see table below), the Plan called for Delta to collect a Tedlar bag sample on the edge of the nearest residential property. According to the Air Monitoring Plan, a Level 2 alert is required if any parameter concentration in the second Tedlar bag sample exceeded 75% of an acute HRV. For a Level 2 Alert MPCA and MDH officials would notify residents of elevated vapor concentrations, and advise them to remain indoors until the Level 2 Alert has been downgraded to a Level 1 Alert (see following Alerts section). If the second Tedlar bag sample concentration *did not* exceed 75% of the acute HRV for any parameter on the table, a Level 1 Alert would be given to nearby residents. (See section below for an explanation of HRV derivation.)

Acute Health Risk Values (HRVs)

Parameter	HRV (ug/m^3)	75% of HRV (ug/m^3)	75% of HRV (ppm)
Ethylbenzene	10,000	7,500	1.70
Toluene	37,000	27,750	7.25
Total Xylenes	43,000	32,250	7.28
Benzene	1,000	750	0.23
1,1,1-Trichloroethane	140,000	105,000	18.93
Tetrachloroethylene (PCE)	20,000	15,000	2.18
Trichloroethylene (TCE)	2,000	1,500	0.27

3. Alerts

Level 0 Alert: Immediately prior to excavation activities, a Level 0 Alert was given. Residents were notified by the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Health (MDH) officials to close their windows and avoid outdoor activities. A Level 0 Alert requires Delta to post a BLUE sign at a location readily visible to nearby residents.

Level 1 Alert: A Level 1 Alert was issued if any parameter vapor concentrations in the exclusion zone, *but not at the nearest residential property* exceed 75% of the acute air risk-based value found in the table. A Level 1 Alert requires Delta to post an ORANGE sign at a location readily visible to nearby

residents. Residents are notified by MPCA and MDH officials to stay in their houses, close their windows, not engage in outdoor activities, and quickly move to and from their vehicles.

Level 2 Alert: A Level 2 Alert was issued if (parameter) vapor concentrations at the edge of the nearest residential property exceeded 75% of the acute air risk-based value in the table. A Level 2 Alert requires Delta to post a RED sign at the same location as the one used for Level 0 and Level 1 Alerts. MPCA and MDH officials notify residents of the elevated vapor concentrations, and advise them to remain indoors until the Level 2 Alert has been downgraded to a Level 1 Alert.

Residents received either visual or verbal notification of the alert level at all times during the excavation phase of the project.

4. Covering Excavation

After excavation work for each day has been completed, the excavation was covered with clean soil or with a plastic tarp. The tarp prevented soil vapors from impacting residents and other people near the site. Fencing around the exclusion zone remained in place at night, to discourage unauthorized/unintended entry into the excavation. No monitoring or alerts are necessary while the excavation is covered.

Health Risk Values (HRVs)

HRVs are health based values for air toxics that are promulgated in MDH rules. There are uncertainties that limit the accuracy of HRVs. These include limited toxicological information, and the use of default exposure assumptions (rates of inhalation, exposure duration). However, because the approaches used to develop HRVs are conservative (i.e., by design they err in the direction of being more protective of public health), MDH is confident that exposures to chemicals in concentrations at or below the HRVs present minimal risk to human health. In addition, because of MDH's conservative approach, exposures to chemical concentrations above HRVs do not necessarily pose a public health risk.

HRVs are based solely on health effects information. Other factors such as the ability to detect or monitor the chemical, the cost of controlling the chemical, or background concentrations of that chemical or substance are not considered in their development. HRVs are developed using public health protective practices that advocate the protection of the most sensitive portions of the population (including but not limited to children, pregnant women and their fetuses, and elderly persons). However, HRVs may not be protective of every individual. HRVs are not necessarily protective of hypersensitive individuals who may respond in an unpredictable way to chemical exposures.

The HRVs provide uniformly developed, publicly reviewed science-based rules. Although the application of HRVs is not specified in rule, they are used by the Minnesota Department of Health and sister agencies such as the Minnesota Pollution Control Agency, to assist in the assessment of potential health risks associated with chemicals in ambient air. HRVs can be used as one set of criteria for assessing risks in the environmental review process, issuing air permits, risk assessments and other site-specific assessments.

The HRVs were derived using standard methodology such as is also used to derive U.S. EPA's Reference Concentrations (RfCs) and California EPA's Reference Exposure Levels (RELs).

Air Monitoring Data

Air monitoring results at the exclusion zone (property perimeter), excavation opening, breathing zone (inside the excavation), and stockpile predominantly showed no detectable contaminants. Only 7 VOC detections were recorded from 14 days of continuous PID readings. The VOC detections ranged from 0.9 to 48.2 ppm (parts per million). The action level (50 ppm) for collecting tedlar bag samples was not exceeded.

The two highest VOC concentrations 48.2 and 15.7 ppm were collected in the excavation (breathing zone; the breathing area of a worker), and 10 feet from the excavation border respectively (see Table 7 for air concentrations and Figure 4 for sample grid locations).

Discussion

Several factors contributed the successful remediation of the Warden Oil Superfund site. The location of the site isolated it from the more densely populated residential areas. Only a few residential homes are located within a block of the site. The remedial activities were conducted predominantly during the colder months of winter when residents tended to be inside their homes with all the windows and doors shut. Additionally, the prevailing winds (out of the north) in the winter months tended to blow site related vapors away from the residential areas on the north side of the site. The colder air temperatures also minimize the vaporization of VOCs from the site soils. The excavation Alert Level remained at Level 0 (Blue) and the job was completed without incident. Clean fill now covers the whole site.

Conclusions

- All of OU1 and portions of OU2 were successfully remediated without incident, and the site has been backfilled with clean fill.
- The Air Monitoring Plan worked as intended, and the site remained on Alert Level 0 throughout the remedial process.
- Conducting soil remedial activities during the colder winter months helps minimize COC volatilization, and receptor inhalation exposure.

Recommendations

- MDH recommends that an Air Monitoring Plan similar to Warden Oil's be used in other future soil excavations located near residential areas involving VOCs, and petroleum compounds.
- MDH recommends that future soil excavations located near residential areas involving VOCs, and petroleum compounds be conducted in the winter when possible to minimize receptor exposures.

Public Health Action Plan

MDH will continue to assist the MPCA in reviewing Air Monitoring Plans for other sites remediating soils contaminated with VOCs and petroleum products.

Certification

This Warden Oil public health consultation was prepared by the Minnesota Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

Technical Project Officer, CAT, SPAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Team Lead, CAT, SPAB, DHAC, ATSDR

References

Remedial Excavation Report: Warden Oil Superfund Site.
Prepared for: Minnesota Pollution Control Agency, March 2004

MDH Public Health Consultation for the Former Warden Oil Facility, Minneapolis Minnesota. Cerclis No. MND006211562116921., August 1994

MDH Health Consultation: Warden Oil Facility (A/K/A Bassett's Creek Industrial Corridor, Minneapolis Minnesota)., March 1997.

Tables

Table 1 **Warden Oil Site Soil Lead Data (Mobile Lab)**

Sample ID	Location	Date	Depth (feet)	Mobile Lab Total Lead mg/kg
J9 Comp	OU-1	10/20/04	0-8	28
K9 Comp	OU-1	10/20/04	0-8	**300**
I8 Comp	OU-1	10/20/04	0-6	110
I9 Comp	OU-1	10/20/04	0-6	11
H9 Comp	OU-1	10/20/04	0-6	100
G9 Comp	OU-1	10/20/04	0-6	240
D7 Comp	OU-1	10/20/04	0-6	98
D8 Comp	OU-1	10/20/04	0-4	11
E7 Comp	OU-1	10/20/04	0-4	120
E9 Comp	OU-1	10/20/04	0-7	160
F9 Comp	OU-1	10/20/04	0-6	160
E8 Comp	OU-1	10/20/04	0-1.5	110
F7 Comp	OU-1	10/20/04	0-8	**1500**
G7 Comp	OU-1	10/20/04	0-6	290
G8 Comp	OU-1	10/20/04	0-7	90
H7 Comp	OU-1	10/20/04	0-6	<10
H8 Comp	OU-1	10/20/04	0-6	10
I7 Comp	OU-1	10/20/04	0-5	190
J6 Comp	OU-1	10/20/04	0-8	130
C7 Comp	OU-1	10/21/04	0-6	**1100**
E7-2 Comp	OU-1	10/21/04	0-6.5	74
F7-2 Comp	OU-1	10/21/04	0-6	70
G7-2 Comp	OU-1	10/21/04	0-6	270
H7-2 Comp	OU-1	10/21/04	0-4	100
I7-2 Comp	OU-1	10/21/04	0-5	<10
J5 Comp	OU-1	10/21/04	0-8	110
I6 Comp	OU-1	10/21/04	0-8	**1500**
J6 Comp	OU-1	10/21/04	0-7	**800**
F6 Comp	OU-1	10/21/04	0-7	170
H6 Comp	OU-1	10/21/04	0-7	**880**
G6 Comp	OU-1	10/21/04	0-8	250
D6 Comp	OU-1	10/21/04	0-6	130
B3 Comp	OU-1	10/21/04	0-5	45
MN RSRV (1999)				**400**

