Five Year Review Report
Northwest Pipe & Casing
Clackamas, Oregon

Prepared for

U.S. Environmental Protection Agency
Region 10 Office of Environmental Cleanup
1200 Sixth Avenue
Seattle, WA 98101

Prepared by

Parametrix
700 NE Multnomah, Suite 1000
Portland, OR 97232-4110
503-233-2400
www.parametrix.com

Contract No: R-10 AES 68-S7-03-04
October 2, 2006 | 415-2328-007 (020)

Five-Year Review Report

for

Northwest Pipe and Casing

ORD 980988307
Clackamas, Oregon

September 2006

PREPARED BY:

USEPA Region 10
Environmental Cleanup Office

Approved by: Date:

9-22-06

for Daniel Opalski
Director, Environmental Cleanup Office
U.S. EPA Region 10

CITATION

U.S. Environmental Protection Agency. 2006.
Five Year Review Report
Northwest Pipe & Casing
Clackamas, Oregon. Prepared by Parametrix,
Portland, Oregon. October 2, 2006.

This page intentionally left blank.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional hydrogeologist licensed to practice as such, is affixed below.

Prepared by Eric A. Roth, R.G.

Approved by Randy Pratt, P.E.

This page intentionally left blank.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (*from WasteLAN*): Northwest Pipe and Casing / Hall Process Company Superfund Site		
EPA ID (*from WasteLAN*):ORD 980988307		
Region 10	**State: Oregon**	**County: Clackamas**
NPL status: **X** Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction **X** Operating ☐ Complete		
Multiple OUs?* X Yes ☐ No	**Construction completion date:** 6/04/2004	
Has site been put into reuse? X Yes ☐ No		
REVIEW STATUS		
Lead agency: X EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: Alan Goodman		
Author title: Remedial Project Manager	**Author affiliation:** USEPA, Region 10	
Review period: January 1, 2006 to May 30, 2006		
Date(s) of site inspection: 1/18/06		
Type of review **X** Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐NPL State/Tribe-lead ☐ Regional Discretion		
Review number: X1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action: **X** Actual RA On-site Construction at OU #1 ☐ Actual RA Start at OU # ☐ Construction Completion ☐ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date (*from WasteLAN*): August 1, 2001		
Due date (*five years after triggering action date*): August 1, 2006		

* ["OU" refers to operable unit.]

Five-Year Review Summary Form, cont'd.

Issues / Recommendations and Follow Up Actions:

OU1

Issue	Recommendations and Follow-Up Action	Affects Protectiveness Current / Future	Responsible Party	Milestone Date
The cancer slope factor for TCE is under review by EPA.	Evaluate the impact of any final change in TCE cancer slope factor to soil RAOs and RGs.	N / Y	EPA	8/01/2011
Invasive weeds are encroaching into the constructed wetland and the wetland buffer.	Continue weed removal as needed.	N / N	DEQ	Ongoing
Plants in the wetland buffer are stressed due to lack of water.	Provide water to plants as needed.	N / N	DEQ	Ongoing

OU2

Issue	Recommendations and Follow-Up Action	Affects Protectiveness Current / Future	Responsible Party	Milestone Date
Groundwater on NWDC property exceeds the RGs for PCE and TCE, yet beneficial use of groundwater on NWDC is not restricted by ICs.	Issue an ESD to require ICs on NWDC for groundwater use. Negotiate an EES between DEQ and NWDC to implement the ICs.	N / Y	EPA & DEQ	9/30/2007
Groundwater use restrictions ICs on ODOT property have not been implemented as required by the ROD.	Negotiate an EES between DEQ and ODOT.	N / Y	DEQ	6/30/2007
PCE and TCE concentrations in off-site groundwater are increasing.	Evaluate effectiveness of existing remedy and take necessary further response action to control off-site migration.	N / Y	EPA	6/30/2007
Contaminant mass removal rates and groundwater extraction rates of existing GCWs in source areas are either low or declining. It is currently not known if the groundwater cleanup will meet MCLs in the source areas in the 5- to 10-year time frame presented in the ROD.	Investigate causes and take necessary corrective actions to attain acceptable COC mass removal and groundwater extraction rates.	N / Y	EPA	6/30/2007

Issue	Recommendations and Follow-Up Action	Affects Protectiveness Current / Future	Responsible Party	Milestone Date
PCE and TCE contaminated groundwater associated with Plume 1 source area is migrating laterally and downward in the Intermediate WBZ. No GCWs are present to treat this groundwater.	Implement further response actions to treat source area groundwater in the Shallow and Intermediate WBZs associated with Plume 1.	N / Y	EPA	9/30/2007
GCW system performance has decreased due to problems such as well screen bio-fouling, reduced ZOI, equipment failures, etc.	Identify causes of decreased performance and implement corrective actions to either improve operational performance of GCWs or use a different technology.	N / Y	EPA	9/30/2007
Natural degradation of groundwater COCs on site is not adequately documented.	Gather additional data on COC natural degradation processes occurring on the site.	N / Y	EPA	8/01/2011
Potential exposure to onsite workers from indoor air vapor intrusion associated with contaminated groundwater.	Further evaluation of indoor air exposure pathway. Communicate results to building occupants on Parcel A. Implement necessary actions to address unacceptable exposure impacts.	N / Y	EPA	6/30/2007
GCW O&M costs are higher than ROD estimates.	Identify and implement actions to reduce O&M costs.	N / N	EPA	6/30/2007
The cancer slope factor for TCE is under review by EPA.	Evaluate the impact of any final change in TCE cancer slope factor on groundwater RAOs and RGs.	N / Y	EPA	8/01/2011
An undetermined source area of groundwater contamination may exist in the vicinity of the ODOT facility.	Investigate area to identify possible source of VOCs and implement any necessary response actions.	N / Y	EPA	9/30/2007

Protective Statements(s):

OU1

The remedy for OU1 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

All elements of the OU1 ROD have been completed, including the following actions:

- The removal and treatment or off-site disposal of highly contaminated surface and subsurface soils.
- The placement of a clean, re-vegetated soil cap on Parcel B.
- The implementation of institutional controls on Parcel B that ensures the cap integrity is not impacted by future uses.

OU2

The remedy for OU2 currently protects human health and the environment because the groundwater exposure pathways are currently incomplete and progress to meet the groundwater RGs is being made through an operating groundwater treatment system. Institutional controls are in place to restrict beneficial use of groundwater on Parcel B, which contains the highest concentrations of groundwater contaminants. Impacted groundwater on the ODOT and NWDC lots of Parcel A is not currently used for beneficial use. However, in order for the groundwater remedy to be protective in the long-term, the following actions need to be taken:

- Issue an ESD to require ICs on NWDC to restrict groundwater use until groundwater RGs are met. Negotiate an EES between DEQ and NWDC to implement the ICs.
- Complete current negotiations between DEQ and ODOT for an EES to implement ICs on the ODOT property.
- Evaluate effectiveness of existing remedy and take necessary further response action, if necessary, to control off-site migration.
- Investigate causes of low or declining contaminant mass removal rates and groundwater extraction rates and implement necessary corrective actions.
- Implement further response actions to treat source area groundwater in the Shallow and Intermediate WBZs associated with Plume 1.
- Identify causes of decreased GCW performance and implement corrective actions to either improve operational performance of GCWs or use a different technology.
- Evaluate the potential exposure to current onsite workers from indoor air vapor intrusion associated with contaminated groundwater. Advise building occupants of the results. Take necessary actions to address unacceptable exposure impacts.
- Evaluate the impact of any final change in TCE cancer slope factor on the groundwater RAOs and RGs.
- Investigate an area near the ODOT facility to identify possible source of VOCs and implement any necessary response actions.

SITE-WIDE

The site is currently protective of human health and the environment because the remedial actions at all OUs currently are protective. However, in order for the site to be protective for the long-term, the actions described above pertaining to the groundwater remedy need to be taken.

Other Comments:

None

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

APPENDICES

ACRONYMS

AOC	Area of Contamination
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Aboveground Storage Tank
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
CCDA	Clackamas County Development Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMT	Continuous Multi-Tubing Well
COC	Contaminant of Concern
CRBG	Columbia River Basalt Group
CRQL	Certified Required Quantitation Limits
CVOC	Chlorinated Volatile Organic Compound
cy	Cubic Yards
DEQ	Oregon Department of Environmental Quality
EA	Excavation Area
E&E	Ecology and Environment
EES	Easement & Equitable Servitude
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
ft/ft	Feet per Food
GCW	Groundwater Circulation Well
gpm	Gallons per Minute
HPC	Hall Process Company
IC	Institutional Control
IDW	Investigation-Derived Waste
LTRA	Long Term Response Action
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Contingency Plan
NGVD	National Geodetic Vertical Datum of 1988
NPL	Superfund National Priority List

ACRONYMS (CONTINUED)

NWDC	Northwest Development Company
NWPC	Northwest Pipe and Casing/Hall Process Company Superfund Site
OC	Oversight Contractor
ODOT	Oregon Department of Transportation
O&M	Operation & Maintenance
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act of 1976
RG	Remedial Goals
RI	Remedial Investigation
ROD	Record of Decision
TCE	Trichloroethene
TOPO	Task Order Project Officer
TSCA	Toxic Substances Control Act of 1976
UST	Underground Storage Tank
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WBZ	Water Bearing Zone
ZOI	Zone of Influence

EXECUTIVE SUMMARY

This report presents the findings of the first five-year review performed for the Northwest Pipe and Casing / Hall Process Company (NWPC) Superfund site located in Clackamas, Oregon. The five-year review was conducted in accordance with the Comprehensive Five-Year Review Guidance, U.S. Environmental Protection Agency, June 2001. The purpose of the review is to confirm that human health and the environment are being protected through the implementation of the remedy for the site.

The NWPC site is located between SE Lawnfield and SE Mather roads in Clackamas County, Oregon, approximately 20 miles southeast of Portland. The site covers approximately

53 acres of land and was divided into two parcels (Parcels A and B) for the purposes of site management. A pipe manufacturing and storage operation (Northwest Pipe and Casing) operated at Parcel A from 1973 to 1985. The eastern lot of Parcel A is owned by Northwest Development Corporation (NWDC) and contains three commercial-use buildings. A pipe coating business (Hall Process Company) operated at Parcel B from 1956 to 1978. Northwest Pipe and Casing leased the Hall property between 1978 and 1985, during which Northwest Pipe and Casing operated the pipe coating facilities. Contaminants released at the site into the soil and groundwater were volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).

The site is underlain by an upper water bearing zone (WBZ) that overlies a silt confining layer above the Troutdale Aquifer. The upper WBZ extends to about 90 feet below the ground surface (bgs) and consists of three hydrogeologic zones (shallow, intermediate, and deep). The silt confining layer serves as a hydraulic barrier between the upper WBZ and the Troutdale Aquifer.

The site was divided into two operable units (OUs) to address soil (OU1) and groundwater contamination (OU2). The remedy for OU1 addressed the bulk of the soil contamination that was found on Parcel B; the remedy for OU2 addressed the four groundwater plumes that extend beneath Parcels A and B.

OPERABLE UNIT 1

The remedial action objectives (RAOs) for OU1 called for preventing direct human contact with on-site contaminated soils and preventing migration of soil contaminants to the groundwater that would result in an excess lifetime cancer risk of one in one million or a Hazard Quotient of 1. The remedy for OU1 included:

- Treatment, removal and/or disposal of 32,310 tons of highly contaminated soil from Parcel B that exceed Oregon Hot Spot limits.
- Placement of a 2-foot clean soil cap over lesser contaminated soil at Parcel B.
- Construction of a wetland to compensate for wetland losses from cap construction.
- Development and implementation of a long-term maintenance program for the soil cap.
- Placement of institutional controls such as restrictive land use covenants.
- Other measures, including perimeter fencing and warning signs.

The findings of the Five-Year Review indicate that the OU1 remedy is functioning as intended. The remedy has been fully implemented and meets the RAOs. Follow-up issues identified include:

- Evaluate the impact of any final change by EPA in TCE cancer slope factor,
- Continue removal of invasive weeds from the wetland, and
- Provide water, as necessary, for distressed plants in the wetland buffer.

OPERABLE UNIT 2

The RAOs for OU2 called for preventing direct human contact with on-site contaminated groundwater and preventing migration of contaminated groundwater to deeper aquifers and off-site areas that would result in an excess lifetime cancer risk of one in one million or a Hazard Quotient of 1. The primary contaminants of concern (COCs) in the groundwater are tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride (VC). The remedy for OU2 has included:

- Installing and operating twelve (12) in-situ air stripping wells (groundwater circulation wells, or GCWs) in the highest COCs concentration areas of the upper aquifer Plumes 1 through 4. The wells are connected to five equipment sheds that each house a blower, vapor extraction equipment, and activated carbon canisters for treatment.
- Installing groundwater monitoring wells in the vicinity of the treatment wells to evaluate their effectiveness over time for reducing contaminant concentrations in groundwater.
- Installing and operating three (3) in-situ air stripping wells and an equipment shed in the vicinity of Lawnfield Road to prevent off-site migration of contaminated groundwater. The wells are to remove contaminants from groundwater before it moves off-site.
- Using natural processes outside of the source areas to reduce contaminant concentrations in groundwater outside of the source areas.
- Conducting annual sampling of groundwater monitoring wells to evaluate the progress toward attaining the groundwater remedial goals. If the data collected during operation show that the expected decline in COCs is not being achieved, then the EPA will adjust system operations. If the data confirms that the expected decline in COCs concentrations is being achieved after five years, then EPA will discontinue operation of the in-situ air stripping wells.
- Placing and enforcing ICs on the western lot of Parcel A and on Parcel B to ensure access for treatment systems operation and monitoring and to restrict future beneficial use of groundwater until cleanup levels are met.

The findings of the Five-Year Review indicate that the OU2 remedy is not fully functioning as intended, despite progress towards meeting the RAOs. Follow-up issues identified include:

- Issue an Explanation of Significant Difference (ESD) to require ICs on the NWDC property for restricting groundwater use until cleanup levels are met. Negotiate an EES between DEQ and NWDC to implement the ICs.
- Complete current negotiations between DEQ and ODOT for an EES to implement ICs on the ODOT property.

- Evaluate effectiveness of existing remedy and take necessary further response action, if necessary, to control off-site migration.
- Investigate causes of low or declining contaminant mass removal rates and groundwater extraction rates and implement necessary corrective actions.
- Implement further response actions to treat source area groundwater in the Intermediate WBZ.
- Identify causes of decreased GCW performance and implement corrective actions to either improve operational performance of GCWs or use a different technology.
- Evaluate the potential exposure to onsite workers from indoor air vapor intrusion associated with contaminated groundwater, communicate evaluation results to building occupants, and identify any necessary follow-up actions.
- Evaluate the impact of any final change in TCE cancer slope factor.
- Investigate an area near the ODOT facility to identify possible source of VOCs and implement any necessary response actions.

This page intentionally left blank.

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) Region 10 prepared this Five-Year Review of completed and ongoing remedial actions (RAs) at the Northwest Pipe and Casing / Hall Process Company Superfund Site (NWPC) in Clackamas, Oregon. This is a "statutory" review and is the first Five-Year Review for the site, covering the period of August 2001 through July 2006. EPA, as lead agency for the site, conducted this review.

This Five-Year Review was conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106] of the NCP, the President shall take or require such action. The President shall report to Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

For the purpose of conducting RAs at the NWPC site, two Operable Units (OUs) were organized (EPA 2000, EPA 2001):

- Operable Unit 1 (OU1); Contaminated Soil and Debris

  OU1 includes Parcel B structures and features, including subsurface piping, underground storage tanks (USTs), aboveground storage tanks (ASTs), soil piles, drums of investigation-derived waste, and contaminated soil.

- Operable Unit 2 (OU2); Contaminated Groundwater

  OU2 includes all impacted groundwater with contamination originating on site.

The triggering action for this review was the initiation of onsite construction activities for OU1 in August 2001. The Five-Year Review is required due to the presence of contaminants that remain at the site above levels that allow for unlimited land use and unrestricted exposure. It is the purpose of this Five-Year Review to confirm that threats to human health and the environment have been addressed through the implementation of the selected remedy; and to evaluate specific elements of the remedy to verify that design, implementation, and operation of the remedy are functioning and/or performing as intended.

This page intentionally left blank.

2. SITE CHRONOLOGY

An overview of site chronology with significant milestones is displayed in Table 2-1.

Table 2-1. Site Chronology

	Date
Parcel B ownership (22.5 acres) transferred to Hall Process Company (HPC) from Orling Lumber Company.	1956
Pipe-coating facility in operation by HPC on Parcel B.	1956 through 1978
Parcel A ownership transferred to Clackamas Land Co. from Mr. Ralph Elle.	April 6, 1967
Parcel B ownership (9.5 acres) transferred to W. Hall Sr. and Jr. from HPC.	1968
W. Hall Jr. acquired 9.5-acre tract from his father.	1972
Parcel A ownership transferred to Northwest Pipe and Casing from Clackamas Land Co.	1973
Northwest Pipe and Casing operated a steel pipe manufacturing facility on Parcel A.	1973 through 1985
Mr. Hall, Jr., acquired 22.5-acre tract of Parcel B from HPC.	1974
HPC ceased operations of pipe coating facility on Parcel B.	1978
Parcel B leased by Northwest Pipe and Casing from Mr. W. Hall, Jr.	1978 through 1985
Northwest Pipe and Casing continued pipe coating operations on Parcel B.	1978 to 1985
Northwest Pipe and Casing declared bankruptcy and stopped all pipe coating operations.	1985
Parcel A divided. Ownership of the western lot (11.8 acres) is transferred to Oregon Department of Transportation (ODOT), which built an office/warehouse and equipment yard. Ownership of the eastern lot (9.1 acres) is transferred to Northwest Development Company (NWDC), which was occupied by three low-rise buildings for commercial business.	1985
A 9.5-acre tract of Parcel B is leased to NWDC from Mr. W. Hall Jr.	1986
EPA contacted by former employee and informed of mishandling of waste; EPA visited the site and assigned a “Medium” inspection priority.	July 1986
Oregon Department of Environmental Quality (DEQ) conducted a Preliminary Assessment of the site.	September 1987
EPA’s contractor Ecology & Environment (E&E) prepared Site Inspection Report.	December 1989
EPA’s contractor E&E conducted a Listing Site Inspection. Off-site migration of contaminants in sediment and groundwater were documented.	1990
NWPC placed on the Superfund National Priority List (NPL).	October 14, 1992
EPA’s contractor E&E conducted a Site Assessment. Elevated levels of inorganic compounds, volatile organic compounds, and polyaromatic hydrocarbons were detected in surface soils. E&E concluded that waste debris was present below ground surface and posed a potential impact to regional groundwater quality.	1993

(Table Continues)

Table 2-1. Site Chronology (Continued)

	Date
A CERCLA Removal Action was conducted on Parcel B, including perimeter fencing, warning signs, demolition of vacant buildings and off-site disposal of demolition debris.	1993
A Health Assessment was conducted by the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR identified soil and the deep aquifer as exposure pathways and ambient air as a past exposure pathway.	1995
EPA issued special notices for potentially responsible parties (PRPs). These include Northwest Pipe and Casing, Mr. W. Hall, Jr., ODOT, and NWDC.	June 1995
EPA initiated a Remedial Investigation (RI) and Feasibility Study (FS).	1996
Consent Decrees between EPA, DEQ and responsible parties entered in federal court. The consent decrees included monetary settlement of PRPs to EPA and to the State.	1997 to 1998
Parcel B ownership transferred from W. Hall to DEQ, as trustee for EPA and DEQ.	1997
Approximately 230 tons of surface debris was removed from Parcel B prior to conducting the RI.	1998
EPA conducted a Baseline Risk Assessment.	1998
Final RI Report for OU1 and OU2, prepared by EPA's contractor Weston.	August 1998
Final FS Report for OU1 and OU2, prepared by EPA's contractor URS.	August 1999
Public comment period for proposed plan.	January 31 to March 31, 2000
The OU1 Record of Decision (ROD) was issued.	June 29, 2000
Phase 1 (soil excavation/treatment) of the Remedial Action (RA) for OU1 was conducted, including the management of 32,010 tons of material.	August 1, 2001 through June 18, 2002
The OU2 ROD was issued.	September 27, 2001
GCW pilot test performed to determine the implementability of the remedial alternative selected for OU2.	January 2003
Final Basis of Remedial Design Report for OU2 by EPA's contractor URS.	March 2003
Initiation of the RA for OU2, including the construction and operation of groundwater circulation wells (GCWs).	July 2003
Phase 2 of the RA (soil capping) for OU1 was completed, including the placement of a 2-foot clean soil cap on the site.	March 31, 2003 through September 8, 2004
The Explanation of Significant Differences (ESD) was issued, primarily wetlands mitigation and restoration.	March 3, 2004
OU2 Baseline Groundwater Monitoring and GCW Performance Testing Report prepared by EPA's contractor URS.	April 2004
Preliminary Close Out Report for Construction Completion issued by EPA.	June 4, 2004
EPA issued final acceptance letter to RA contractor for construction phases of OU1 and OU2 RAs.	July 27, 2004
Combined Final RA Report for OU1 and Interim RA Report for OU2, prepared by EPA's contractor URS.	August 2004
Continuous Multi Tubing (CMT) Wells were installed to delineate and characterize newly discovered groundwater contamination.	August 2004
Final Wetland Monitoring Report Year 1 of 5, prepared by EPA's contractor URS.	September 2004

(Table Continues)

Table 2-1. Site Chronology (Continued)

	Date
Final Wetland Monitoring Report for Year 2 of 5, prepared by EPA's contractor URS.	June 2005
Final Year 1 GCW Operation Monitoring Report, prepared by EPA's contractor URS.	June 2005
Operational and Functional Determination for OU1 and OU2 issued by EPA.	July 20, 2005
State assumes responsibility for operation and maintenance of OU1.	July 20, 2005
Start of Long Term Response Action (LTRA) for OU2.	July 20, 2005
Final Technical Memorandum for Proposed Expansion of GCW Treatment System, prepared by EPA's contractor URS.	July 21, 2005
Failure of well GCW-15.	July 2005
Ownership of Parcel B transferred from DEQ/EPA to Clackamas County through property sale. The county takes over operation and maintenance responsibilities for OU1. EPA retains responsibilities for OU2.	October 5, 2005
Installation of supplemental groundwater monitoring wells by EPA's contractor Parametrix.	February 2006
Installation and start-up of replacement well GCW-15R.	March 2006
Final Site-Wide Groundwater Monitoring Report, prepared by EPA's Contractor Parametrix.	April 12, 2006
Supplemental Groundwater Monitoring Report, prepared by EPA's Contractor Parametrix.	June 28, 2006

This page intentionally left blank.

3. BACKGROUND

This chapter presents a brief overview of the NWPC's physical characteristics, current and future land and resource use, contamination history, initial agency response, and basis for taking action.

3.1 SITE LOCATION / GENERAL DESCRIPTION

The NWPC is located between SE Lawnfield and SE Mather roads in Clackamas County, Oregon, approximately 20 miles southeast of Portland (Figure 3-1). The site lies immediately to the east of the Southern Pacific Railroad tracks and approximately 0.5 mile east of Interstate 205. The vicinity of the site consists primarily of light industrial and commercial properties. The closest residential community is located approximately 0.5 mile south-southeast of the site (URS 1999).

