REPORT

Cleanup Action Plan

Sea-Tac Development Site
SeaTac, Washington

Submitted To: Riddell Williams P.S.
1001 Fourth Avenue, Suite 4500
Seattle, Washington 98154

Prepared For: Department of Ecology
3190 160th Ave SE
Bellevue, Washington 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, Washington 98052 USA

Distribution:

1 Copy	Harry Grant, Riddell Williams
3 Copies	Jerome Cruz, Department of Ecology

November 2, 2011 **Project No. 073-93368-05.04**

A world of capabilities delivered locally

Golder Associates

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

Table of Contents

List of Tables

List of Figures

List of Appendices

List of CAP Attachments

LIST OF ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
ARAR	applicable or relevant and appropriate requirements – appropriate regulatory criteria
AVC	Aviation Commercial
AVO	Aviation Operations
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAO	cleanup action objectives
CAP	Cleanup Action Plan
CB-C	Community Business in Urban Center
CMP	compliance monitoring plan
COC	contaminants of concern
cm/sec	centimeters per second
CQA	construction quality assurance
DCAP	Draft Cleanup Action Plan
DNR	Washington State Department of Natural Resources
DNS	Determination of Non-significance
Ecology	Washington State Department of Ecology
EDB	1,2-dibromoethane (ethylene dibromide)
EDR	Engineering Design Report
EPA	United States Environmental Protection Agency
EPA-RAGS	EPA Risk Assessment Guidelines
ERA	Expedited Response Action
ESA	Phase I Environmental Site Assessment
FCAP	Final Cleanup Action Plan
FID	flame ionization detector
FML	flexible membrane liner
FS	feasibility study
GCL	geosynthetic clay liner
HASP	health and safety plan
IAS	In-situ Air Sparging
IRA	Independence Remedial Action
ISCO	In-situ Chemical Oxidation
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MFS	Minimum Functional Standards
mgd	millions of gallons per day
MNA	monitored natural attenuation
MSL	mean sea level
MTCA	Model Toxics Control Act
O&M	operation and maintenance
PCB	polychlorinated biphenyls
PID	photoionization detector
PLP	Potentially Liable Party
PPE	personal protective equipment
Qva	Quaternary advanced outwash deposits (Vashon Stade)
Qvr	Quaternary recessional outwash deposits (Vashon Stade)
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of the State of Washington
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROI	radius of influence
SEPA	State Environmental Policy Act
SHA	Site Hazard Assessment
SL	screening level
SMCL	Secondary Maximum Contaminant Level

SVE	soil vapor extraction
SVOC	semi-volatile organic compound
TCE	trichloroethene
TDS	total dissolved solids
TPH	total petroleum hydrocarbon
UST	underground storage tank
VCP	Voluntary Cleanup Program
VOC	volatile organic compound
WAC	Washington Administrative Code
WDOH	Washington State Department of Health

SEA-TAC DEVELOPMENT SITE

DECLARATIVE STATEMENT

Consistent with the Model Toxics Control Act, Chapter 70.105D RCW as implemented by the Model Toxics Control Act Cleanup Regulation, Chapter 173-340 WAC, it is determined that the selected cleanup actions are protective of human health and the environment, attain federal and state requirement that are applicable or relevant and appropriate, comply with cleanup standards, provide for compliance monitoring, use permanent solutions to the maximum extent practicable, provide for a reasonable restoration time-frame, and consider public concerns raised during public comment.

6-12-2012

Jerome B. Cruz, Ph.D. Date
Site Manager
Toxics Cleanup Program
Northwest Regional Office

6/14/12

Robert W. Warren, P.Hg., MBA Date
Regional Section Manager
Toxics Cleanup Program
Northwest Regional Office

1.0 INTRODUCTION

1.1 Purpose and Objectives

This document is the Draft Cleanup Action Plan (DCAP) for the Sea-Tac Development Site (the Site) located in SeaTac, Washington. This DCAP was prepared by Golder Associates Inc. (Golder) for SeaTac Investments LLC, Scarsella Brothers Inc. and ANSCO Properties, LLC (the PLP group) pursuant to the Agreed Order under the Model Toxics Control Act (MTCA) dated July 10, 2009. The PLP group entered into an Agreed Order (No. DE 6844 with the Washington State Department of Ecology (Ecology) to complete a RI/FS and Draft Cleanup Action Plan (DCAP) for the Site. A DCAP is required as part of the site cleanup process established by Ecology under Washington Administrative Code (WAC) Chapter 173-340, Model Toxics Control Act (MTCA) Cleanup Regulations as amended February 12, 2001. The purpose of the DCAP is to identify the proposed cleanup action for the Site and to provide an explanatory document for public review. Specific items to be included as outlined in WAC 173-340-380, DCAP, consist of the following:

- A general description of the proposed cleanup action including compliance monitoring.
- A brief summary of other alternative cleanup actions evaluated in the Site's Remedial Investigation/Feasibility Study.
- Site cleanup levels and points of compliance for each hazardous substance and for each media of concern.
- The schedule for implementation of the cleanup action including, if known, restoration time frame.
- Required institutional controls and site use restrictions, if any, for the proposed cleanup action.
- Justification for selecting a cleanup action that uses cleanup technologies having a lower preference than higher representative cleanup technologies.
- Applicable state and federal laws for the proposed cleanup action, when these are known at this step of the cleanup process.
- A preliminary determination by Ecology that the proposed cleanup action will comply with sections 173-340-360 and –370.
- Where the cleanup action involves on-Site containment, specification of the types, levels, and amounts of hazardous substances remaining on Site and the measures that will be utilized to prevent migration and contact with those substances.

1.2 Previous Work

The DCAP presents a brief description and history of the Site. Results from applicable studies and reports are summarized to provide background information pertinent to the DCAP. These studies and reports include, among others, the *Remedial Investigation/Feasibility Study (RI/FS) Work Plan For Sea-Tac Development Site* (Golder 2009), *Remedial Investigation/Feasibility Study Sea-Tac Development Site* (Golder 2010). Portions of the DCAP text are taken directly from these documents.

1.3 The DCAP and the Cleanup Process

The DCAP is one of a series of documents used by Ecology to monitor the progress of Site investigation and cleanup. Figure 1 identifies documents required under the MTCA site cleanup process.