Sample ID	Location	Date	Depth (feet)	Mobile Lab Total Lead mg/kg
E6 Comp	OU-1	10/21/04	0-6	39
C2 Comp	OU-1	10/21/04	0-7	160
C3 Comp	OU-1	10/21/04	0-6	95
E4 Comp	OU-1	10/21/04	0-6	220
E5 Comp	OU-1	10/21/04	0-8	45
F4 Comp	OU-1	10/21/04	0-6	160
E9-WL-E	OU-1	10/25/04	5	170
E9-B	OU-1	10/25/04	10	380
D9-WL	OU-1	10/25/04	5	NA
D7-B	OU-1	10/25/04	10	280
D7-WL	OU-1	10/25/04	8	**480**
C6-B	OU-1	10/25/04	10	270
C5-WL	OU-1	10/25/04	8	170
B4-B	OU-1	10/25/04	8	**430**
B4-WL	OU-1	10/25/04	6	**1700**
D6-B	OU-1	10/26/04	10	**520**
C4-B	OU-1	10/26/04	10	39
B4-B2	OU-1	10/26/04	10	**2100**
B4-WL2	OU-1	10/26/04	8	59
F9-WL	OU-1	10/27/04	4	80
F7-B	OU-1	10/27/04	6	**620**
E7-B2	OU-1	10/27/04	6	<10
E6-B	OU-1	10/27/04	8	18
E6-B2	OU-1	10/27/04	8	83
E5-B	OU-1	10/27/04	10	52
D5-B2	OU-1	10/27/04	11	210
D4-B* (C4-B)	OU-1	10/27/04	8	**930**
D4-B2* (C4-B)	OU-1	10/27/04	8	380
C4-B2* (C3-B2)	OU-1	10/28/04	8	**1500**
C3-B	OU-1	10/28/04	8	**550**
Tank North	OU-1	10/28/04	Composite	120
Tank South	OU-1	10/28/04	Composite	300
Tank TCLP	OU-1	10/28/04	5	**530**
MN RSRV (1999)				**400**

Notes:

* = These sampling locations were mislabeled during sampling. The correct sample location is the grid square in parentheses.

mg/kg = milligrams per kilogram;

MN RSRV = Minnesota Residential Soil Reference Value (mg/kg)

BOLD indicates concentration equals or exceeds the MN RSRV

Table 1 Cont. **Warden Oil Site Soil Lead Data (Mobile Lab)**

Sample ID	Location	Date	Depth (feet)	Mobile Lab Total Lead mg/kg
D1-B	OU-1	11/12/04	8	**450**
D1-B2	OU-1	11/12/04	8	**890**
A1 - Comp	OU-2(b)	10/20/04	0-2	110
G9-B	OU-1	11/03/04	4	99
F8-B2	OU-1	11/03/04	4	120
G8-B	OU-1	11/03/04	4	54
E6-B3	OU-1	11/03/04	7	220
E7-B3	OU-1	11/03/04	6	170
F6-B	OU-1	11/03/04	7	64
F7-B2	OU-1	11/03/04	6	<10
G8-B2	OU-1	11/04/04	5	250
G9-B2	OU-1	11/04/04	4	<10
G7-B2	OU-1	11/04/04	6	69
G6-B	OU-1	11/04/04	7	**410**
G6-B2	OU-1	11/04/04	7	200
H9-WL	OU-1	11/04/04	7	180
H9-B	OU-1	11/04/04	7	390
H8-B	OU-1	11/04/04	7	36
H8-B2	OU-1	11/04/04	7	25
H7-B	OU-1	11/05/04	6	48
H7-B2	OU-1	11/05/04	6	**2200**
I9-WL	OU-1	11/05/04	6	61
I9 -B	OU-1	11/05/04	10	350
I8-B	OU-1	11/05/04	10	**1400**
I8-B2	OU-1	11/05/04	10	**2100**
J9-WL	OU-1	11/05/04	6	121
J9-B	OU-1	11/05/04	10	22
J9-B2	OU-1	11/05/04	11	**4700**
J9-B3	OU-1	11/08/04	10	14
K9-WL-N	OU-1	11/08/04	5	72
K9-WL-E	OU-1	11/08/04	5	110
K9-B	OU-1	11/08/04	10	14
K9-B2	OU-1	11/08/04	10	14
J8-B2	OU-1	11/08/04	10	18
MN RSRV (1999)				**400**

Sample ID	Location	Date	Depth (feet)	Mobile Lab Total Lead mg/kg
K8-B	OU-1	11/08/04	12	16
I7-B	OU-1	11/08/04	6	30
I7-B2	OU-1	11/08/04	10	16
J7-B2	OU-1	11/09/04	10	17
K7-B2	OU-1	11/9/2004	10	17
J5-WL	OU-1	11/10/04	8	140
K5-WL-N	OU-1	11/10/04	8	41
K5-B	OU-1	11/10/04	10	30
K5-WL-W	OU-1	11/10/04	6	25
I5-WL	OU-1	11/10/04	7	74
I5-B	OU-1	11/10/04	10	23
H5-WL	OU-1	11/10/04	6	100
H5-B	OU-1	11/10/04	10	18
H5-B2	OU-1	11/10/04	10	20
G5-B2	OU-1	11/11/04	10	18
G4-WL	OU-1	11/11/04	6	**400**
G4-B	OU-1	11/11/04	9	14
G4-B2	OU-1	11/11/04	9	11
F5-B	OU-1	11/11/04	9	**1100**
F5-B2	OU-1	11/11/04	9	<10
F4-B	OU-1	11/11/04	9	25
F4-B2	OU-1	11/11/04	9	**1000**
F4-WL	OU-1	11/11/04	6	310
E4-B3	OU-1	11/11/04	8	**1300**
E3-WL	OU-1	11/11/04	4	180
E3-B	OU-1	11/11/04	7	**3100**
D3-B	OU-1	11/11/04	6	150
C1-WL-S	OU-1	11/12/04	3	340
C1-WL-W	OU-1	11/12/04	3	11
C1-B	OU-1	11/12/04	7	290
C1-B2	OU-1	11/12/04	7	310
C2-B	OU-1	11/12/04	7	740
D3-B (2)	OU-1	11/12/04	8	**630**
D1-WL	OU-1	11/12/04	3	<10
MN RSRV (1999)				**400**

Notes:

* = These sampling locations were mislabeled during sampling. The correct sample location is the grid square in parentheses.

mg/kg = milligrams per kilogram;

MN RSRV = Minnesota Residential Soil Reference Value (mg/kg)

BOLD indicates concentration equals or exceeds the MN RSRV

Table 1 Cont. **Warden Oil Site Soil Lead Data (Mobile Lab)**

Sample ID	Location	Date	Depth (feet)	Mobile Lab Total Lead mg/kg
D2-B2	OU-1	11/12/04	8	85
E1-B	OU-1	11/12/04	8	15
E1-B2	OU-1	11/12/04	8	**1100**
E2-B	OU-1	11/12/04	8	180
E2-B2	OU-1	11/12/04	8	150
B3-WL	OU-2(a)	11/15/04	4	360
I4-B2	OU-2(a)	11/15/04	4	**860**
F3-SP	OU-2(a)	11/15/04	Composite	61
G2-SP	OU-2(a)	11/15/04	Composite	73
H1-SP	OU-2(a)	11/15/04	Composite	370
H3-SP	OU-2(a)	11/15/04	Composite	150
K2-SP	OU-2(a)	11/15/04	Composite	390
H4-B	OU-2(a)	11/16/04	4	39
H4-B2	OU-2(a)	11/16/04	4	<10
A1 - Comp	OU-2(b)	10/20/04	2-4	83
A1-WL-N	OU-2(b)	10/20/04	2	NA
MN RSRV (1999)				**400**

Sample ID	Location	Date	Depth (feet)	Mobile Lab Total Lead mg/kg
A1-WL-E	OU-2(b)	10/20/04	2	NA
A1-WL-S	OU-2(b)	10/20/04	2	NA
A1-WL-W	OU-2(b)	10/20/04	2	NA
A1-B-N	OU-2(b)	10/20/04	4	NA
A1-B-S	OU-2(b)	10/20/04	4	NA
A1-SP (0-2')	OU-2(b)	10/20/04	0-2	NA
A1-SP (2-4')	OU-2(b)	10/20/04	2-4	NA
B2 - Comp	OU-2(b)	10/20/04	0-2	**400**
B2 - Comp	OU-2(b)	10/20/04	2-4	280
B2-WL-W	OU-2(b)	10/20/04	2	**3200**
B2-B-S	OU-2(b)	10/20/04	4	**1200**
B2-WL-S	OU-2(b)	10/20/04	2	240
B2-WL-E	OU-2(b)	10/20/04	2	<10
B2-WL-N	OU-2(b)	10/20/04	2	49
B2-B-N	OU-2(b)	10/20/04	4	47
A2, B2, C2, Stab	OU-2(b)	11/11/04	2-4 Comp	130
MN RSRV (1999)				**400**

