GROUND WATER
QUARTERLY STATUS REPORT

Lakewood Towne Center
5731 Main Street SW
Lakewood, Washington

Prepared for

MBK Northwest, Inc.
4949 SW Meadows Road, Suite 675
Lake Oswego, Oregon

Prepared by

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September 23, 2003

Introduction

This report summarizes field activities and analytical results for the tenth round of ground water monitoring conducted at the Lakewood Towne Center site located in Lakewood, Washington. Since the Lakewood Towne Center site characterization project began in the summer of 2000, Herrera Environmental Consultants, Inc. (Herrera) has prepared the following deliverables:

Date	Deliverables
May 2000	Phase I Environmental Site Assessment
February 2001	Phase II Environmental Site Assessment
March 2001	Ground Water Quarterly Status Report (first quarter)
June 2001	Ground Water Quarterly Status Report (second quarter)
September 2001	Ground Water Quarterly Status Report (third quarter)
January 2002	Ground Water Monitoring Annual Summary Report (fourth quarter and first year summary)
February 2002	Updated Phase I Environmental Site Assessment
March 2002	Ground Water Quarterly Status Report (fifth quarter)
June 2002	Limited Phase II Site Investigation and Ground Water Quarterly Status Report (sixth quarter)
October 2002	Ground Water Quarterly Status Report (seventh quarter)
January 2003	Ground Water Monitoring Annual Summary Report (eighth quarter and second year summary)
April 2003	Ground Water Quarterly Status Report (ninth quarter)
August 2003	Ground Water Quarterly Status Report (tenth quarter)

Analytical results of samples collected during these field investigations indicate that a dry cleaner solvent, perchloroethylene (PCE), had been detected in ground water across the northwest portion of the site. The main source was identified by the presence of elevated PCE and its degradation by-products in shallow ground water near the former East Concourse building, which was occupied by a dry cleaner between 1968 and 1987. As part of site characterization activities and the implementation of a ground water monitoring program for the Lakewood Towne Center site, seven ground water monitoring wells were installed in the following locations (Figure 1):

- MW-1s (shallow), MW-1m (mid depth), and MW-1d (deep) in the source area
- MW-2d (deep) upgradient of the source area
- MW-3 (shallow) at the northwest property boundary (approximately 1,300 feet downgradient of the source area)

- MW-4 (shallow) immediately downgradient of the source area
- MW-5 (shallow) immediately downgradient of the source area.

Monitoring and analytical results from quarterly sampling events conducted since the monitoring program began in July/September 2000 indicate continued presence of residual PCE contamination in ground water, particularly within the source area located in the north-central portion of the mall property (Herrera 2003, 2002). PCE and biodegradation by-products exceeding Model Toxics Control Act (MTCA) method A and B ground water cleanup levels continue to be found near the water table with low PCE concentrations found at the deeper wells. PCE degradation has occurred in the source area at shallow depth, as indicated by the increased concentrations of vinyl chloride and presence of other PCE degradation by-products detected in shallow well MW-1s. Low concentrations of some contaminants have spread downgradient across the northwest quadrant of the Lakewood Towne Center site at levels below MTCA method A and B criteria (Herrera 2003, 2002).

Ground Water Conditions

Ground water levels were measured on August 21, 2003 at seven of the eight site monitoring wells; well MW-6 was not monitored or sampled this quarter. Static ground water levels were encountered at depths ranging from 11.07 feet below ground surface in well MW-2d to 17.75 feet below ground surface in well MW-3. Ground water elevation data collected from these wells indicate a general ground water flow direction toward the west-southwest, with an average hydraulic gradient of less than 0.01 feet per foot. The overall flow direction and gradient are consistent with previous monitoring data collected during the previous ten quarterly monitoring events starting in July 2000.

Sampling Procedure and Analysis

Ground water samples were collected for chemical analysis from the four shallow wells on August 21, 2003 using a low-flow purge method with dedicated polyethylene tubing and a peristaltic pump. Sample MW-7 was a field duplicate sample collected from well MW-1s. Five water samples were submitted to OnSite Environmental, Inc. of Redmond, Washington for analysis of halogenated volatile organic compounds (HVOCs) using U.S. Environmental Protection Agency (EPA) Method 8260B. The complete laboratory analytical report, including chain-of-custody form and data quality assurance review of all analytical results, is attached to this report.

Ground Water Analytical Results

Analytical results of ground water samples collected from wells MW-1s, MW-3, MW-4, and MW-5 are summarized in Table 1, and illustrated in Figure 1. Contaminants of concern found at the Lakewood Towne Center site since site characterization began in spring of 2000 include:

PCE—perchloroethylene or tetrachloroethylene
TCE—trichloroethylene
cis DCE—cis 1,2-dichloroethylene
trans DCE—trans 1,2-dichloroethylene
1,1 DCE—1,1-dichloroethene
1,1 DCA—1,1-dichloroethane
1,4 DCB—1,4-dichlorobenzene
Vinyl chloride
Chloroform