The Remedial Investigation/Feasibility Study (RI/FS) report presents results of investigations into the geology and hydrogeology of a site, the nature and extent of contamination, the risks posed by that contamination, and evaluates the feasibility of alternative methods of remediating the site. These investigations, assessments, and evaluations for this Site were performed according to an Ecology approved work plan, the *Remedial Investigation/Feasibility Study (RI/FS) Work Plan For Sea-Tac Development Site* (Golder 2009). This work plan was incorporated into an Agreed Order (Order No. DE 6844 (Ecology 2009) signed on July 10, 2009. The Agreed Order directed the PLP Group to conduct the RI/FS. The PLP Group completed the draft RI/FS and submitted the report to Ecology on April 30, 2010. The final RI/FS will ultimately be submitted for public review and comment.

Under the terms of the Agreed Order, the RI/FS was conducted using a phased approach. The phased approach was implemented because previous investigations had collected a significant amount of Site data. The first phase of the Remedial Investigation (RI) conducted in 2007 and 2008 delineated much of the extent of the groundwater gasoline plume on the Site (Golder 2008a and 2008b). The second phase of the RI, conducted in 2009 and 2010 focused on data gaps that were identified with respect to the major potential exposure pathways for the Site releases and groundwater and also included further characterization and delineation of the down-gradient extent of the gasoline plume. The RI/FS document that was prepared for the PLP Group, therefore, represents a complete and final RI and Feasibility Study (FS) set of documents sufficient to enable Ecology to identify and evaluate cleanup alternatives. Public comments on the RI/FS Report and this DCAP will be formally documented in the *Responsiveness Summary for the SeaTac Development Site Cleanup Action Plan*. The RI/FS Report, DCAP and eventual the Responsiveness Summary are available for review at state repository locations identified in the Public Participation Plan (Attachment D to the DCAP).

The DCAP identifies the proposed cleanup action for the Site based on the Site investigation results and remedial alternative evaluations presented in the RI/FS. Upon completion of a public comment period for the DCAP, Ecology, after review and consideration of the comments received, will issue a Final Cleanup Action Plan (FCAP). The FCAP is expected to be incorporated into an Administrative order such as an Agreed Order, which is a legal agreement negotiated between Ecology and the PLP Group for implementing the remedial actions outlined in the FCAP. The public will have an opportunity to comment on the DCAP and Agreed Order before cleanup work begins.

An Engineering Design Report (EDR) and Construction Plans and Specifications provide the necessary technical drawings and specifications to allow contractors to implement the methods described in the FCAP for remediating the Site.

An Operation and Maintenance (O&M) Plan presents technical guidance to assure effective operations and maintenance under both normal and emergency conditions.

The Compliance Monitoring Plan (CMP) includes a program for protection monitoring to confirm that human health and the environment are adequately protected during construction and operation and maintenance periods of the cleanup action; performance monitoring to confirm that cleanup standards or other performance standards have been attained; and confirmational monitoring to confirm the long-term effectiveness of the cleanup action.

Construction documentation includes as-built drawings and documentation that cleanup and/or performance standards required to be met during construction were attained, as well as any changes or modifications that were necessary during the course of implementing the remedial action.

2.0 SITE DESCRIPTION AND HISTORY

The following sections provide general information regarding the Site including the location, type of historic operations conducted at the Site, and a synopsis of the Site history, including previous remedial actions.

2.1 Site Description

The Site is located in SeaTac, Washington, within Section 28, Township 23 North, Range 4 East (Figure 2). The Site currently includes portions, or all of the following contiguous properties:

- MasterPark Lot C (the MasterPark Facility)
- Louden Property
- City of SeaTac (South 160th Street) right-of-way
- Washington Memorial Cemetery
- Port of Seattle Property (north of South 160th Street)

The Site is defined, for purposes of this document, as the area of land that is impacted by the MasterPark Facility's contamination. Figure 3 depicts the Site location as defined by the plume boundary as well as the contiguous properties included within the Site. The Site extends beyond South 160th Street to the north onto Port of Seattle Property, is bound by International Boulevard to the east, and extends onto Washington Memorial Cemetery to the west. The specific legal description of the Site is provided in Attachment A of the DCAP.

The MasterPark Facility is approximately 7 acres, located at 16025 International Boulevard, SeaTac, Washington and is called MasterPark Lot C. The MasterPark Facility is bounded by the Louden property to the north, International Boulevard to the east, and Washington Memorial Cemetery to the west and south. A legal description of the MasterPark Facility is provided in Attachment A of the DCAP. SeaTac Investments LLC is currently operating the MasterPark Facility as a public valet parking lot, doing business as MasterPark Lot C. SeaTac Investments LLC leases the majority of the land from ANSCO Properties, LLC (current land owner of the north portion of the MasterPark Facility) under the terms of a long-term lease agreement. Current data indicates that the known soil contamination, the highest levels of groundwater contamination, and possibly the primary source of contamination (former underground storage tanks) are located on the MasterPark Facility property, but groundwater impacts extend beyond the Facility property boundaries. Thus, the area where groundwater has been impacted above MTCA cleanup levels is defined as the Site.

Presently the eastern majority of the Site, where the MasterPark Facility is operated, consists of relatively flat ground covered by asphalt. The western portion of the Site is owned and operated as a cemetery. The northern portion of the Site includes the Louden property and South 160th Street.

2.1.1 Adjacent Property Uses

The Site is located within a commercial part of the City of SeaTac, Washington. To the north of the MasterPark Facility is the Louden property and South 160th Street. The Louden property contains an office building utilized by a real estate business and a warehouse building. The warehouse building has been utilized for the storage of goods and materials by various businesses. The Port of Seattle has major construction occurring north of South 160th Street for commercial buildings and infrastructure to support airport transportation. To the east is Pacific Highway South (State Route 99) with numerous commercial businesses and buildings. Further east of the MasterPark Facility (about 0.25 miles) a residential neighborhood exists. To the west and south of the MasterPark Facility is land owned by the Washington Memorial Cemetery. A single residence exists on the cemetery property just west of the northwest corner of the MasterPark Facility. Further west of the cemetery is Port of Seattle parking and commercial office buildings, followed by the airport access highway and SeaTac Airport.

The only municipal groundwater supply well system within a mile of the Facility is located about 0.5 miles east, within a residential neighborhood. Washington Memorial Cemetery has a groundwater well located south-southwest of the MasterPark Facility. The water pumped from this well is only used for cemetery irrigation and for use in a decorative fountain. Groundwater from this well has been sampled by Golder and Ecology in the past and analytical results indicate the groundwater is not impacted.