Notes:
* = These sampling locations were mislabeled during sampling. The correct sample location is the grid square in parentheses.
mg/kg = milligrams per kilogram;
MN RSRV = Minnesota Residential Soil Reference Value (mg/kg)
BOLD indicates concentration equals or exceeds the MN RSRV

Table 1 Cont. **Warden Oil Site Soil Lead Data (Mobile Lab)**

Sample ID	Location	Date	Depth (feet)	Mobile Lab Total Lead mg/kg
D2-B2	OU-1	11/12/04	8	85
E1-B	OU-1	11/12/04	8	15
E1-B2	OU-1	11/12/04	8	**1100**
E2-B	OU-1	11/12/04	8	180
E2-B2	OU-1	11/12/04	8	150
B3-WL	OU-2(a)	11/15/04	4	360
I4-B2	OU-2(a)	11/15/04	4	**860**
F3-SP	OU-2(a)	11/15/04	Composite	61
G2-SP	OU-2(a)	11/15/04	Composite	73
H1-SP	OU-2(a)	11/15/04	Composite	370
H3-SP	OU-2(a)	11/15/04	Composite	150
K2-SP	OU-2(a)	11/15/04	Composite	390
H4-B	OU-2(a)	11/16/04	4	39
H4-B2	OU-2(a)	11/16/04	4	<10
A1 - Comp	OU-2(b)	10/20/04	2-4	83
A1-WL-N	OU-2(b)	10/20/04	2	NA
MN RSRV (1999)				**400**

Sample ID	Location	Date	Depth (feet)	Mobile Lab Total Lead mg/kg
A1-WL-E	OU-2(b)	10/20/04	2	NA
A1-WL-S	OU-2(b)	10/20/04	2	NA
A1-WL-W	OU-2(b)	10/20/04	2	NA
A1-B-N	OU-2(b)	10/20/04	4	NA
A1-B-S	OU-2(b)	10/20/04	4	NA
A1-SP (0-2')	OU-2(b)	10/20/04	0-2	NA
A1-SP (2-4')	OU-2(b)	10/20/04	2-4	NA
B2 - Comp	OU-2(b)	10/20/04	0-2	**400**
B2 - Comp	OU-2(b)	10/20/04	2-4	280
B2-WL-W	OU-2(b)	10/20/04	2	**3200**
B2-B-S	OU-2(b)	10/20/04	4	**1200**
B2-WL-S	OU-2(b)	10/20/04	2	240
B2-WL-E	OU-2(b)	10/20/04	2	<10
B2-WL-N	OU-2(b)	10/20/04	2	49
B2-B-N	OU-2(b)	10/20/04	4	47
A2, B2, C2, Stab	OU-2(b)	11/11/04	2-4 Comp	130
MN RSRV (1999)				**400**

Notes:
* = These sampling locations were mislabeled during sampling. The correct sample location is the grid square in parentheses.
mg/kg = milligrams per kilogram;
MN RSRV = Minnesota Residential Soil Reference Value (mg/kg)
BOLD indicates concentration equals or exceeds the MN RSRV

Table 2 **Warden Oil Site Soil Metals Data (Fixed Lab)**

				Fixed Lab (Pace Analytical)							
Sample ID	Location	Date	Depth (feet)	Arsenic mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Lead mg/kg	Selenium mg/kg	Silver mg/kg	Mercury mg/kg
C6-WL	OU-1	10/25/04	5	19.2	321	0.2	12.7	733	<0.78	7.2	**2.1**
C5-B	OU-1	10/25/04	10	14.1	536	0.42	15.7	409	<1.0	1	**1.7**
D4-B	OU-1	11/02/04	6	19.2	223	1.9	9.9	500	<0.78	<0.52	**0.74**
C3-B	OU-1	11/02/04	7	16.3	758	4	32.3	1620	<1.7	0.83	**1.3**
G9-WL	OU-1	11/04/04	4	1.6	123	<0.051	19.8	9.6	<0.76	<0.51	0.032
G7-B	OU-1	11/04/04	6	9.6	**1390**	26.2	36.9	**3230**	<1.3	4.2	**29.1**
J8-B	OU-1	11/08/04	9	<0.82	225	0.25	3.1	1.2	24.3	1.6	<0.035
K8-WL	OU-1	11/08/04	5	0.48	50	0.081	17.1	36.3	<0.71	0.77	0.067
G5-B	OU-1	11/11/04	10	6.4	109	0.22	21.0	13.5	<0.94	0.72	0.073
H4-WL	OU-1	11/11/04	6	<0.73	328	0.20	11.6	3.2	14.0	1.3	<0.032
D2-B	OU-1	11/12/04	8	**47.7**	303	0.53	16.6	369	<0.84	<0.56	0.30
E1-WL-W	OU-1	11/12/04	3	3.8	69.2	0.07	12.7	57.9	<0.77	<0.51	0.13
I4-B	OU-2(a)	11/15/04	4	6.1	64.2	<0.054	8.4	60.4	<0.82	<0.54	0.12
K4-WL	OU-2(a)	11/17/04	3	NA	NA	NA	NA	68.9	NA	NA	NA
K4-B	OU-2(a)	11/17/04	3	NA	NA	NA	NA	12.6	NA	NA	NA
K3-WL	OU-2(a)	11/17/04	3	NA	NA	NA	NA	57.2	NA	NA	NA
K3-B	OU-2(a)	11/17/04	4	NA	NA	NA	NA	33.3	NA	NA	NA
J3-B	OU-2(a)	11/17/04	4	NA	NA	NA	NA	**1090**	NA	NA	NA
I3-B	OU-2(a)	11/17/04	4	NA	NA	NA	NA	**1390**	NA	NA	NA
G3-B	OU-2(a)	11/17/04	4	NA	NA	NA	NA	7.4	NA	NA	NA
F3-B	OU-2(a)	11/17/04	4	NA	NA	NA	NA	0.52	NA	NA	NA
K2-WL	OU-2(a)	11/18/04	2	NA	NA	NA	NA	8.3	NA	NA	NA
K2-B	OU-2(a)	11/18/04	4	NA	NA	NA	NA	15.6	NA	NA	NA
J2-B	OU-2(a)	11/18/04	4	NA	NA	NA	NA	37.5	NA	NA	NA
K1-B	OU-2(a)	11/18/04	4	NA	NA	NA	NA	23.1	NA	NA	NA
K1-WL-W	OU-2(a)	11/18/04	2	NA	NA	NA	NA	105	NA	NA	NA
K1-WL-N	OU-2(a)	11/18/04	2	NA	NA	NA	NA	20.6	NA	NA	NA
H3-B	OU-2(a)	11/18/04	4	NA	NA	NA	NA	336	NA	NA	NA
J1-WL	OU-2(a)	11/18/04	2	NA	NA	NA	NA	15.8	NA	NA	NA
J1-B	OU-2(a)	11/18/04	4	8.5	336	1.6	26.4	352	<0.95	0.67	0.35
H2-B	OU-2(a)	11/22/04	3	NA	NA	NA	NA	2.4	NA	NA	NA
F1-B	OU-2(a)	11/22/04	2.5	NA	NA	NA	NA	135	NA	NA	NA
F1-WL	OU-2(a)	11/22/04	1.5	NA	NA	NA	NA	111	NA	NA	NA
H1-WL	OU-2(a)	11/22/04	1.5	NA	NA	NA	NA	77.0	NA	NA	NA
H1-B	OU-2(a)	11/22/04	2.5	NA	NA	NA	NA	35.3	NA	NA	NA
G1-B	OU-2(a)	11/22/04	2.5	NA	NA	NA	NA	185	NA	NA	NA
G1-WL	OU-2(a)	11/22/04	1.5	2.8	113	<0.055	27.5	8.9	<0.82	<0.55	0.046
MN RSRV (1999)				**10**	**1200**	**35**	**71****	**400**	**170**	**170**	**0.7**

Notes:
** = Denotes the concentration for chromium VI. Chromium III RSRV = 34,300 mg/kg.
NA = Not Analyzed
mg/kg = milligrams per kilogram; mg/L = milligrams per liter
MN RSRV = Minnesota Residential Soil Reference Value (mg/kg)
BOLD indicates concentration equals or exceeds the MN RSRV