The site covers approximately 53 acres of land and is divided into two parcels for the purposes of site management (Figure 3-2). This division is based on historical uses of the property. Parcel A consists of 21 acres, and was the historical location of the Northwest Pipe and Casing facility. Parcel B consists of 32 acres, and was the historical location of the Hall Process Company and the Northwest Pipe and Casing facility.

3.1.1 Parcel A

Parcel A is divided into two lots adjacent to SE Industrial Way.

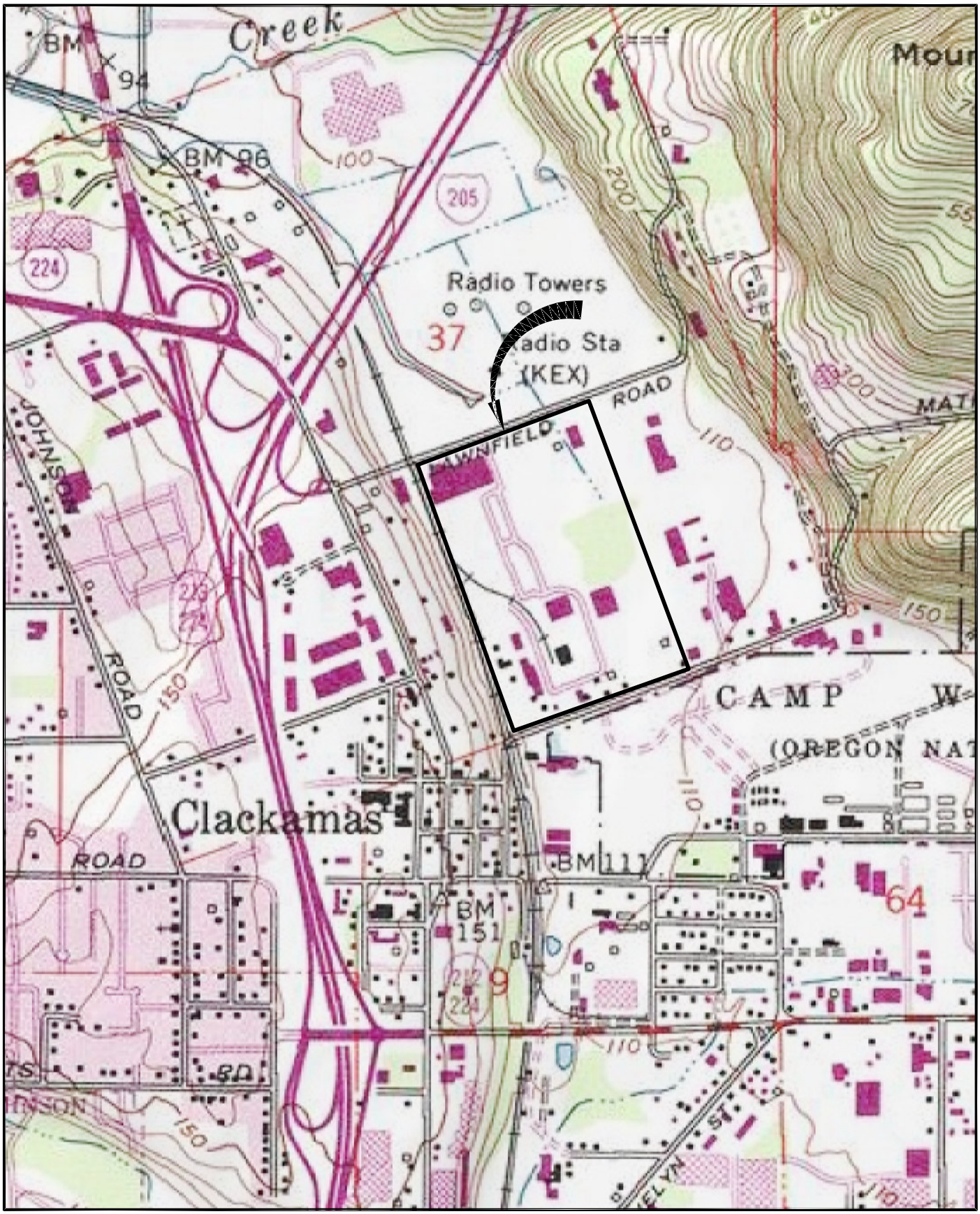
The western lot (11 acres) is owned by ODOT. The property currently houses office/warehouse space, an equipment yard, and a greenhouse and plant nursery. A card-lock fueling station is located in the western end of the equipment yard. The majority of the lot is paved, with some landscaping on the northern and eastern portions. Four groundwater circulation wells (GCWs), two associated equipment sheds, and twelve monitoring wells associated with the remedial actions are also located on this lot.

The eastern lot (10 acres) is owned by NWDC. The property is currently occupied by the Clackamas Commerce Park and consists of three warehouse/office spaces and associated parking lots. The entire lot is paved, with the exception of landscaping on the northern portion. Eight monitoring wells associated with the RA are also located on this lot.

3.1.2 Parcel B

Parcel B is the location of former pipe-coating operations. The parcel is now vacant, with the exception of wells and structures or features associated with the RA. The entire 32-acre parcel is covered with a soil cap placed as part of Phase 2 of the OU1 RA. A 1-acre artificial wetland which drains north to Dean Creek was also created in the northeast portion of the parcel as part of Phase 2 of the OU1 RA. Gravel roads transecting the parcel and providing access to equipment sheds and wells were installed after the soil cap was completed. An office trailer and equipment storage locker associated with the operation of the on-site remedial systems are located at the southern end of Parcel B.

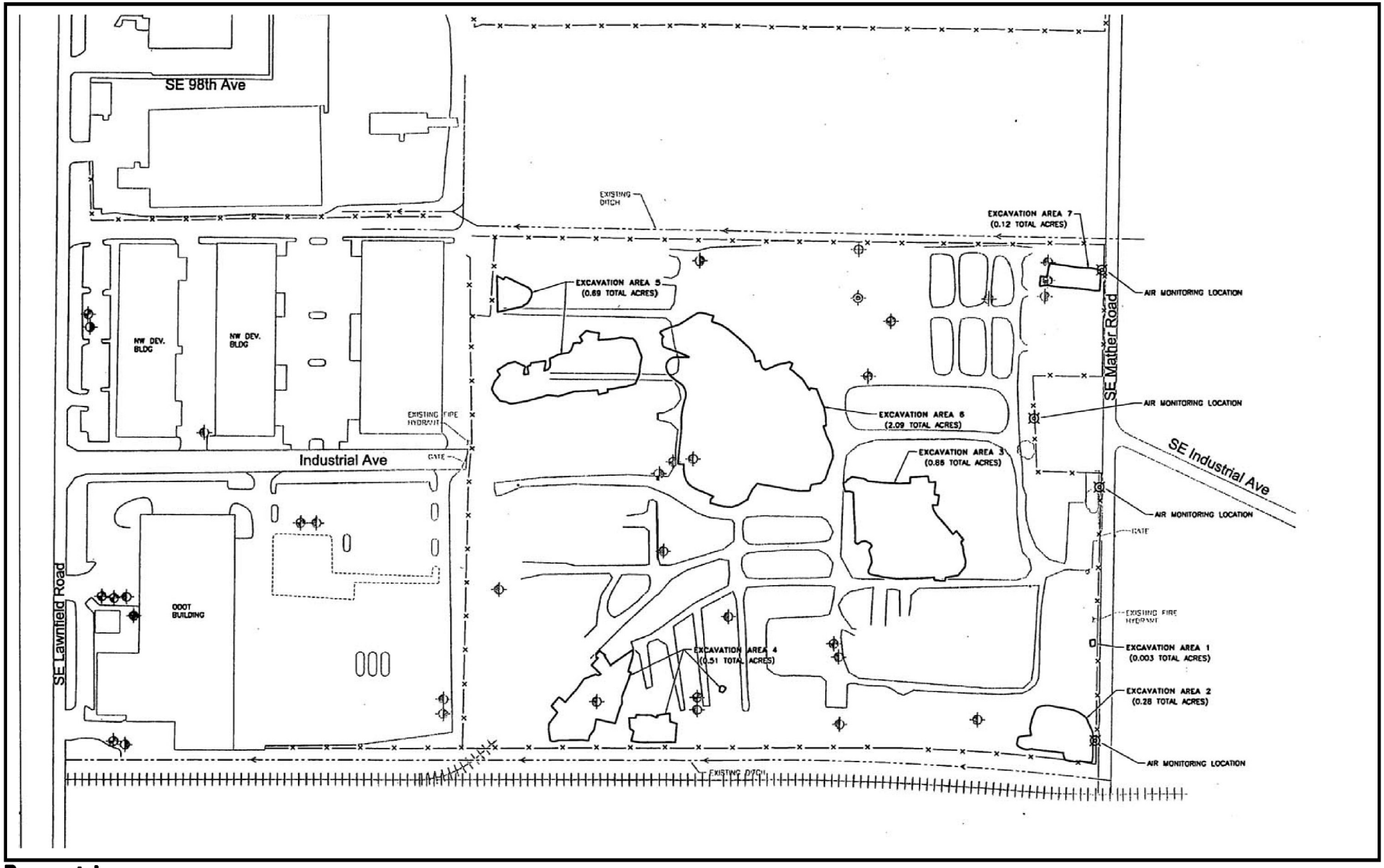
This page intentionally left blank.



Parametrix DATE: May 18, 2006 FILE: PO2328007CF-06

Figure 3-1
Site Location Map

This page intentionally left blank.



Parametrix DATE: Aug 08, 2006 FILE: PO2328007CF-31

N

NOT TO SCALE

REFRENCE:
URS CORPORATION; INTERIM REMEDIAL ACTION REPORT, 2002
NORTHWEST PIPE AND CASING/ HALL PROCESS COMPANY. FIGURE 4.

Figure 3-2
Site Features Map

This page intentionally left blank.

3.2 PHYSICAL CHARACTERISTICS

The following section describes the NWPC's physical characteristics, including topography, surface water drainage, geology, and hydrogeologic strata underlying the site.

3.2.1 Physical Setting

The site is located in a north-south trending valley bounded by Mount Talbert to the east and a low lying bluff to the west. Ground surface elevations at the site range between 100 and 115 feet National Geodetic Vertical Datum 1988 (NGVD), with Mount Talbert approximately 740 feet NGVD and the western bluff approximately 150 feet NGVD (Weston 1998a). The valley is within the Portland Basin, a major structural depression trending north-southeast that is bounded by the Tualatin Hills to the west and the Cascade Mountains to the east.

3.2.2 Drainage

The valley is currently drained by Dean Creek and Mount Scott Creek, which flow to the north-northwest and ultimately to the Willamette River (Weston 1998a). Surface water along the southern boundary of Camp Withycombe drains south to the Clackamas River, indicating that a surface water divide exists south of NWPC (Weston 1998a). The regional drainage pattern of the Clackamas River and the area topography suggests that the valley in which the site lies may have been formerly occupied by the ancestral Clackamas River.

The site is not within the Clackamas River floodplain; however, it is susceptible to surface water ponding due to poor drainage (Weston 1998a). The highest historical monthly rainfall occurs between November and January, with average monthly totals exceeding 5.5 inches (Weston 1998a). Groundwater in the wet season is at or near the surface. On-site runoff generally drains into manmade ditches on the eastern and western boundaries of the site, which in turn flow into Dean Creek.

3.2.3 Regional Geology

The Portland Basin is underlain by Eocene to Miocene volcanic and sedimentary rocks, the most extensive of which are the flood basalts of the Columbia River Basalt Group (CRBG). These basement rocks are in turn overlain by the Miocene to Holocene consolidated and unconsolidated fluvial sediments. The Sandy River mudstone and the Troutdale Formation are the oldest of the basin-filling sediments. These sediments are up to 1,500 feet thick, and were deposited by the ancestral Columbia River and ancestral streams from the Cascades.

The Pliocene Sandy River mudstone consists of mudstone, siltstone, sand, and claystone that lie directly on top of the CRBG.

The Troutdale Formation generally overlies the Sandy River mudstone, although the two units are locally interbedded. The Troutdale Formation consists of quartzite-bearing conglomerate and vitric sandstone, and is considered an important water bearing unit in the Portland basin.

Locally, Pliocene-Pleistocene Boring lavas (such as Mount Talbert immediately to the east of the site) are interbedded with and overlie the Troutdale Formation.

Coarse-grained Pleistocene fluvial deposits and clay-dominated debris flows overlie the Troutdale Formation and Boring lavas. In the vicinity of the site, the fluvial deposits were likely deposited by the ancestral Clackamas River. Overlying the fluvial deposits are

generally coarse-grained upper Pleistocene catastrophic flood deposits. The uppermost regional unit is Holocene alluvium consisting of interbedded silts, sands, and gravels.

3.2.4 Site Geology

Five distinct subsurface geologic units were identified at the site (Weston 1998a; Parametrix 2006a):

Fill Unit. Consists of grayish brown silty gravel that was imported as fill material over much of Parcel B and portions of Parcel A. The fill unit is typically between 1 to 1.5 feet thick; however, it may be up to 5 feet thick in areas that were locally excavated. This unit does not include the fill material brought in as a cap as part of the OU1 RA.

Upper Silt Unit. Consists of grayish brown sandy silt / silt having moderate to high plasticity, with some fine gravel. The upper silt unit is encountered at a depth of 5 to 10 feet below ground surface (bgs), and is interpreted as Holocene overbank deposits and lacustrine sediments deposited by the ancestral Clackamas River.

Upper Gravel Unit. Consists of a grayish brown silty gravel in the upper portion of the unit (10 to 25 feet bgs) and grades to yellowish brown sandy gravel / gravel in the lower portion of the unit (25 to 90 feet bgs). Interbedded sands and silts of various thicknesses have been noted, but do not appear to be laterally continuous. The Upper Gravel Unit is interpreted as Pleistocene catastrophic flood deposit.

Lower Silt Unit. Consists of greenish gray to black gray silt, dense, and hard. The unit is encountered between 90 feet and 110 feet bgs, and is interpreted to be Eocene to Miocene low-energy environment deposit that may be associated with the ancestral Columbia River.

Lower Gravel Unit. Consists of sandy gravel, which is encountered at approximately 110 to 135 feet bgs. The unit is interpreted to be the Troutdale Formation or equivalent.

3.2.5 Site Hydrogeology

Five hydrostratigraphic units are interpreted to occur beneath the site (Weston 1998a; Parametrix 2006b):

- **Shallow Water Bearing Zone (WBZ)**: corresponds to the upper portion of Upper Gravel Unit. The shallow WBZ extends from approximately 15 to 25 feet bgs, and typically yields water at rates from 2–10 gallons per minute (gpm).
- **Intermediate WBZ**: corresponds to the lower portion of the Upper Gravel Unit. The intermediate WBZ extends from approximately 25 to 60 feet bgs, and typically yields water at rates from 10 to 25 gpm.
- **Deep WBZ**: corresponds to the lower portion of the Upper Gravel Unit. The deep WBZ extends from approximately 60 to 90 feet bgs. Hydraulic properties of this zone have not been determined; however, they are thought to yield water at rates greater than 20 gpm.
- **Confining Unit**: corresponds to the Lower Silt Unit. The Confining Unit extends from 90 to 110 feet bgs. Hydraulic properties of the unit have not been determined; however, drillers logs indicate the unit has poor water bearing properties.

- **Lower WBZ (Troutdale Gravel Aquifer equivalent)**: corresponds to Lower Gravel Unit, and is observed at depths greater than 100 feet bgs. The Lower WBZ is reportedly under confined conditions. The Troutdale Aquifer is an important and productive source of groundwater in the Portland Basin.

The shallow, intermediate and deep WBZs are considered to be part of the upper WBZ. The Confining Unit separates the upper WBZ from the lower WBZ.

Groundwater elevations in the Shallow and Intermediate WBZs range from 100 to 106 feet NGVD. Groundwater flow direction in the Shallow and Intermediate WBZs is approximately north to northwest (Figures 3-3 and 3-4, respectively). Natural groundwater hydraulic gradients vary seasonally and range from 1.0E-03 feet per foot (ft/ft) to 1.0E-05 ft/ft.

3.3 HISTORIC, CURRENT AND POTENTIAL FUTURE LAND USE

The following section presents historic land use and a summary of site activities at NWPC. NWPC is currently zoned for light industrial use. Tentative future plans for the site include the construction of a state highway connector (Sunrise Corridor) through the western portion of Parcel A and Parcel B. Reasonably anticipated future land use for the remaining area of the site is light industrial use / commercial.

3.3.1 Parcel A

Historic Use

Land use from 1973 to 1985 consisted of pipe manufacturing and storage by Northwest Pipe and Casing Company. Manufacturing operations entailed milling bulk steel coil into the desired pipe diameter and cut to length in a process that used a soluble oil and water bath. Metal filings were generated and accumulated in the bottom of the oil/water bath. Small-scale patch coating reportedly occurred in the vicinity of the former pipe manufacturing plant. Northwest Pipe and Casing declared bankruptcy in 1985.

Current Use

In 1985 Northwest Pipe and Casing subdivided Parcel A into an eastern and western lot. The lots were bisected by Industrial Way. The western half of the property (11.8 acres) was purchased by ODOT for highway maintenance. ODOT constructed a warehouse, office space, equipment yard, and nursery on the western lot of Parcel A that are currently in use.

The eastern half of the property (9.1 acres) was purchased by Northwest Development Corporation, which built three low-lying buildings for commercial and light industrial use that are currently occupied. Remaining portions of Parcel A are either paved or landscaped.

Both ODOT and NWDC retain ownership in their respective properties.

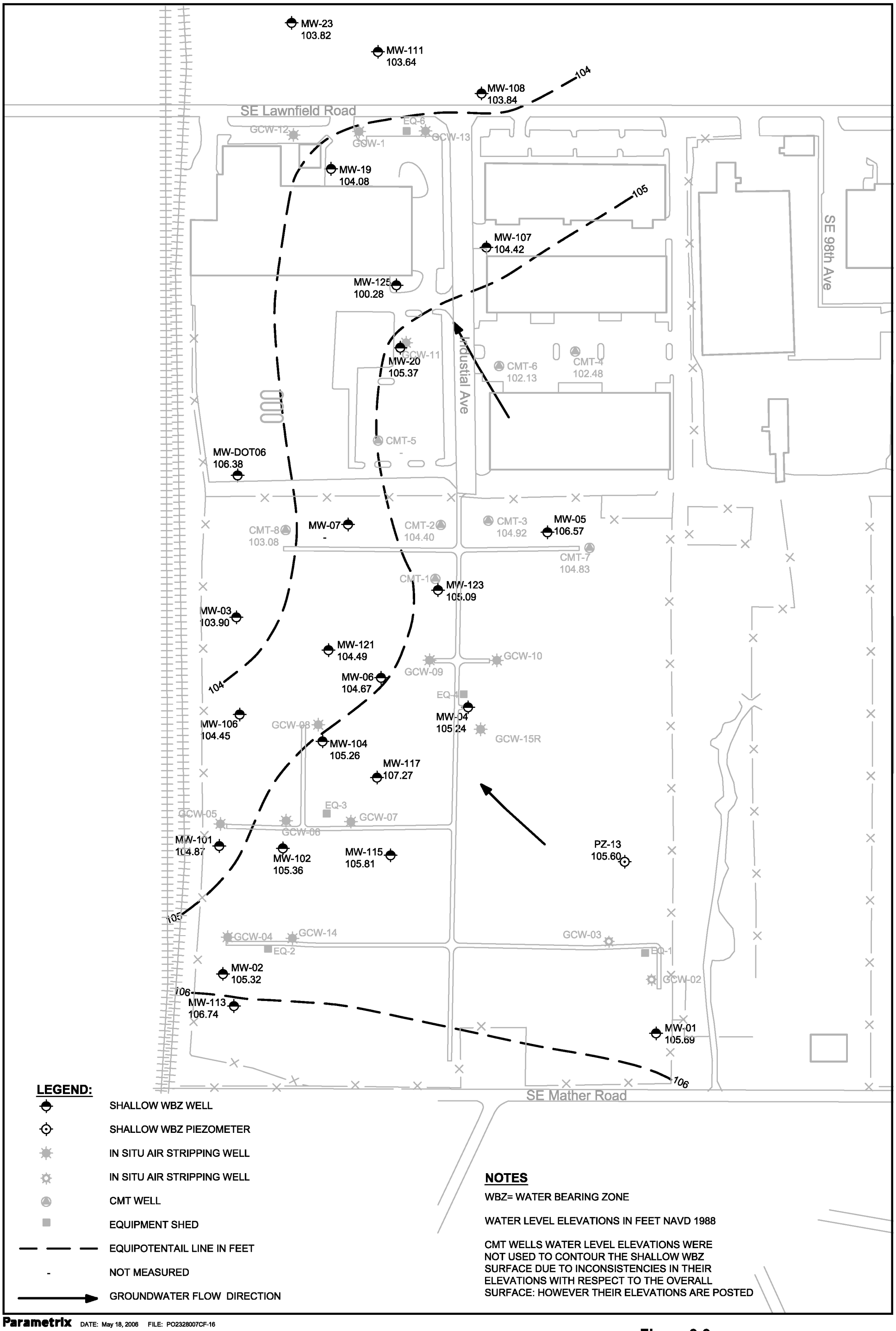
Future Use

Based on communications with NWDC, the future use of the eastern half of Parcel A will remain commercial and/or light industrial.

Based on communications with ODOT and Clackamas County Development Agency (CCDA), buildings and structures on the western half of Parcel A will need to be demolished prior to the construction of roadway and roadside development that will link I-205 to

Hwy 224 via the Sunrise Corridor Project. Change in current conditions will not likely occur before Year 2010.

This page intentionally left blank.



Parametrix DATE: May 18, 2006 FILE: PO2328007CF-16

N

0 200'

SCALE IN FEET

Figure 3-3
Water Level Elevation Contour Map
Shallow Water Bearing Zone
November 2005

This page intentionally left blank.