Sampling performed in August 2003 represents the twelfth assessment of ground water quality at well locations MW-1s, MW-3, MW-4, and MW-5. Overall, concentrations of most contaminants of concern have remained at consistent levels since initial site characterization was conducted over 2 ½ years ago. The highest concentrations of each contaminant continue to be found in the source area located in the north-central portion of the mall property, represented by shallow well MW-1s. Concentrations of dry cleaning chemicals and breakdown by-products spiked in February 2002, due to temporary removal of pavement, exposing the source area to increased rainfall percolation that may have mobilized contaminants to the shallow ground water. HVOC concentrations have generally reduced over the following 15 months. Seven HVOC constituents detected in MW-1s decreased compared to concentrations in the previous May 2003 sampling event. Methylene chloride was not detected at MW-1s/MW-7 (duplicate) during this sampling event compared with concentrations detected in samples collected in the previous February 2003 and August 2002 events. Methylene chloride, a common laboratory contaminant, was not detected in the QA method blank or in the five remaining water samples during the August 2002 and February 2003 sampling events, nor was it detected in any of the samples or QA method blank during the November 2002 sampling event. The presence of this compound is most likely a result from laboratory contamination during August 2002 and February 2003 sampling events.

Water quality at MW-4 represents conditions immediately downgradient of the source area and has consistently exhibited lower chemical concentrations than the source area. Concentrations rose in February 2002 and have generally fallen over the following 15 months to below MTCA method A and B cleanup levels. Four HVOC concentrations detected in MW-4 decreased compared with concentrations of the previous May 2003 sampling event.

PCE and cis DCE continued to be detected at concentrations below MTCA method A and B cleanup levels at MW-3 located in the northwest corner of the site. No chloroform was detected above the practical quantitation limit since it was first detected during the November 2002 sampling event. No TCE has been detected above the practical quantitation limit since it was first detected in February 2002.

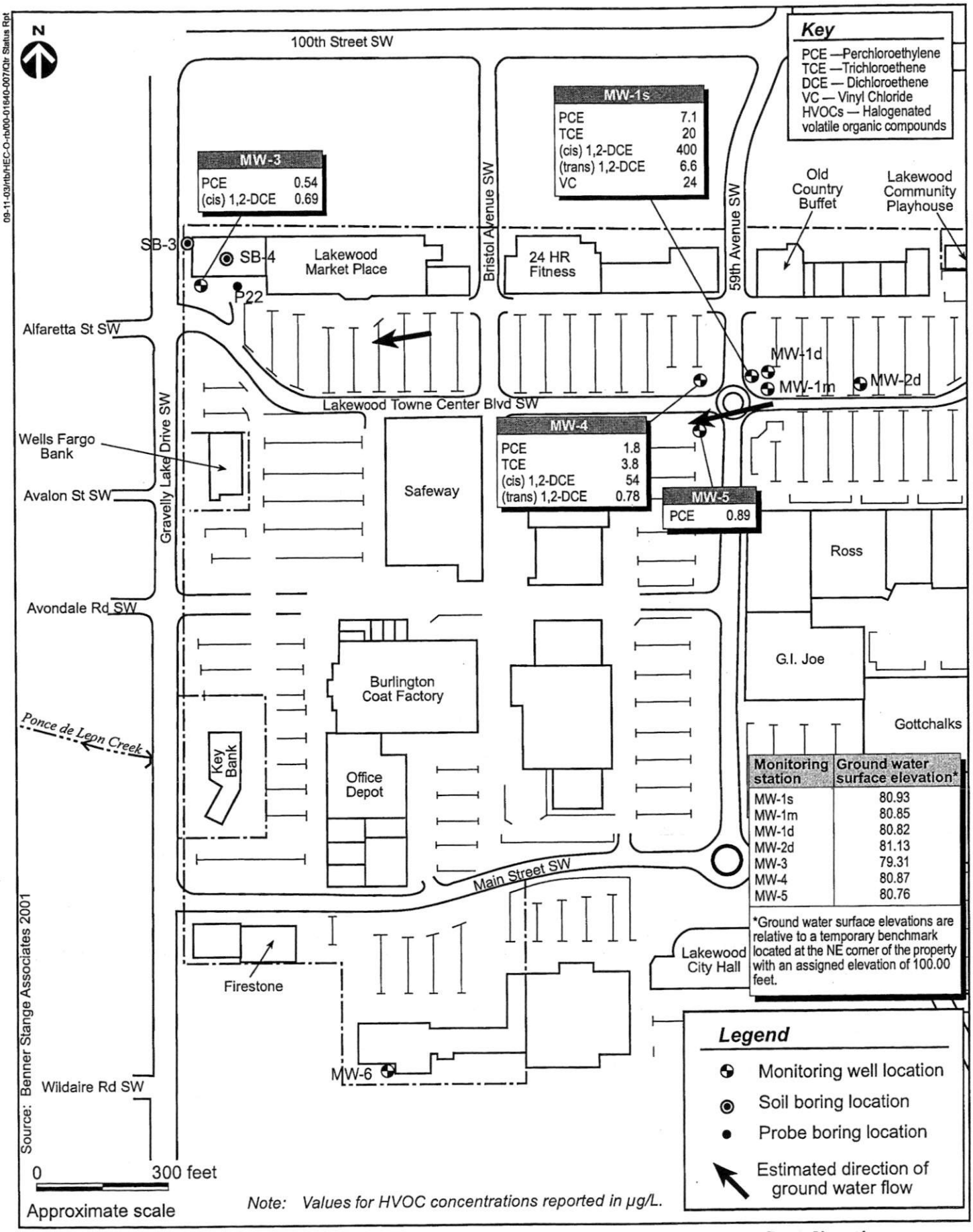

Figure 1. **HVOC concentrations in ground water and inferred ground water flow direction, August 21, 2003, Lakewood Towne Center, Lakewood, Washington.**

Table 1. HVOC results for ground water samples collected at the Lakewood Towne Center site (µg/L).