Table 3 Warden Oil Site Soil Gasoline Range Organic Constituent Data

Sample ID	Location	Date	Depth (feet)	1,2,4-Trimethylbenzene ug/kg	1,2-Dichlorobenzene ug/kg	1,3,5-Trimethylbenzene ug/kg	Benzene ug/kg	Naphthalene ug/kg	Xylene (total) ug/kg
E9-WL-E	OU-1	10/25/2004	5	**28300**	9520	**8960**	573	**13100**	25500
E9	OU-1	10/25/2004	10	**52500**	17400	**15300**	<279	**27600**	<4190
D7	OU-1	10/25/2004	10	**31900**	2850	**7100**	147	**23800**	<850
F8	OU-1	10/27/2004	6	**161000**	**32500**	**48100**	**2880**	**61100**	**139000**
C3	OU-1	10/28/2004	8	**30900**	<2970	**14300**	<594	4290	<8910
G9	OU-1	11/3/2004	4	**68100**	10200	**17400**	644	**31500**	44300
F6	OU-1	11/3/2004	7	**10000**	1260	3470	<123	2300	6170
D2	OU-1	11/12/2004	8	**6420**	476	606	364	4640	4140
D9	OU-1	11/16/2004	4	**101000**	**32800**	**30200**	808	**25400**	73300
J1	OU-2(a)	11/18/2004	4	<330	<330	<330	<65.9	<330	<989
MN RSRV (ug/kg)		**1999**		**5000**	**26000**	**4000**	**1500**	**10000**	**110000**

Notes:
ug/kg = micrograms per kilogram
MN RSRV = Minnesota Residential Soil Reference Value
BOLD indicates concentrations equals or exceeds the MN RSRV

Table 4 Warden Oil Site Soil Semi-Volatile Organic Compound (SVOC) Data

Sample ID	Location	Date	Depth (feet)	Acenaphthene ug/kg	Acenaphthylene ug/kg	Anthracene ug/kg	Benzo(a)anthracene ug/kg	Benzo(a)pyrene ug/kg	Benzo(b)fluoranthene ug/kg	Benzo(g,h,i)perylene ug/kg	Benzo(k)fluoranthene ug/kg	Chrysene ug/kg	Dibenzofuran ug/kg
E9-WL-E	OU-1	10/25/04	5	<22400	<22400	<22400	<22400	<22400	<22400	<22400	<22400	<22400	<22400
E9-B	OU-1	10/25/04	10	<22300	<22300	<22300	<22300	<22300	<22300	<22300	<22300	<22300	<22300
C6-WL	OU-1	10/25/04	5	<42600	<42600	<42600	<42600	<42600	<42600	<42600	<42600	<42600	<42600
C5-B	OU-1	10/25/04	10	<28900	<28900	<28900	<28900	<28900	<28900	<28900	<28900	<28900	<28900
E7-B	OU-1	10/26/04	10	<37600	<37600	<37600	<37600	<37600	<37600	<37600	<37600	<37600	<37600
E5-B	OU-1	10/27/04	10	<2230	<2230	<2230	<2230	<22300	<22300	<22300	<22300	<2230	<2230
C3-B	OU-1	11/02/04	7	<39100	<39100	<39100	<39100	<39100	<39100	<39100	<39100	<39100	<39100
C2-WL	OU-1	11/02/04	4	<369	<369	<369	1230	652	1610	<369	<369	<369	<369
G9-WL	OU-1	11/04/04	4	<391	<391	<391	<391	<391	<391	<391	<391	<391	<391
G7-B	OU-1	11/04/04	6	<11700	<11700	<11700	<11700	<11700	<11700	<11700	<11700	<11700	<11700
I6-B	OU-1	11/09/04	10	<624	<624	<624	<624	<624	<624	<624	<624	<624	<624
G5-B	OU-1	11/11/04	10	<482	<482	<482	<482	<482	<482	<482	<482	<482	<482
H4-WL	OU-1	11/11/04	6	<518	<518	<518	<518	<518	<518	<518	<518	<518	<518
D2-B	OU-1	11/12/04	8	<4210	<4210	<84200	<84200	<84200	<84200	<84200	<84200	<84200	<4210
E1-WL-W	OU-1	11/12/04	3	<365	<365	<365	<365	<365	<365	<365	<365	<365	<365
I4-B	OU-2(a)	11/15/04	4	<1890	<1890	4720	8680	**6740**	6180	3300	6450	7950	<1890
J1-B	OU-2(a)	11/18/04	4	<431	<431	<431	<431	<431	<431	<431	<431	<431	<431
G2-B	OU-2(a)	11/18/04	2.5	656	960	2300	4740	**4060**	5980	3610	5800	4160	526
G1-WL	OU-2(a)	11/22/04	1.5	<402	<402	<402	<402	<402	<402	<402	<402	<402	<402
A1-WL-N	OU-2(b)	10/20/04	2	<1830	<1830	<1830	<1830	<1830	<1830	<1830	<1830	<1830	<1830
A1-WL-E	OU-2(b)	10/20/04	2	<20100	<20100	<20100	27400	<20100	35800	<20100	22600	22600	<20100
A1-WL-S	OU-2(b)	10/20/04	2	<20300	<20300	<20300	<20300	<20300	<20300	<20300	<20300	<20300	<20300
A1-WL-W	OU-2(b)	10/20/04	2	<1760	<1760	<1760	<1760	<1760	<1760	<1760	<1760	<1760	<1760
A1-B-N	OU-2(b)	10/20/04	4	<18400	<18400	<18400	47700	**45300**	77100	36400	46100	46100	<18400
A1-B-S	OU-2(b)	10/20/04	4	<18800	<18800	<18800	<18800	<18800	<18800	<18800	<18800	<18800	<18800
MN RSRV	**(ug/kg)**	**1999**		**1200000**		**7880000**		**2000**					**104000**

Notes:
ug/kg = micrograms per kilogram
MN RSRV = Minnesota Residential Soil Reference Value
BOLD indicates concentration equals or exceeds the MN RSRV

Table 4 cont. Warden Oil Site Soil Semi-Volatile Organic Compound (SVOC) Data

Sample ID	Location	Date	Depth (feet)	Fluorene ug/kg	Indeno(1,2,3-cd)pyrene ug/kg	1-Methylnaphthalene ug/kg	2-Methylnaphthalene ug/kg	Naphthalene ug/kg	Phenanthrene ug/kg	Pyrene ug/kg	1,2-Dichlorobenzene ug/kg	Fluoranthene ug/kg
E9-WL-E	OU-1	10/25/04	5	<22400	<22400	54700	49000	24800	<22400	<22400	<22400	<22400
E9-B	OU-1	10/25/04	10	<22300	<22300	54000	43600	26900	<22300	<22300	<22300	<22300
C6-WL	OU-1	10/25/04	5	<42600	<42600	<42600	<42600	<42600	<42600	<42600	<42600	<42600
C5-B	OU-1	10/25/04	10	<28900	<28900	<28900	<28900	<28900	<28900	<28900	<28900	<28900
E7-B	OU-1	10/26/04	10	<37600	<37600	<37600	<37600	<37600	<37600	<37600	<37600	<37600
E5-B	OU-1	10/27/04	10	<22300	<22300	11800	7130	3330	6880	9870	3030	5690
C3-B	OU-1	11/02/04	7	<39100	<39100	<39100	<39100	<39100	<39100	<39100	<39100	<39100
C2-WL	OU-1	11/02/04	4	<369	<369	<369	<369	<369	1390	1070	<369	1600
G9-WL	OU-1	11/04/04	4	<391	<391	<391	<391	<391	<391	<391	<391	<391
G7-B	OU-1	11/04/04	6	<11700	<11700	49600	23900	<11700	<11700	<11700	<11700	<11700
I6-B	OU-1	11/09/04	10	<624	<624	<624	<624	<624	<624	<624	<624	<624
G5-B	OU-1	11/11/04	10	<482	<482	<482	<482	<482	<482	<482	<482	<482
H4-WL	OU-1	11/11/04	6	<518	<518	<518	<518	<518	<518	<518	<518	<518
D2-B	OU-1	11/12/04	8	<4210	<84200	13100	15600	<4210	<84200	<84200	<4210	<84200
E1-WL-W	OU-1	11/12/04	3	<365	<365	<365	<365	<365	556	544	<365	669
I4-B	OU-2(a)	11/15/04	4	2390	3030	2360	3230	2780	14200	12600	<1890	15100
J1-B	OU-2(a)	11/18/04	4	<431	<431	<431	<431	<431	718	497	1840	510
G2-B	OU-2(a)	11/18/04	2.5	1020	2980	<387	<387	418	7620	9910	<387	9920
G1-WL	OU-2(a)	11/22/04	1.5	<402	<402	<402	<402	<402	<402	<402	<402	<402
A1-WL-N	OU-2(b)	10/20/04	2	<1830	<1830	<1830	<1830	<1830	<1830	<1830	<1830	<1830
A1-WL-E	OU-2(b)	10/20/04	2	22600	<20100	<20100	<20100	<20100	44700	48500	<20100	60200
A1-WL-S	OU-2(b)	10/20/04	2	<20300	<20300	<20300	<20300	<20300	<20300	<20300	<20300	<20300
A1-WL-W	OU-2(b)	10/20/04	2	<1760	<1760	<1760	<1760	<1760	<1760	<1760	<1760	<1760
A1-B-N	OU-2(b)	10/20/04	4	46100	30100	<18400	<18400	<18400	25900	76400	<18400	87300
A1-B-S	OU-2(b)	10/20/04	4	<18800	<18800	<18800	<18800	<18800	<18800	<18800	<18800	<18800
MN RSRV	**(ug/kg)**	**1999**		**1140000**				**10000**		**890000**	**26000**	**1080000**