2.2 Site History

It is suspected that portions of the Washington Park Cemetery may have been developed prior to 1936 as indicated by the presence of some of the current cemetery roads (to the south of the MasterPark Facility) in a 1936 aerial photograph. The Site showed the first development in a 1946 aerial photograph with a single building. Major development of the MasterPark Facility property (uses prior to the current development) and surrounding properties was evident in a 1956 aerial photograph. Since the 1960s, the MasterPark Facility property was mainly a construction staging area that supported the construction of Interstate 5. The currently existing Louden property buildings were constructed at some point between 1960 and 1969 as indicated by aerial photographs of this vintage. More recently a number of small manufacturing and warehousing facilities operated at the MasterPark Facility including public parking. Today, the entire MasterPark Facility is a paved parking lot with a single administrative building supporting the business.

A series of investigations and remedial actions were conducted at MasterPark Lot C starting in September 2000 with a Phase I Environmental Site Assessment (ESA) followed by Phase II ESA investigations. Impacted soil and groundwater were discovered at the Facility during the course of the Phase II ESA investigations, which lead to an independent remedial action that was conducted in coordination with property development in September 2001. Ecology performed groundwater sampling at

the Site in 2006, and remedial Site investigations resumed in 2007. The activities and results of these investigations are reported in documents that are briefly summarized in this Section. Pertinent tables and figures from each report are included in Appendix B of the RI/FS report (Golder 2010). The first three reports were submitted to Ecology in April 2001 for review under the Voluntary Cleanup Program (VCP). The fourth report (2001c) was submitted to Ecology in October 2001. Additional reports addressing remedial actions conducted during redevelopment and construction at the MasterPark Facility were also submitted to Ecology under the VCP. All referenced documents are on file at Ecology's Northwest Regional Office in Bellevue, Washington and are listed below.

2.2.1 2001-2002 Investigations

- Golder Associates Inc. (Golder) 2000. *Phase I Environmental Site Assessment, SunReal Inc., SeaTac Airport Site, SeaTac, Washington*. October 12.
- Golder. 2001a. Final Phase II Environmental Site Assessment Report, SeaTac Parking Garage Development Site, SeaTac, Washington. April 5.
- Golder. 2001b. *Final Report for Extended Phase II Extended Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, Washington.* April 5.
- Golder. 2001c. *Final Report for the Phase III Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, Washington.* April 5.
- Golder. 2001d. *Final Field Sampling Plan for Limited Remedial Actions at the Sea-Tac Parking Lot Development Site, 16000 Block International Boulevard, Sea-Tac, Washington (Rev.0)*. June 25.
- Golder. 2001e. *Collection and Analytical Results of Groundwater Sample from Washington Memorial Park Cemetery, Private Well Letter Report Addressed to SeaTac Investments*, Attention Mr. Douglas Rigoni. September 27.
- Golder. 2001f. *Site Assessment Conducted for the Closure of a 3,000- and 10,000-Gallon Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, Washington*. October 4.
- Golder. 2001g. *Site Assessment Conducted for the Closure of a 1,000-Gallon Gasoline Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, Washington*. October 4.
- Golder. 2001h. *Site Assessment Conduct For the Closure of a 1,000-Gallon Heating Oil Underground Storage Tank, Master Park Lot C 16000 Block International Boulevard, SeaTac, Washington*. October 4.
- Golder. 2001i. *Site Assessment for the Closure of a 300-Gallon Underground Storage Tank, Master Park Lot C 16000 Block International Boulevard, SeaTac, Washington*. October 24.
- Golder. 2002. *Final Independent Remedial Action Report SeaTac Parking Garage Development Site SeaTac, Washington (MasterPark Lot C). Prepared for: SeaTac Investments LLC*. January 24.

2.2.2 2006-2007 Investigations

- EA Engineering, Science, and Technology, Inc., 2006. *SeaTac Development Site, Summary of June 2006 Groundwater Monitoring Results – Work Order #17079, Contract Number: 30700 - Prepared for Washington Department of Ecology*. September 6.

- Golder. 2008a. *On-Site Source and Groundwater Investigation Summary – June to November 2007*. Prepared for Riddell Williams P.S. January 14.
- Golder. 2008b. *Addendum to On-Site Source and Groundwater Investigation Summary* – June to November 2007 Report (Dated January 14, 2008). Prepared for Riddell Williams P.S. March 13.

2.2.3 Previous Remedial Actions

The MasterPark Facility was redeveloped (to its current condition) during the summer of 2001. An independent remedial action and closure activities were conducted concurrently with the MasterPark Facility redevelopment to its current configuration and use. As indicated above, the remediation and closure activities were documented in Golder's Final IRA Report (Golder 2002).

2.2.4 Restrictive Covenant

A restrictive covenant was recorded in 2002 as the result of the IRA conducted at the MasterPark Facility because residual concentrations of diesel and oil range petroleum hydrocarbons in soil and gasoline range petroleum hydrocarbons remain in groundwater exceeding MTCA Method A cleanup levels. The restrictions and property use limitations specified by the restrictive covenant include the following:

- Groundwater at the MasterPark Facility cannot be used for any purpose other than remedial actions.
- Activities resulting in the release or exposure of capped contaminated materials are prohibited, without prior approval from Ecology.
- Activities interfering with the integrity of the remedial action are prohibited.
- Ecology must receive 30 day written notice of the owner's intent to convey interest in the MasterPark Facility property.
- Leases of the MasterPark Facility property must be for uses and activities consistent with the restrictive covenant.
- Ecology must be notified prior to the use of the MasterPark Facility property that is inconsistent with the restrictive covenant.
- Ecology is authorized by the owner to enter the MasterPark Facility property for the purpose of evaluating the remedial action.
- The owner of the MasterPark Facility property has the right to record an instrument that provides that the restrictive covenant no longer limits the use of the MasterPark Facility property.