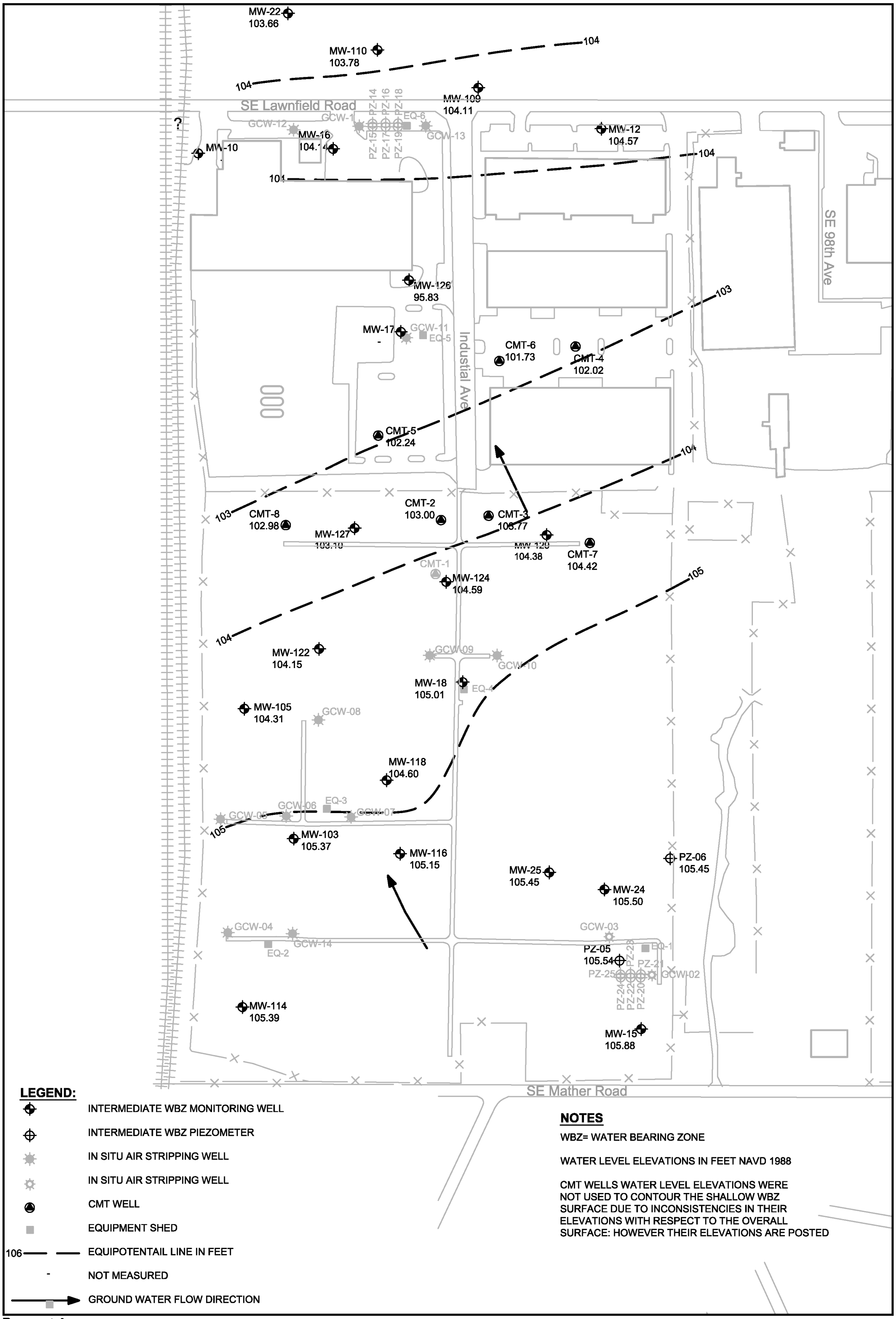


Figure 3-4
Water Level Elevation Contour Map
Intermediate Water Bearing Zone
November 2005

This page intentionally left blank.

3.3.2 Parcel B

Historic Use

HPC acquired a majority of Parcel B (22.5 acres) in 1956 from Orling Lumber Company. Historical land use activities associated with lumber operations is poorly understood. The remaining portion of Parcel B (9.5 acres) was purchased jointly by Wayne Hall, Sr., and Wayne Hall, Jr., in 1968. Mr. Hall, Jr., acquired his father's interest in the tract sometime after 1972. Mr. Hall, Jr., purchased HPC's interest in Parcel B, and became the sole owner of the entire parcel.

HPC conducted pipe coating activities from 1956 to 1978. In 1978, HPC ceased operations and Mr. Hall, Jr., leased the property and pipe coating facility to Northwest Pipe and Casing, which continued pipe coating operations until 1986. These operations entailed sandblasting with steel shot, spraying with primer, and covering the pipe with a coating material. A VOC-based primer was used to help the coating adhere to the pipe. Coating materials included coal tar, coal tar epoxy, asphalt, polyethylene epoxy, and concrete. Various solvents were used in the maintenance of pipe coating machinery.

The parcel was used by an export company from September 1986 to January 1987, and subsequently by a truck driving school until January 1989. In 1993 the buildings which remained on-site were demolished under EPA authority.

In 1997 ownership was transferred from Mr. Hall, Jr., to DEQ as a trustee for EPA and the State, as part of the Consent Decree settlement.

Current and Future Use

The property was purchased from the agencies by Clackamas County Development Agency on October 5, 2005. The property is currently vacant except for structures associated with the groundwater remediation activities. The future intended use of the property is to connect Highway 224 to Interstate 205 via the proposed Sunrise Corridor Project. The project could take up to 10 years to complete (URS 1999). EPA was advised in July 2006 by CCDA that it is considering allowing interim uses of Parcel B prior to construction of the Sunrise Corridor. These interim uses include a rail spur and storage yard. No details of these planned interim uses were available to EPA at the time this Five Year Review Report was prepared. Development activities on Parcel B are required to be reviewed and approved by DEQ and EPA under the terms of an Easement and Equitable Servitude recorded with the property deed in 2005.

Adjacent Property Current and Future Use

Property adjacent and in proximity to the site is used for a variety of industrial and commercial purposes, such as metal fabrication and equipment manufacturing. Adjacent properties include:

A large transmission tower and complex operated by KEX radio occupies a large open field north of the site. Based on communications with Clackamas County Development Agency, an on ramp / off ramp for the Sunrise Corridor Project is likely to be constructed on a portion of the KEX property.

The National Guard Camp Withycombe facility operates southeast of the site. Based on communications with Clackamas County Development Agency, the camp will likely expand its complex to the northwest towards the southeast portion of Parcel B.

Oregon Iron Works operates a manufacturing facility east of the site. Based on communications with Clackamas County Development Agency, the facility has inquired about placement of a rail spur on the northeast corner of Parcel B.

The closest residence to the site is located 500 feet to the southwest. A small residential area known as Hollywood Garden is located approximately 0.5 mile southeast of the site

(EPA 2000). No information regarding changes in future use was readably available.

3.4 CURRENT AND POTENTIAL FUTURE USE OF GROUNDWATER

Businesses and residences at and in the vicinity of the site are connected to municipal water sources through the Clackamas County Water District (EPA 2001). No current use of groundwater for drinking water exists at or adjacent to the site. The nearest potential receptor well is the KEX industrial well, located approximately 450 feet north of Parcel A and

SE Lawnfield Road. The well is not used for potable water and has no observed detections of COCs in groundwater. The closest reported domestic well downgradient of the NWPC is located approximately 3,000 feet north-northwest of SE Lawnfield Road.

However, groundwater at the site is considered to be a potential source of drinking water and therefore is classified as Class II groundwater under the EPA Guidelines of Ground-Water Classification, Final Draft (December 1986). There are no immediate plans for groundwater beneficial use at or in the vicinity of the site (EPA 2001).

3.5 HISTORY OF CONTAMINATION

Historical, on-site mishandling of wastes associated with pipe manufacturing and pipe coating operations are the primary source of contamination at NWPC (Weston 1998a).

The major classes of contaminants include polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and chlorinated volatile organic compounds (CVOCs). Coal tar used for coating pipes was the main source of PAHs. PCBs most likely originated from cutting oils, hydraulic oils, cooling oils, and/or electrical transformers. PCB contaminated oils may have been used for on-site dust suppression, based on their widespread distribution. Chlorinated solvents such as tetrachlorethene (PCE) and trichloroethene (TCE) were reportedly used during pipe coating and routine maintenance activities.

The conceptual site model (EPA 2000) indicates that the primary source of contamination was from historic waste disposal and buried wastes. Release of these contaminants to the environment was through the following mechanisms:

Release Mechanism	Final Medium
• Direct contact	• Surface and subsurface soils
• Infiltration and leaching	• Groundwater
• Runoff / Erosion	• Surface water
• Runoff / Erosion	• Sediments

3.5.1 Parcel A

No major sources of contamination were identified on Parcel A, although former employees have alleged that small amounts of waste were disposed outside of the former Northwest Pipe and Casing manufacturing plant (not the ODOT building) (URS 1999).

3.5.2 Parcel B

Three large contaminated debris burial piles were encountered in soil during the site investigation. Buried debris consisted mostly of solidified coal tar fragments, milled wood, plastic, metal, and concrete. Several buried drums containing coal tar were also encountered during site investigation (Figure 3-2) (URS 1999).

Soil underlying and surrounding the former pipe coating plant buildings was impacted by coal tar and oils, most likely originating from poor housekeeping practices, spills, discharges, and product leaks from buried process lines.

Two underground storage tanks (USTs) (1,000- and 12,000-gallon capacities) located near the former machine shop in the southern portion of Parcel B were the source of limited gasoline impacts to soil (URS 1999). The tanks were subsequently removed by DEQ.

3.6 INITIAL RESPONSE

In July 1986, EPA was contacted by a former employee of Northwest Pipe and Casing who alleged that dumping of waste had occurred north of Plant 4 and directly into the sewer. Improperly disposed waste included paint, paint thinner, xylene, paint bitumastic primer, and zinc chromate. It was also alleged that over 20 drums of coal tar and 200 drums of smoke stack scrubber waste had been dumped on site (EPA 2000).

An initial site visit was made by the EPA in July 1986 and a “Medium” inspection priority was assigned to the site. The DEQ conducted a Preliminary Assessment and identified potential hazards at the site in September 1987.

DEQ conducted a preliminary assessment of the site in 1987 (DEQ 1987). This was followed by a Preliminary Site Inspection in 1989 (E&E 1988) and a Listing Site Inspection in 1990 (E&E 1990), conducted by EPA after unsuccessful attempts by DEQ to have PRPs undertake remedial investigations at the site. The site was placed on the Superfund National Priorities List (NPL) on October 14, 1992.

EPA conducted a removal action in 1993 to provide site perimeter security fencing and to demolish site buildings being used by transients for shelter.

3.7 BASIS FOR TAKING ACTION

A CERCLA Remedial Investigation (RI) (Weston 1998a) and a baseline risk assessment (Weston 1998b) were completed by Weston in 1998. The RI confirmed that high levels of contaminants were present in soil, sediment, surface water and groundwater on or adjacent to the site.

The baseline risk assessment confirmed that unacceptable carcinogenic and non-cancer risks existed at Parcel B for current transient trespassers, and/or future construction workers and maintenance workers through exposure to PAHs and PCBs via combined ingestion and dermal contact with soil.

The risk assessment also confirmed unacceptable cancer risk to future off-site adult and child residents exposed to PCE and VC via combined ingestion of, dermal contact with, and inhalation of volatiles emitted from groundwater during all indoor use of tap water (EPA 2001).

3.7.1 Contaminants of Concern

Table 3-1 summarizes the maximum concentrations of COCs for OU1 (soil) and OU2 (groundwater). COCs are selected based on potential human health exposure at the site. They represent specific chemicals for which remedial action objectives and remediation goals (RGs) are established.

Table 3-1. Summary of Maximum Concentrations of COCs in OU1 and OU2

Operable Unit	Group	Contaminant	Maximum Detected Concentration
OU1 (Soil)	VOCs	Tetrachloroethene (PCE)	370 mg/kg
		Trichloroethene (TCE)	NA
		Vinyl Chloride	NA
	PAHs	Benzo(a)anthracene	950 mg/kg
		Benzo(b)fluoranthene	800 mg/kg
		Benzo(k)fluoranthene	530 mg/kg
		Benzo(a)pyrene	410 mg/kg
		Chrysene	2,100 mg/kg
		Dibenz(a,h)anthracene	89 mg/kg
		Indeno(1,2,3-cd)pyrene	250 mg/kg
	PCBs	Total PCBs	870 mg/kg
OU2 (Ground water)	VOCs	Tetrachlorethene (PCE)	11,000 µg/L
		Trichloroethene (TCE)	320 µg/L
		Vinyl Chloride	100 µg/l

3.8 NATURE AND EXTENT OF IDENTIFIED CHEMICALS IN SOIL

3.8.1 Parcel A

Limited sampling was performed on Parcel A during the RI due to extensive coverage by buildings and constraints from active businesses. No major sources of contamination were found in soils. Concentrations of PAHs and PCBs in Parcel A soils were generally much lower than the levels observed at Parcel B (EPA 2000).

3.8.2 Parcel B

The RI identified widespread occurrence of PAHs and PCBs, and to a lesser extent VOCs in surface soil and subsurface soil across the entire parcel (EPA 2000).

3.8.2.1 Surface Soil (depths of 0 to 3 feet bgs)

PAHs concentrations in surface soil samples collected from test pits completed throughout Parcel B frequently exceeded 10,000 mg/kg. Total PCBs concentrations in soil samples varied considerably, from less than 1 mg/kg to 100 mg/kg.

The highest concentrations of PAHs and PCBs in surface soil are located in the northern portion of Plant 3, where PAHs concentrations exceed 390,000 mg/kg and PCBs concentrations were detected up to 870 mg/kg.

3.8.2.2 Subsurface Soils (depths greater than 3 feet bgs)

Subsurface soil contaminated with PAHs and PCBs were observed underlying and surrounding the former plant buildings on Parcel B. Subsurface soil in theses areas was frequently stained and contained localized accumulations of black oily free product and hardened coal tar. In test pits not containing buried debris, elevated PAHs concentrations greater than 300 mg/kg were observed in subsurface soil to the top of the water table. The highest levels of PAHs and PCBs in subsurface soil occurred at Plant 3 and Plant 4, although localized concentrations exceeding 1,000 mg/kg also occur along the west side of Plant 2.

3.9 NATURE AND EXTENT OF IDENTIFIED CHEMICALS IN GROUNDWATER

COCs were observed in groundwater extensively across Parcel B and the western portion of Parcel A (URS 2003a, 2004a). Four groundwater plumes of COCs (PCE and its respective breakdown products) were identified in the Shallow and Intermediate WBZs (Figures 3-5 and 3-6, respectively). A north south profile of COCs concentrations distribution is presented in Figure 3-7.

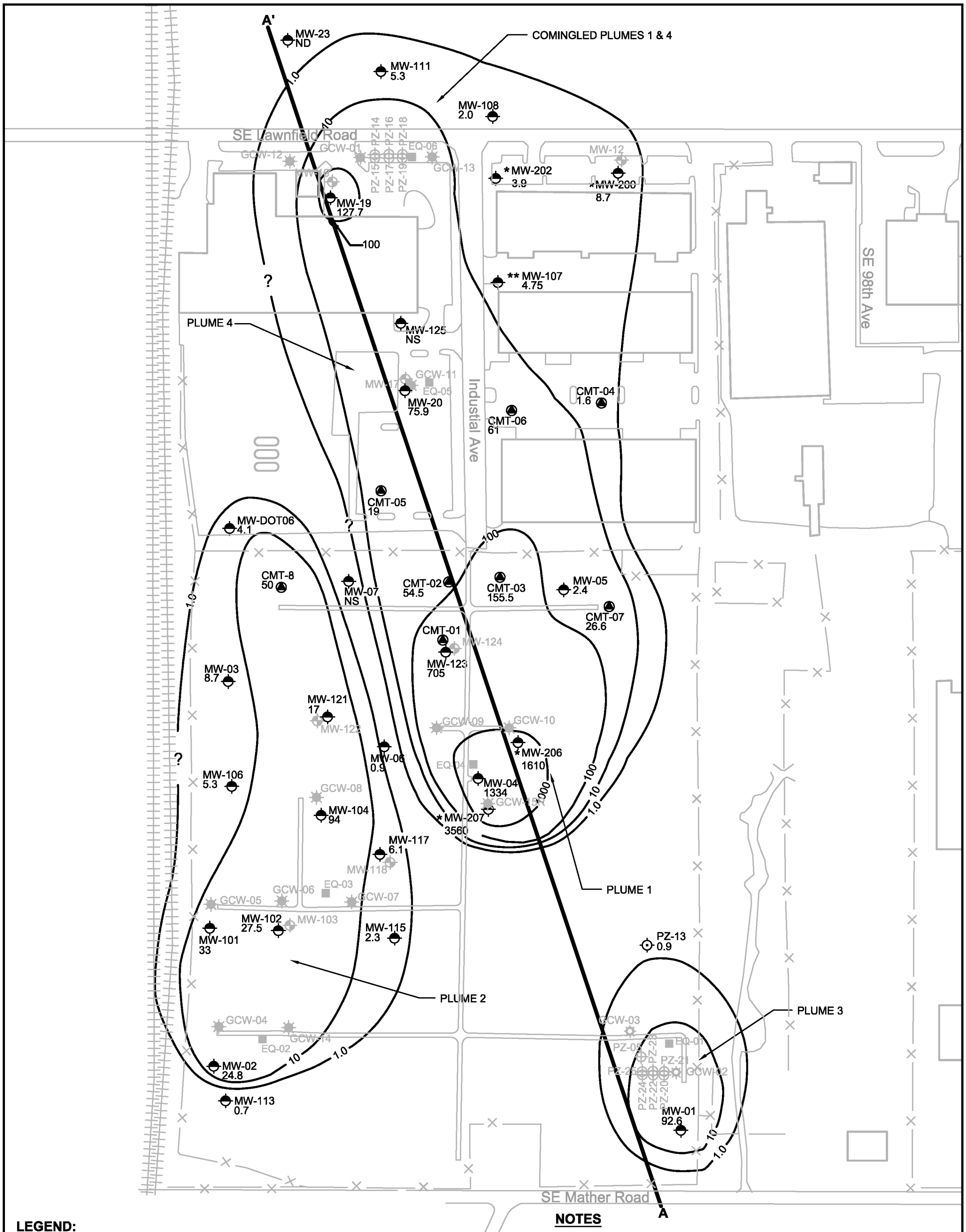
Plume 1 originated near former Plant 3, and covers an estimated 12 acres. PCE, TCE, and VC impacts were observed in groundwater in both the Shallow and Intermediate WBZs, with concentrations of Total COCs (PCE, TCE & VC) greater than 1,000 µg/L observed in the Shallow WBZ (Figure 3-5).

Plume 2 is located in the southwest portion of Parcel B and covers an estimated 9 acres. This plume has no identifiable source; however, in 2001 buried partially full drums of solvent waste were discovered in the vicinity of Plume 2. PCE and TCE were observed in groundwater in both the Shallow and Intermediate WBZs, with concentrations greater than 100 µg/L of Total COCs observed in the Intermediate WBZ (see Figure 3-6).

Plume 3 is located in the southeast corner of Parcel B and covers an estimated 3.5 acres. PCE and TCE impacts were observed in groundwater in both the Shallow and Intermediate WBZs, with concentrations of Total COCs greater than 10 µg/L observed in both the Shallow and Intermediate WBZs (Figure 3-5 and 3-6). Even after extensive site investigations by EPA, a source area for Plume 3 has not been identified.

Plume 4 is located in the northern portion of Parcel A and the adjacent off-site KEX property. The plume has commingled with Plume 1 to form Commingled Plumes 1&4. PCE and TCE impacts were observed in groundwater from both the Shallow and Intermediate WBZs, with concentrations of Total COCs greater than 100 µg/L observed in the Shallow WBZ (Figure 3 5).

This page intentionally left blank.



LEGEND:

- SHALLOW WBZ WELL
- SHALLOW WBZ PIEZOMETER
- CMT WELL
- EQUIPMENT SHED
- IN SITU AIR STRIPPING WELL (BOTTOM AT 50 FEET BELOW GROUND SURFACE)
- IN SITU AIR STRIPPING WELL (BOTTOM AT 70 FEET BELOW GROUND SURFACE)
- WBZ= WATER BEARING ZONE
- 1.0 — ISOCONCENTRATION LINE IN ug/L
- FENCE
- RAILROAD

NOTES

ND= NOT DETECTED

NS= NOT SAMPLED

COCs= CHEMICALS OF CONCERN PCE, TCE, VC

PCE= TETRACHLOROETHENE

TCE= TRICHLOROETHENE

VC= VINYL CHLORIDE

* MARCH 2006 ANALYTICAL RESULTS

** FEBRUARY 2005 CONCENTRATIONS

Parametrix DATE: Aug 08, 2006 FILE: PO2328007CF-23

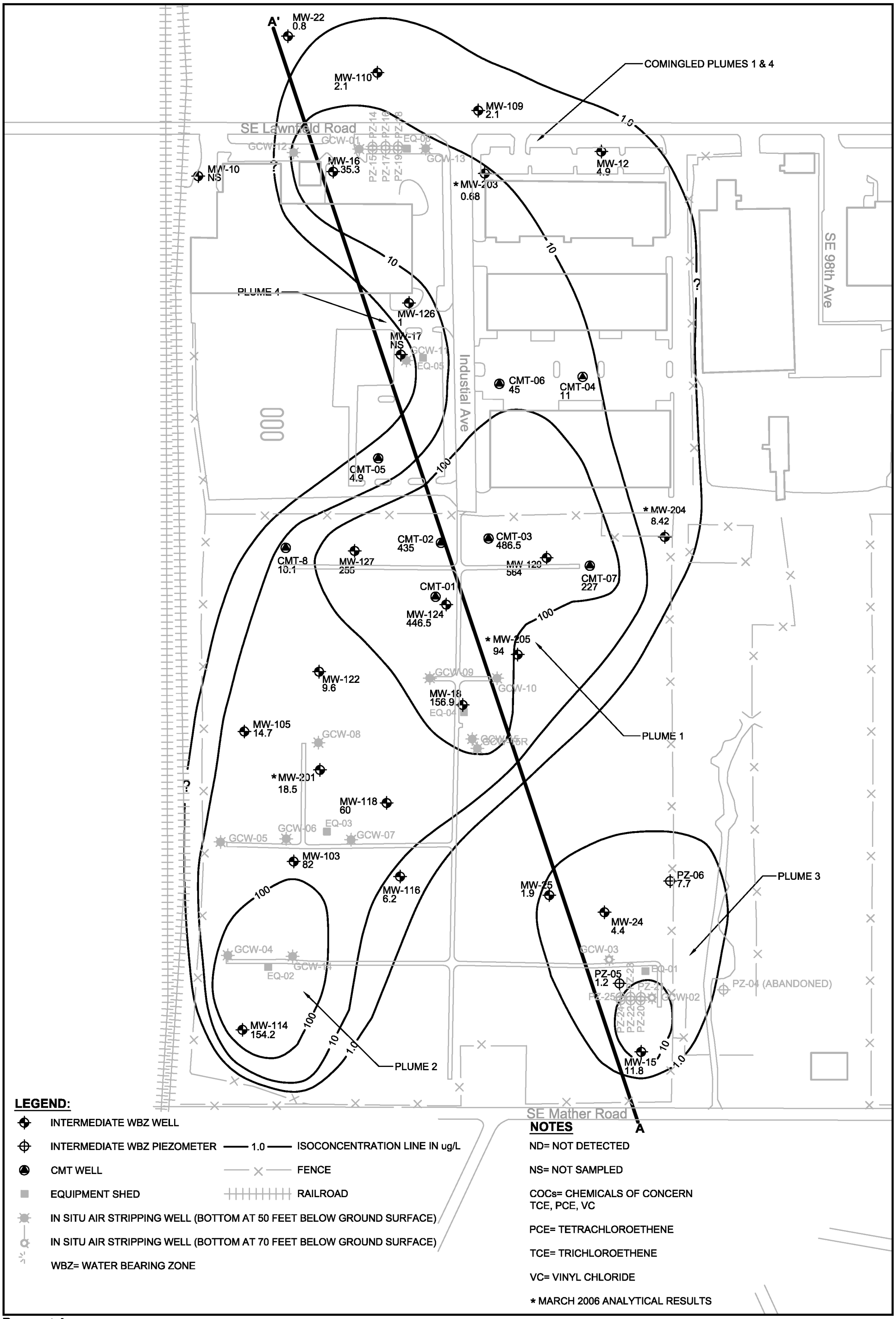
N

0 200'

SCALE IN FEET

Figure 3-5
Total COCs Isoconcentration Map
Shallow Water Bearing Zone
November 2005/MARCH 2006

This page intentionally left blank.