Notes:
ug/kg = micrograms per kilogram
MN RSRV = Minnesota Residential Soil Reference Value
BOLD indicates concentration equals or exceeds the MN RSRV

Table 5

Warden Oil Site Volatile Organic Compound (VOCs) Data

Sample ID	Location	Date	Depth (feet)	1,1-Dichlorethene ug/kg	1,2,4-Trichlorobenzene ug/kg	cis-1,2-Dichlorethene ug/kg	1,4-Dichlorobenzene ug/kg	2-Chlorotoluene ug/kg	Chlorobenzene ug/kg	Isopropylbenzene ug/kg	sec-Butylbenzene ug/kg
E9-WL-E	OU-1	10/25/04	5	<1400	<1400	<1400	<1400	<1400	<1400	1680	1990
E9-B	OU-1	10/25/04	10	<1400	7100	<1400	1830	<1400	<1400	2470	3260
D7-B	OU-1	10/25/04	10	<284	<284	<284	579	<284	709	1790	1760
D7-WL	OU-1	10/25/04	8	<390	<390	<390	<390	<390	<390	<390	<390
C6-WL	OU-1	10/25/04	5	<327	581	<327	<327	<327	478	<327	376
C5-B	OU-1	10/25/04	10	<442	<442	<442	<442	<442	<442	<442	536
B4-B	OU-1	10/25/04	8	<430	<430	<430	<430	<430	<430	<430	<430
B4-WL	OU-1	10/25/04	6	<379	<379	<379	<379	<379	<379	<379	<379
E7-B	OU-1	10/26/04	10	<578	<578	<578	<578	<578	<578	<578	<578
D6-B	OU-1	10/26/04	10	<599	<599	<599	<599	<599	<599	<599	<599
F8-B	OU-1	10/27/04	6	<5450	6290	<5450	<5450	<5450	<5450	7520	8130
E5-B	OU-1	10/27/04	10	<338	<338	<338	<338	<338	<338	<338	<338
D4-B	OU-1	10/27/04	8	<346	<346	<346	<346	<346	446	422	444
C3-B	OU-1	10/28/04	8	<2970	<2970	<2970	<2970	<2970	<2970	<2970	<2970
B3-WL	OU-1	11/2/04	6	<369	<369	<369	1220	<369	6210	<369	<369
D2-B	OU-1	11/2/04	7	<329	<329	<329	<329	<329	<329	<329	<329
C2-WL	OU-1	11/2/04	4	<281	<281	<281	<281	<281	<281	<281	<281
E3-B	OU-1	11/2/04	7	<353	<353	<353	<353	<353	<353	<353	<353
G9-B	OU-1	11/3/04	4	359	1330	515	1820	<348	1550	4020	3750
F6-B	OU-1	11/3/04	7	<614	<614	<614	<614	<614	1380	764	665
G9-WL	OU-1	11/4/04	4	<303	<303	<303	358	<303	1220	<303	<303
G7-B	OU-1	11/4/04	6	<445	<445	<445	<445	453	<445	1820	1280
H8-B	OU-1	11/4/04	7	<308	<308	<308	<308	<308	2290	326	625
I9-WL	OU-1	11/5/04	6	<322	<322	<322	<322	<322	<322	<322	<322
I9 -B	OU-1	11/5/04	10	<309	<309	<309	<309	<309	<309	<309	<309
K9-WL-E	OU-1	11/8/04	5	<473	<473	<473	<473	<473	<473	<473	<473
K9-B	OU-1	11/8/04	10	<535	<535	<535	<535	<535	<535	<535	<535
J8-B	OU-1	11/8/04	9	<462	<462	<462	<462	<462	<462	<462	<462
K8-WL	OU-1	11/8/04	5	<290	<290	<290	<290	<290	<290	<290	<290
I7-B	OU-1	11/8/04	6	<332	<332	<332	<332	<332	<332	<332	508
I7-B2	OU-1	11/8/04	10	<479	<479	<479	<479	<479	<479	<479	<479
K7-B	OU-1	11/9/04	10	<463	<463	<463	<463	<463	<463	<463	<463
H6-B	OU-1	11/9/04	10	<522	<522	<522	<522	<522	<522	<522	<522
J6-B	OU-1	11/9/04	10	<451	<451	<451	<451	<451	<451	<451	<451
K6-WL	OU-1	11/9/04	5	<358	<358	<358	<358	<358	<358	<358	<358
J5-WL	OU-1	11/10/04	8	<303	<303	<303	<303	<303	<303	<303	<303
MN 1999 RSRVs (ug/kg)				**600**	**200000**	**8000**	**30000**	**436000**	**11000**	**30000**	**25000**

Notes:

ug/kg = micrograms per kilogram

MN RSRV = Minnesota Residential Soil Reference Value

BOLD indicates concentrations exceed the MN RSRV

Table 5 Cont.

Warden Oil Site Volatile Organic Compound (VOCs) Data

Sample ID	Location	Date	Depth (feet)	Methylene chloride ug/kg	Methyl-tert-butyl ether ug/kg	Tetrachloroethene ug/kg	Trichloroethene ug/kg	Vinyl Chloride ug/kg	n-Butylbenzene ug/kg	n-Propylbenzene ug/kg	p-Isopropyltoluene ug/kg
K5-WL-N	OU-1	11/10/04	8	<385	<385	<385	<385	<770	<385	<385	<385
K5-B	OU-1	11/10/04	10	<376	<376	<376	<376	<753	<376	<376	<376
H5-WL	OU-1	11/10/04	6	<365	<365	<365	<365	<729	<365	<365	<365
G5-B	OU-1	11/11/04	10	<365	<365	<365	<365	<730	<365	<365	<365
H4-WL	OU-1	11/11/04	6	<398	<398	<398	<398	<796	<398	<398	<398
F4-B	OU-1	11/11/04	9	<355	<355	<355	<355	<710	<355	<355	<355
F4-WL	OU-1	11/11/04	6	<349	<349	<349	<349	<697	<349	<349	<349
E3-B	OU-1	11/11/04	7	<314	<314	<314	<314	<628	1280	<314	<314
C1-WL-W	OU-1	11/12/04	3	<262	<262	<262	<262	<524	<262	<262	<262
C1-B	OU-1	11/12/04	7	<330	<330	<330	<330	<660	951	466	<330
D2-B	OU-1	11/12/04	8	<319	<319	<319	<319	<638	1500	1380	<319
E1-WL-W	OU-1	11/12/04	3	<282	<282	<282	352	<564	<282	<282	<282
E1-B	OU-1	11/12/04	8	<449	<449	<449	<449	<898	<449	<449	<449
B5-WL	OU-1	11/16/04	4	<295	<295	<295	<295	<590	<295	<295	<295
C7-WL	OU-1	11/16/04	4	<283	<283	<283	301	<565	544	<283	439
D9-WL-2	OU-1	11/16/04	4	<1230	<1230	<1230	2170	<2470	15000	9530	8450
E2-WL	OU-2(a)	11/15/04	6	<276	<276	<276	<276	<551	<276	<276	<276
B3-WL	OU-2(a)	11/15/04	4	<307	<307	<307	<307	<615	<307	<307	<307
I4-B	OU-2(a)	11/15/04	4	<286	<286	<286	<286	<571	<286	<286	<286
K4-WL	OU-2(a)	11/17/04	3	<353	<353	<353	<353	<705	<353	<353	<353
K4-B	OU-2(a)	11/17/04	3	<371	<371	<371	<371	<741	<371	<371	<371
J3-B	OU-2(a)	11/17/04	4	<316	<316	<316	<316	<632	<316	<316	<316
F3-B	OU-2(a)	11/17/04	4	<324	<324	<324	<324	<649	<324	<324	<324
K2-WL	OU-2(a)	11/18/04	2	1940	<281	<281	<281	<562	<281	<281	<281
K2-B	OU-2(a)	11/18/04	4	<320	<320	<320	<320	<640	<320	<320	<320
K1-WL-W	OU-2(a)	11/18/04	2	<289	<289	<289	<289	<578	<289	<289	<289
H3-B	OU-2(a)	11/18/04	4	<298	<298	1310	<298	<595	<298	<298	<298
J1-B	OU-2(a)	11/18/04	4	<330	<330	<330	**130000**	<659	<330	<330	<330
I2-B	OU-2(a)	11/18/04	4	<267	<267	<267	<267	<534	<267	<267	<267
I1-WL-W	OU-2(a)	11/18/04	5	2340	<341	<341	<341	<682	<341	<341	<341
G2-B	OU-2(a)	11/18/04	2.5	470	<294	<294	377	<588	<294	<294	<294
F1-B	OU-2(a)	11/22/04	2.5	2800	<313	<313	<313	<626	<313	<313	<313
H1-B	OU-2(a)	11/22/04	2.5	2280	<335	<335	<335	<670	<335	<335	<335
G1-WL	OU-2(a)	11/22/04	1.5	<310	<310	<310	<310	<620	<310	<310	<310
MN 1999 RSRVs (ug/kg)				**97000**	**---**	**72000**	**29000**	**250**	**30000**	**30000**	**---**

Notes:

ug/kg = micrograms per kilogram

MN RSRV = Minnesota Residential Soil Reference Value

BOLD indicates concentrations exceed the MN RSRV

Table 5 Cont.