3.0 SUMMARY OF ENVIRONMENTAL ISSUES

3.1 Methods of Investigation

The approach taken during the RI (June 2007 to December 2009) was to focus environmental sampling efforts on potential exposure pathways and to characterize/delineate the down-gradient portion of the gasoline plume, since significant amount of Site data already existed. As such, data collection activities conducted under the RI included the following primary tasks:

- Soil Gas Investigations. Two soil gas investigations were conducted in 2007 and 2009. The 2007 program investigated the soil vapor in and around the source area. The 2009 program investigated the likelihood of vapor intrusion by conducting a soil gas survey around the residence on the Washington Memorial Park Cemetery. An ambient air sample was also collected from the crawlspace below the residence at the same time as the 2009 soil gas survey was conducted. Background atmospheric air samples were also collected during both soil gas investigations for comparison purposes.
- Geophysical Investigation. In order to identify if there were any on-Site sources contributing to the impacts to the groundwater, namely undocumented underground storage tanks (USTs), a non-intrusive geophysical survey was conducted at the northeast portion of the MasterPark Facility in September 2007. Ground-penetrating radar, magnetometry, and time domain electromagnetic method (TDEM) were implemented for the survey. Detailed results of the geophysical investigation are included in Golder's report, On-Site Source and Groundwater Investigation Summary – June to November 2007 (2008a).
- Geodetic Survey. Several geodetic surveys were conducted to identify the X, Y, and Z coordinates of all of the monitoring wells associated with Site investigations. The geodetic surveys were conducted in July 2007, November 2007, February 2008, and December 2009 after each monitoring well installation event. For each survey event, all of the new wells were surveyed in addition to select old wells for confirmatory purposes. For those wells that have been surveyed multiple times, the average elevation of all of the surveys was used for determining groundwater contours and flow directions.
- Monitoring Well Drilling and Installation. Five new monitoring wells (MW-19 through MW-23) were installed at the Site during the RI (see Figure 4). MW-19 was installed at the northeast corner of the MasterPark Facility to further characterize the hydraulic gradient, direction of flow, and the potential for off-Site contaminant migration. Well MW-20 was installed directly west of the center portion of the gasoline plume to identify the western extent of the plume. The last round of well installations included MW-21, MW-22, and MW-23. MW-21 was installed on the Washington Memorial Park Cemetery property to characterize the southwestern boundary of the plume. MW-22 and MW-23 were installed within the center lane of South 160th Street to characterize the northwest and northeast boundary of the plume, respectively.
- Monitoring of Groundwater. The hydrogeologic study focused on the groundwater quality directly beneath and downgradient of the MasterPark Facility. The downgradient extent of the gasoline plume in the advanced outwash deposits (Qva) aquifer represented a data gap and was part of this RI/FS. A total of five distinct groundwater monitoring events have been conducted (after each round of well installations) as part of this RI/FS investigation. These events occurred in the summer and fall of 2007, winter 2008, the spring and fall of 2009, and the winter of 2010. Historic groundwater sampling at the MasterPark Facility occurred during the winter of 2001 and the summer of 2006. Because the monitoring wells were installed using a phased approach from 2001 to 2009,

the groundwater monitoring periods prior to 2009 did not have analytical results for all of the wells. Furthermore, prior to the RI/FS groundwater samples had never been collected during the spring season and had not been collected during the winter since 2001, which represented a data gap. The hydrogeologic study for this RI/FS intended to address these data gaps. Groundwater from all viable Site wells was sampled for chemical analysis during each of the sampling events. During the 2007 and 2008 groundwater investigations, all groundwater samples were analyzed for gasoline range petroleum hydrocarbons and fuel additives associated with gasoline (Benzene, toluene, ethylbenzene, and xylene [BTEX]). Groundwater samples collected from newly installed wells were also analyzed for motor oil and diesel range petroleum hydrocarbons. Two groundwater sampling events were conducted in 2009 (May and December) and one sampling event was conducted in 2010 (March). During the May 2009 investigation, selected groundwater samples were obtained and analyzed for chemical constituents of concern per MTCA Table 830-1 "Required Testing for Petroleum Releases," as specified by the RI/FS Work Plan. The remaining wells were only analyzed for gasoline and BTEX. Groundwater samples collected in December 2009 and March 2010 were only analyzed for those chemical constituents of concern that were positively detected during the May 2009 investigation, which included gasoline, BTEX, naphthalene, n-hexane, and 1,2-Dibromoethane (EDB).

- Subsurface Soil Sampling. Subsurface soil investigations occurred on several occasions in 2007, 2008, and 2009. The subsurface investigations included the collection of soil samples from test pits, soil borings, or during well installation. The test pits and soil borings were conducted to assess geophysical anomalies and to a general horizontal and vertical profile of contaminated soil in potential source areas.

The results of these investigations are described below.

3.2 Source Characteristics

All known and suspected sources of contamination identified in the previous investigations at the MasterPark Facility have been characterized and interim remedial actions were implemented in 2001-2002. Soil, soil gas, and groundwater sample results coupled with results of the geophysical investigation indicate that the gasoline and benzene source area affecting the Qva aquifer is in the vicinity of MW-18, where underground fuel storage tanks were previously removed. The highest concentrations in soil in the source area were between 10 and 50 feet bgs and consisted of gasoline concentrations ranging between 10,000 µg/kg to 1,800,000 µg/kg.

3.3 Site Geology and Hydrogeology

3.3.1 Geology

The Site is located in the Central Puget Lowland, where the geologic formation was significantly modified by the last glaciations of the Vashon Stade. Predominantly, the surficial geology of the Site is Quaternary recessional outwash (Qvr) deposits, characterized by stratified sand and gravel that is moderately well to well sorted (USGS 2004). These were deposited by channels carrying meltwater from the margin of the ice as it was retreating. A portion of the southeastern side of the Site consists of Quaternary advanced outwash (Qva) deposits, characterized by bedded sand and gravel that were deposited by fluvial processes in advance of the ice sheet. Because of the massive glaciation through the area, bedrock is

only occasionally observed in outcrops northeast of the Site, such as portions of the hillsides adjacent to the Duwamish River. Bedrock in these areas includes volcanic, marine and continental sedimentary rocks of the Tertiary age. The depth to bedrock at the Site is unknown, but could range from 300 to 1,500 meters below ground surface (bgs).

The Site ground surface elevation generally declines from the southwest to the northeast with a maximum elevation near 400 feet above mean sea level (amsl) at the southwest corner of the Site and a minimum elevation of approximately 350 feet amsl near the northeast corner.

Near surface soils consist of a layer of fill that may be up to approximately 10 feet thick in places. Beneath the fill, till and/or layers of outwash sand are encountered. In general, the till occurs in the range of 10 to 30 feet bgs. Below the till is dense to very dense Qva consisting of unstratified fine to coarse grained sandy deposits. Although the RI did not include boreholes deeper than the Qva stratum, regional geologic maps indicate the potential presence of lacustrine clayey silts and silty clay deposits beneath the Qva stratum at an unknown depth (USGS 2004).

3.3.2 Hydrogeology

A continuous zone of groundwater representing a regional aquifer occurs across the Site at a depth of approximately 50 feet bgs. This water-bearing unit is contained within Qva sand present beneath till. The thickness of this saturated coarse-grained deposit is at least 40 feet based on the drilling of a monitoring well (MW-10) to a depth of 92 feet bgs. Above this regional aquifer, isolated pockets of perched groundwater occur at selected locations at depths less than about 20 feet bgs. These zones are limited in occurrence, not hydraulically continuous across the Site, and likely form over layers of till.