Well identification	Date sampled	PCE	TCE	cis DCE	trans DCE	1,1-DCE	1,1-DCA	Vinyl chloride	1,4-DCB	Chloroform
MTCA method A cleanup level [a]		*5*	*5*	*na*	*na*	*na*	*na*	*0.2*	*na*	*na*
MTCA method B cleanup level [b]		*0.858*	*3.98*	*80*	*160*	*0.0729*	*800*	*0.0292*	*1.82*	*7.17*
MW-1s	9/15/00	2.2	**19**	**670**	14	**0.76**	6.1	**52**	0.25	1.3
	2/12/01	1.2	**15**	**390**	8.2	**0.37**	3.1	**47**	(0.20)	(0.20)
	5/17/01	2.3	**18**	**600**	10	**0.64**	5.5	**41**	0.30	(0.20)
	8/15/01	1.7	**14**	**490**	8.3	**0.56**	4.2	**40**	(0.20)	(0.20)
	11/15/01	0.51	**9.1**	**320**	6.4	**0.47**	2.3	**59**	0.21	(0.20)
	2/20/02	**37**	**68**	**540**	7.2	**0.83**	3.1	**28**	0.35	(0.20)
	5/20/02	**18**	**37**	**520**	8.3	**0.61**	2.3	**25**	0.32	(0.20)
	8/19/02	**5.5**	**16**	**540**	7.3	(2.0)	(2.0)	**31**	(2.0)	(2.0)
	11/20/02	2.8	**17**	**330**	8.5	**1.0**	(0.20)	**58**	(0.20)	(0.20)
	2/20/03	**5.8**	**18**	**290**	3.6	(2.0)	(2.0)	**22**	(2.0)	(2.0)
	5/21/03	**10**	**28**	**470**	6.7	**0.55**	(0.20)	**24**	0.23	(0.20)
	8/21/03	**7.1**	**20**	**400**	6.6	(2.0)	(2.0)	**24**	(2.0)	(2.0)
MW-1m	7/21/00	0.80	0.45	5.0	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/15/01	0.87	(0.20)	0.95	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/20/02	0.69	0.24	0.93	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
MW-1d	7/21/00	0.50	(0.20)	0.29	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/15/01	0.64	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/20/02	0.52	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
MW-2d	7/21/00	0.73	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/16/01	1.2	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/21/02	1.2	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
MW-3	7/21/00	0.69	(0.20)	1.1	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	2/12/01	0.66	(0.20)	0.23	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	5/17/01	0.64	(0.20)	1.3	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)

Table 1. HVOC results for ground water samples collected at the Lakewood Towne Center site (µg/L) (continued).

Well identification	Date sampled	PCE	TCE	cis DCE	trans DCE	1,1-DCE	1,1-DCA	Vinyl chloride	1,4-DCB	Chloroform
MTCA method A cleanup level [a]		*5*	*5*	*na*	*na*	*na*	*na*	*0.2*	*na*	*na*
MTCA method B cleanup level [b]		*0.858*	*3.98*	*80*	*160*	*0.0729*	*800*	*0.0292*	*1.82*	*7.17*
MW-3 (continued)	8/15/01	0.66	(0.20)	0.88	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/15/01	0.57	(0.20)	0.73	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	2/20/02	0.66	0.31	1.3	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	5/20/02	0.52	(0.20)	0.93	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	8/19/02	0.57	(0.20)	0.79	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/20/02	0.57	(0.20)	0.84	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	0.37
	2/20/03	0.68	(0.20)	1.1	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	5/21/03	0.50	(0.20)	0.91	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	8/21/03	0.54	(0.20)	0.69	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
MW-4	9/15/00	1.6	4.9	**120**	2.8	(0.20)	1.0	(0.20)	(0.20)	(0.20)
	2/12/01	1.0	2.3	48	0.90	(0.20)	0.22	(0.20)	(0.20)	(0.20)
	5/17/01	1.0	3.4	**100**	1.6	(0.20)	1.0	(0.20)	(0.20)	(0.20)
	8/15/01	0.97	2.9	70	1.1	(0.20)	0.68	(0.20)	(0.20)	(0.20)
	11/15/01	0.99	1.6	35	0.57	(0.20)	0.29	(0.20)	(0.20)	(0.20)
	2/20/02	**9.8**	**18**	**110**	1.3	(0.20)	0.71	(0.20)	(0.20)	(0.20)
	5/20/02	3.8	**6.6**	65	0.90	(0.20)	0.32	(0.20)	(0.20)	(0.20)
	8/19/02	2.4	4.2	77	1.7	(0.40)	(0.40)	(0.40)	(0.40)	(0.40)
	11/21/02	1.6	3.7	38	0.99	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	2/20/03	1.5	3.1	36	0.48	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	5/21/03	2.4	4.7	65	0.97	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	8/21/03	1.8	3.8	54	0.78	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
MW-5	9/15/00	1.2	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	2/12/01	0.70	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	5/17/01	0.62	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)

Table 1. HVOC results for ground water samples collected at the Lakewood Towne Center site (µg/L) (continued).