Warden Oil Site Volatile Organic Compound (VOCs) Data

Sample ID	Location	Date	Depth (feet)	1,1-Dichlorethene ug/kg	1,2,4-Trichlorobenzene ug/kg	cis-1,2-Dichlorethene ug/kg	1,4-Dichlorobenzene ug/kg	2-Chlorotoluene ug/kg	Chlorobenzene ug/kg	Isopropylbenzene ug/kg	sec-Butylbenzene ug/kg
K5-WL-N	OU-1	11/10/04	8	<385	<385	<385	<385	<385	<385	<385	<385
K5-B	OU-1	11/10/04	10	<376	<376	<376	<376	<376	<376	<376	<376
H5-WL	OU-1	11/10/04	6	<365	<365	<365	<365	<365	<365	<365	<365
G5-B	OU-1	11/11/04	10	<365	<365	<365	<365	<365	<365	<365	<365
H4-WL	OU-1	11/11/04	6	<398	<398	<398	<398	<398	<398	<398	<398
F4-B	OU-1	11/11/04	9	<355	<355	<355	<355	<355	<355	<355	<355
F4-WL	OU-1	11/11/04	6	<349	<349	<349	<349	<349	<349	<349	<349
E3-B	OU-1	11/11/04	7	<314	<314	<314	<314	<314	<314	579	1090
C1-WL-W	OU-1	11/12/04	3	<262	<262	<262	<262	<262	<262	<262	<262
C1-B	OU-1	11/12/04	7	<330	<330	<330	<330	458	<330	374	527
D2-B	OU-1	11/12/04	8	<319	<319	<319	<319	<319	<319	555	604
E1-WL-W	OU-1	11/12/04	3	<282	<282	<282	<282	<282	<282	<282	<282
E1-B	OU-1	11/12/04	8	<449	<449	<449	<449	<449	<449	<449	<449
B5-WL	OU-1	11/16/04	4	<295	<295	<295	<295	<295	<295	<295	<295
C7-WL	OU-1	11/16/04	4	<283	394	<283	<283	<283	<283	<283	<283
D9-WL-2	OU-1	11/16/04	4	<1230	<1230	<1230	3960	<1230	<1230	4090	4440
E2-WL	OU-2(a)	11/15/04	6	<276	<276	<276	<276	<276	<276	<276	<276
B3-WL	OU-2(a)	11/15/04	4	<307	<307	<307	<307	<307	<307	<307	<307
I4-B	OU-2(a)	11/15/04	4	<286	<286	<286	<286	<286	<286	<286	<286
K4-WL	OU-2(a)	11/17/04	3	<353	<353	<353	<353	<353	<353	<353	<353
K4-B	OU-2(a)	11/17/04	3	<371	<371	<371	<371	<371	<371	<371	<371
J3-B	OU-2(a)	11/17/04	4	<316	<316	<316	<316	<316	<316	<316	<316
F3-B	OU-2(a)	11/17/04	4	<324	<324	<324	<324	<324	<324	<324	<324
K2-WL	OU-2(a)	11/18/04	2	<281	<281	<281	<281	<281	<281	<281	<281
K2-B	OU-2(a)	11/18/04	4	<320	<320	<320	<320	<320	<320	<320	<320
K1-WL-W	OU-2(a)	11/18/04	2	<289	<289	<289	<289	<289	<289	<289	<289
H3-B	OU-2(a)	11/18/04	4	<298	<298	<298	<298	<298	<298	<298	<298
J1-B	OU-2(a)	11/18/04	4	<330	<330	<330	<330	<330	<330	<330	<330
I2-B	OU-2(a)	11/18/04	4	<267	<267	<267	<267	<267	<267	<267	<267
I1-WL-W	OU-2(a)	11/18/04	5	<341	<341	<341	<341	<341	<341	<341	<341
G2-B	OU-2(a)	11/18/04	2.5	<294	<294	<294	<294	<294	<294	<294	<294
F1-B	OU-2(a)	11/22/04	2.5	<313	<313	<313	<313	<313	<313	<313	<313
H1-B	OU-2(a)	11/22/04	2.5	<335	<335	<335	<335	<335	<335	<335	<335
G1-WL	OU-2(a)	11/22/04	1.5	<310	<310	<310	<310	<310	<310	<310	<310
MN 1999 RSRVs (ug/kg)				**600**	**200000**	**8000**	**30000**	**436000**	**11000**	**30000**	**25000**

Notes:

ug/kg = micrograms per kilogram

MN RSRV = Minnesota Residential Soil Reference Value

BOLD indicates concentrations exceed the MN RSRV

Table 5 Cont.

Warden Oil Site Volatile Organic Compound (VOCs) Data

Sample ID	Location	Date	Depth (feet)	Methylene chloride ug/kg	Methyl-tert-butyl ether ug/kg	Tetrachloroethene ug/kg	Trichloroethene ug/kg	Vinyl Chloride ug/kg	n-Butylbenzene ug/kg	n-Propylbenzene ug/kg	p-Isopropyltoluene ug/kg
E9-WL-E	OU-1	10/25/04	5	<1400	<1400	<1400	<1400	<2800	5450	3980	2860
E9-B	OU-1	10/25/04	10	<1400	<1400	<1400	<1400	<2790	10900	7080	4990
D7-B	OU-1	10/25/04	10	<284	<284	<284	<284	<568	6880	3620	4630
D7-WL	OU-1	10/25/04	8	<390	<390	<390	<390	<780	639	540	<390
C6-WL	OU-1	10/25/04	5	<327	<327	<327	<327	<654	648	496	<327
C5-B	OU-1	10/25/04	10	<442	<442	<442	<442	<885	679	627	<442
B4-B	OU-1	10/25/04	8	<430	<430	<430	<430	<860	563	<430	<430
B4-WL	OU-1	10/25/04	6	<379	<379	<379	<379	<758	<379	<379	<379
E7-B	OU-1	10/26/04	10	<578	<578	<578	<578	<1160	<578	<578	<578
D6-B	OU-1	10/26/04	10	<599	<599	<599	<599	<1200	<599	<599	<599
F8-B	OU-1	10/27/04	6	<5450	<5450	<5450	<5450	<10900	28000	20900	11500
E5-B	OU-1	10/27/04	10	<338	<338	<338	<338	<676	<338	<338	<338
D4-B	OU-1	10/27/04	8	<346	<346	<346	<346	<692	690	660	<346
C3-B	OU-1	10/28/04	8	<2970	<2970	<2970	<2970	<5940	4490	3370	3170
B3-WL	OU-1	11/2/04	6	<369	<369	<369	<369	<738	<369	<369	<369
D2-B	OU-1	11/2/04	7	<329	<329	<329	<329	<659	<329	<329	<329
C2-WL	OU-1	11/2/04	4	<281	<281	<281	<281	<561	<281	<281	<281
E3-B	OU-1	11/2/04	7	<353	<353	<353	<353	<706	670	629	<353
G9-B	OU-1	11/3/04	4	<348	<348	<348	530	<696	12400	7870	6630
F6-B	OU-1	11/3/04	7	<614	<614	<614	<614	<1230	<614	1850	<614
G9-WL	OU-1	11/4/04	4	<303	<303	<303	<303	<606	<303	<303	<303
G7-B	OU-1	11/4/04	6	<445	<445	<445	<445	<890	2930	2690	2380
H8-B	OU-1	11/4/04	7	<308	<308	<308	<308	<616	845	654	<308
I9-WL	OU-1	11/5/04	6	<322	<322	<322	<322	<643	<322	<322	<322
I9 -B	OU-1	11/5/04	10	<309	<309	<309	<309	<618	<309	<309	<309
K9-WL-E	OU-1	11/8/04	5	<473	<473	<473	<473	<947	<473	<473	<473
K9-B	OU-1	11/8/04	10	<535	<535	<535	<535	<1070	<535	<535	<535
J8-B	OU-1	11/8/04	9	<462	<462	<462	<462	<924	<462	<462	<462
K8-WL	OU-1	11/8/04	5	<290	<290	<290	<290	<580	<290	<290	<290
I7-B	OU-1	11/8/04	6	<332	<332	<332	<332	<665	866	544	<332
I7-B2	OU-1	11/8/04	10	<479	<479	<479	<479	<958	<479	<479	<479
K7-B	OU-1	11/9/04	10	<463	<463	<463	<463	<927	<463	<463	<463
H6-B	OU-1	11/9/04	10	<522	<522	<522	<522	<1040	<522	<522	<522
J6-B	OU-1	11/9/04	10	<451	<451	<451	<451	<901	<451	<451	<451
K6-WL	OU-1	11/9/04	5	<358	<358	<358	<358	<716	<358	<358	<358
J5-WL	OU-1	11/10/04	8	<303	<303	<303	<303	<606	<303	<303	<303
MN 1999 RSRVs (ug/kg)				**97000**	**---**	**72000**	**29000**	**250**	**30000**	**30000**	**---**