The results of all of the hydraulic gradient events indicate that the groundwater flow direction is predominantly to the west (with some flow components to the northwest and southwest) and is not appreciably affected by seasons. Figure 5 depicts the groundwater elevation contours for the March 2010 monitoring event.

3.4 Extent of Contamination

The soil gas, soil, and groundwater analytical data collected as part of the RI, as well as other data collected during the preliminary investigations, were evaluated in the RI to assess the nature and extent of chemical constituents in environmental media at the SeaTac Development Site. The primary purpose of this evaluation was to identify the chemical compounds within each media that potentially pose a human or environmental health risk and/or which exceed potential regulatory criteria. Such compounds are termed the Contaminants of Concern (COC). In order to accomplish this, the data were evaluated through a step-wise screening process which considered laboratory and field blank data, background concentrations (if available) and applicable or relevant and appropriate requirements (ARARs).

3.4.1 Air

The soil gas COCs at the Site have high volatility and pose a potential risk of human inhalation by vapor intrusion into Site buildings. Two rounds of soil gas sampling were conducted at the Site in 2007 and 2009. The RI/FS report provides a detailed narrative of the sampling locations and results. In summary, benzene was detected only in soil vapor samples from probes SG-3, SG-6, SG-13 during the 2007 sampling event. The other soil vapor analytical results had a laboratory reporting limit of 22 to 24 µg/m^3, which is above the MTCA Method B screening level (SL) for shallow (sub-slab) soil gas samples. Therefore, there is uncertainty whether the undetected benzene is above the MTCA Method B shallow SL. The only analyzed constituents (ethylbenzene, toluene, and xylenes) that were detected above the MTCA Method B shallow SLs were associated with sample SG-6, which was from the vadose zone source soils area near well MW-18. The only samples that had a soil vapor constituent above the MTCA Method C shallow SLs was SG-6 and SG-13. Again the SG-6 sample is from the vadose zone source soils. Sample SG-13 is from a probe near the western MasterPark Facility boundary.

The 2009 soil vapor sample analysis was conducted using the lowest achievable laboratory detection limits and expanded the analytes based on the results of groundwater analyses. Benzene was detected in all soil vapor samples obtained during the 2009 event at concentrations above the proposed Method B shallow SL, but below the MTCA Method C shallow SL. Crawl space air sampled beneath the residence on the cemetery property had detections of COCs at concentrations that were comparable to the outside ambient atmospheric air concentrations, indicating that any soil gas intrusion into the crawl space was mixing with atmospheric air and thus does not pose a risk to residents. No other analyzed constituent from soil vapor samples were detected above either MTCA Method B or C shallow SLs form the 2009 sampling event. 1,2-dibromoethane (EDB) was not detected in any soil vapor sample with a reporting limit of 0.22 to 0.24 µg/m^3. Although the laboratory reporting limit (practical quantification limit) is above the MTCA Method B shallow SL, the actual analytical method detection limit (MDL) is much lower than the laboratory reporting limit. See the tables (Table 3-4 and 3-5) and figures (Figure 3-5) in the RI/FS report for a summary of detections and sample locations (Golder, 2010).

3.4.2 Groundwater

The RI in 2007 and 2009 defined the location of the groundwater plume, with the exception of the corner of the plume to the northwest of MW-22. Since the Port of Seattle has the entire area north of South 160th Street under heavy construction, it is not possible to confirm the extent of the gasoline plume to the northwest of MW-22 at this time; however it is the intention of the PLP Group to install an additional well in this location once they are permitted to do so by the Port of Seattle. The RI/FS report provides a detailed narrative of the groundwater sampling results over the course of the RI. The following is just a summary of the COCs for the Site groundwater:

- Gasoline range petroleum hydrocarbons were detected in groundwater samples collected at the MasterPark Facility and on down-gradient portions of the Site at concentrations exceeding MTCA Method A cleanup levels. Diesel was also detected in groundwater at one well on the MasterPark Facility and two down-gradient wells on adjacent Site properties (however only a select number of wells were analyzed for diesel in 2007). It is likely that the gasoline is mobilizing the diesel and carrying it down-gradient. Both diesel and gasoline are recognized as COCs for the Site groundwater.
- BTEX detections occurred in twelve wells at the Site and were at concentrations well above cleanup levels. BTEX therefore is considered a COC for the Site groundwater.
- Naphthalene was detected in eight wells at the Site and was detected at concentrations more than double the cleanup level. Naphthalene therefore is considered a COC for the Site groundwater.
- EDB was detected in seven wells at the Site and was at concentrations well above the cleanup level. EDB therefore is considered a COC for the Site groundwater.
- Lead was detected in only one well (MW-13) during the May 2009 sampling event at a concentration slightly exceeding the cleanup level. Lead was detected in three other wells, but at concentrations less than half the cleanup level. The other detections of lead were also in wells that are in and/or adjacent to the source area. The calculated average lead concentration for wells located within the source area is 9.5 µg/L, which is less than the cleanup level. Because lead was only detected in one well above the cleanup level, and the average lead concentration within the source area was less than the cleanup level during a sampling event that exhibited the highest gasoline concentrations to date, it is suspected that lead is not a COC for Site groundwater. However, since lead has only been measured during one sampling event, the next round of analysis will include lead in the monitoring wells within the source area to confirm that lead is not a site COC.

The source of the groundwater impact historically was a leaking UST that has since been removed from the site. Since the original source has been removed, the current source to groundwater is related to gasoline entrained in vadose zone soil). Groundwater analytical results confirm that the source of impact is bounded by MW-12 to the north, MW-14 to the south, MW-18 to the east, and MW-13 to the west based on the highest concentrations of COCs located within this area. This is demonstrated by gasoline isoconcentration contour maps. The March 2010 gasoline isoconcentration contour map is depicted in Figure 6. Figure 7 depicts the benzene isoconcentration contours for March 2010. The EDB isoconcentration contour map for March 2010 is also depicted as Figure 8 of this report.