Parametrix DATE: Aug 08, 2006 FILE: PO2328007CF-26

N

0 200'

SCALE IN FEET

Figure 3-6
Total COCs Isoconcentration Map
Intermediate Water Bearing Zone
November 2005/March 2006

This page intentionally left blank.

KEX | SE LAWNFIELD RD | PARCEL A | PARCEL B | SE MATHER RD

NORTH A' — A SOUTH

MW-22 MW-23 | GCM-12 | GCW-01 MW-16 MW-13 MW-19 | GCW-11 MW-20 | CMT-5-15 CMT-5-40 CMT-5-58 | CMT-2-17 CMT-2-37 | MW-124 MW-123 | GCW-09 MW-205 | GCW-10 MW-18 MW-206 | MW-04 | GCW-15R MW-207 | MW-25 | MW-24 | GCW-03 GCW-02 | MW-15 MW-01

ELEVATION (FEET IN NGVD)

110 90 70 50 30 10

0 | 0.8 | 127.7 | 35.3 | 0 | 75.9 | 19 | 4.9 | 0 | 54.5 | 435 | 446.5 | 705 | 94 | 1334 | 1610 | 3560 | 456.9 | 1.9 | 4.4 | 92.6 | 11.8

SHALLOW WATER BEARING ZONE

INTERMEDIATE WATER BEARING ZONE

DEEP WATER BEARING ZONE

LEGEND

GROUND LEVEL — WATER TABLE

WATER LEVEL — WELL CASING

ZONE BOUNDARY — SCREEN

0 — TOTAL COC'S(PCE,TCE,VC)

ISOCONCENTRATIONS IN ug/L

1,000

100

10

1

DIRECTION OF GROUNDWATER FLOW

Parametrix DATE: May 18, 2006 FILE: PO2328007CF-27

HORIZONTAL SCALE (1"=200')
VERTICAL SCALE (1"=15')

NOTE:
CONCENTRATION AND WATER LEVELS FROM SITEWIDE SAMPLING EVENT (NOVEMBER 2005).

CONCENTRATIONS AND WATER LEVELS FOR NEW WELLS (MW-200 THROUGH MW-207) FROM FEBRUARY 2006.

Figure 3-7
A'-A Cross Section

This page intentionally left blank.

4. REMEDIAL ACTIONS

This chapter discusses implementation of the NWPC remedy, beginning with the description in the ROD and continuing through design, construction, and operation and maintenance.

4.1 REMEDY SELECTION OF OPERABLE UNIT 1—SOIL

The Record of Decision (ROD) is the regulatory instrument EPA used to select a remedy to address Remedial Action Objectives (RAOs). The NWPC ROD for OU1 was signed by EPA on June 2000 (EPA 2000).

4.1.1 Remedial Action Objectives for OU1

The RAOs are site-specific goals for protecting human health and the environment. RAOs were developed as a result of data collected during the RI and the baseline risk assessment to aid in the development and screening of remedial alternatives to be considered in the FS. The following RAOs for soil-specific COCs were developed:

- Prevent exposure of trespassers, future construction workers, and future maintenance workers through direct contact (ingestion or dermal contact) with contaminated soil that would result in an excess lifetime cancer risk greater than one in a million for individual carcinogens, above one in one hundred thousand for additive carcinogenic contaminants, or above a Hazard Quotient of 1.
- Prevent migration of soil contaminants to groundwater that would result in exposure to future off-site residents through direct contact (ingestion, inhalation, and dermal contact) with contaminated groundwater that would result in an excess lifetime cancer risk greater than one in a million for individual carcinogens, above one in one hundred thousand for additive carcinogenic contaminants, or above a Hazard Quotient of 1.

4.1.2 Remedy Selection for OU1

The ROD for OU1 identified soil and debris treatment and/or removal, placement of a clean soil cap, and institutional controls to protect cap integrity as the principal elements of the soil remedy. The components of the selected remedy for OU1 described in the ROD include:

1. Site structures and subsurface features will be removed or remain in-place.
    - Soil pile 4 will be disposed off-site and thermally treated.
    - Above ground tank containing solidified coal tar and bins containing refuse will be disposed off-site.
    - USTs will be properly decommissioned and disposed off-site.
    - Subsurface piping in excavated areas will be disposed off-site.
    - Soil pile 1 will be buried on-site.
    - Soil piles 2 and 3 will be backfilled or graded flat, depending on COCs concentrations.
    - In-ground structures at Plant 3 will be left in-place or disposed off-site based upon extent of contamination.

2. All soil with COCs concentrations exceeding excavation criteria (Oregon Hot Spot limits) will be excavated and removed from the site (see Table 4-1). Seven distinct excavation areas (EA) (EA-1 through EA-7) on Parcel B exceed one or more of the EC threshold concentrations, including primary areas located near Plants 2 and 3 and burial areas 1 and 2 (see Figure 3-2). Soil removal will adhere to the following criteria:
    - Maximum depth of excavations will be to the top of the water table, approximately 8 to 9 feet bgs.
    - The total volume of Oregon Hot Spot soil to be removed is estimated to be 32,600 cubic yards.
    - Additional soil testing will be conducted to verify excavation locations and volumes.
    - Stormwater control measures will be taken as necessary during construction activities to minimize adverse impacts to surface water.
3. Excavated soil with concentrations exceeding their respective ECs and with PCB concentrations less than 50 mg/kg (PCB Threshold) (an estimated 28,550 cubic yards [cy]) will be thermally treated off-site. Thermally treated soil will be returned to the site and used as backfill in excavated areas if it meets the maximum COCs concentrations in treated soil (See Table 4-2).
4. Excavated soil that exceeds PCB threshold concentration of 50 mg/kg (estimated at 4,050 cy) will be disposed at a TSCA-compliant RCRA Subtitle C landfill.
5. An Area of Contamination (AOC), encompassing all of Parcel B, is designated by the ROD.
6. Security patrols of Parcel B will be continued until the site cap is completed.

Table 4-1. Criteria for Excavating Soil

Group	Contaminant of Concern	Threshold Concentrations
VOCs	Tetrachloroethene (PCE)	39 µg/kg
	Trichloroethene (TCE)	40 µg/kg
	Vinyl Chloride	9 µg/kg
PAHs	Benzo(a)anthracene	250,000 µg/kg
	Benzo(b)fluoranthene	250,000 µg/kg
	Benzo(k)fluoranthene	250,000 µg/kg
	Benzo(a)pyrene	25,000 µg/kg
	Chrysene	25,000,000 µg/kg
	Dibenz(a,h)anthracene	25,000 µg/kg
	Indeno(1,2,3-cd)pyrene	250,000 µg/kg
PCBs	Total PCBs	20,000 µg/kg

Table 4-2. Maximum Limits for COCs in Treated Soil

Group	Contaminant of Concern	Threshold Concentrations
VOCs	Tetrachloroethene (PCE)	7 µg/kg
	Trichloroethene (TCE)	13 µg/kg
	Vinyl Chloride	0.1 µg/kg
PAHs	Benzo(a)anthracene	2,500 µg/kg
	Benzo(b)fluoranthene	2,500 µg/kg
	Benzo(k)fluoranthene	2,500 µg/kg
	Benzo(a)pyrene	250 µg/kg
	Chrysene	250,000 µg/kg
	Dibenz(a,h)anthracene	250 µg/kg
	Indeno(1,2,3-cd)pyrene	2,500 µg/kg
PCBs	Total PCBs	1 mg/kg

7. Cleanup levels for COCs are presented on Table 4-3. Cleanup levels for individual PAHs in soil were selected to correspond to lifetime cancer risk of 1E-06 from direct contact with soil by trespassers, construction workers, and maintenance workers. Cleanup levels for PCE, TCE, and vinyl chloride in soil were selected to be protective of groundwater used in the future for drinking water by off-site residents.

Table 4-3. Soil Cleanup Levels for COCs

Group	Contaminant of Concern	Soil Cleanup Level
VOCs	Tetrachloroethene (PCE)	7 µg/kg
	Trichloroethene (TCE)	13 µg/kg
	Vinyl Chloride	0.1 µg/kg
PAHs	Benzo(a)anthracene	2,500 µg/kg
	Benzo(b)fluoranthene	2,500µ g/kg
	Benzo(k)fluoranthene	2,500 µg/kg
	Benzo(a)pyrene	250 µg/kg
	Chrysene	250,000 µg/kg
	Dibenz(a,h)anthracene	250 µg/kg
	Indeno(1,2,3-cd)pyrene	2,500 µg/kg
PCBs	Total PCBs	1 mg/kg

8. A two-foot cap of clean soil will be placed on Parcel B and graded to an acceptable contour. The cap will be revegetated. The soil cap will be constructed after all soil excavation and backfilling are completed. A stormwater management system for Parcel B will be evaluated after cap placement, and constructed, if needed.
9. A long-term monitoring and maintenance program will be developed and implemented for the Parcel B soil cap.

10. Institutional controls (ICs) to limit and manage human exposure to remaining contaminated soil underneath the soil cap on Parcel B will be obtained. ICs will consist of deed restriction and/or restrictive covenants, security fencing, and warning signs. DEQ will be the enforcing agency as long as it retains ownership. At such time as DEQ, with EPA approval, sells or otherwise transfers ownership of Parcel B, ICs will be transferred with title and run with the land.
11. If the Plume 4 source area investigation of Parcel A identifies contaminated soil with COCs concentrations exceeding the VOC hot spot levels, EPA expects to remediate this soil using the remedy selected in this ROD, if practicable.
12. In evaluating transportation routes for the site ingress and egress during construction of the selected remedy, EPA will consider the comments and views of the local community and will seek to minimize or avoid increased truck traffic through residential areas in the site's vicinity.

ROD Amendments or Explanation of Significant of Differences

No amendments were made to the ROD at the time of this review. An Explanation of Significant Difference (ESD) (EPA 2004) for OU1 was completed in March 2004.

The ESD describes two significant differences from the original OU1 ROD:

- The cleanup level of vinyl chloride at the site was raised from 0.1 µg/kg to 1.0 µg/kg as a result of the analytical laboratories being unable to guarantee the consistent analysis of VC in soil at or below the original 0.1 µg/kg cleanup level. The EPA and DEQ concluded that raising the cleanup level to 1.0 µg/kg would still be protective of groundwater at the site.
- Site visits after completion of the RI (which concluded that no wetlands were present on site) identified several suspected wetland areas. A wetland delineation was performed and identified six wetland areas on Parcel B with a total area of approximately 1 acre. The Basis of Design Report (URS 2003b) for the soil cap identified additional applicable or relevant and appropriate requirements (ARARs) regarding wetlands, including the need to mitigate for wetland losses. Since the planned soil cap construction would destroy these wetland areas, EPA determined that a new 1-acre wetland should be created on site (coincident with soil cap construction) to compensate for loss of the existing wetland areas.

4.2 REMEDY IMPLEMENTATION OF OU1

The implementation of the RA for OU1 occurred in two phases. Phase 1 included the excavation and/or treatment of contaminated soil or "hot spots." Phase 1 was completed between June 2001 and December 2001 by EPA's Oversight Contractor (OC) URS, with support from URS's subcontractor Remtech (URS 2002a, 2002b). Phase 2 included the installation of a 2-foot clean soil cap on Parcel B, construction of a 1-acre mitigation wetland in the northeast corner of Parcel B, and placement of institutional controls. Phase 2 construction activities were conducted between July 2003 and July 27, 2004 (URS 2004a).

Parcel B was sold to CCDA in September 2005. Coincident with the sale, institutional controls specified by the soil and groundwater RODs for Parcel B were put into place via execution of several documents. These documents include an Easement and Equitable Servitude (EES), Waste Management Plan, Soil Cap Monitoring and Maintenance Plan, and an Agreement for Release and Waiver of Liens (Lien Waiver).

The EES and the Lien Waiver, in part, restrict any use of the property that will penetrate, disturb and/or could jeopardize the integrity of the soil cap. The property owner is required to maintain the soil cap in accordance with the Soil Cap Monitoring and Maintenance Plan (DEQ and EPA 2005). Also, the EES restricts operations and/ or use of the property that will or likely will impair the proper function of the one-acre wetland in the northeast corner of the property without written approval by the DEQ. Finally, the EES and Lien Waiver provide DEQ and EPA access to the property.

EPA determined the OU1 RA was operational and functional in July 2005, at which time. DEQ took over official responsibility for operation and maintenance (O&M) for the soil cap and wetland. With the sale of Parcel B to Clackamas County in October 2005, legal responsibility for O&M of the soil cap, fencing, and constructed wetland transferred to Clackamas County. DEQ has agreed with CCDA to conduct wetland monitoring and maintenance through 2008.

4.2.1 OU1 Phase 1 – Remedial Activities

Phase 1 of the OU1 RA included the following activities:

- Excavation, removal, and/or treatment of 32,010 tons of contaminated soil and debris. The soil and debris was removed from seven designated excavation areas, EA-1 through EA-7 (Figure 3-2). Soil and debris were either transported to Waste Management's (WM) Subtitle D landfill in Hillsboro, Oregon or WM's Subtitle C landfill in Arlington, Washington; disposed of on-site; or removed to TPS Technologies' facility in Portland, Oregon, thermally treated, and returned to the site as backfill, depending on the COCs concentrations of the soil and debris.
- Approximately fifty buried drums were encountered in two areas during excavation in the southwest corner of the site (EA-6) (URS 2002a). Many of the drums contained brown oil liquid and/or sludge. Since many of the drums were crushed, were rusted, and/or contained holes, removal of the drums released some liquids into the excavation. Treated soil was used to help adsorb or stabilize liquids in the drums or in the excavation. Approximately seventy three cubic yards of soil associated with these drums was treated on-site to below TCLP PCE levels and/or disposed at Arlington Landfill. Drums were disposed of at Arlington Landfill.
- An 11,000 gallon slotted underground storage tank was removed from the western margin of former Plant 2. The tank appears to have been used for dewatering in the vicinity of Plant 2. Approximately 10,000 gallons of fluid was removed from the tank. Approximately 121 cubic yards of soil was removed from the tank excavation area (EA-3).
- Decommissioning of a 5,000 gallon above ground tank in the southwest corner of the site (URS 2002a). Solidified coal tar within the tank was removed and disposed at Hillsboro Landfill. The upper portion of the tank was recycled and the lower portion of the tank was disposed at Hillsboro Landfill.
- Implementation of erosion and sediment control measures to facilitate control of surface runoff and sediment migration off-site during and after the RA. These measures included erection of a silt fence around construction areas, washing of roads and truck tires, construction of berms around soil stockpile areas, placement of wood chip bags, and hydroseeding of disturbed areas.

- Grading of soil piles disposed on-site. Four soil piles were used as fill for on-site excavation areas.
- Construction of chain link fence to contain the entirety of Parcel B.
- Demolition of vacant buildings and off-site disposal of debris.
- Management of investigation-derived waste (IDW).

4.2.2 OU1 Phase 2 - Remedial Activities

Phase 2 of the OU1 RA included the following activities:

- Construction of the clean soil cap over Parcel B. Prior to the construction of the cap, the site was cleared of vegetation. The cap consisted of soil from several local sources which were blended on-site to meet required specifications (URS 2004b). The soil cap was constructed in 8-inch lifts to achieve an average thickness of 2-feet across the parcel. The soil cap design and placement maintained a similar topography to that of pre-existing conditions.
- Construction of a 1-acre wetland in the northeast corner of Parcel B. The wetland was constructed to replace several small wetland areas which were filled in due to the site-wide cap.
- Construction of approximately 1,300 feet of graveled access roads across Parcel B, and installation of new fencing along the east side of the constructed wetland.
- Implementation of erosion and sediment control measures to facilitate control of surface runoff and sediment migration off-site during and after the RA. These measures included erection of a silt fence around Parcel B, washing of roads and truck tires, placement of storm sewer inlet sediment filters, placement of wood chip bags to control surface runoff, and hydroseeding of disturbed areas.

4.2.2.1 Soil Cap Monitoring and Maintenance Requirements

As the soil cap exists to serve as a physical barrier preventing human contact with the residual, low-level contaminants in the soil on site, maintenance is required to ensure that the barrier remains intact. The following measures were recommended in the Final Remedial Action Report for OU1 (URS 2004b):

- No Mowing – The existing vegetative cover over the cap exists to stabilize it and to minimize erosion. For this reason, mowing of the cover was not recommended unless it was deemed necessary for fire protection purposes.
- Inspection of Growth – The cap should be inspected annually in the spring. Areas on the cap where vegetation is not strongly established should be reseeded.
- Inspection of Cap to Identify Areas of Significant Erosion – The cap should be inspected annually to identify areas where surface erosion may be occurring. Areas determined to be in need of repair should be filled with soil and/or reseeded.
- Restriction of Vehicles to Roads – To protect the integrity of the cap, it is recommended that vehicles on the cap be restricted to gravel roads whenever possible.

The soil cap on Parcel B is inspected regularly by the property owner using procedures and criteria outlined in the Soil Cap Monitoring and Maintenance Plan (DEQ 2005). The plan

outlines specific procedures for monitoring and maintaining the integrity of the cap. Soil Cap Inspection Reports are prepared by the property owner and submitted to EPA and DEQ. Currently, the schedule for conducting cap inspections is quarterly.

On-site activities that breach or penetrate the soil cap must follow procedures and protocols in the Waste Management Plan (DEQ 2005). The plan details requirements relating to the identification, management, and disposal of waste derived from these activities. The plan is intended to ensure that contaminated soil, groundwater, and other derived waste materials are managed properly and cap integrity is maintained. The plan outlines the following requirements for management and disposal of waste:

- Soil removed from within the existing soil cap is considered clean soil and may be managed on the Property without any restrictions.
- Backfill removed from below the soil cap and within the boundary limits of Excavation Areas 1 through 7 may be managed on the Property, provided that a protective cap must be placed over such soil in accordance with applicable portions of the plan. Backfill managed under this shall be segregated to avoid commingling with soil from the overlying cap and soil from outside or below the backfill.
- All other soil removed from below the soil cap shall be managed in accordance with applicable portions of the plan, which include but are not limited to testing of excavated and in-situ soils.

No activities have occurred to date to disturb the soil cap, except for drilling activities for GCW and monitoring well installation (Parametrix 2006b and 2006c). Waste generated during these activities was managed and disposed of consistent with the Waste Management Plan.

4.2.2.2 Monitoring Results of Soil Cap Inspection

Results of the soil cap inspection for the January 1, 2006 to March 31, 2006 reporting period are presented in the Soil Cap Inspection Report Form (GeoDesign 2006). The report indicates that:

- Soil cap and surface slopes displayed:
  - No holes, burrowing, rills, sloughing, ruts, or exposure of surface debris
  - Some settlement in the northwest and northeast portion of the site
  - Wood chip berms are intact
  - Some invasive vegetation including blackberries along perimeter fencing
  - Ponding of surface water in northern portion of the site
  - No maintenance activities for the soil cap were required
- Vegetative cover displayed
  - Some bald spots in the southwest corner of the site
  - Some dead or dying vegetation in the southeast corner of the site
  - No fire danger
  - No maintenance is required for the vegetative cover

4.2.2.3 Wetland Monitoring and Maintenance Requirements

The wetland is required to be assessed annually to satisfy the *Wetland Mitigation and Monitoring/Maintenance Plan* (URS 2003c). An annual assessment is required to be performed during July or August for the first 5 years following the wetlands completion. The plan lays out success criteria for the wetland, which include:

- Percent aerial coverage of native vegetation
- Percent aerial coverage of rock, surface water, and/or large woody debris
- Assessment of vascular, non-vascular, and non-native species
- Assessment of water regime. Requires that the upper 10 inches of the soil profile are saturated for at least 14 days during the growing season
- Erosion monitoring. Areas of erosion filled and reseeded per specifications

Monitoring Results of Wetland Assessment

Results for 2003 (winter) to 2004 (spring) monitoring are presented in the Remedial Action Report (URS 2004b). The report concluded that:

- The wetland is functioning as predicted with three to six inches of inundation during periods of high water flow in the east drainage ditch, and surface water runoff from the cap also contributing to the inundation.
- Installation of underground habitat structures has occurred.
- A thriving and diverse community of wetland species was documented during the July 20, 2004 final inspection.

Results of the 2004 wetland monitoring report (URS 2004c) indicate that:

- The forested wetland and emergent wetland areas have a combined total of 60 percent coverage of native species. This coverage exceeds the 30 percent aerial coverage requirement of the wetland in the first growing season set forth in the Mitigation Plan (URS 2003c).
- Surface water or ponding was observed during the growing season in March and April, satisfying the requirement of inundation or saturation of the upper 10-inches of surface soil for a minimum of 14 days during the growing season.
- Depth of groundwater is shallower in the southern end of the wetlands than the northern end. As a result emergent species are more dominant in the southern end.
- Several non-native hawthorne trees were mistakenly installed instead of the native black hawthorne trees.

Results of the 2005 wetland monitoring report (URS 2005b) indicate that:

- Year 2 of the wetland hydrology monitoring indicates that the entire wetland bottom meets the Army Corps definition of wetland hydrology.
- The forested wetland and emergent wetland areas have a combined total of 78 percent coverage of native species, representing an increase of native species from 60 percent in 2004. This coverage exceeds the 50 percent aerial coverage requirement of the wetland in the second growing season set forth in the Mitigation Plan (URS 2003c).

- Some noxious and persistent non-native weeds, most notably Scotch broom, are present in relatively small populations in the upland buffer area, but are not dominant.
- Some non-native hawthorne trees were mistakenly installed in the upland buffer. These trees were tagged for removal and replacement with native hawthorne trees.

Site visits conducted by the DEQ in March 2006 (DEQ 2006a) and April 2006 (DEQ 2006b) indicate that:

- Approximately 80 percent of the wetlands floor is inundated with standing water. The deepest water, approximately 10 inches, was observed in the southeast corner.
- Colloidal iron, typically having an orange color, was observed in some buried habitats and in the drainage ditch.
- A clay layer seen between 29 and 32 inches appears to be acting as an aquiclude, keeping groundwater from rising higher toward the base of the wetlands. As such the wetlands may not be in hydraulic contact with groundwater.
- The six buried habitats were inspected to see if they are acting as conduits for pore water within the soil cap. Five of the six are actively discharging water or exhibit saturated soil conditions at their opening. Only BH-1, the northern one, was dry. A worn path in the surrounding grass leading into the habitat indicated that some animal is actually using it as a den, most likely nutria that are seen in the area.
- The majority of the water entering the wetlands appears to be surface runoff from the soil cap routed through the ditch on the east side of the property. No evidence for the statement made in the first two monitoring reports that "groundwater discharge is the primary hydrologic source to the wetland" was observed.
- New plant growth was observed. However, the type and amount were not quantified.
- Scotch broom and Canadian thistles were observed on the upland slopes.

4.2.3 Summary of Remedial Action Costs for OU1

The estimated total cost for the selected soil remedy (excluding the wetland construction) was $6,700,000 capital costs, with $3,000 per year maintenance cost (in 2001 dollars).