Notes:

ug/kg = micrograms per kilogram

MN RSRV = Minnesota Residential Soil Reference Value

BOLD indicates concentrations exceed the MN RSRV

Table 6 Warden Oil Site Soil Polychlorinated Biphenyl (PCB) Data

Sample ID	Location	Date	Depth (feet)	PCB-1254 mg/kg	PCB-1260 mg/kg	PCB-1268 mg/kg	Total PCBs** mg/kg
D9-WL	OU-1	10/25/2004	5	<0.044	0.61	<0.044	0.61
D7-B	OU-1	10/25/2004	10	<0.038	0.62	<0.038	0.62
C6-B	OU-1	10/25/2004	10	<0.062	<0.062	<0.062	---
C6-WL^	OU-1	10/25/2004	5	<5.0	<5.0	<5.0	---
C5-B	OU-1	10/25/2004	10	<0.057	0.57	<0.057	0.57
B4-B	OU-1	10/25/2004	8	<0.057	0.65	<0.057	0.65
B4-WL	OU-1	10/25/2004	6	<0.049	0.20	<0.049	0.2
D6-B	OU-1	10/26/2004	10	<0.078	<0.078	<0.078	---
E5-B	OU-1	10/27/2004	10	<0.045	<0.045	<0.045	---
B3-WL	OU-1	11/2/2004	6	<0.049	<0.049	<0.049	---
C3-B	OU-1	11/2/2004	7	<0.43	<0.43	<0.43	---
C2-WL	OU-1	11/2/2004	4	<0.037	0.79	<0.037	0.79
G7-B	OU-1	11/4/2004	6	<0.058	**1.2**	<0.058	1.2
D2-B	OU-1	11/12/2004	8	<0.042	0.93	<0.042	0.93
I4-B	OU-2(a)	11/15/2004	4	<0.038	0.057	<0.038	0.057
J1-B	OU-2(a)	11/18/2004	4	<0.043	0.11	<0.043	0.11
G2-B	OU-2(a)	11/18/2004	2.5	0.09	0.12	<0.038	0.21
G1-WL	OU-2(a)	11/22/2004	1.5	<0.040	<0.040	<0.040	---

Notes:

^ = Sample C6-WL was analyzed as PCBs in oil due to the significant concentration of product in the sample.

** = Total PCBs sum the total of PCBs detected above method detection limits.

In samples with no PCBs detected above method detection limits, --- indicates a sum could not be determined.

BOLD indicates concentration equals or exceeds the MN PCB RSRV (1999) (1.2 mg/kg)

Table 7

Warden Oil Site
Air Monitoring Data - Main Excavation

Sample ID	Date	Distance	PID ppm
E8	10/26/2004	0-5 feet	0.0
Perimeter	10/26/2004	fenceline	0.0
B4 Stockpile	10/26/2004	0-5 feet	5.1
F8 Breathing Zone	10/27/2004	5-10 feet	48.2
F8 Downwind	10/27/2004	10 feet	7.9
Perimeter (8:30AM)	10/27/2004	fenceline	0.0
Perimeter (10:30AM)	10/27/2004	fenceline	0.0
Perimeter (2:45PM)	10/27/2004	fenceline	0.0
D4 Downwind	10/27/2004	20 feet	0.0
D4 Downwind	10/27/2004	10 feet	2.3
F9/G9 Border	10/28/2004	10 feet	15.7
F9/G9 Border	10/28/2004	20 feet	6.9
F9/G9 Border	10/28/2004	30 feet	1.8
Perimeter (6:30AM)	10/28/2004	fenceline	0.0
E4/E5 Stockpile	11/3/2004	10 feet	0.0
E4/E5 Border	11/3/2004	10 feet	0.0
Perimeter (8:15AM)	11/3/2004	fenceline	0.0
Perimeter (1:30PM)	11/3/2004	fenceline	0.0
F7 Stockpile	11/3/2004	10 feet	0.0
F7 Excavation	11/3/2004	10 feet	0.0
Perimeter (8:00AM)	11/4/2004	fenceline	0.0
G8 Excavation	11/4/2004	0-5 feet	0.0
G8 Stockpile	11/4/2004	10 feet	0.0
Perimeter (10:15AM)	11/4/2004	fenceline	0.0
G7 Excavation	11/4/2004	0-5 feet	0.0
G7 Stockpile	11/4/2004	10 feet	0.0
Perimeter (1:45PM)	11/8/2004	fenceline	0.0
I7 Excavation	11/8/2004	0-5 feet	0.0
I7 Stockpile	11/8/2004	10 feet	0.0
Perimeter (10:00AM)	11/9/2004	fenceline	0.0
J7 Excavation	11/9/2004	0-5 feet	0.0
J7 Stockpile	11/9/2004	10 feet	0.0
Perimeter (11:30AM)	11/9/2004	fenceline	0.0
K7 Excavation	11/9/2004	0-5 feet	0.0
K7 Stockpile	11/9/2004	10 feet	0.0
Perimeter (10:45AM)	11/10/2004	fenceline	0.0
I5 Excavation	11/10/2004	0-5 feet	0.0
Perimeter (1:00PM)	11/11/2004	fenceline	0.0
F4 Excavation	11/11/2004	0-5 feet	0.0
Perimeter (12:45PM)	11/12/2004	fenceline	0.0
D1 Excavation	11/12/2004	20 feet	0.0
D1 Excavation	11/12/2004	0-5 feet	0.0
J4 Excavation	11/15/2004	0-5 feet	0.0
A3 Concrete Wall Excavation	11/15/2004	0-5 feet	0.0
E1 Downwind	11/15/2004	20 feet	0.0
B4 Concrete Wall Excavation	11/15/2004	0-5 feet	0.0
B4 Downwind	11/15/2004	20 feet	0.0
D8 Concrete Wall Excavation	11/16/2004	0-5 feet	1.3
D9 Concrete Wall Excavation	11/16/2004	0-5 feet	0.9
D8/D9 Downwind	11/16/2004	10 feet	0.0
I4 Excavation	11/17/2004	0-5 feet	0.0
I4/J4 Stockpile	11/17/2004	0-5 feet	0.0
H2 Stockpile	11/18/2004	0-5 feet	0.0
H2 Stockpile - Downwind	11/18/2004	10 feet	0.0
Downwind from Leef (sweet odor)	11/18/2004	on site	0.0