Well identification	Date sampled	PCE	TCE	cis DCE	trans DCE	1,1-DCE	1,1-DCA	Vinyl chloride	1,4-DCB	Chloroform
MTCA method A cleanup level [a]		*5*	*5*	*na*	*na*	*na*	*na*	*0.2*	*na*	*na*
MTCA method B cleanup level [b]		*0.858*	*3.98*	*80*	*160*	*0.0729*	*800*	*0.0292*	*1.82*	*7.17*
MW-5 (continued)	8/15/01	0.88	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/15/01	0.90	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	2/20/02	0.44	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	5/20/02	0.39	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	8/19/02	0.71	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/21/02	0.86	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	2/20/03	0.62	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	5/21/03	0.52	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	8/21/03	0.89	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
MW-6	5/20/02	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	8/19/02	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	11/20/02	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
	2/20/03	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)

Values in **boldface** type indicate constituent detected above the established MTCA method A or method B ground water cleanup level.
PCE = perchloroethylene; TCE = trichloroethene; cis DCE = (cis) 1,2-dichloroethene; trans DCE = (trans) 1,2-dichloroethene; 1,1-DCE = 1,1-dichloroethene; 1,1-DCA = 1,1-dichloroethane; 1,4-DCB = 1,4-dichlorobenzene.
(0.20) Analyte was not detected above the enclosed practical quantitation limit indicated.
na Established ground water cleanup level for this constituent is not available.
[a] Model Toxics Control Act Cleanup Regulation (Ecology 2001a).
[b] Cleanup Levels and Risk Calculations under the Model Toxics Control Act Cleanup Regulation (Ecology 2001b).
Shaded values represent results of the most recent sampling event.

References

Benner Stange Associates. 2001. Development site map of Lakewood Towne Center. Map produced by Benner Stange Associates, Architects of Lake Oswego, Oregon for MBK Northwest, Inc. Mr. Tony Nastansky, Lakewood Towne Center Management, provided a copy of the map to Herrera Environmental Consultants during the January 28, 2002 site visit.

Ecology. 2001a. Model Toxics Control Act Cleanup Regulation, Chapter 173-340 WAC. Washington State Department of Ecology, Toxics Cleanup Program. Publication no. 94-06. Amended February 21, 2001.

Ecology. 2001b. Cleanup Levels and Risk Calculations (CLARC) under the Model Toxics Control Act Cleanup Regulation. Washington State Department of Ecology, Toxics Cleanup Program. Publication no. 94-145. Amended November 2001.

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USGS. 1959 (photorevised 1994). Steilacoom, Washington. Topographic 7.5 min. quadrangle map (47122-B5-TF-024). U.S. Geological Survey, Denver, CO.

Yoshida, Inc. 1986. Site plan of Villa Plaza Shopping Center—Water System Improvements. Prepared for Vyzis Company. Scale 1 inch = 100 feet. Mr. Tony Nastansky, Lakewood Mall Management, provided a copy of the map to Herrera Environmental Consultants.

ATTACHMENT A

Laboratory Analytical Report and Data Quality Assurance Review Summary

OnSite Environmental Inc.
Analytical Testing and Mobile Laboratory Services

September 3, 2003

Peter Jowise
Herrera Environmental Consultants, Inc.
2200 6th Avenue, Suite 1100
Seattle, WA 98121

Re: Analytical Data for Project C00-01640-007
Laboratory Reference No. 0308-148

Dear Peter:

Enclosed are the analytical results and associated quality control data for samples submitted on August 21, 2003.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

Case Narrative

Samples were collected on August 21, 2003, and received by the laboratory on August 21, 2003. They were maintained at the laboratory at a temperature of 2°C to 6°C.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a footnote reference and will be included on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Date Extracted:	8-26-03
Date Analyzed:	8-26-03
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	08-148-01
Client ID:	**MW-1s**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		2.0
Chloromethane	ND		2.0
Vinyl Chloride	24		2.0
Bromomethane	ND		2.0
Chloroethane	ND		2.0
Trichlorofluoromethane	ND		2.0
1,1-Dichloroethene	ND		2.0
Iodomethane	ND		10
Methylene Chloride	ND		10
(trans) 1,2-Dichloroethene	6.6		2.0
1,1-Dichloroethane	ND		2.0
2,2-Dichloropropane	ND		2.0
(cis) 1,2-Dichloroethene	400		2.0
Bromochloromethane	ND		2.0
Chloroform	ND		2.0
1,1,1-Trichloroethane	ND		2.0
Carbon Tetrachloride	ND		2.0
1,1-Dichloropropene	ND		2.0
1,2-Dichloroethane	ND		2.0
Trichloroethene	20		2.0
1,2-Dichloropropane	ND		2.0
Dibromomethane	ND		2.0
Bromodichloromethane	ND		2.0
2-Chloroethyl Vinyl Ether	ND		10
(cis) 1,3-Dichloropropene	ND		2.0
(trans) 1,3-Dichloropropene	ND		2.0