3.4.3 Soil

A source of gasoline impacted soils exists within the MasterPark Facility near the former location of the former gasoline USTs. Available data or information do not suggest near surface soils are impacted off the MasterPark Facility property, except for allegations that there were petroleum UST(s) on the Louden property in the past. Soil analytical data indicates the source of impacted soil is located near the northwest corner of the MasterPark Facility. The following constituents have been identified in near-surface and aquifer soils exceeding cleanup levels and therefore are considered COCs for the Site:

- Petroleum Hydrocarbons - Gasoline

- Volatile Organic Compounds (VOCs) – Benzene, toluene, ethylbenzene, and xylenes

Although no surface soil samples were collected during the RI, it is assumed that there are localized areas of surface soil beneath the asphalt cap outside of the source area at the MasterPark Facility that exceed cleanup levels for petroleum hydrocarbons. The presence of these localized impacted areas was identified through observation of the surface soil prior to MasterPark Facility redevelopment (to its current configuration), when vehicles were parked on top of bare soil. During MasterPark Facility remediation and redevelopment, the asphalt cap was placed over the entire MasterPark Facility property to prevent any potential direct contact with these surface soils that remained in place.

3.5 Risks to Human Health and the Environment

As noted above, COCs were observed at levels of concern in soil, groundwater, and soil gas. The operative pathways for exposure to chemicals at the Site were evaluated in the RI/FS. See the RI/FS report for a detailed discussion of risk. A summary of the results of the risk evaluation are discussed below.

3.5.1 Soil

Near surface soils (upper 15 feet) in all Site properties surrounding the MasterPark Facility are not impacted by the source and therefore there is no potential for exposure of any receptor group to soil on-Site (but off of the MasterPark Facility).

Future MasterPark Facility construction workers could become exposed by direct contact and incidental ingestion to the Site near surface soils during construction excavation or impacted soil removal activities in the vicinity of MW-18 source area. The MasterPark Facility will remain zoned as Community Business in Urban Center (CB-C) for the foreseeable future and it is reasonably unlikely that the MasterPark Facility will be developed for residential purposes; therefore the potential for unacceptable exposure via direct contact to MW-18 source area soils by future residents is not a complete exposure pathway.

Institutional controls that can reduce risk of exposure to contaminated soil include deed restrictions, property use restrictions, and zoning restrictions. The institutional controls that are currently in place at the MasterPark Facility (as per the existing Restrictive Covenant) include deed and use restrictions. It is not likely that soil on the Site (outside of the MasterPark Facility) will require institutional controls to protect human health and the environment.

3.5.2 Groundwater

Groundwater at the Site exists in the Qva beneath the Site. This aquifer is impacted with gasoline constituents including EDB as a gasoline additive. Groundwater is between 45 and 115 feet below land surface at the Site. There is no known discharge of Site groundwater to surface water in the area, including the wetland area and man-made pond on the cemetery property south of the Site. Therefore,

terrestrial and aquatic wildlife are not exposed to Site groundwater. There are no potable groundwater supply wells within a mile of the Site in the general downgradient direction (west, southwest or northwest) from the Site. The closest groundwater supply well is in the Washington Memorial Park Cemetery, south of the Site, and is used for watering. However, this cemetery well has not been impacted by Site releases (as per results from EA Engineering, Science, and Technology, Inc., 2006 and Golder's 2001 sampling events). Therefore, there are no current groundwater exposure pathways to off-Site humans from drinking water impacted by Site releases.

The only manner in which future humans can become exposed to Site groundwater is by extracting groundwater from on-Site wells for ingestion (drinking or cooking) and bathing (dermal contact). The Restrictive Covenant on record for the MasterPark Facility states that groundwater at the MasterPark Facility may not be used for any purpose other than for remedial actions. As long as the restrictive covenant remains in place, the current and future risk of human exposure through ingestion of groundwater on the MasterPark Facility does not exist. Depending on the location of a theoretical future groundwater supply well, the potential exists for groundwater used for drinking water to contain unacceptable concentrations of gasoline (and constituents), benzene, and EDB.

3.5.3 Air

The results of the soil vapor sampling events and Tier I preliminary assessment indicated that there is not an unacceptable risk to the current resident at the Site or current commercial workers at the MasterPark Facility. Since the Tier I soil vapor sampling results also indicate that soil vapors are below shallow soil screening levels at the property boundary, there is no unacceptable risk from vapor intrusion into current commercial buildings to workers on the Site (but off of the MasterPark Facility). However, future commercial workers, if the MasterPark Facility is ever redeveloped and buildings are built over the source area near well MW-18 may be exposed to unacceptable vapor intrusion from soil gases if proper precautions are not incorporated into the building installation to abate vapor intrusion.

3.5.4 Surface Water

Perennial surface water bodies do not exist within 500 feet of the Site contamination. The man-made pond on the cemetery property that receives groundwater from a well is located to the southwest by approximately 1,500 feet of the Site contamination. It is not anticipated to become impacted in the future by Site contamination because it is side gradient to the plume. The cemetery pond well has been sampled by Golder and Ecology in the past and has been free of contamination. Therefore, exposures to surface water by releases from the Site are not an operable pathway for human or ecological receptors.

3.5.5 Exposure Summary

The following is a summary of operable potential receptors and exposure pathways to Site contamination:

- Future use of Site groundwater
  - If future groundwater supply wells are installed in the Qva within the Site, groundwater quality exceed Federal and State drinking water maximum contaminant levels (MCLs) and would pose a risk.
- Future MasterPark Facility commercial workers
  - Exposure to MasterPark Facility soil vapors, if a commercial building were built over impacted groundwater at the source area near MW-18.
- Future MasterPark Facility construction workers
  - Exposure to MasterPark Facility soils through direct contact and ingestion.

3.6 Potential Contaminant Transport

The Site COCs are petroleum products and related fuel additives, all of which are volatile, highly mobile compounds. The groundwater pathway represents the most significant contaminant transport pathway. Groundwater flow beneath the Site is predominantly to the west, but as the plume diagrams have indicated, there are some flow components to the northwest and southwest. Mobilization of compounds in the groundwater will also occur through volatilization into the soil gas. The COCs are subjected to several physical processes as they migrate through the subsurface environment including advection, dispersion, and molecular diffusion. Advection is the migration of a substance due to the bulk movement of water. Advection tends to move chemicals in the direction of flow. Hydrodynamic dispersion, which consists of both mechanical dispersion and molecular diffusion, dilutes concentrations primarily in the direction of flow. Mechanical dispersion of ground water plumes is caused primarily by the movement of ground water around the soil particles that are in the flow path. These particles divert the forward motion of groundwater and tend to disperse substances. Molecular diffusion also causes chemicals to disperse and dilute in ground water.