The actual cost for the Phase I RA was $3,060,000 (in 2001 dollars), and for the Phase II RA was approximately $3,100,000 (in 2003 dollars). The actual project cost was approximately 8 percent less than the costs estimated by the ROD, due to the following:

- Much of the soil cap was acquired from ongoing construction projects at a substantially lower unit cost than quarry purchase.
- Use of a waste tracking database during soil and debris excavation facilitated rapid, accurate, and cost-effective soil management decision making.
- Use of a cost tracking database during soil and debris excavation provided accurate cost information and estimates-to-complete on a weekly basis, allowing close management of all project costs.

4.3 REMEDY SELECTION FOR OPERABLE UNIT 2 —GROUNDWATER

The NWPC ROD for OU2 was signed by EPA on September 2001 (EPA 2001).

4.3.1 Remedial Action Objectives for OU2

The following RAOs for groundwater-specific COCs were developed for OU2:

- Prevent exposure of future off-site residents and future on-site maintenance workers from direct contact (ingestion, dermal contact, and inhalation) to contaminated upper aquifer groundwater that would result in an excess lifetime cancer risk greater than one in a million for individual carcinogens, above one in one hundred thousand for additive carcinogenic contaminants, or above a Hazard Quotient of 1 (see Table 4-4).

Table 4-4. Groundwater Remedial Goals for COCs

Group	Contaminant of Concern	Remedial Goal
VOCs	Tetrachloroethene (PCE)	1 µg/L
	Trichloroethene (TCE)	1.6 µg/L
	Vinyl Chloride	1 µg/L

- Prevent migration of upper aquifer groundwater to off-site areas or deeper aquifers with contaminant concentrations that would result in an excess lifetime cancer risk greater than one in a million for individual carcinogens, above one in one hundred thousand for additive carcinogenic contaminants, or above a Hazard Quotient of 1.
- Restore use of the upper aquifer groundwater as a drinking water source. The goals for restoration are the federal and state safe drinking water standards (MCLs):
  - 5 µg/l for PCE
  - 5 µg/l for TCE
  - 2 µg/l for VC

Remedy Selection for OU2

The OU2 ROD (EPA 2001) identifies the cleanup strategy for groundwater as source control, treatment, natural processes, and institutional controls (Alternative G3a). The ROD calls for the most highly contaminated groundwater to be treated with in-situ air stripping wells (groundwater circulation wells [GCWs]). The ROD stated that areas of lesser contamination were to be addressed through natural processes. The major components of the selected remedies described in the OU2 ROD include:

1. Installation of approximately ten in-situ air stripping wells (GCWs) in the highest COCs concentration areas of the upper WBZ Plumes 1 through 4. The wells would be connected to five equipment sheds that house a blower, vapor extraction, and activated carbon canisters for treatment.
2. Installing groundwater monitoring wells in the vicinity of the treatment wells to evaluate their effectiveness over time for reducing COCs concentrations in groundwater.
3. Installation of four in-situ air stripping wells (GCWs) and an equipment shed in the vicinity of Lawnfield Road to prevent off-site migration of contaminated groundwater. The wells would remove COCs from groundwater before it is moved off-site.

4. Installation and annual sampling of groundwater monitoring wells to evaluate the progress towards attaining groundwater RGs. To ensure that the RGs continue to be maintained after attainment, groundwater monitoring will continue annually for the first 5 years after attainment, and then every five years after.
5. Using natural processes outside of the source areas to reduce COCs concentrations in groundwater outside of the source area.
6. Operating the in-situ air stripping wells (GCWs) for a minimum of five years, during which EPA expects that groundwater COCs in the source areas of the plumes and in the vicinity of Lawnfield Road would decline up to 75 percent. Treatment performance data will be carefully monitored on a regular basis.
    - If the performance data collected during operation show that this expected decline in COCs is not being achieved, EPA will adjust system operations.
    - If the system performance data confirms the expected COCs concentration decline is being achieved after five years, then EPA will discontinue operation of the in-situ air stripping wells.

7. Placing and enforcing ICs on Parcel B and the western lot of Parcel A to limit future use of groundwater until such time as MCLs are achieved and to ensure EPA access for treatment systems operation, maintenance and monitoring.

4.4 REMEDY IMPLEMENTATION OF OU2

Remedial design for OU2 was initiated in 2002. Design activities included GCW pilot test (URS 2003d), installation of monitoring wells, and groundwater sampling and analysis (URS 2003e). Results of these activities were incorporated into the Basis of Design Report, which provides substantive requirements for the design of groundwater treatment and monitoring, and develops project plans and specifications (URS 2003f).

Construction of the groundwater remedy began in 2003, followed by start-up, shakedown and EPA acceptance in early 2004. The overall groundwater remedy has been operating continuously since March 2004 under an EPA contract with CDM Constructors, Inc.

Parcel B was sold to CCDA in September 2005. Coincident with the sale, institutional controls specified by the soil and groundwater RODs for Parcel B were put into place via execution of several documents. These documents include an EES, Waste Management Plan, Soil Cap Monitoring and Maintenance Plan, and an Agreement for Release and Waiver of Liens. The EES restricts the beneficial use of groundwater on Parcel B as long as the contaminant concentrations exceed cleanup levels.

A draft EES for the ODOT property has been prepared by DEQ and EPA and submitted to Oregon Department of Transportation in June 2006. This EES is intended to implement ICs specified by the OU2 ROD for the ODOT property on Parcel A. The EES for the ODOT property has not been executed as of the date of the Five-Year Review Report.

Remedial Activities – OU2

The following remedial activities were completed by EPA's oversight Contractor URS and RA Contractor CDM from June 16, 2003, to July 27, 2004:

- Installation of fifteen GCW circulation wells, water treatment units, pump assemblies, and appurtenances

- Construction of six vapor treatment equipment sheds
- Utility hookup (power and telephone)
- Well head modification to convert aboveground monitoring well security monuments to flush monuments
- Construction of additional groundwater monitoring wells
- Preparation of an Operation and Maintenance Plan
- Technology transfer to O&M Contractor
- System start-up / shakedown
- Prepare an Operation and Maintenance Manual that specifies system components (CDM 2004)

The in-situ air-stripping wells (GCWs), the OU2 selected remedy, were constructed in 2003 and have been operating since March 2004, with the exception of GCW-15R which was constructed in February 2006 and was operational in April 2006. The GCWs are grouped into six treatment systems, each of which is composed of one treatment shed and one to four wells. The systems consist of three primary components: the groundwater recirculation well, the air-stripping unit in an in-ground vault, and the vapor treatment system (Figure 4-1). Each component is discussed below.

- **Groundwater Recirculation Well**. Each well consists of two 10-inch diameter, 10-foot long stainless steel screens separated by an inflatable packer. Groundwater is pumped from the upper screen through the influent pump, through the flow meter, and into the air-stripping unit inside the vault. Once treated by the air-stripper, the water is then pumped back down through the effluent pipe and out through the lower screen back into the formation. Influent and effluent sampling ports are provided to allow for the sampling of untreated and treated groundwater. The flow rates of the influent and effluent pumps are balanced in order that influent volume equal effluent volume.

- **Air-Stripping Units**. As the contaminated groundwater passes through the air-sparge tank within the vault, clean air (effluent from the vapor treatment system) is bubbled through the water by diffusers in the bottom of the tank. The fine bubbles which are created within the tank create a large surface area over which air-water contaminant transfer can occur. Once the water is channeled through the treatment tank it enters a settling basin; from there it is pumped to the effluent screen and out of the GCW. The contaminated air is sent through the influent air line to the vapor treatment system housed in one of the six equipment sheds.

- **Vapor Treatment Systems**. The contaminated air flows into the treatment shed via the influent air line and through a moisture separator and vacuum blower, then into the first of two granular activated carbon vessels designed to absorb contaminants from the air stream. The second carbon vessel is necessary to address potential contaminant breakthrough in the first vessel. The air then flows from the second carbon vessel to a zeolite vessel filled with permanganate, a strong oxidizer, to facilitate the breakdown of VC (which has less affinity for activated carbon than do PCE and TCE). Exhaust from the vapor treatment system is passed through a heat exchanger to reduce temperatures to near ambient, then passed through the effluent line and returned to the air-stripper unit at each of the fifteen GCW well heads. Vapor sampling ports are located before and after each vessel to allow for the efficiency sampling.

GENERAL NOTES

1. AN AFTERCOOLER IS PROVIDED TO REDUCE HEAT INCREASE TO REINJECTED WATER IN ORDER TO MINIMIZE SCALING.

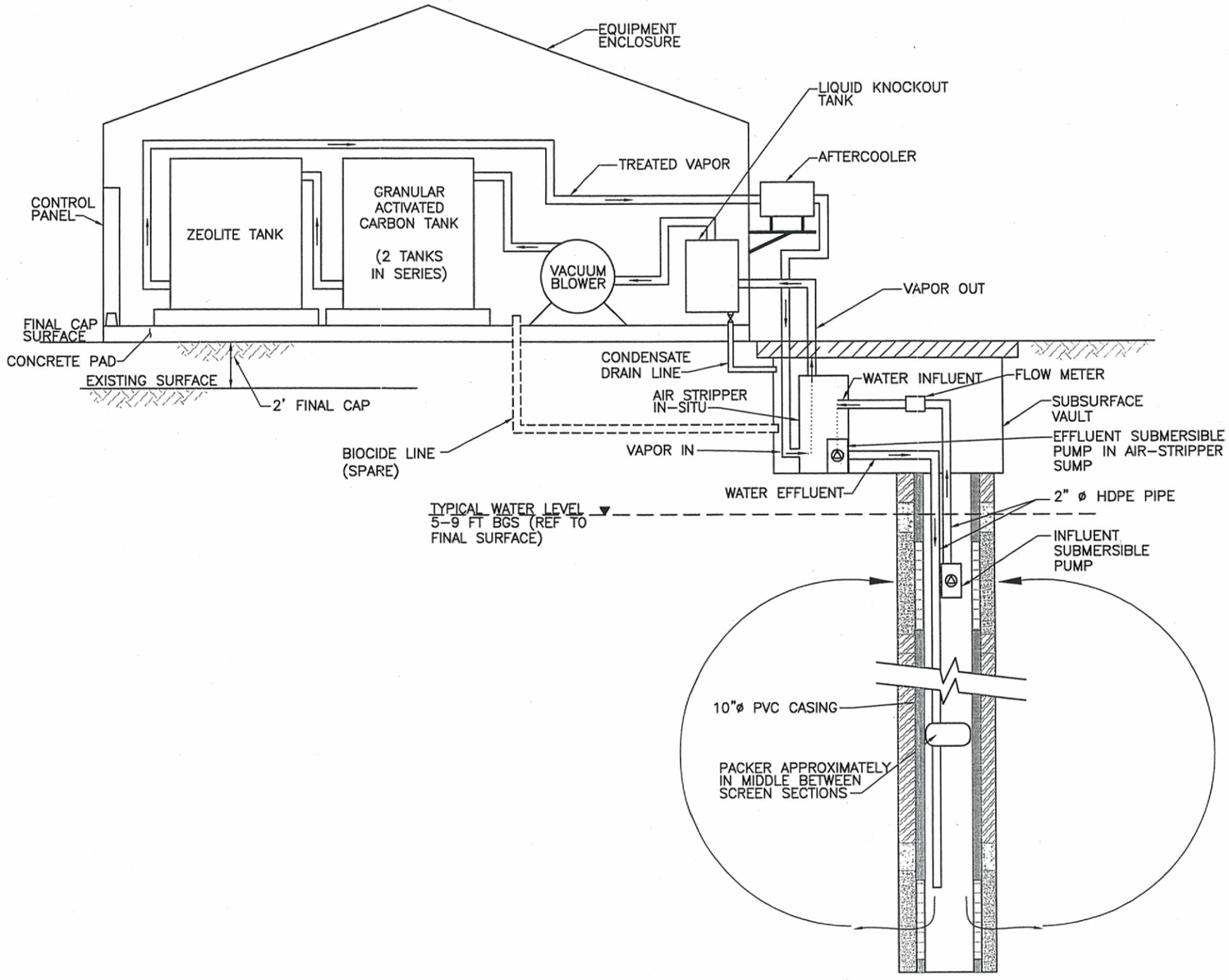
2. THE BIOCIDE DOSING SYSTEM IS AN OPTION THAT MAY NEED TO BE ADDED AFTER SYSTEM START UP. THE BIOCIDE SYSTEM WAS NOT INSTALLED AS PART OF THIS SCOPE OF WORK, BUT PIPING BETWEEN THE ENCLOSURE AND THE GCW'S WAS INSTALLED DURING CONSTRUCTION. THE CONTRACTOR'S PROPOSED SYSTEM CONFIGURATION PROVIDES FOR FUTURE INSTALLATION OF BIOCIDE DOSING SYSTEM AND 55 GALLON DRUM WITH MINIMAL SYSTEM ALTERATIONS.

3. THE CONTRACTOR PROVIDED AN EQUIPMENT ENCLOSURE WITH APPROPRIATE LIGHTING AND ACCESS FOR MAINTENANCE OF EQUIPMENT. EACH ENCLOSURE HAS ONE STANDARD 110–V OUTLET.

4. THE TREATMENT SYSTEM PROVIDED BY THE CONTRACTOR COMBINES THE VAPOR COMPONENTS WITHIN EACH EQUIPMENT ENCLOSURE FOR MULTIPLE GCW'S.

5. THE WELL PACKER HAS AN INFLATION LINE AND PRESSURE GAGE THAT IS MOUNTED ON THE WELLHEAD ASSEMBLY.

6. PACKER HAS A GAS RELIEF LINE TO VENT AWAY GAS BUILD–UP BELOW THE PACKER. THE LINE IS NORMALLY CLOSED AND THE VALVE IS MOUNTED ON THE WELLHEAD ASSEMBLY.



Parametrix DATE: May 18, 2006 FILE: PO2328007CF-30

NOT TO SCALE

REFRENCE:
URS.2004.OPERATION AND MAINTENANCE PLAN NORTHWEST PIPE AND CASING, OPERABLE UNIT 2 GROUNDWATER REMEDIAL ACTION. FIGURE 4.

Figure 4-1
Schematic of GCW Treatment System

This page intentionally left blank.

4.4.2 System Operation and Maintenance[1]

EPA determined the OU2 RA was operational and functional in July 2005, thus marking the official start of the 10-year Long Term Response Action (LTRA) period for OU2. The LTRA is the period up to ten years when EPA continues to fund operation of a groundwater remedy which involves the restoration of groundwater quality to a level that assures protection of human health and the environment. Since DEQ did not request to be the lead agency for conducting the LTRA, EPA has maintained the primary responsibility for conducting the LTRA.

The following O&M activities are required to ensure the continued effectiveness of the GCW systems. Table 4-5 provides a summary of the operation and monitoring tasks and reporting schedule.

- System Operation and Maintenance – Specifications require that the systems operate with a maximum of 3 days per month downtime, assessed on a 3 month rolling average. The O&M Contractor is required to submit monthly logs showing maintenance performed as well as operating times for each GCW (URS 2004c).
- Groundwater Treatment Performance Monitoring – Specifications require a 95 percent stripping efficiency of influent groundwater COCs. (URS 2004c). Influent and treated effluent samples are collected and analyzed monthly to verify that the required stripping efficiency is being met at each treatment unit.
- Evaluation of Site-Wide Groundwater COCs Concentrations – Annual site-wide groundwater monitoring is conducted to assess the effectiveness of the treatment systems and evaluate the extent to which the RGs are being achieved (URS 2004a).
- 5-Year Review – The OU1 and OU2 RODs require that a Five-Year Review be completed, beginning 5 years after initiation of the Soil RA, to evaluate if the soil and groundwater remedies remain protective of human health and the environment.

[1] The operation of treatment facilities to achieve cleanup goals is typically termed "operation and maintenance" (O&M). For the purpose of discussing the operational progress and performance of the groundwater remedy at NWPC in this Five-Year Review, EPA will use the term O&M. However, it is important to note that under Section 104(c)(6) of CERCLA, the phrase "operation and maintenance" takes on a different meaning: "For the purposes of paragraph (3) of this subsection, in the case of ground or surface water contamination, completed remedial action includes the completion of treatment or other measures, whether taken onsite or offsite, necessary to restore ground and surface water quality to a level that assures protection of human health and the environment. With respect to such measures, the operation of such measures for a period of up to 10 years after the construction or installation and commencement of operation shall be considered remedial action. Activities required to maintain the effectiveness of such measures following such period or the completion of remedial action, whichever is earlier, shall be considered operation or maintenance."

Table 4-5. Summary of Operation, Maintenance and Monitoring Tasks and Schedule for OU2

Component	Task	Location	Frequency	Reporting Requirements
GCWs	Vault Inspections Flow Meter Measurements Water Level Measurements Alarm Response Maintenance Activities Packer Inflation Equipment Logs	GCW-01 through GCW-15	Weekly	Monthly
GCWs	Influent / Effluent Water Sampling and Analysis	GCW-01 through GCW-15	Monthly	Monthly
Equipment Shed	Shed Inspection Maintenance Activities Equipment Logs Alarm Response	EQ-01 through EQ-06	Weekly	
Equipment Shed	Vapor Sampling and Analysis	EQ-01 through EQ-06	Quarterly	Quarterly
GCW Treatment System	Run Time / Down Time Performance Evaluation Treatment System Efficiency Evaluation	Treatment System	Monthly	Monthly
Monitoring Wells	Water Level Elevations Water Quality Parameters Groundwater Sampling and Analysis	Site-wide	Annual	Annual
Site	Security	Site	Daily	Monthly

4.4.3 Summary of Remedial Action Costs for OU2

The estimated total cost for the selected groundwater remedy was $1,607,100 in capital costs, with $194,000 per year operation and maintenance cost (in 2001 dollars).

The actual construction cost for the selected remedy was approximately $1,300,000 (in 2003 dollars). The actual project cost was approximately 20% less than the costs estimated by the ROD. The actual annual operation and maintenance costs have been about $210,000 in 2004 and 2005. O&M costs for the first six months of 2006 are approximately $135,000, which represents an annualized expenditure of $270,000.

4.4.4 Supplemental Remedial Action Activities

Concurrent with the OU2 RA, two monitoring wells were installed downgradient of Plume 1 to evaluate the performance of GCW-09, GCW-10, and GCW-15. Groundwater analytical results indicated elevated concentrations of COCs above their respective RGs were present in the Shallow and Intermediate WBZ. Based on these results, eight additional continuous multi-channel tubing (CMT) monitoring wells were installed on Parcels A and B in 2004 and 2005 to further characterize these groundwater impacts. Groundwater analytical results from

the CMT wells indicated that significant concentrations of COCs existed downgradient of Plume 1 source area (URS 2005c), including Parcel A.

In 2006, eight additional groundwater monitoring wells were installed and sampled to further understand the distribution of COCs in the Shallow and Intermediate WBZ, and to help evaluate the performance of selected GCWs.

GCW-15 treatment well was determined to be inoperable in July 2005. An inspection revealed the GCW-15 well casing and screen was compromised at a depth of approximately 30 feet bgs due to the failure of the well's inflatable packer (Parametrix 2006b). GCW-15R was constructed in February 2006 to replace GCW-15, and was activated in April 2006.

Discharge rates in GCW-01 and GCW-10 have significantly declined over the two years of performance to below 5 gallons a minute (Parametrix 2005). Effort was made by the Contractor to rehabilitate these wells. However, this effort has not produced significantly higher discharge rates.

A sodium bromide tracer test was conducted at GCW-08 in April 2006 to assist in explaining unexpectedly low concentrations of COCs in influent water. The tracer test results suggested that short-circuiting of the wells zone of influence (ZOI) was occurring, where treated water was being continually cycled between the upper and lower well screens.

4.4.5 ROD Amendments or Explanation of Significant Differences

No amendments were made to the ROD for OU2 at the time of this review.

This page intentionally left blank.

5. PROGRESS SINCE LAST REVIEW

This is the first five-year review for the site.

This page intentionally left blank.

6. FIVE-YEAR REVIEW PROCESS

6.1 ADMINISTRATIVE COMPONENTS

The approach used to conduct this five-year review followed EPA Comprehensive Five-Year Guidance, and Task Order 20 Final Work Plan Assignment, Parametrix, dated May 27, 2004. Specific work plan tasks included:

- Document Review (Task 03)
- Review of applicable or relevant and appropriate standards (ARARs) (Task 04)
- Site Visit / Site Review (Task 05)
- Site Inspection / Technology Review (Task 06)
- Preparation and submittal of the Five-Year Review (Task 07)

The Five-Year Review effort was led by EPA Region 10 task order project officer (TOPO), Mr. Alan Goodman. Mr. Goodman was assisted by the EPA Community Involvement Coordinator (CIC) Judy Smith, by EPA Attorney-Advisor Mary Queitzsch, by EPA Region 7 (AES) Contract Officer James E. Price, and by Parametrix's Supervising Manager Randy Pratt and Project Manager Eric Roth. The Five-Year Review was conducted from January 1, 2006, to May 30, 2006.

6.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

Community involvement is an important component of the Five-Year Review process. Steps taken to involve the community in this five-year review include preparation and distribution of a postcard (included in Appendix A) by EPA providing specific information on the Five-Year Review and its objectives, and interviews with state and county leaders and adjacent property owners.

6.3 STANDARDS REVIEW

The remedies selected in the OU1 and OU2 RODs are intended to be protective of human health and the environment and to comply with ARARs. The ARARs are reviewed to identify any new or updated state or federal regulatory standards that might affect the protectiveness of the remedy. Summaries of applicable new or updated ARARs identified in the course of this five-year review are located in Section 7.2.

6.4 DOCUMENT REVIEW

A list of relevant documents including O&M records and monitoring data reviewed is displayed in Appendix B. To ease the review process, documents are separated into categories that include: General – EPA; General – Contractor; OU1 - O&M; OU2 - O&M; OU2 – Monitoring.

6.5 DATA REVIEW

This section presents a summary of data reviewed for OU1 and OU2.

6.5.1 OU1

Review of data and information summarized in the DEQ and Clackamas County inspection reports and listed documents in Section 6.4 indicate:

Soil Cap

- The integrity of the soil cap is being maintained. Some erosion due to rainfall occurred immediately after construction, at the western margin of the cap; however, erosion along the margin has been stabilized. Erosion due to vehicle traffic at the northern entrance to the site has been stabilized by the addition of gravel material.
- Vigorous growth of the vegetative cover planted on the cap after construction continues and aids in reducing runoff from rainfall. However, the cap requires mowing in the summer to reduce the potential for fire hazard.
- The bermed areas for erosion control are functioning as intended.
- The soil cap has no significant ruts from vehicle traffic.
- Shallow swales retain ponded water in the winter and spring months. Ponded water swales up to 150 feet in diameter have been observed. Ponded water and resulting runoff has promoted the growth of wetland grasses such as sedges.
- Fencing around the site, required by the ROD, is in good condition. Where the fencing has been cut or damaged due to vandalism, repair has been responsive.
- Access roads on the northern and southern entrances to Parcel B are in good condition.
- The appropriate warning signs on the north and south gate required by the ROD are posted and in good condition.