gpc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Page 2 of 2

Lab ID: 08-148-01
Client ID: MW-1s

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		2.0
Tetrachloroethene	7.1		2.0
1,3-Dichloropropane	ND		2.0
Dibromochloromethane	ND		2.0
1,2-Dibromoethane	ND		2.0
Chlorobenzene	ND		2.0
1,1,1,2-Tetrachloroethane	ND		2.0
Bromoform	ND		10
Bromobenzene	ND		2.0
1,1,2,2-Tetrachloroethane	ND		2.0
1,2,3-Trichloropropane	ND		2.0
2-Chlorotoluene	ND		2.0
4-Chlorotoluene	ND		2.0
1,3-Dichlorobenzene	ND		2.0
1,4-Dichlorobenzene	ND		2.0
1,2-Dichlorobenzene	ND		2.0
1,2-Dibromo-3-chloropropane	ND		10
1,2,4-Trichlorobenzene	ND		2.0
Hexachlorobutadiene	ND		2.0
1,2,3-Trichlorobenzene	ND		2.0

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	110	63-130
Toluene, d8	87	78-113
4-Bromofluorobenzene	87	77-109

gsc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Date Extracted:	8-26-03
Date Analyzed:	8-26-03
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	08-148-02
Client ID:	**MW-3**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.20
Chloromethane	ND		0.20
Vinyl Chloride	ND		0.20
Bromomethane	ND		0.20
Chloroethane	ND		0.20
Trichlorofluoromethane	ND		0.20
1,1-Dichloroethene	ND		0.20
Iodomethane	ND		1.0
Methylene Chloride	ND		1.0
(trans) 1,2-Dichloroethene	ND		0.20
1,1-Dichloroethane	ND		0.20
2,2-Dichloropropane	ND		0.20
(cis) 1,2-Dichloroethene	0.69		0.20
Bromochloromethane	ND		0.20
Chloroform	ND		0.20
1,1,1-Trichloroethane	ND		0.20
Carbon Tetrachloride	ND		0.20
1,1-Dichloropropene	ND		0.20
1,2-Dichloroethane	ND		0.20
Trichloroethene	ND		0.20
1,2-Dichloropropane	ND		0.20
Dibromomethane	ND		0.20
Bromodichloromethane	ND		0.20
2-Chloroethyl Vinyl Ether	ND		1.0
(cis) 1,3-Dichloropropene	ND		0.20
(trans) 1,3-Dichloropropene	ND		0.20

gpc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

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Lab ID: 08-148-02
Client ID: MW-3

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.20
Tetrachloroethene	0.54		0.20
1,3-Dichloropropane	ND		0.20
Dibromochloromethane	ND		0.20
1,2-Dibromoethane	ND		0.20
Chlorobenzene	ND		0.20
1,1,1,2-Tetrachloroethane	ND		0.20
Bromoform	ND		1.0
Bromobenzene	ND		0.20
1,1,2,2-Tetrachloroethane	ND		0.20
1,2,3-Trichloropropane	ND		0.20
2-Chlorotoluene	ND		0.20
4-Chlorotoluene	ND		0.20
1,3-Dichlorobenzene	ND		0.20
1,4-Dichlorobenzene	ND		0.20
1,2-Dichlorobenzene	ND		0.20
1,2-Dibromo-3-chloropropane	ND		1.0
1,2,4-Trichlorobenzene	ND		0.20
Hexachlorobutadiene	ND		0.20
1,2,3-Trichlorobenzene	ND		0.20

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	115	63-130
Toluene, d8	88	78-113
4-Bromofluorobenzene	88	77-109

gsc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Date Extracted:	8-26-03
Date Analyzed:	8-26-03
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	08-148-03
Client ID:	**MW-4**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.20
Chloromethane	ND		0.20
Vinyl Chloride	ND		0.20
Bromomethane	ND		0.20
Chloroethane	ND		0.20
Trichlorofluoromethane	ND		0.20
1,1-Dichloroethene	ND		0.20
Iodomethane	ND		1.0
Methylene Chloride	ND		1.0
(trans) 1,2-Dichloroethene	0.78		0.20
1,1-Dichloroethane	ND		0.20
2,2-Dichloropropane	ND		0.20
(cis) 1,2-Dichloroethene	54		2.0
Bromochloromethane	ND		0.20
Chloroform	ND		0.20
1,1,1-Trichloroethane	ND		0.20
Carbon Tetrachloride	ND		0.20
1,1-Dichloropropene	ND		0.20
1,2-Dichloroethane	ND		0.20
Trichloroethene	3.8		0.20
1,2-Dichloropropane	ND		0.20
Dibromomethane	ND		0.20
Bromodichloromethane	ND		0.20
2-Chloroethyl Vinyl Ether	ND		1.0
(cis) 1,3-Dichloropropene	ND		0.20
(trans) 1,3-Dichloropropene	ND		0.20

gac 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Lab ID: 08-148-03
Client ID: MW-4