Natural attenuation, which is the reduction of contaminant mass, mobility, or concentration, is a natural phenomenon that occurs without human intervention (Deming 2002). Natural attenuation can incorporate some of the physical processes described above (dispersion, dilution, etc.) and also includes destruction of contaminants by microorganisms. Hydrocarbons are known for being biodegraded by microorganisms under aerobic conditions. This means that the metabolism of microorganisms is more active (and hence biodegradation will increase) in the presence of oxygen. Biodegradation is a more rapid form of natural attenuation, in comparison to abiotic destructive processes. Microbial degradation is also more rapid when the plume concentrations are low and the source is controlled. Therefore, as COCs migrate, all of these physical processes act in combination with the chemical and biological degradation processes, to retard and dilute COC concentrations in water along ground water pathways. As such, these concepts are incorporated into the selected alternative.

3.7 Ecological and Social Data

The Site qualifies for exclusion to a formal terrestrial ecological evaluation pursuant to WAC 173-340-7491(1)(a,b) of the amended February 12, 2001 MTCA. The MasterPark Facility has a recorded Restrictive Covenant (dated 2002) pertaining to the use of groundwater at the MasterPark Facility and the maintenance of the asphalt cap that is in place. Additionally, the contaminated material at the Site that is not capped is greater than 15 feet bgs. The following summarizes key ecological and social data compiled during the RI/FS.

3.7.1 Zoning and Sensitive Areas

According to a City of SeaTac zoning map (February 2009), the MasterPark Facility is zoned as CB-C. Washington Park Cemetery and the associated cemetery residence are zoned as "Park." To the north of Washington Park Cemetery the land is zoned AVO or "Aviation Operations." The property immediately north of South 160th Street is zoned as AVC or "Aviation Commercial." To the east of the MasterPark Facility, on the east side of International Boulevard, the land has mixed zoning including CB-C, followed by "Urban High Density Residential," and "Urban Medium Density Residential."

Sensitive areas as defined by the King County Sensitive Areas Ordinance (Ordinance 9614) include wetlands, areas prone to stream and flood hazards, erosion hazards, seismic hazards, and coal mine hazards. Development of land within identified sensitive areas requires special development standards as well as special studies to assess impacts and to propose adequate mitigation, maintenance, monitoring, and contingency plans for those areas.

Because of the Site's location within a historically urban area, it is not likely that the Site or surrounding adjacent properties provide necessary habitat for species other than infrequent transient visitors, such as birds and raptors. There is a forested section of the Site that is located on the Washington Memorial Park Cemetery, but the size of the forested area has increasingly diminished over time due to expansion of the cemetery property. This forested land includes a potential wetland area (but not designated as a wetland by Washington Department of Fish & Wildlife [WDFW] or King County [King County iMAP 2010]) located adjacent south of the MasterPark Facility on the cemetery property. However, this potential wetland area is located more than 500 feet from the Site contamination and is not connected to the regional groundwater aquifer. Furthermore, the WDFW has not classified this as a wetland, according to their Habitats and Species Map (2010). The water in this wetland area was sampled as part of Golder's Phase II investigation in 2000, the results of which did not indicate any contamination above MTCA Method A. At this time, this area has not been delineated as a wetland nor has an ecological survey been conducted to identify the various resident or transient species that may use the wetland area. Therefore, this wetland area is not considered sensitive habitat. A man-made pond on the cemetery property that receives groundwater from a well located at the southern end of the pond is located approximately 1,500

feet south of the Site contamination. It is not anticipated to become impacted in the future by Site contamination because it is side gradient to the plume. Both the wetland and the pond may attract local waterfowl and may contain some aquatic species.

Fencing surrounding the MasterPark Facility reduces access to the MasterPark Facility (which occupies most of the Site) for most wildlife. There are no surface water impoundments, except for the wetland area and man-made pond described above, or streams on or adjacent to the Site, which precludes any listed aquatic species from being potentially impacted by the Site.

There are no site-specific landslide or seismic hazard areas identified for the Site.

3.7.2 Water Use

Surface Water. The nearest major surface water body is Bow Lake, located approximate 1.25 miles to the south of the Site. There is no known discharge of Site groundwater to surface water in the area, including the wetland area and man-made pond on the cemetery property south of the Site.

Groundwater. There are no potable groundwater supply wells within a mile of the Site in the general down-gradient direction (west, southwest or northwest) from the Site. Figure 2-2 in the RI/FS depicts the locations of local groundwater supply wells (Golder 2010). The closest groundwater supply well is in the Washington Memorial Park Cemetery, south of the Site, and is used for watering. However, this cemetery well has not been impacted by Site releases (as per results from EA Engineering, Science, and Technology, Inc., 2006 and Golder's 2001 sampling events). As mentioned earlier, groundwater at the MasterPark Facility cannot be used for any purpose other than remedial actions because of a restrictive covenant recorded in 2002.

4.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The laws and regulations to be adhered to under the SeaTac Development Site cleanup are termed the ARARs. ARARs are determined by Ecology and include, among other items, soil and groundwater cleanup standards, design standards, and permitting and monitoring requirements. The following discussion focuses on the most significant potential ARARs. The full list of ARARs is presented in Tables A-1 and A-2 (Appendix A).

4.1 General

The primary ARARs for the Site include the following:

- Model Toxics Control Act (MTCA), RCW 70.105D, and MTCA Cleanup Regulations, WAC 173-340
- Minimum Functional Standards for Solid Waste Handling, WAC 174-304

In addition, portions of the dangerous waste regulations (WAC 173-303) are relevant and appropriate. These are discussed below.

MTCA, RCW 70.105D, and MTCA Cleanup Regulations, WAC 173-340. MTCA is the key governmental regulation governing the conduct of the overall investigation and cleanup process for the site. MTCA describes the requirements for selecting cleanup actions, preferred technologies, policies for use of permanent solutions, the time frame for cleanup, and the process for making decisions.

Recent amendments to MTCA (RCW 70.105D.090) exempt remedial actions conducted pursuant to an Agreed Order or a Consent Decree from the procedural requirements of several state laws, although substantive compliance with these laws is still required. These include the State Clean Air Act (RCW 70.94), Solid Waste Management - Reduction and Recycling Act (RCW 70.95), Hazardous Waste Management Act (RCW 70.105), Water Pollution Control Law (RCW 90.48), Shoreline Management Act (RCW 90.58), and Construction Projects in State Waters (RCW 75.20). The exemption only applies to the procedural requirements of any laws requiring or authorizing local governmental permits or approval for the remedial action. Therefore, while substantive compliance is necessary, permits and approvals are not required for remedial actions at the site. The Agreed Order or Consent Decree will specify the substantive compliance requirements to be achieved during the remedial actions.