Wetlands

- The wetland is functioning as intended with three to six inches of inundation during periods of high water flow in the east drainage ditch, and surface water runoff from the cap also contributing to the inundation.
- The constructed wetland area is hydraulically connected to the eastern drainage ditch, which supplies it with an influx of surface water. Water also enters the wetland from overland runoff during storm events.
- Combined forested wetland and emergent wetland areas have exceeded their aerial coverage requirements.
- Surface soil material has promoted the growth of native grasses and sedges.
- Invasive weeds such as blackberries, Scotch broom and thistles continue to appear on the wetland slope leading to the soil cap. In 2005, CDM and DEQ removed some invasive weeds; however, continued monitoring and mitigation are required. Blackberries on the eastern property boundary are a continuing source of invasive weeds.
- Buried features were installed to promote wildlife habitat. No evaluation criteria for these features has been specified. It appears that a Nutria has inhabited some of these features during the 2006 winter months.

- Some willow and hawthorne trees planted upland of the wetlands to provide shade and habitat are distressed.

6.5.2 OU2

GCW Treatment System O&M

Review of data and information summarized in the O&M Contractor's monthly status reports from March 2004 to March 2006 and listed documents in Section 6.4 indicate:

Operation

- Monthly reports completed by the O&M Contractor contained relevant and applicable information necessary to evaluate system operation. Reports contained evaluation of system downtime, alarms, operation, and maintenance activities. Status reports were provided to the EPA in a timely manner, typically by the first week of the month.
- The O&M Contractor provided trained personnel to satisfy operation requirements.
- System downtime did not exceed 3 days per month on a 3-month rolling average, except when noted due to equipment failure or maintenance.
- A greater than expected start-stop count occurred over time at the pump controllers.
- A greater level of labor hours were required to respond to high water alarms associated with the air strippers.
- Greater than expected labor hours were necessary to balance influent and effluent pumping rates.
- Influent flow rates significantly decreased over time at GCW-01, GCW-02, GCW-09, GCW-10, and GCW-12.

Maintenance

- Monthly operating logs completed by the O&M Contractor contained relevant and applicable information necessary to evaluate system maintenance. Logs were provided to the EPA in a timely manner.
- The O&M Contractor performed scheduled routine maintenance activities.
- The O&M Contractor responded to unscheduled non-routine maintenance activities in a timely manner. The O&M Contractor reasonably communicated these activities with the EPA.
- Greater than expected labor hours and costs have been required to replace specialized 10-inch inflatable packers, due to de-lamination issues and the packers not holding pressure (observed in GCW-02, GCW-03, GCW-07, GCW-10, and GCW-15).
- Greater than expected labor hours and costs have been required to replace or repair influent and effluent submersible pumps (observed in GCW-05, GCW-07, GCW-10, GCW-11, GCW-14, GCW-15) and effluent submersible pump (GCW-02, GCW-03), due to a greater than expected number of start/ stop cycles. The design of the wells requires that the entire influent pump assembly and packer be pulled to service the pump.

- Blower failures were observed in EQ-01, EQ-03, and EQ-04. The blowers required repair/replacement.
- Less than expected labor hours and costs and costs of treatment media replacement have been required to change out carbon and zeolite vessels. Carbon vessels were expected to be changed out once per quarter per equipment shed. Logs indicate that carbon vessels were changed once in EQ-03 and four times in EQ-04; zeolite vessels have been changed once in EQ-04 since start-up in March 2004. No other change outs of treatment media have occurred.
- Greater than expected labor hours were required due to automatic shut downs by high level alarm system in the unit's air stripper. This is thought to be due to inadequate balance in flow between the influent and effluent pumps (observed in GCW-01, GCW-02, GCW-05, GCW-06, GCW-11, and GCW-14).
- Greater than expected labor hours have been required to service air stripper misting sleeves.
- Greater than expected labor hours have been required to dewater vaults during winter and spring months. The vaults were constructed below the seasonal high water table. The vaults were not equipped with watertight lids in accordance with the design and water seeps in around the lids, along construction joints, and along penetrations into the vaults.

GCW Treatment System Performance Evaluation

Review of data and information summarized in the Technical Assistance Contractor's monthly performance evaluation reports from March 2004 to March 2006 and listed documents in Section 6.4 indicate:

In-situ Air Stripping

- Influent water is being effectively treated by air stripping. In general, analytical results indicated that treatment by air stripping meets the COC removal efficiency performance standard of 95 percent (Appendix C). Analytical results indicate that removal efficiencies below 95 percent have been observed; however removal efficiencies significantly below 90 percent have been not been observed.

GCW

- Bio-fouling is observed in GCW-01. Biological growth appears throughout the well and is likely related to the carbon steel conductor casing. Redevelopment using physical and chemical treatments had limited success in increasing the discharge capacity of the well.
- Short circuiting of the ZOI is likely occurring in GCW-08, based on a sodium bromide tracer test. Short circuiting is thought to be due to construction methods, where the integrity of the seal between the upper and lower well screens may be compromised.
- The integrity of well construction at GCW-10 is in question due to the presence of filter pack material and bentonite seal in the annulus of the well. Well redevelopment using physical and chemical treatment had limited success at increasing the well's extremely low discharge capacity.
- The integrity of GCW-15 was compromised due to failure of the well's inflatable packer in July 2005. Review of well construction details and inflatable packer

pressure and placement suggest that the PVC well casing near a threaded joint may have cracked due to pressure induced by the packer. GCW-15 was replaced by GCW-15R in February 2006.

- Influent flow rates into the air stripper units are typically significantly less than effluent flow rates out of the air stripper, requiring flow balancing and which can cause the system alarms to trigger.
- Flow rates less than the optimum pumping rate of 6.6 gpm for on-site containment of Commingled Plume 1&4 were observed at GCW-01 (URS 2003f). Well placement for containment was based on an optimum flow rate.
- Flow rates less than the optimum pumping rate of 6.6 gpm for source reduction of Plume 1 were observed at GCW-10 (URS 2003f). Well placement for source removal was based on an optimum flow rate.
- Flow rates less than the optimum pumping rate of 18.5 gpm for source reduction of Plume 3 were observed at GCW-02 (URS 2003f). Well placement for source removal was based on an optimum flow rate.
- Flow rates have significantly decreased from March 2004 to March 2006 in GCW-01, GCW-02, GCW-06, GCW-10, and GCW-12 (Appendix C).

Carbon / Zeolite Vapor Treatment

- The influent vapor stream is being effectively treated by granulated activated carbon. No performance standard for COC removal efficiency has been set for the vapor stream; however, analytical results indicate that COC removal efficiency is greater than 90 percent for treated water.
- Vinyl chloride is not detected at or above its certified required quantitation limits (CRQLs) in any of the influent or effluent vapor samples.

General

- Influent COC concentrations less than RGs are observed at source area wells GCW-03 (Plume 3), GCW-06, and GCW-07 (Plume 2).
- Influent COC concentrations at GCW-05 through GCW-08, GCW-12, and GCW-15 are significantly less than COC concentrations in groundwater from upgradient monitoring wells constructed in the Shallow WBZ.
- Mass removal calculations indicate that approximately 24,908 grams (54.9 pounds) of COCs have been removed by the GCW treatment system from March 2004 to March 2006 (Appendix C): 16,270 grams (35.9 pounds) from March 2004 to December 2004, 7,880 grams (17.4 pounds) from January 2005 to December 2005, and 758 grams (1.7 pounds) from January 2006 to March 2006. Start-up of the system occurred in January 2004; however no analytical data was collected during start-up. Due to this data gap, it is likely that the amount of mass removed by the GCW treatment system is underestimated.
- The mass removal rate has decreased from March 2004 to March 2006 in GCW-01, GCW-05, GCW-06, GCW-10, GCW-12, and GCW-14; it has not changed in GCW-02, GCW-04, GCW-07 through GCW-09, GCW-11, and GCW-13 (Figures 6-1 through 6-6).

- Limited amounts of mass removal of COCs (less than 5 grams per month) are observed at source areas wells GCW-03, and GCW-05 through GCW-07.
- Annual O&M costs for 2004 and 2005 are approximately $193,700 and $211,400, respectively.
- Estimated cost of COCs mass removal is $5,395.50 per pound in 2004, and $12,150.50 per pound in 2005.
- Time of treatment may be greater than the 5 to 10 years projected in the ROD, if the current mass removal rate continues.

Site-Wide Groundwater Monitoring

Review of data and information summarized in the Technical Assistance Contractor's site-wide groundwater monitoring reports and documents listed in Section 6.4 indicates:

Hydrology

Shallow WBZ

- The water level elevation contour map for October 2003 (Baseline) indicates a north groundwater flow direction (URS 2003a). Water level elevation contour maps for January 2005 (Year 1) and November 2005 (Year 2) indicate a north-northwest groundwater flow direction (URS 2005c; Parametrix 2006a). The change in the flow direction between baseline and Years 1 and 2 is thought to be related to the expansion of the monitoring well network over time, seasonal fluctuations in precipitation and groundwater baseflow, and/or start-up of the groundwater recirculation flow system.
- The estimated horizontal hydraulic gradient in the Shallow WBZ is relatively flat.
- Well discharge capacity of the Shallow WBZ is thought to range from 3 to 10 gpm based on pumping tests, observed conditions, and observations conducted during drilling.

Intermediate WBZ

- The direction of groundwater flow in the Intermediate WBZ is north-northwest, with a relatively greater horizontal hydraulic gradient than the Shallow WBZ.
- The well capacity of the Intermediate WBZ is thought to range from 10 to 30 gpm based on pumping tests, observed conditions, and observations conducted during drilling.
- An upward vertical hydraulic gradient is observed in the upper WBZ in the northern portion of the site; a downward vertical gradient is observed in the upper WBZ in the southern and central portions of the site.

Commingled Plume 1&4

- Concentrations of Total COCs (PCE & TCE) are increasing over time in monitoring wells constructed in the Shallow WBZ downgradient of the site (Figure 6-1). Two of the three off-site shallow monitoring wells display increasing concentrations of Total COCs, with one well (MW-111) having PCE and TCE concentrations greater than their respective RGs.
- Detected concentrations of PCE and TCE in groundwater at or above their respective CRQLs are observed in downgradient monitoring wells constructed in the Intermediate WBZ (Figure 3-6).

- Concentrations of Total COCs are increasing over time in downgradient monitoring wells constructed in the Intermediate WBZ (Figure 6-2). No off-site monitoring wells have COCs concentrations greater than their respective RGs.
- VC was not detected at or above its respective MRLs in groundwater collected from off-site downgradient wells constructed in the shallow, intermediate, and deep WBZs.
- Concentrations of COCs above their respective RGs persist in groundwater from monitoring wells constructed in the Shallow and Intermediate WBZs that are upgradient of GCW-01 and GCW-12 (Figures 3-5 and Figure 3-6). Contamination may be coming from an undetermined source area in the vicinity of the ODOT facility (former Northwest Pipe and Casing Manufacturing Plant).

Plume 1

- Total COCs concentrations in the Plume 1 source area are decreasing over time in monitoring wells constructed in the Shallow WBZ (Figure 6-3); however, PCE and TCE concentrations in the Plume 1 source area persist at concentration greater than 1,000 µg/L and 100 µg/L, respectively.
- Total COCs concentrations downgradient of the Plume 1 source area are generally increasing over time in monitoring wells constructed in the Intermediate WBZ (Figure 6 4). PCE and TCE concentrations directly downgradient of the Plume 1 source area have PCE and TCE concentrations greater than 100 µg/L.
- Concentrations of PCE and TCE associated with the Plume 1 source area appear to be migrating laterally (north-northwest) within the Shallow WBZ and downward to the Intermediate WBZ (Figure 3-5, Figure 3-6, and Figure 3-7).
- Detectable concentrations of VC are observed hydraulically downgradient of the Plume 1 source area in the shallow and intermediate WBZs.

Plume 2

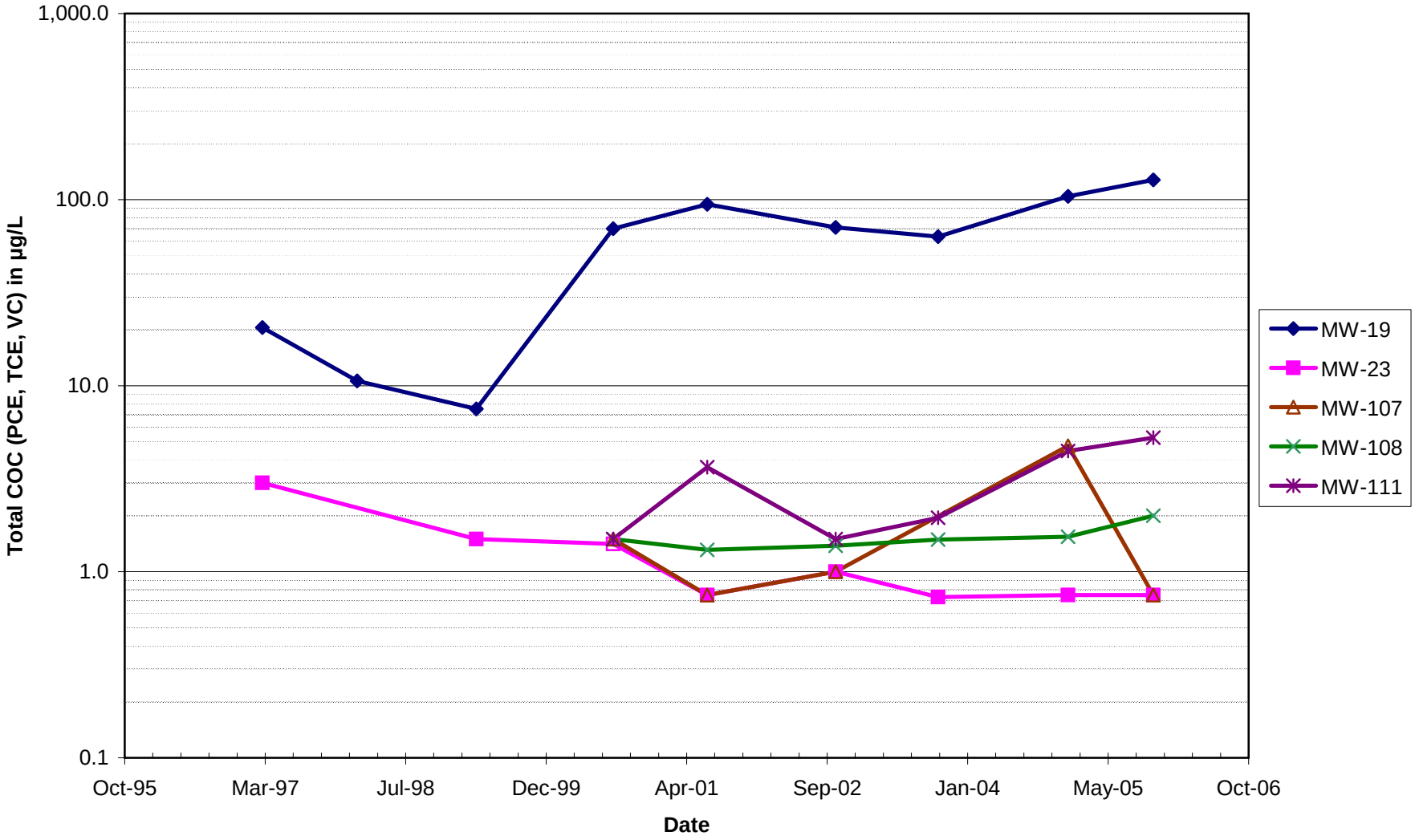
- Total COC concentrations in the Plume 2 source area are decreasing over time in monitoring wells constructed in the Shallow WBZ; however, concentrations of Total COCs above their respective RGs persist (Figure 6-5).
- Concentrations of Total COCs associated with the Plume 2 source area appear to be migrating hydraulically downgradient in both the Shallow and Intermediate WBZ (Figure 3-5 and Figure 3-6).

Plume 3

- Concentrations of Total COCs associated with the Plume 3 source area are decreasing over time in monitoring wells constructed in the Shallow WBZ (Figure 6-6).

This page intentionally left blank.

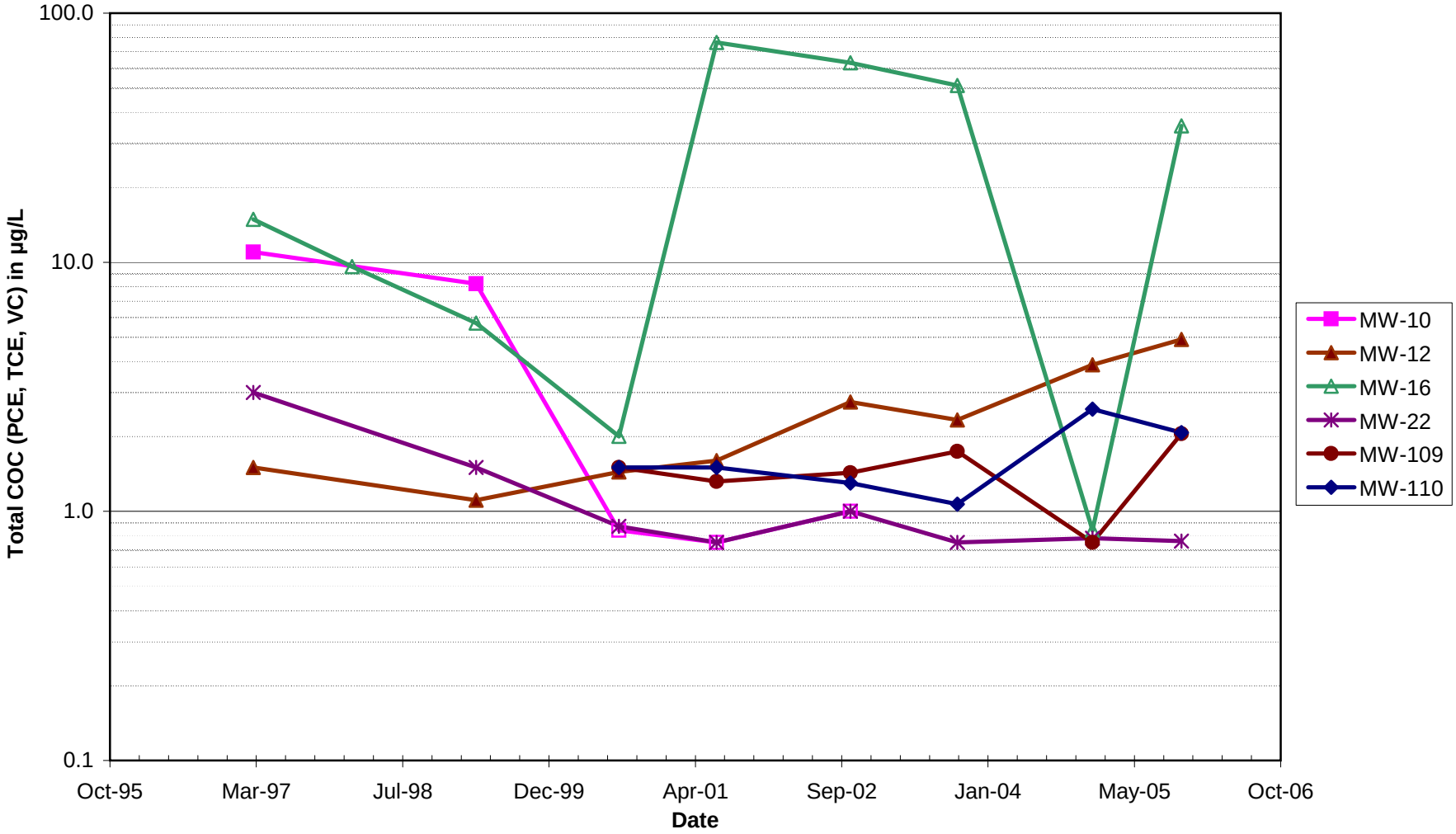
Figure 6-1
Total COCs (PCE, TCE, VC) Concentration Trends in Comingled Plumes 1 and 4
Shallow Water Bearing Zone
NW Pipe and Casing Inc, Clackamas Oregon



L:\415-2328-007 - AES Contract\0020 NW Pipe & Casing\5.0 Dsgn Stud Supp Docs\10 Analytical Support\10.1 Site Wide GW Samp\Tables\WorkingTables_032206.xls

This page intentionally left blank.

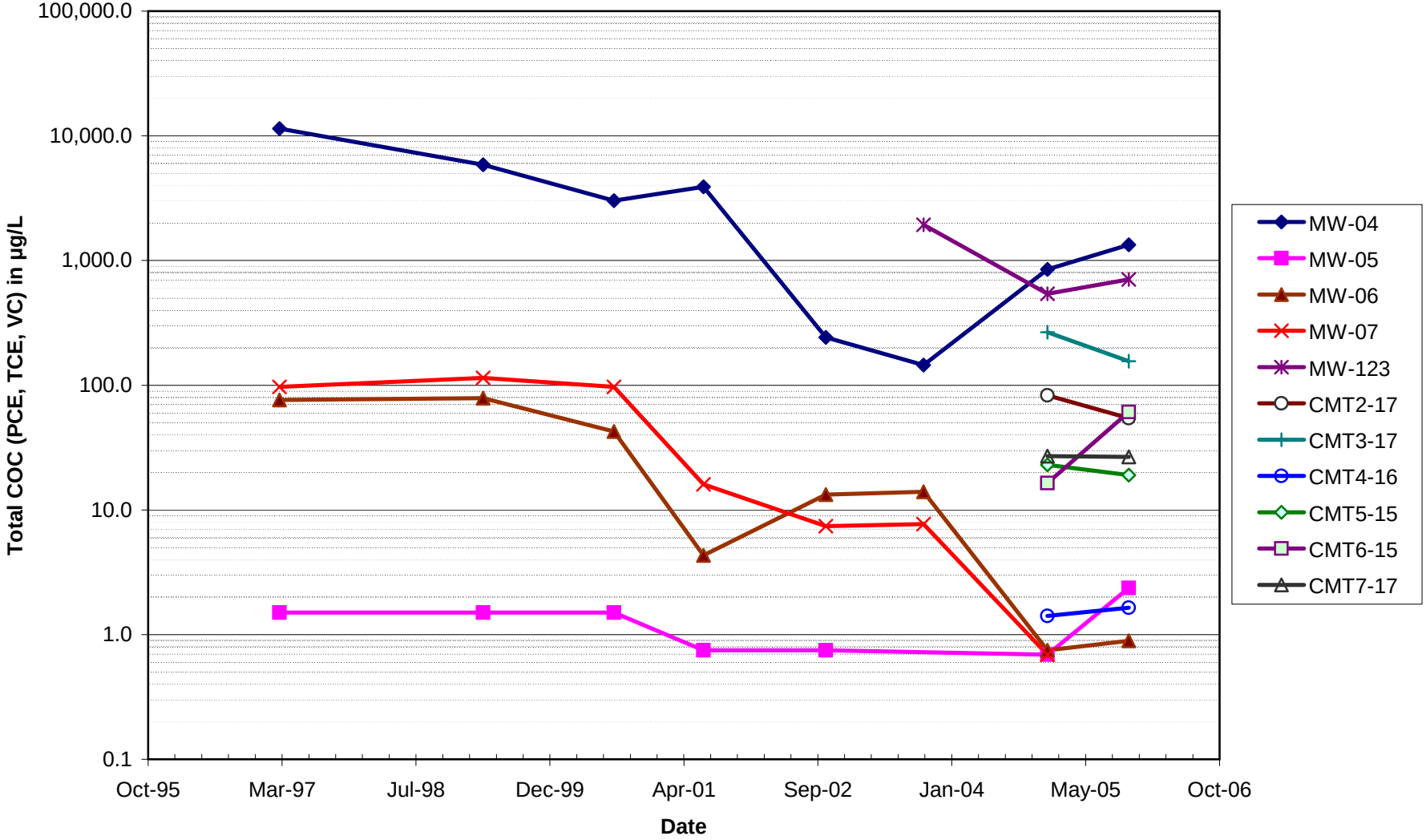
Figure 6-2
Total COCs (PCE, TCE, VC) Concentration Trends in Comingled Plumes 1 and 4
Intermediate Water Bearing Zone
NW Pipe and Casing Inc, Clackamas Oregon



L:\415-2328-007 - AES Contract\0020 NW Pipe & Casing\5.0 Dsgn Stud Supp Docs\10 Analytical Support\10.1 Site Wide GW Samp\Tables\WorkingTables_032206.xls

This page intentionally left blank.