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.20
Tetrachloroethene	1.8		0.20
1,3-Dichloropropane	ND		0.20
Dibromochloromethane	ND		0.20
1,2-Dibromoethane	ND		0.20
Chlorobenzene	ND		0.20
1,1,1,2-Tetrachloroethane	ND		0.20
Bromoform	ND		1.0
Bromobenzene	ND		0.20
1,1,2,2-Tetrachloroethane	ND		0.20
1,2,3-Trichloropropane	ND		0.20
2-Chlorotoluene	ND		0.20
4-Chlorotoluene	ND		0.20
1,3-Dichlorobenzene	ND		0.20
1,4-Dichlorobenzene	ND		0.20
1,2-Dichlorobenzene	ND		0.20
1,2-Dibromo-3-chloropropane	ND		1.0
1,2,4-Trichlorobenzene	ND		0.20
Hexachlorobutadiene	ND		0.20
1,2,3-Trichlorobenzene	ND		0.20

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	108	63-130
Toluene, d8	88	78-113
4-Bromofluorobenzene	87	77-109

gpc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Date Extracted:	8-26-03
Date Analyzed:	8-26-03
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	08-148-04
Client ID:	**MW-5**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.20
Chloromethane	ND		0.20
Vinyl Chloride	ND		0.20
Bromomethane	ND		0.20
Chloroethane	ND		0.20
Trichlorofluoromethane	ND		0.20
1,1-Dichloroethene	ND		0.20
Iodomethane	ND		1.0
Methylene Chloride	ND		1.0
(trans) 1,2-Dichloroethene	ND		0.20
1,1-Dichloroethane	ND		0.20
2,2-Dichloropropane	ND		0.20
(cis) 1,2-Dichloroethene	ND		0.20
Bromochloromethane	ND		0.20
Chloroform	ND		0.20
1,1,1-Trichloroethane	ND		0.20
Carbon Tetrachloride	ND		0.20
1,1-Dichloropropene	ND		0.20
1,2-Dichloroethane	ND		0.20
Trichloroethene	ND		0.20
1,2-Dichloropropane	ND		0.20
Dibromomethane	ND		0.20
Bromodichloromethane	ND		0.20
2-Chloroethyl Vinyl Ether	ND		1.0
(cis) 1,3-Dichloropropene	ND		0.20
(trans) 1,3-Dichloropropene	ND		0.20

gpc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Lab ID: 08-148-04
Client ID: **MW-5**

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.20
Tetrachloroethene	0.89		0.20
1,3-Dichloropropane	ND		0.20
Dibromochloromethane	ND		0.20
1,2-Dibromoethane	ND		0.20
Chlorobenzene	ND		0.20
1,1,1,2-Tetrachloroethane	ND		0.20
Bromoform	ND		1.0
Bromobenzene	ND		0.20
1,1,2,2-Tetrachloroethane	ND		0.20
1,2,3-Trichloropropane	ND		0.20
2-Chlorotoluene	ND		0.20
4-Chlorotoluene	ND		0.20
1,3-Dichlorobenzene	ND		0.20
1,4-Dichlorobenzene	ND		0.20
1,2-Dichlorobenzene	ND		0.20
1,2-Dibromo-3-chloropropane	ND		1.0
1,2,4-Trichlorobenzene	ND		0.20
Hexachlorobutadiene	ND		0.20
1,2,3-Trichlorobenzene	ND		0.20

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	118	63-130
Toluene, d8	89	78-113
4-Bromofluorobenzene	87	77-109

gpc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Date Extracted:	8-26-03
Date Analyzed:	8-26-03
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	08-148-05
Client ID:	**MW-7**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		2.0
Chloromethane	ND		2.0
Vinyl Chloride	25		2.0
Bromomethane	ND		2.0
Chloroethane	ND		2.0
Trichlorofluoromethane	ND		2.0
1,1-Dichloroethene	ND		2.0
Iodomethane	ND		10
Methylene Chloride	ND		10
(trans) 1,2-Dichloroethene	6.4		2.0
1,1-Dichloroethane	ND		2.0
2,2-Dichloropropane	ND		2.0
(cis) 1,2-Dichloroethene	390		2.0
Bromochloromethane	ND		2.0
Chloroform	ND		2.0
1,1,1-Trichloroethane	ND		2.0
Carbon Tetrachloride	ND		2.0
1,1-Dichloropropene	ND		2.0
1,2-Dichloroethane	ND		2.0
Trichloroethene	20		2.0
1,2-Dichloropropane	ND		2.0
Dibromomethane	ND		2.0
Bromodichloromethane	ND		2.0
2-Chloroethyl Vinyl Ether	ND		10
(cis) 1,3-Dichloropropene	ND		2.0
(trans) 1,3-Dichloropropene	ND		2.0

gpc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B

Lab ID: 08-148-05
Client ID: **MW-7**

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		2.0
Tetrachloroethene	6.9		2.0
1,3-Dichloropropane	ND		2.0
Dibromochloromethane	ND		2.0
1,2-Dibromoethane	ND		2.0
Chlorobenzene	ND		2.0
1,1,1,2-Tetrachloroethane	ND		2.0
Bromoform	ND		10
Bromobenzene	ND		2.0
1,1,2,2-Tetrachloroethane	ND		2.0
1,2,3-Trichloropropane	ND		2.0
2-Chlorotoluene	ND		2.0
4-Chlorotoluene	ND		2.0
1,3-Dichlorobenzene	ND		2.0
1,4-Dichlorobenzene	ND		2.0
1,2-Dichlorobenzene	ND		2.0
1,2-Dibromo-3-chloropropane	ND		10
1,2,4-Trichlorobenzene	ND		2.0
Hexachlorobutadiene	ND		2.0
1,2,3-Trichlorobenzene	ND		2.0