Notes:
ppm = parts per million

Figures


Figure 1 Warden Oil
N
Basset Creek

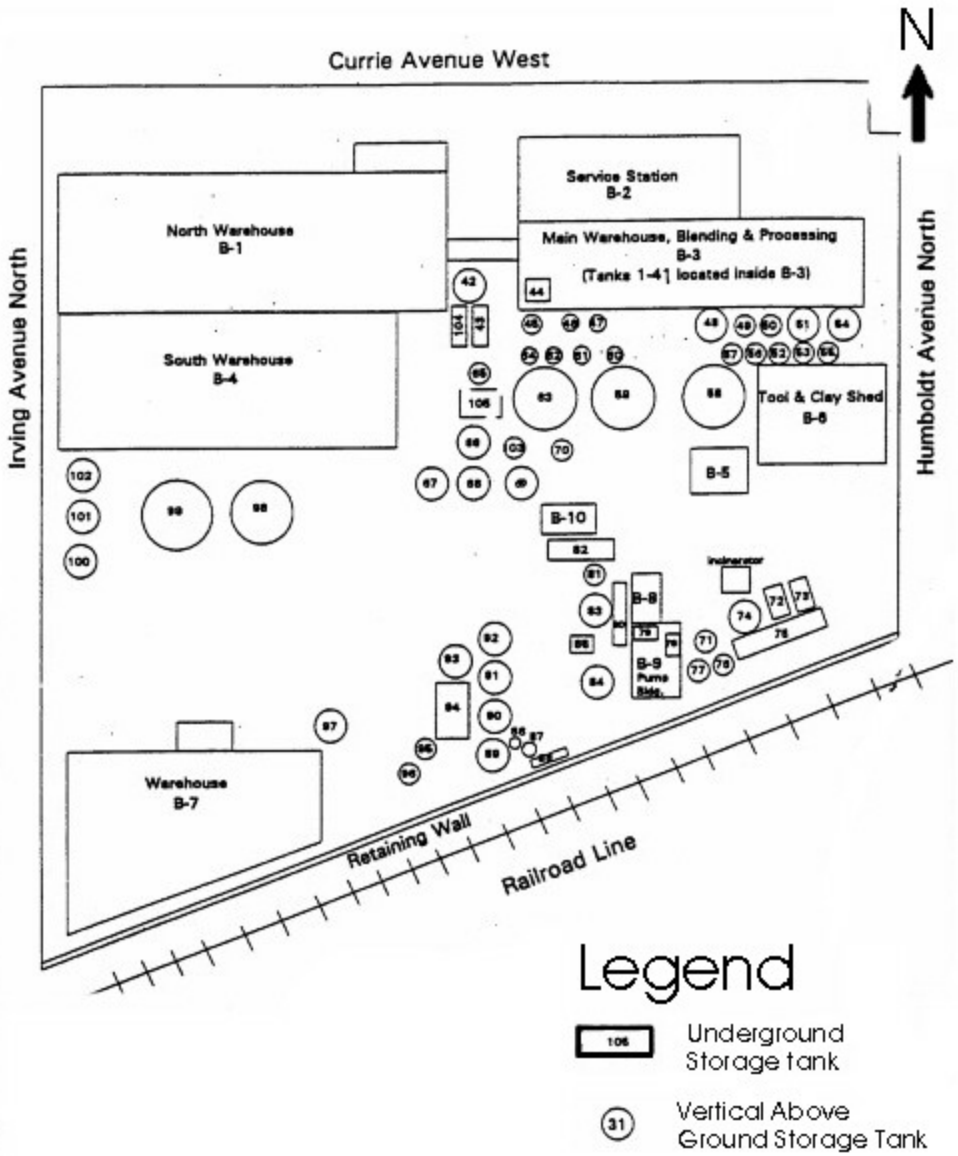

Figure 2 Warden Oil

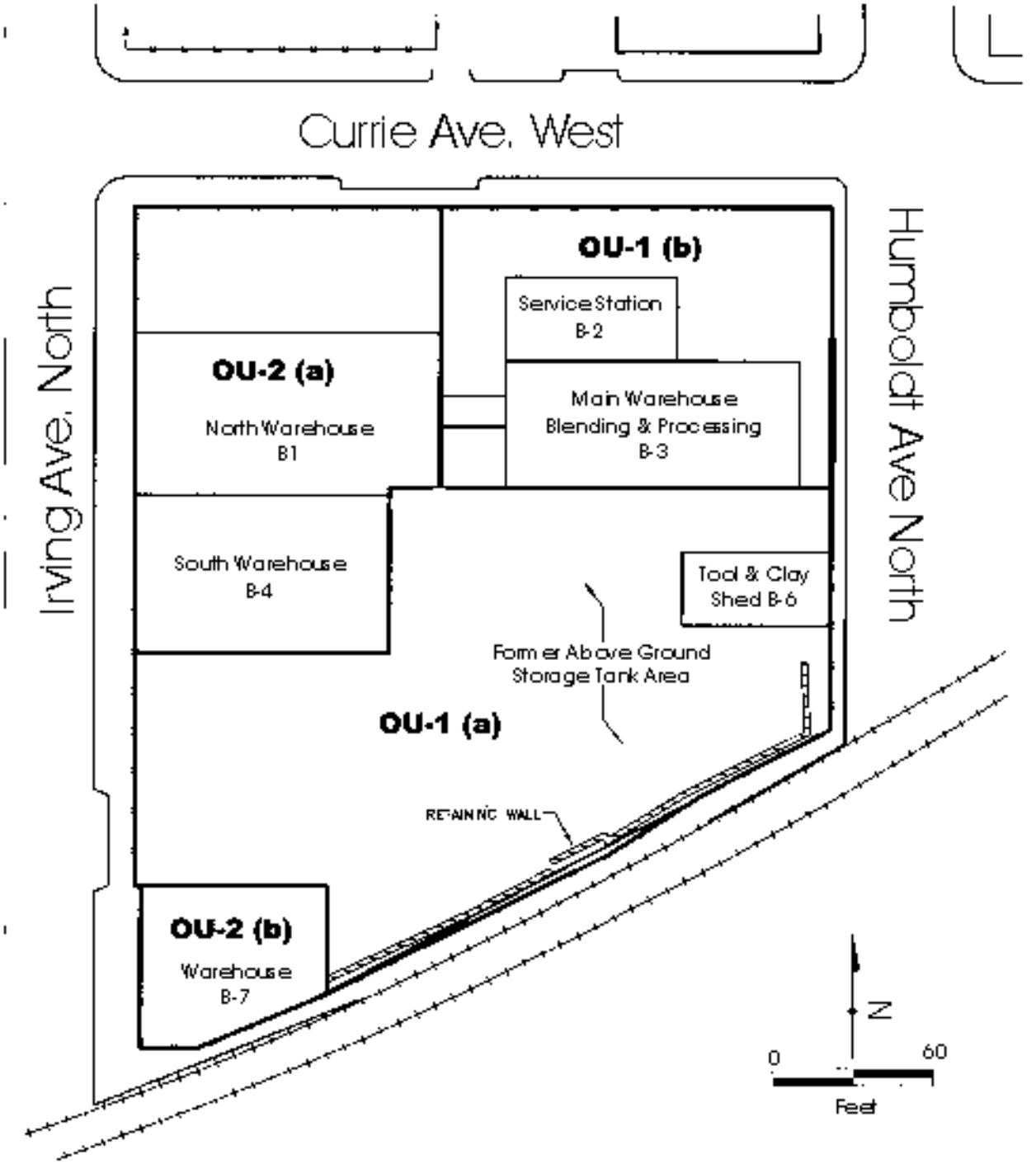

Figure 3 Warden Oil Operable Units

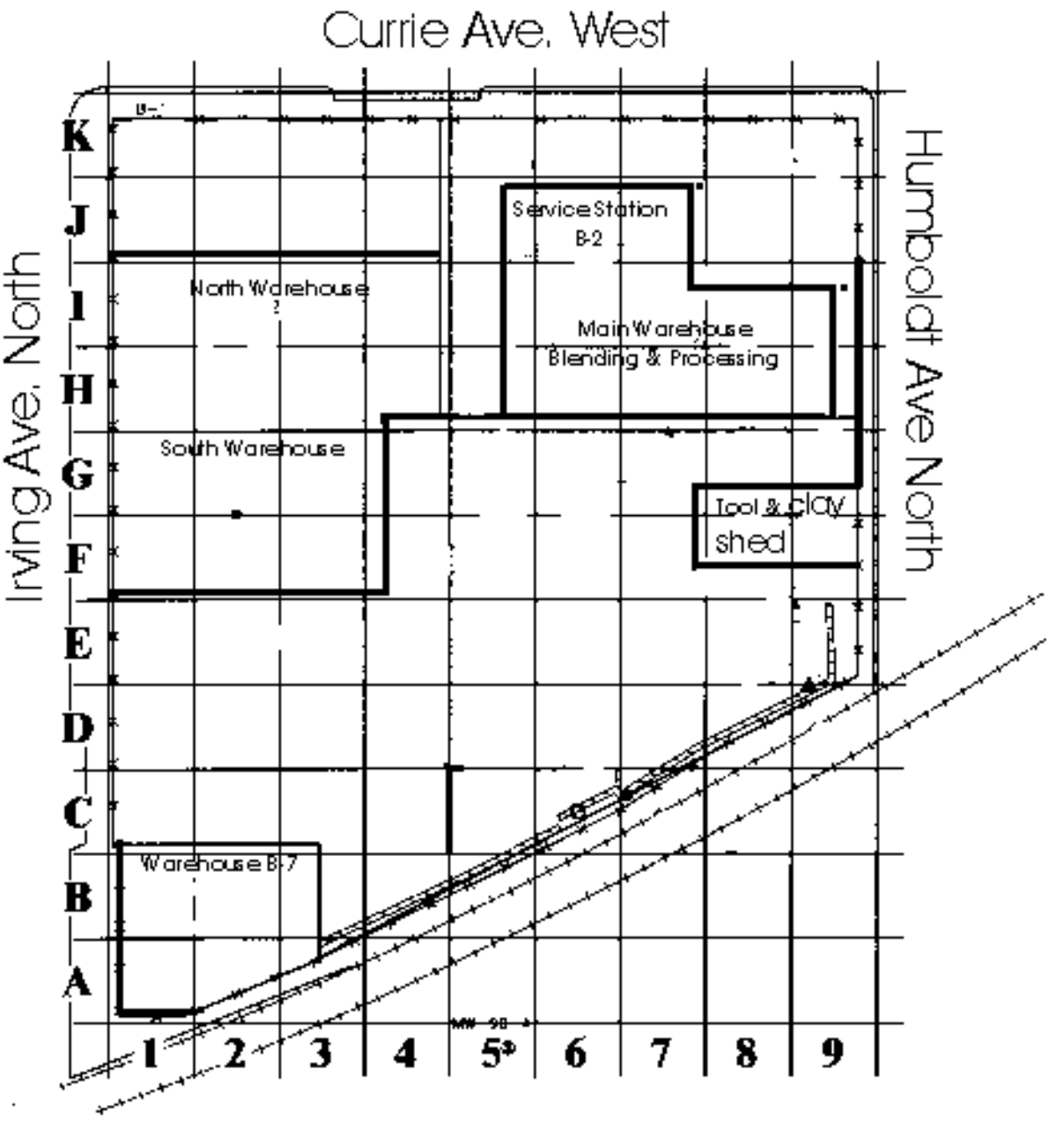

Figure 4
Warden Oil Excavation Grid