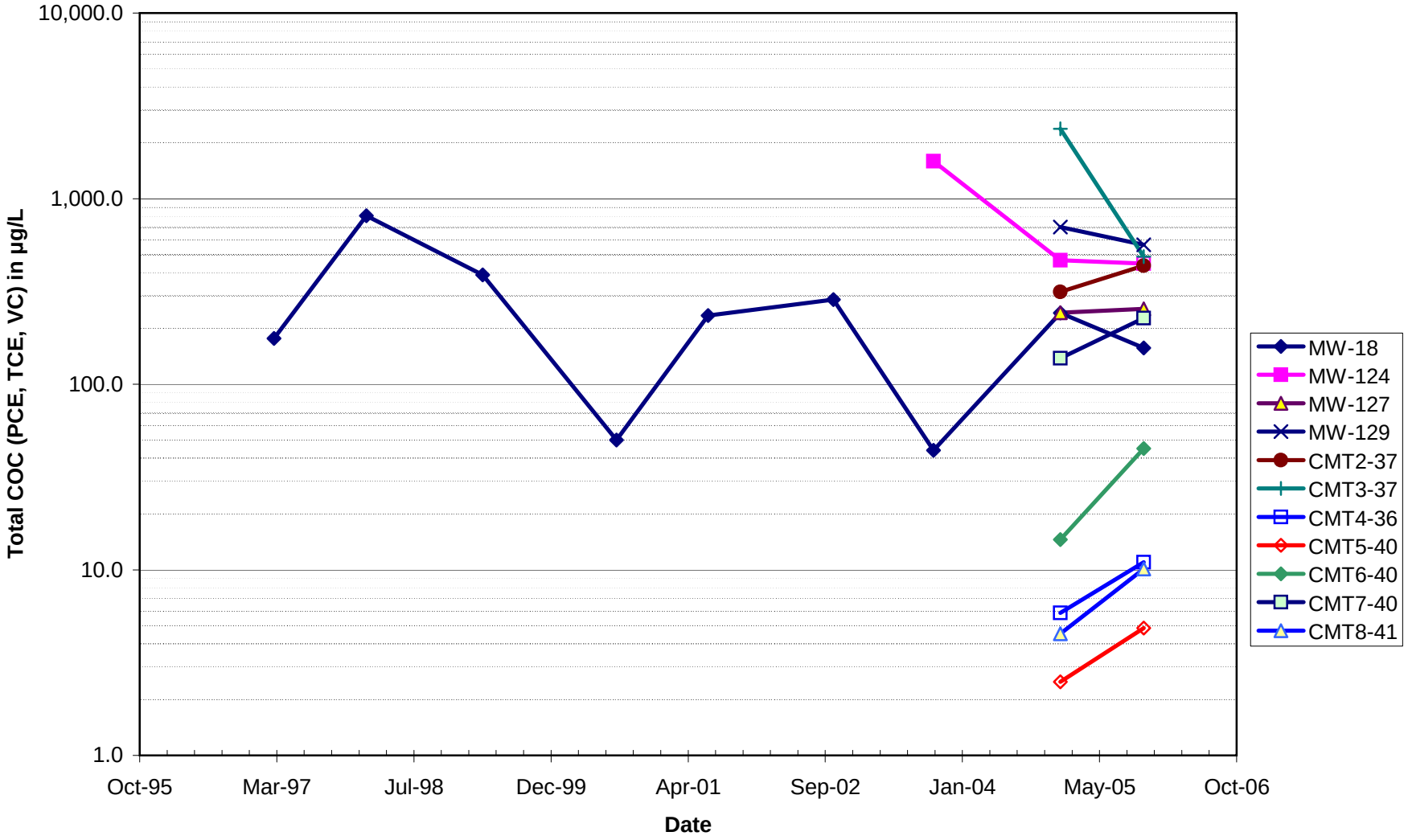
Figure 6-3
Total COCs (PCE, TCE, VC) Concentration Trends in Plume 1
Shallow Water Bearing Zone
NW Pipe and Casing Inc, Clackamas Oregon



L:\415-2328-007 - AES Contract\0020 NW Pipe & Casing\5.0 Dsgn Stud Supp Docs\10 Analytical Support\10.1 Site Wide GW Samp\Tables\WorkingTables_032206.xls

This page intentionally left blank.

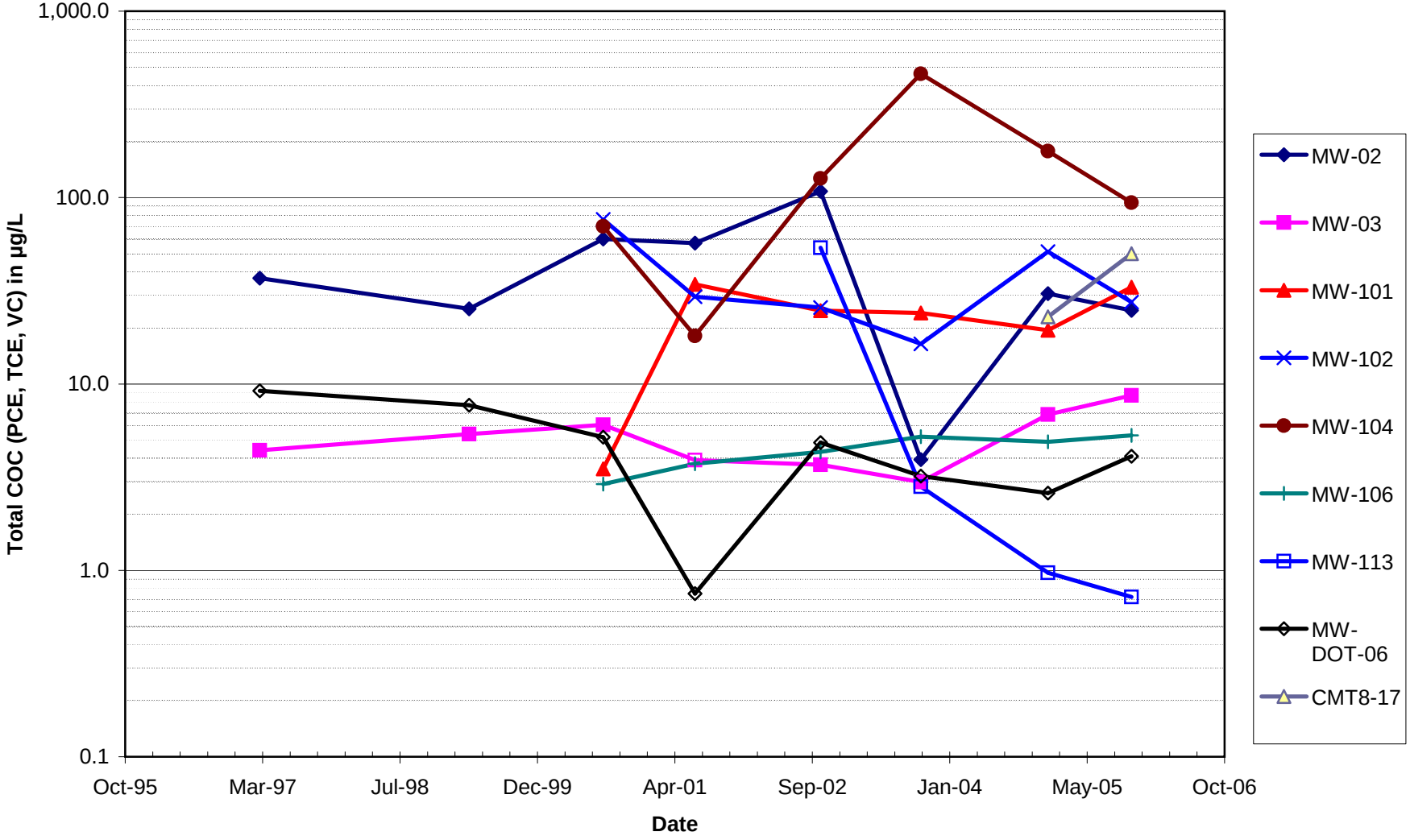
Figure 6-4
Total COCs (PCE, TCE, VC) Concentration Trends in Plumes 1
Intermediate Water Bearing Zone
NW Pipe and Casing Inc, Clackamas Oregon



L:\415-2328-007 - AES Contract\0020 NW Pipe & Casing\5.0 Dsgn Stud Supp Docs\10 Analytical Support\10.1 Site Wide GW Samp\Tables\WorkingTables_032206.xls

This page intentionally left blank.

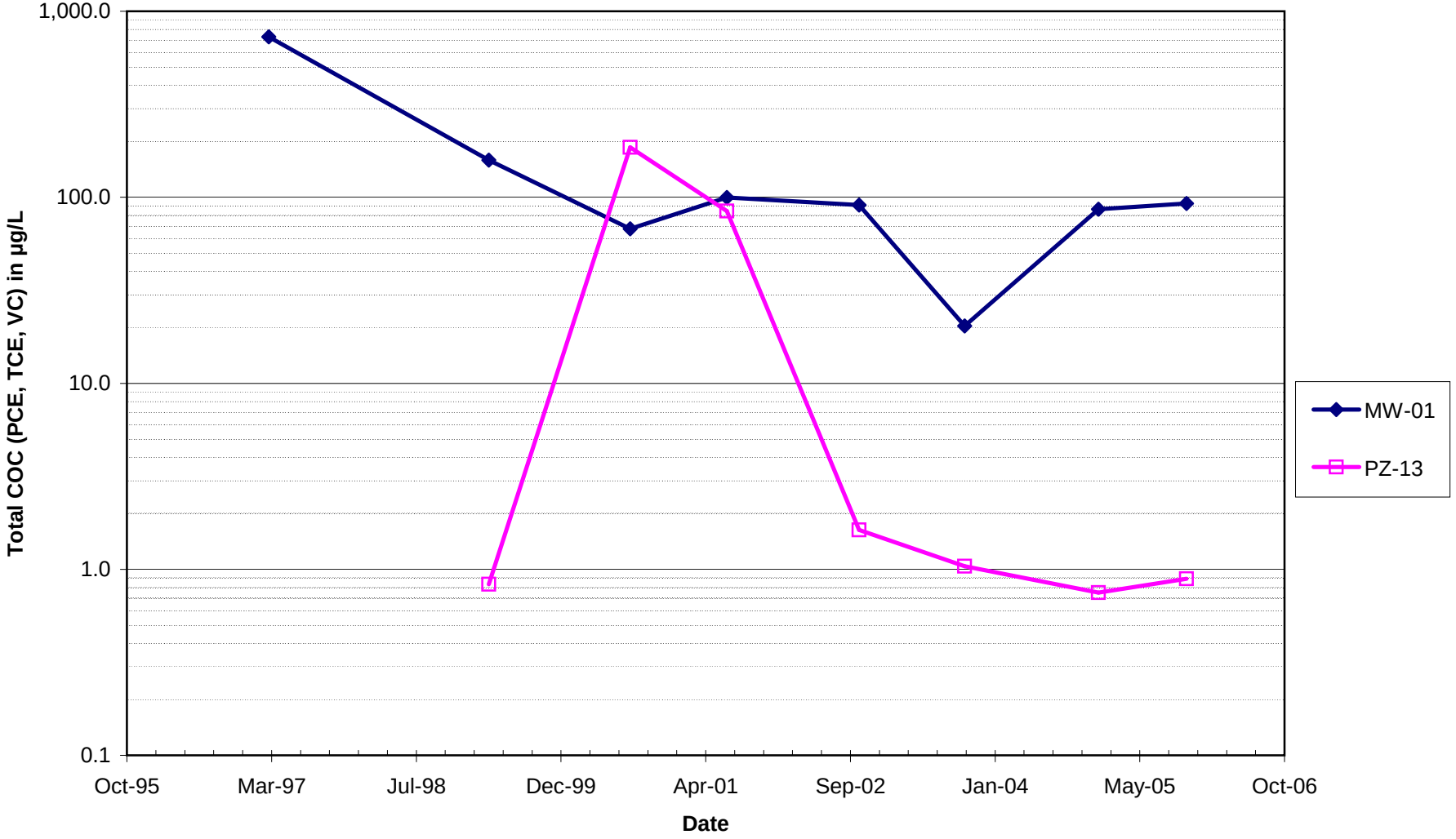
Figure 6-5
Total COCs (PCE, TCE, VC) Concentration Trends in Plume 2
Shallow Water Bearing Zone
NW Pipe and Casing Inc, Clackamas Oregon



L:\415-2328-007 - AES Contract\0020 NW Pipe & Casing\5.0 Dsgn Stud Supp Docs\10 Analytical Support\10.1 Site Wide GW Samp\Tables\WorkingTables_032206.xls

This page intentionally left blank.

Figure 6-6
Total COCs (PCE, TCE, VC) Concentration Trends in Plume 3
Shallow Water Bearing Zone
NW Pipe and Casing Inc, Clackamas Oregon



L:\415-2328-007 - AES Contract\0020 NW Pipe & Casing\5.0 Dsgn Stud Supp Docs\10 Analytical Support\10.1 Site Wide GW Samp\Tables\WorkingTables_032206.xls

This page intentionally left blank.

6.6 SITE INSPECTION

A site inspection was conducted by the Contractor on January 4, 2006 (see Appendix D). The purpose of the inspection was to assess the protectiveness of the remedy through the reviews discussed below.

Institutional Controls (ICs)

- An easement and equitable servitude (EES) was entered between the CCDA (Grantor) and the Oregon DEQ (Grantee) on October 6, 2005 (Clackamas County Official Records 2005-100312). A primary purpose of the EES is to implement the ICs specified in the OU1 and OU2 RODs for Parcel B. The EES restricts:
  - The beneficial use of groundwater on the property as long as the contaminant concentrations exceed cleanup levels.
  - The use of the property that will penetrate, disturb, and/or jeopardize the integrity of the soil cap. The owner must maintain the soil cap in accordance with the Soil Cap Monitoring and Maintenance Plan (DEQ and EPA 2005).
  - Operations and/ or use of the property that will or likely will impair the proper function of the one-acre wetland in the northeast corner of the property without written approval by the DEQ.
  - The access to the property as necessary to protect the soil cap, groundwater treatment system, and wetlands.
- A draft EES for the ODOT property has been prepared by DEQ and EPA and submitted to Oregon Department of Transportation in June 2006. This EES is intended to implement ICs for groundwater use restrictions specified by the OU2 ROD for the ODOT property. The EES has not yet been executed as of the date of this Five-Year Review.

OU1 Soil

Inspection of the soil cap indicated:

- The cap was revegetated with grass in most areas. Vegetation height ranged from 3 to 8 inches.
- Vehicle traffic was limited to roadways. Some potholes were observed.
- The soil cap appears to be in good condition. Some soil erosion is apparent at the north gate due to vehicle traffic.
- Surface water ponding was observed throughout Parcel B. Ponded water has occurred in shallow swales up to 20 feet in diameter.
- Condition of the wetlands meets or exceeds required monitoring criteria for water regime and vegetative cover.
- Fencing and locked gates restrict access to Parcel B. The fencing appears to be in good condition; however the northwest, southeast, and south corners of the fence line have been repaired due to vandalism. “No Trespassing”/“Hazardous Waste Site” signs are posted along the perimeter of the fence, and EPA / DEQ contact information is provided on signs posted on the north and south gates.
- Vandalism has occurred at the site trailer and storage box. The O&M Contractor performs periodic security checks of fencing typically once a week.

OU2 Groundwater

Inspection of the GCW treatment systems indicated:

- Equipment sheds appeared to be in good physical condition. No leaks were observed. Safety signs displaying "Ear Protection Required" were posted. Some sheds displayed mouse and insect activity, and loose nail heads along the structure.
- Treatment vaults appeared to be in good condition. Plastic sheets were laid over each vault to prevent goose fecal matter from entering the vault. Some vaults showed signs of insect activity, standing water, and degradation of water-resistant grout along piping runs. Sumps in some of the vaults could not be effectively used because they were covered by the air stripper units.
- The monitoring well network appears to be in good condition. Well heads, security monuments, and bollards are functioning as intended.

6.7 INTERVIEWS

A summary of interviews is presented in Appendix E. Face-to-face interviews were conducted; parties were identified and interviewed based on the following criteria:

- On-site property owners
- Public entities affected by operation of the remedy

Parties identified and interviewed include:

- Deborah Bailey, Project Manager, Oregon Department of Environmental Quality
- Judy Smith, CIC, Environmental Protection Agency
- Gary Cook, Manager, Clackamas County Development Agency
- Mark La Noue, President, La Noue Development & Brokerage (owner of NWDC property)
- Larry Olsen, Facility Manager, Oregon Department of Transportation

Parties were asked the following questions:

- *Role and responsibilities?*
- *Have EPA and its contractors kept you informed and have they supplied appropriate levels of information regarding site activities?*
- *Are there any duties EPA and/or contractor have not fulfilled?*
- *Do the remedial actions coincide with the objectives of the State, County, or private entity?*
- *Do you have any concerns regarding the site?*
- *Are there any new developments, either constructed or planned in the area, that the agency is unaware about? Construction permits pending or submitted?*
- *What follow-up actions should be taken?*

In general, parties indicated that they were well informed, and a good line of communication existed between them and the EPA TOPO. However, Deborah Bailey, DEQ, indicated that she was concerned regarding the effectiveness of the groundwater remedy and its respective costs; Larry Olsen, ODOT, indicated that he and his employees were concerned regarding the potential exposure to site-related contaminants.

7. TECHNICAL ASSESSMENT—OU1

This chapter presents an assessment of the remedy's performance as implemented at the NWPC. The assessment was prepared to answer the following questions for OU1 provided under Sections 7.1 through 7.3.

7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENT?

The soil remedy is functioning as intended. Technical assessment of the remedy indicates that:

- The remedy has been successful in treating, removing or disposing approximately 32,310 tons of contaminated soil material at the site.
- The remedy provides effective means through ICs and the soil cap for limiting potential direct exposure of contaminated soil to current/ future workers and trespassers.
- The implementation of the remedy was conducted in an effective manner.
- The soil cap is in good condition and receives the necessary monitoring, inspection, and maintenance.
- Soil RGs for VOCs remain protective of MCLs in the underlying groundwater. Although the toxicity factors for TCE in place at the time of ROD issuance are under review by EPA, EPA has not changed the MCL for TCE which is the basis of the soil RG for TCE.
- Actual OU1 project costs for remedial action work, soil cap placement, and wetland restoration were less than costs estimated by the ROD.
- The wetland is functioning as intended and meets the required performance criteria.

The remedy for OU1 is also functioning to attain the RAOs specified in the ROD. Each RAO is presented below in italics, followed by a discussion of how the remedy is functioning with respect to the intent of the RAO.

Prevent exposure of trespassers, future construction workers, and future maintenance workers through direct contact (ingestion or dermal contact) with contaminated soil that would result in an excess lifetime cancer risk greater than one in a million for individual carcinogens, above one in one hundred thousand for additive carcinogenic contaminants, or above a Hazard Quotient of 1.

The remedy satisfies the intended function of the RAO.

- Exposure to future construction workers through direct contact is limited by the EES, which specifies adherence to the Soil Cap Monitoring and Maintenance Plan and the Waste Management Plan. These plans provide conditions and requirements for maintaining and inspecting the soil cap and for future work activities that disturb the cap, respectively.
- Approximately 32,010 tons of known contaminated soil and debris was excavated. Of this 32,010 tons, approximately 10,463 tons of soil, debris and oversized material

was disposed of at a Subtitle C Landfill in Arlington, Oregon; approximately 7,479 tons of soil was thermally treated off-site and then reused as backfill on-site; and approximately 5,466 tons of debris and oversized material was disposed at a Subtitle D landfill in Hillsboro, Oregon.

- Lesser contaminated soil having concentrations less than excavation criteria remains in place and is covered by the protective soil cap.
- Direct exposure to trespassers and future construction and maintenance workers through direct contact is prevented through placement of a clean 2-foot soil cap covering contaminated soils on Parcel B. Inspection and maintenance activities are performed to ensure the soil cap integrity is maintained.
- Exposure to trespassers through direct contact of contaminated soils is further prevented by fully enclosed fencing and warning signs that inhibit access to the site.

Prevent migration of soil contaminants to groundwater that would result in exposure to future off-site residents through direct contact (ingestion, inhalation, and dermal contact) with contaminated groundwater that would result in an excess lifetime cancer risk greater than one in a million (1E-06) for individual carcinogens, above one in one hundred thousand for additive carcinogenic contaminants, or above a Hazard Quotient of 1.

The remedy satisfies the intended function of the RAO.

- The ROD established RGs for TCE, PCE, and vinyl chloride in soil at levels which are protective of the groundwater MCLs. Migration of soil contaminants to groundwater was substantially reduced at the site through treatment or removal of a majority of contaminated soils which exceeded the soil RGs for these contaminants.
- Migration of soil contaminants to groundwater was further reduced through the placement of a clean 2-foot soil cap over the remaining lesser contaminated soils. The soil cap, by design, allows some infiltration, and thus rainfall percolation could reach groundwater; however, there is no indication that such infiltration is causing volatile COCs in soil underneath the cap to leach to groundwater.

Wetland

The wetland is meeting the performance criteria established in the *Wetland Mitigation and Monitoring/Maintenance Plan*. Based on annual assessments conducted by EPA in 2004 and 2005 and by DEQ in 2006:

- The wetland is functioning as intended with three to six inches of inundation during periods of high water flow in the east drainage ditch, and indications of surface water runoff from the cap also contributing to the inundation.
- The constructed wetland area is hydraulically connected to the eastern drainage ditch, which supplies it with an influx of surface water. Water also enters the wetland from overland runoff during storm events. The wetland may not be in direct connection with groundwater.
- Combined forested wetland and emergent wetland areas have exceeded their aerial coverage requirements.
- Surface soil material has promoted the growth of native grasses and sedges.
- Invasive weeds such as blackberries, Scotch broom, and thistles continue to reappear on the wetland slope leading to the soil cap. In 2005, CDM and DEQ removed some

invasive weeds; however, continued monitoring and mitigation, typical activities associated with a newly constructed wetland, are required. Blackberries on the eastern property boundary are a continuing source of invasive weeds.

- Buried features were installed to promote wildlife habitat. No evaluation criteria for these features has been specified. DEQ observed in a winter 2006 inspection that a Nutria inhabited some of these features.
- Some willow and hawthorne trees planted upland of the wetlands to provide shade are distressed.