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	110	63-130
Toluene, d8	88	78-113
4-Bromofluorobenzene	87	77-109

gpc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B
METHOD BLANK QUALITY CONTROL
Page 1 of 2

Date Extracted:	8-26-03
Date Analyzed:	8-26-03
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	MB0826W1

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.20
Chloromethane	ND		0.20
Vinyl Chloride	ND		0.20
Bromomethane	ND		0.20
Chloroethane	ND		0.20
Trichlorofluoromethane	ND		0.20
1,1-Dichloroethene	ND		0.20
Iodomethane	ND		1.0
Methylene Chloride	ND		1.0
(trans) 1,2-Dichloroethene	ND		0.20
1,1-Dichloroethane	ND		0.20
2,2-Dichloropropane	ND		0.20
(cis) 1,2-Dichloroethene	ND		0.20
Bromochloromethane	ND		0.20
Chloroform	ND		0.20
1,1,1-Trichloroethane	ND		0.20
Carbon Tetrachloride	ND		0.20
1,1-Dichloropropene	ND		0.20
1,2-Dichloroethane	ND		0.20
Trichloroethene	ND		0.20
1,2-Dichloropropane	ND		0.20
Dibromomethane	ND		0.20
Bromodichloromethane	ND		0.20
2-Chloroethyl Vinyl Ether	ND		1.0
(cis) 1,3-Dichloropropene	ND		0.20
(trans) 1,3-Dichloropropene	ND		0.20

gpc 9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B
METHOD BLANK QUALITY CONTROL
Page 2 of 2

Lab ID: MB0826W1

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.20
Tetrachloroethene	ND		0.20
1,3-Dichloropropane	ND		0.20
Dibromochloromethane	ND		0.20
1,2-Dibromoethane	ND		0.20
Chlorobenzene	ND		0.20
1,1,1,2-Tetrachloroethane	ND		0.20
Bromoform	ND		1.0
Bromobenzene	ND		0.20
1,1,2,2-Tetrachloroethane	ND		0.20
1,2,3-Trichloropropane	ND		0.20
2-Chlorotoluene	ND		0.20
4-Chlorotoluene	ND		0.20
1,3-Dichlorobenzene	ND		0.20
1,4-Dichlorobenzene	ND		0.20
1,2-Dichlorobenzene	ND		0.20
1,2-Dibromo-3-chloropropane	ND		1.0
1,2,4-Trichlorobenzene	ND		0.20
Hexachlorobutadiene	ND		0.20
1,2,3-Trichlorobenzene	ND		0.20

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	101	63-130
Toluene, d8	85	78-113
4-Bromofluorobenzene	89	77-109

9/15/03

Date of Report: September 3, 2003
Samples Submitted: August 21, 2003
Laboratory Reference: 0308-148
Project: C00-01640-007

HALOGENATED VOLATILES by EPA 8260B
MS/MSD QUALITY CONTROL

Date Extracted: 8-26-03
Date Analyzed: 8-26-03

Matrix: Water
Units: ug/L (ppb)

Lab ID: 08-185-03

Compound	Sample Amount	Spike Amount	MS	Percent Recovery	MSD	Percent Recovery	Recovery Limits	Flags
1,1-Dichloroethene	ND	10.0	10.3	103	10.3	103	69-113	
Benzene	ND	10.0	12.1	121	12.1	121	71-128	
Trichloroethene	ND	10.0	10.3	103	10.1	101	82-122	
Toluene	ND	10.0	10.6	106	10.5	105	54-118	
Chlorobenzene	ND	10.0	9.93	99	9.99	100	85-103	

	RPD	RPD Limit	Flags
1,1-Dichloroethene	0	15	
Benzene	0	10	
Trichloroethene	2	12	
Toluene	1	15	
Chlorobenzene	1	6	

9/15/03

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

D - Data from 1:____ dilution.

E - The value reported exceeds the quantitation range, and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

G - Insufficient sample quantity for duplicate analysis.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeniety. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

O - Hydrocarbons outside the defined gasoline range are present in the sample.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD is outside control limits due to sample inhomogeniety.

X - Sample extract treated with a silica gel cleanup procedure.

Y - Sample extract treated with a silica gel/acid cleanup procedure.

Z -

ND - Not Detected at PQL
MRL - Method Reporting Limit
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

Chain of Custody

Page 1 of 1

OnSite Environmental Inc.
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • Fax: (425) 885-4603

Company: HERRERA ENVIRONMENTAL CONSULTANTS
Project Number: C00-01640-007
Project Name: LTC01
Project Manager: PETER JOWISE/DIANA PHELAN
Sampled by: DIANA PHELAN

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Day ☐ 3 Day
☒ Standard (7 working days)
☐ _____ (other)

Laboratory Number: 08-148

Requested Analysis

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B*	Semivolatiles by 8270C	PAHs by 8270C / SIM	PCBs by 8082	Pesticides by 8081A	Herbicides by 8151A	Total RCRA Metals (8)	TCLP Metals	HEM by 1664	VPH	EPH				% Moisture
1	MW-1S*	8-21-03	11:25	W	3					X														
2	MW-3		09:55	W	3					X														
3	MW-4		13:10	W	3					X														
4	MW-5		14:15	W	3					X														
5	MW-7*		12:15	W	3					X														

	Signature	Company	Date	Time
Relinquished by	Diana M. Phelan	HERRERA	8-21-03	17:33
Received by		OSE	8/21/03	1733
Relinquished by				
Received by				
Relinquished by				
Received by				
Reviewed by/Date		Reviewed by/Date		

Comments/Special Instructions:
REQUEST 0.2 ug/L or less PQL ON ALL SAMPLES
*POSSIBLE HIGH CONCENTRATIONS

Chromatograms with final report ☐

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Data Quality Assurance Review Summary

A data quality assurance review was performed on all analytical data from ground water samples collected during the August 2003 quarterly ground water sampling efforts conducted at the Lakewood Towne Center site in Lakewood, Washington. The laboratory's performance was reviewed in accordance with quality control specifications outlined by the analytical methods and the U.S. Environmental Protection Agency (EPA) functional guidelines for organic data review (U.S. EPA 1999).

Five water samples (including one field duplicate) were collected for chemical analysis from monitoring wells MW-1s, MW-3, MW-4, and MW-5 on August 21, 2003. OnSite Environmental Inc. of Redmond, Washington analyzed all water samples for halogenated volatile organic compounds (HVOCs) using U.S. EPA Method 8260B.

Quality control data submitted by the laboratory were reviewed; raw laboratory data were not provided or reviewed. Review of the laboratory report and data validation results is summarized below.

Water HVOC Analytical Results

Five water samples collected from wells MW-1s, MW-3, MW-4, and MW-5 were analyzed for HVOCs. The water HVOC results were determined to be acceptable for use and no data were qualified, based on the following criteria:

Holding Times—All water samples were preserved with hydrochloric acid and analyzed within the maximum holding time (14 days) for U.S. EPA Method 8260B.

Laboratory Reporting Limits—The laboratory reporting (practical quantitation) limits for HVOC constituents in water were below regulatory criteria (i.e., WAC 173-340), with the exception of 1,1-DCE. The MTCA method B ground water cleanup criterion for 1,1-DCE is 0.0729 µg/L (Ecology 2001), but the practical quantitation limit was 0.20 µg/L. The usability of 1,1-DCE data for all samples is limited. The practical quantitation limits of all compounds for project samples MW-1s and MW-7 were elevated by a factor of 10 because the samples were diluted to quantify the high concentration of (cis) 1,2-dichloroethene in the samples.

Blank Analysis—One method blank was analyzed with the water samples. The method blank did not contain reportable levels of HVOC constituents above practical quantitation limits, and no data have been qualified. No field blanks were collected.

Surrogate Analysis—Three surrogate compounds were analyzed with the project samples and method blank in accordance with the U.S. EPA Method 8260B. As shown in Table A-1, surrogate recovery values for each compound were within the respective laboratory control limits.

Table A-1. Water HVOC surrogate recovery results.

Compound	Project Water Samples Percent Recovery	Method Blank Percent Recovery	Laboratory QC Limits
Dibromofluoromethane	108-118	101	63-130
Toluene-d8	87-89	85	78-113
4-Bromofluorobenzene	87-88	89	77-109

Matrix Spike Analysis—A matrix spike/matrix spike duplicate (MS/MSD) sample was analyzed for a batch QC sample. Matrix spike levels were 10 to 50 times the laboratory reporting (practical quantitation) limits. Percent recovery and relative percent difference (RPD) results were correctly calculated. As shown in Table A-2, percent recovery and RPD values for the five HVOC constituents were within the respective laboratory control limits.

Table A-2. Water HVOC matrix spike results.

Compound	MS % Recovery	MSD % Recovery	Laboratory % Recovery Limits	MS/MSD RPD	Laboratory RPD Limits
1,1-Dichloroethene	103	103	69-113	0	0-15
Benzene	121	121	71-128	0	0-10
Trichloroethene	103	101	82-122	2	0-12
Toluene	106	105	54-118	1	0-15
Chlorobenzene	99	100	85-103	1	0-6

Field Duplicate Analysis—Water sample MW-7 was analyzed as the field duplicate of water sample MW-1s. As shown in Table A-3, the relative percent difference (RPD) values between results of detected compounds were within the 30 percent control limit. The RPD value for 1,4-dichloroenzene was not calculated because 1,4-dichlorobenzene was not reported at a concentration above the practical quantitation limit in sample MW-1s. No data were qualified due to field duplicate results.

Table A-3. Field duplicate analysis results for detected compounds.

Compound	Project Water Sample MW-1s (µg/L)	Field Duplicate Water Sample MW-7 (µg/L)	Relative Percent Difference
Vinyl chloride	24	25	4
trans 1,2-Dichloroethene (trans DCE)	6.6	6.4	3
cis 1,2-Dichloroethene (cis DCE)	400	390	3
Trichloroethene (TCE)	20	20	0
Tetrachloroethene (PCE)	7.1	6.9	3

References

U.S. EPA. 1999. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency, Washington, D.C. EPA 540/R-94-012, October 1999.