7.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES USED AT THE TIME OF THE REMEDY SELECTION STILL VALID?

The exposure and land use assumptions and RAOs used at the time of the remedy selection remain valid. The cleanup levels in the ROD for VOCs in soil are based on attaining MCLs for these VOCs in groundwater. For all COCs except TCE the slope factors and reference doses have not changed. However, the cancer slope factor for TCE is under review and the impact of any final change by EPA in the slope factor will be evaluated during the next five year review.

There have been no changes in federal or state standards or regulations which were cited as ARARs in the ROD that could affect the protectiveness of the remedy. The MCL for TCE has not changed, although the cancer slope factor for TCE is under review by EPA.

7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

There have been no changes to the physical condition of the site that would affect the protectiveness of the remedy. The sale in 2005 of Parcel B to Clackamas County Development Agency, under coordination with EPA, is not believed to affect the protectiveness of the remedy in the short-term. Physical changes to the site from future highway construction will likely not occur until Year 2010. It is unknown at this time if future highway construction would affect protectiveness of the remedy. Potential interim uses on Parcel B being considered by Clackamas County Development Agency include a rail spur and storage yard. No details concerning these uses are currently available to EPA; consequently, their potential impact on the protectiveness of the site remedy is unknown at this time. Development activities on Parcel B are required to be reviewed and approved by DEQ and EPA under the terms of an Easement and Equitable Servitude recorded with the property deed in 2005.

This page intentionally left blank.

8. TECHNICAL ASSESSMENT—OU2

This chapter presents a technical assessment of the groundwater remedy performance as implemented at the NWPC. The assessment was prepared to answer the following questions for OU2 provided under Sections 8.1 through 8.3.

8.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENT?

The groundwater remedy is not fully functioning as intended by the ROD, although the remedy has made progress towards attaining the RAOs for OU2. Technical assessment of the remedy indicates that:

- Exposure of future on-site maintenance workers through direct contact with contaminated groundwater in the upper aquifer is partially prevented through an EES in place on Parcel B. An EES to accomplish the same exposure protection for the ODOT property is not yet in place. Recent groundwater monitoring data for the NWDC property show that MCLs for the COCs are being exceeded. EPA believes ICs to restrict use of groundwater should be required.
- The ROD did not address the indoor air vapor intrusion pathway for current and future on-site workers and future off-site residents. Off-site migration of COCs at concentrations above the RGs has occurred. This migration has been in the vicinity of GCW-01, GCW-12, and GCW-13. Currently, there is no beneficial use of the groundwater in the vicinity of the off-site plume migration; therefore, there is no current exposure.
- The cancer slope factor for TCE is under review by EPA. A change could affect implementation of the groundwater RAOs.
- The upper aquifer groundwater is progressing toward being restored as a drinking water source as indicated by removal of over 50 lbs of COC contaminant mass and continuing decreases in COC concentrations in plume source areas.
- COCs mass removal rates have decreased at a majority of the GCWs. GCWs-03 through GCW-08 display limited mass removal rates of approximately 5 grams per month or less.
- Short circuiting is thought to occur in GCW-08 based on different lines of evidence. Short-circuiting may be due to design and/or construction of the GCW.
- Natural degradation of COCs is thought to be occurring; however, these processes are not well understood at this time.
- O&M costs for 2004 and 2005 were somewhat higher than anticipated due to greater than expected labor hours and maintenance costs. O&M costs in 2006 are expected to be even higher than the ROD estimate.

The groundwater remedy for OU2 has not been fully implemented, so it does not yet meet the RAOs specified in the ROD. Each RAO is presented below in italics, followed by a discussion of how the remedy is functioning with respect to the RAO.

Prevent exposure of future off-site residents and future on-site maintenance workers from direct contact (ingestion, dermal contact and inhalation) to contaminated upper aquifer groundwater that would result in an excess lifetime cancer risk greater than one in a million for individual carcinogens, above one in one hundred thousand for additive carcinogenic contaminants, or above a Hazard Quotient of 1.

The remedy has not fully attained this RAO.

- Exposure of future on-site maintenance workers through ingestion and dermal contact of contaminated groundwater in the upper aquifer is prevented through an EES placed on Parcel B restricting on-site beneficial use of groundwater until groundwater RGs are met.
- A similar EES agreement is being developed for the ODOT property.
- Groundwater impacts exceeding RGs have recently extended onto the NWDC property; however, there is no ROD requirement that beneficial use restrictions be placed on this property.
- The ROD did not evaluate the indoor air vapor intrusion pathway for current and future on-site workers and future off-site residents.
- Potential exposure to future off-site residents at levels above the RGs may exist through ingestion and dermal contact due to off-site migration of COCs. Currently, there is no beneficial use of the groundwater in the vicinity of the off-site plume; therefore no current complete exposure pathway exists.

Prevent migration of upper aquifer groundwater to off-site areas or deeper aquifers with contaminant concentrations that would result in an excess lifetime cancer risk greater than one in a million for individual carcinogens, above one in one hundred thousand for additive carcinogenic contaminants, or above a Hazard Quotient of 1.

The remedy has not fully met this RAO.

- A group of three GCWs operate along SE Lawnfield Road to control off-site migration of contaminants in the upper water bearing zone. However, it appears that these GCWs may not be fully containing the migration of COCs off-site. There has been an increase in COC concentrations in groundwater off-site and downgradient of groundwater circulation wells GCW-01, GCW-12, and GCW-13.
- Concentrations of COCs are increasing over time in groundwater from on-site and off-site downgradient monitoring wells constructed in the Intermediate WBZ (MW-12, MW-16, and MW-110).
- Natural degradation of COCs is thought to be occurring based on observed degradation products; however, the extent of these natural processes throughout the site has not been adequately documented.

Restore use of the upper aquifer groundwater as a drinking water source. The goals for restoration are the federal and state safe drinking water standards (MCLs): 5 µg/l for PCE; 5 µg/l for TCE; 2 µg/l for VC.

The remedy has not met this RAO. Progress, however, is evidenced by the following:

- Over 50 lbs of COC mass have been removed from the groundwater at the site since GCW wells began operation. The rate of mass removal has diminished, as is typical for a pump & treat type treatment system. However, at least six GCWs (GCW-03,

GCW-04 through GCW-08) installed in their respective source areas are removing very small amounts of COCs per month.

- General COC concentration trends in Plumes 1, 2, and 3 source areas have decreased since the GCW wells began operation.

The ROD states that the technology used in the remedy is expected to achieve significant removal of contaminants in the groundwater source areas in a period of 5- to 10 years. Results of the first two years of operation of the groundwater remedy indicate nominal removal of COC mass. It is currently not known if the groundwater cleanup at the site will meet MCLs in the source areas in the 5- to 10-year time frame presented in the ROD. It is possible that groundwater in the source areas could require a longer time frame to attain MCLs if COC mass removal rates do not increase.

8.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES USED AT THE TIME OF THE REMEDY SELECTION STILL VALID?

The exposure and land use assumptions used at the time of the remedy selection remain valid. The cleanup levels set in the ROD for VOCs in soil are based on attaining MCLs for these VOCs in groundwater. For all COCs except TCE the slope factors and reference doses have not changed. However, the cancer slope factor for TCE is under review. The impact of any change by EPA in the slope factor will be evaluated during the next five year review.

Potential exposure from indoor air vapor intrusion was not evaluated in the site conceptual model for human health exposure at the time of ROD issuance. This exposure pathway is currently incomplete on Parcel B because there are no habitable buildings. The exposure pathway is currently complete on the ODOT and NWDC properties because there are occupied buildings on these lots. However, COC concentrations in groundwater on ODOT and NWDC are orders of magnitude lower than on Parcel B.

There have been no changes in federal or state standards or regulations which were cited as ARARs in the ROD which could affect the protectiveness of the remedy. The MCL for TCE has not changed, although the cancer slope factor for TCE is under review by EPA.

8.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

The following information may in part call into question the protectiveness of the remedy:

- Concentrations of PCE and TCE in groundwater exceeding their respective RGs are observed in off-site downgradient monitoring wells constructed in the Shallow WBZ. Increasing concentrations of Total COCs are observed in groundwater from off-site monitoring wells MW-108 and MW-11. This suggests that containment wells GCW-01, GCW-12, and GCW-13 may not be completely effective in containing on-site contamination at the leading edge of the plume.
- Elevated concentrations of PCE and TCE in groundwater above their respective method reporting limits are observed in off-site downgradient monitoring wells constructed in the Intermediate WBZ. Increasing concentrations of Total COCs are observed in groundwater from MW-12. No effective treatment methodology is in place to contain off-site contamination in the Intermediate WBZ at the leading edge of the plume.

- Concentrations of PCE and TCE associated with the Plume 1 source area appear to be migrating laterally (north-northwest) within the Shallow WBZ and downward to the Intermediate WBZ. This suggests that capture wells GCW-09, GCW-10 and GCW-15 may not be effectively removing the source area impacts at Plume 1 and/or a larger Plume 1 source area maybe present. No effective treatment methodology is in place to remove contamination in the Intermediate WBZ of Plume 1.
- Concentrations of PCE and TCE associated with Plume 2 appear to be migrating hydraulically downgradient in both the shallow and intermediate WBZ. In certain portions of Plume 2, the Intermediate WBZ has higher concentrations of contaminants than the Shallow WBZ. This suggests that capture wells GCW-04 through GCW-08 and GCW-14 may not be effectively removing source area impacts at Plume 2.
- Limited COCs mass removal, less than approximately 5 grams per month, is observed routinely in wells GCW-03 through GCW-08. These low mass removal rates are observed in conjunction with elevated COCs concentration in upgradient monitoring wells, suggesting that the wells may not be functioning as intended due to short-circuiting of the wells' zone of influence.
- GCW-15 was taken out of service due to failure of its inflatable packer.
- The ROD does not call for ICs to be in place on NWDC, however, groundwater impacts exceeding RGs have extended onto the NWDC property.
- Contamination may be coming from an undetermined source area in the vicinity of the ODOT facility, based on site-wide monitoring results from 2006. Although there are two GCWs immediately downgradient of this area, recent data indicates these GCWs may not be effectively preventing off-site migration.

There have been no changes to the physical condition of the site that would affect the protectiveness of the remedy. The sale in 2005 of Parcel B to Clackamas County Development Agency, under coordination with EPA, is not believed to affect the protectiveness of the remedy in the short-term. Physical changes to the site from future highway construction will likely not occur until Year 2010. It is unknown at this time if future highway construction would affect protectiveness of the remedy. Potential interim uses on Parcel B being considered by Clackamas County Development Agency include a rail spur and storage yard. No details concerning these uses are currently available to EPA; consequently, their potential impact on the protectiveness of the site remedy is unknown at this time. Development activities on Parcel B are required to be reviewed and approved by DEQ and EPA under the terms of an Easement and Equitable Servitude recorded with the property deed in 2005.

9. ISSUES, RECOMMENDATIONS AND FOLLOW-UP ACTIONS

This section presents issues and recommendations identified in this Five-Year Review. Recommendations for OU1 and OU2 are presented in Table 9-1 and Table 9-2, respectively.

Table 9-1. Recommendations for OU1

Issue	Recommendations and Follow-Up Action	Affects Protectiveness Current / Future	Responsible Party	Milestone Date
The cancer slope factor for TCE is under review by EPA.	Evaluate the impact of any final change in TCE cancer slope factor to soil RAOs and RGs.	N / Y	EPA	8/01/2011
Invasive weeds are encroaching into the constructed wetland and the wetland buffer.	Continue weed removal as needed.	N / N	DEQ	Ongoing
Plants in the wetland buffer are stressed due to lack of water.	Provide water to plants as needed.	N / N	DEQ	Ongoing

Table 9-2. Recommendations for OU2

Issue	Recommendations and Follow-Up Action	Affects Protectiveness Current / Future	Responsible Party	Milestone Date
Groundwater on NWDC property exceeds the RGs for PCE and TCE, yet beneficial use of groundwater on NWDC is not restricted by ICs.	Issue an ESD to require ICs on NWDC for groundwater use. Negotiate an EES between DEQ and NWDC to implement the ICs.	N / Y	EPA & DEQ	9/30/2007
Groundwater use restrictions ICs on ODOT property have not been implemented as required by the ROD.	Negotiate an EES between DEQ and ODOT.	N / Y	DEQ	6/30/2007
PCE and TCE concentrations in off-site groundwater are increasing.	Evaluate effectiveness of existing remedy and take necessary further response action to control off-site migration.	N / Y	EPA	6/30/2007

(Table Continues)

Table 9-2. Recommendations for OU2 (Continued)

Issue	Recommendations and Follow-Up Action	Affects Protectiveness Current / Future	Responsible Party	Milestone Date
Contaminant mass removal rates and groundwater extraction rates of existing GCWs in source areas are either low or declining. It is currently not known if the groundwater cleanup will meet MCLs in the source areas in the 5- to 10-year time frame presented in the ROD.	Investigate causes and take necessary corrective actions to attain acceptable COC mass removal and groundwater extraction rates.	N / Y	EPA	6/30/2007
PCE and TCE contaminated groundwater associated with Plume 1 source area is migrating laterally and downward in the Intermediate WBZ. No GCWs are present to treat this groundwater.	Implement further response actions to treat source area groundwater in the Shallow and Intermediate WBZs associated with Plume 1.	N / Y	EPA	9/30/2007
GCW system performance has decreased due to problems such as well screen bio-fouling, reduced ZOI, equipment failures, etc.	Identify causes of decreased performance and implement corrective actions to either improve operational performance of GCWs or use a different technology.	N / Y	EPA	9/30/2007
Natural degradation of groundwater COCs on site is not adequately documented.	Gather additional data on COC natural degradation processes occurring on the site.	N / Y	EPA	8/01/2011
Potential exposure to onsite workers from indoor air vapor intrusion associated with contaminated groundwater.	Further evaluation of indoor air exposure pathway. Communicate results to building occupants on Parcel A. Implement necessary actions to address unacceptable exposure impacts.	N / Y	EPA	6/30/2007
GCW O&M costs are higher than ROD estimates.	Identify and implement actions to reduce O&M costs.	N / N	EPA	6/30/2007
The cancer slope factor for TCE is under review by EPA.	Evaluate the impact of any final change in TCE cancer slope factor on groundwater RAOs and RGs.	N / Y	EPA	8/01/2011
An undetermined source area of groundwater contamination may exist in the vicinity of the ODOT facility.	Investigate area to identify possible source of VOCs and implement any necessary response actions.	N / Y	EPA	9/30/2007

10. PROTECTIVENESS STATEMENTS

10.1 OPERABLE UNIT 1—SOIL

The remedy for OU1 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

All elements of the OU1 ROD have been completed, including the following actions:

- The removal and treatment or off-site disposal of highly contaminated surface and subsurface soils.
- The placement of a clean, re-vegetated soil cap on Parcel B.
- The implementation of institutional controls on Parcel B that ensures the soil cap integrity is not impacted by future uses.

10.2 OPERABLE UNIT 2—GROUNDWATER

The remedy for OU2 currently protects human health and the environment because the groundwater exposure pathways are currently incomplete and progress to meet the groundwater RGs is being made through an operating groundwater treatment system. Institutional controls are in place to restrict beneficial use of groundwater on Parcel B, which contains the highest concentrations of groundwater contaminants. Impacted groundwater on the ODOT and NWDC lots of Parcel A is not currently used for beneficial use. However, in order for the groundwater remedy to be protective in the long-term, the following actions need to be taken:

- Issue an ESD to require ICs on NWDC to restrict groundwater use until groundwater RGs are met. Negotiate an EES between DEQ and NWDC to implement the ICs.
- Complete current negotiations between DEQ and ODOT for an EES to implement ICs on the ODOT property.
- Evaluate effectiveness of existing remedy and take necessary further response action, if necessary, to control off-site migration.
- Investigate causes of low or declining contaminant mass removal rates and groundwater extraction rates and implement necessary corrective actions.
- Implement further response actions to treat source area groundwater in the Shallow and Intermediate WBZs associated with Plume 1.
- Identify causes of decreased GCW performance and implement corrective actions to either improve operational performance of GCWs or use a different technology.
- Evaluate the potential exposure to current onsite workers from indoor air vapor intrusion associated with contaminated groundwater. Advise building occupants of the results. Take necessary actions to address unacceptable exposure impacts.
- Evaluate the impact of any final change in TCE cancer slope factor on the groundwater RAOs and RGs.
- Investigate an area near the ODOT facility to identify possible source of VOCs and implement any necessary response actions.

10.3 SITE-WIDE

The site is currently protective of human health and the environment because the remedial actions at all OUs currently are protective. However, in order for the site to be protective for the long-term, the actions described in Section 10.2 above pertaining to the groundwater remedy need to be taken.

11. NEXT REVIEW

The next Five-Year Review for NWPC is required by August 1, 2011, five years from this review date.

This page intentionally left blank.

12. REFERENCES

CDM. 2004. Operation and Maintenance Manual. Prepared for US Environmental Protection Agency by CDM Engineers & Constructors, Inc. May 26, 2004.

DEQ. 1987. Preliminary Assessment, Northwest Pipe and Casing. September 1987.

____. 2005. Waste Management Plan, Northwest Pipe and Casing / Hall Process Company Property. Prepared by the Department of Environmental Quality and US Environmental Protection Agency. August 31, 2005.

____. 2006a. Memorandum, NWPC Wetland Inspection, 3/27/06. March 29, 2006.

____. 2006b. Memorandum, NWPC Wetland Inspection, 4/17/06. April 18, 2006.

DEQ and EPA. 2005. Soil Cap Monitoring and Maintenance Plan. August 31, 2005.

E&E. 1988. Site Inspection Report, Northwest Pipe and Casing, Clackamas, Oregon. Prepared for US Environmental Protection Agency by Earth and Environmental. December 2, 1988.

_____. 1990. Listing Site Inspection Report, Northwest Pipe and Casing, Clackamas, Oregon. Prepared for US Environmental Protection Agency by Earth and Environmental. June 14, 1990.

_____. 1993. Site Assessment, Northwest Pipe and Casing, Clackamas, Oregon. Prepared for US Environmental Protection Agency by Earth and Environmental. July 2, 1993.

EPA. 2000. Record of Decision, Operable Unit 1, Northwest Pipe and Casing. June 2000.

_____. 2001. Record of Decision Operable Unit 2, Northwest Pipe and Casing. September 2001.

_____. 2004. Explanation of Significant Differences – Operable Unit 1, Northwest Pipe and Casing / Hall Process Company, Clackamas County Oregon. March 23, 2004.

_____. 2005. Waste Management Plan, Northwest Pipe and Casing / Hall Process Company, Clackamas County, Oregon.

Geodesign. 2006. Soil Cap Inspection Report Form.

Parametrix. 2005. Technical Memorandum, Proposed Actions for GCWs, Northwest Pipe and Casing, Clackamas, Oregon. Prepared for US Environmental Protection Agency by Parametrix. October 31, 2005.

_____. 2006a. Site Wide Groundwater Monitoring Report, November 2005. Prepared for US Environmental Protection Agency by Parametrix. April 12, 2006.

_____. 2006b. Replacement Groundwater Circulation Well GCW-15R: Installation, Construction, Development and Start-up. Prepared for U.S. Environmental Protection Agency by Parametrix. April 28, 2006.

_____. 2006c. Supplemental Monitoring Well Installation and Groundwater Sampling and Analysis. Prepared for the U.S. Environmental Protection Agency by Parametrix. June 28, 2006.

URS / CH2M Hill. 1999. Final Feasibility Study, Northwest Pipe and Casing / Hall Process Company. Prepared for the US Environmental Protection Agency by URS Greiner in association with CH2M Hill. August 1999.

URS Corporation. 2002a. Interim Remedial Action Report, Northwest Pipe and Casing / Hall Process Company Superfund Site Operable Unit 1. Prepared for US Environmental Protection Agency. March 2002.

_____. 2002b. Addendum #1 to the Interim Remedial Action Report, Northwest Pipe and Casing / Hall Process Company Superfund Site Soil Operable Unit (OU 1). Prepared for US Environmental Protection Agency. June 2002.

_____. 2003a. Final Sampling and Analysis Plan, Baseline Groundwater Monitoring, Groundwater Circulation Well Performance Testing & Monitoring, and Vapor Monitoring, Northwest Pipe and Casing Operable Unit 2 Groundwater Remedial Action. Prepared for US Environmental Protection Agency. December 2003.

_____. 2003b. Final Basis of Design Report. Northwest Pipe and Casing / Hall Process Company Soil Cap Remedial Design. Prepared for US Environmental Protection Agency. March 2003.

_____. 2003c. Wetland Mitigation and Monitoring/Maintenance Plan. Prepared for US Environmental Protection Agency. July 2003.

_____. 2003d. Final Groundwater Circulation Well Pilot Test Technical Memorandum, Northwest Pipe and Casing Operable Unit 2 Groundwater Remedial Design. Prepared for US Environmental Protection Agency. January 2003.

_____. 2003e. 2002 Monitoring Well Installation and Groundwater Sampling Technical Memorandum. Prepared for the US Environmental Protection Agency. January 2003.

_____. 2003f. Final Basis of Design Report. Northwest Pipe and Casing / Hall Process Company Remedial Design Groundwater Operable Unit. Prepared for US Environmental Protection Agency. March 2003.

_____. 2003g. Construction Quality Assurance Plan. Prepared for US Environmental Protection Agency. March 2003.

_____. 2004a. Final Technical Memorandum, Baseline Groundwater Monitoring, Groundwater Circulation Well Performance Testing & Monitoring, and Vapor Treatment System Monitoring, Northwest Pipe and Casing Groundwater Operable Unit 2 Remedial Action. Prepared for US Environmental Protection Agency. April 2004.

_____. 2004b. Combined Final Remedial Action Report for OU1 – Soil and Interim Remedial Action Report for OU2 – Groundwater. Prepared for US Environmental Protection Agency by URS Corporation. August 2004.

_____. 2004c. Final Wetland Monitoring Report for Monitoring Year 1 of 5 (2004). Northwest Pipe and Casing, Operable Unit 1 Soil Cap Remedial Action. Prepared for US Environmental Protection Agency by URS Corporation. September 2004.

_____. 2004d. Operation and Maintenance Plan. Northwest Pipe and Casing Operable Unit 2 Groundwater Remedial Action. Prepared for US Environmental Protection Agency. September 2004.

_____. 2005a. Soil Cap Monitoring and Maintenance Plan. Northwest Pipe and Casing Operable Unit 2 Groundwater Remedial Action. Prepared for US Environmental Protection Agency. January 4, 2005.

_____. 2005b. Final Wetland Monitoring Report for Monitoring Year 2 of 5 (2005). Northwest Pipe and Casing, Operable Unit 1 Soil Cap Remedial Action. Prepared for US Environmental Protection Agency by URS Corporation. June 2005.

_____. 2005c. MW-123 & MW-124 Well Pair Groundwater Characterization and Year 1 (2005) GCW Operation Groundwater Monitoring Event. Prepared for US Environmental Protection Agency. June 2005.

Weston. 1998a. Remedial Investigation Report, Northwest Pipe and Casing / Hall Process Company. Prepared for US Environmental Protection Agency. August 1998.

_____. 1998b. Human Health Risk Assessment Technical Memorandum – Contaminants of Concern/Exposure Assessment, Northwest Pipe and Casing. Prepared for US Environmental Protection Agency. January 27 1998.