WAC 173-340-700 establishes cleanup levels for environmental media, including groundwater, soil, surface water, using three methods: Method A (routine, using tables), Method B (standard), and Method C (conditional, primarily for industrial sites). These are discussed in detail below in Section 4.2.

Dangerous Waste Regulations - WAC 173-303. The Washington State Dangerous Waste Regulations (WAC 173-303) are the state equivalent of the federal Resource Conservation and Recovery Act (RCRA)

regulations, and contain a series of rules relating to the generation, handling, storage, and disposal of "dangerous waste." Recent MTCA amendments, as discussed above, exempt cleanup actions conducted under an Agreed Order or a Consent Decree from the procedural requirements of these regulations. In addition, a recent amendment to the state Hazardous Waste Management Act (RCW 70.105) provides a conditional exemption to state-only dangerous wastes generated when a remedial action is conducted pursuant to an Agreed Order or a Consent Decree with Ecology. The exemption is not applicable to material that is a hazardous waste under RCRA.

WAC 173-303 substantive requirements pertaining to dangerous waste generation, handling, storage, and disposal will be applicable, if non-exempt dangerous waste is generated and/or transported off the Site unit boundary during cleanup. Because the remedy selected in this DCAP consists of capping, it is not expected that any dangerous wastes will be generated.

Some of these standards (WAC 173-303-610, -645, and -665) are applicable or relevant and appropriate to the Site.

Minimum Functional Standards (MFS) for Solid Waste Handling - WAC 173-304. WAC 173-304-407 and -460 describe closure and post-closure standards and landfill standards, respectively. Under MTCA, MFS must always be used as the "minimum requirements" for landfill closure conducted as a MTCA cleanup action. On this basis, the MFS are applicable to this site. WAC 173-304-460 capping requirements include a minimum 2-foot thick soil layer having a permeability of 1×10^{-6} or lower. Alternately, a synthetic liner material may be substituted for the soil layer. The MFS standards are the primary capping criteria to consider for the Site.

State Environmental Policy Act (SEPA) WAC 197-11. SEPA is applicable to remedial actions at the Site. An environmental checklist and Ecology's determination that the Site qualifies for a Determination of Non-significance (DNS) are included in Appendix B.

4.2 Cleanup Levels and Points of Compliance

Cleanup levels are numeric expressions of remedial action. A cleanup level is the maximum acceptable concentration of a constituent of concern to which the human or ecological receptors would be exposed via a specified exposure route (e.g., direct contact) under a specified exposure scenario (e.g., industrial land use). Cleanup levels are generally established for constituents of concern as the lower of a numeric chemical-specific ARAR or a risk-based cleanup concentration.

For the SeaTac Development Site, COCs identified are associated with soils in the source area, soil vapor at the source and at the residence, and in groundwater at the source and down-gradient of the source. A list of Site COCs is provided in Table 2 in which COCs are listed by media.

Under MTCA (WAC 173-340-700), three methods are established for determining cleanup levels for environmental media, including groundwater, soil, and surface water. The three methods are Method A (routine, using tables), Method B (standard), and Method C (conditional, primarily for industrial sites). All three MTCA methods for determining cleanup levels require compliance with other federal or state ARARs, and consideration of cross-media contamination.

Method A cleanup levels are generally used for routine cleanups with relatively few contaminants. Since the cleanup at the Site is considered routine, Method A for unrestricted land use is applicable to this Site in regards to the groundwater cleanup levels. The objective for the cleanup is to protect the most beneficial use of the groundwater, which is as a source for drinking water. In order to meet that objective, the groundwater must meet Method A cleanup levels.

Method B is the standard method for determining cleanup levels, and shall be considered applicable to this Site in certain cases for groundwater COCs that are not included in the MTCA Method A standard tables. Method B will also be applicable for cleanup levels pertaining to residential indoor air (if applicable at this Site). Method B cleanup levels assume a residential use scenario and are determined using risk-based equations specified in MTCA regulations. For individual carcinogens, the cleanup levels are based on the upper bound of the excess lifetime cancer risk of one in one million (1×10^{-6}). Total excess cancer risk under Method B for multiple substances and pathways cannot exceed one in one hundred thousand (1×10^{-5}), and the total hazard index for substances with similar types of toxic response must be less than 1. In addition, Method B levels must comply with applicable state and federal regulations or criteria (MCLs, for instance). However, no cleanup level shall be more stringent than an established area background concentration for the Site.

Cleanup levels for soil and soil gas will be Site-specific assuming commercial land-use (or park land-use in the case of the cemetery). Site-specific cleanup levels were calculated using standard risk calculation equations using default input parameters pertaining to a commercial worker as specified in MTCA and in the Ecology (2009) *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*. The exposure intake parameters for indoor air intrusion and soil ingestion for a commercial worker are basically the same as for an industrial worker, except most risk assessment guidance (EPA – RAGS) have commercial worker breathing rate less than an industrial worker, assuming that an industrial worker is breathing harder (higher breathing rate) due to more exhaustive work activities.

A “point of compliance” is selected for determining whether the cleanup level has been met. The point of compliance is defined as the point or points throughout the Site where cleanup levels are established in accordance with the cleanup requirements for groundwater and soil. The point of compliance for soil cleanup levels based on the protection of groundwater is to be achieved in all soils throughout the Site.

For soil cleanup levels based on human exposure via direct contact, the point of compliance shall be established throughout the Site from the ground surface to a depth of 15 feet. These depths represent the extent that soils may be potentially excavated or disturbed as a result of Site development. For cleanup alternatives that involve containment, however, the soil cleanup levels are not required to be met at the points of compliance described above. WAC 173-340-720(8)(c) provides that where hazardous substances remain on-Site as part of the cleanup action, Ecology may approve a conditional point of compliance for groundwater cleanup which shall be as close as practicable to the source of hazardous substances, not to exceed the property boundary.

Therefore, cleanup levels and points of compliance at the Site will consist of the following:

- Two points of compliance are established for soils at the SeaTac Development Site: (1) from 0-15 feet depth for the protection of humans, terrestrial ecology, and groundwater; and (2) a second for soils below 15 feet for the protection of groundwater. The cleanup action conducted in 2001 included containment of some impacted soils. The new cleanup action will comply with cleanup standards, but some residual impacted soil may remain contained under the asphalt pavement (past surface oil spills). Nevertheless, institutional controls specified in Section 5.3.4 and compliance monitoring and periodic reviews specified in Section 5.3.3.2 will ensure the long-term effectiveness of the remedy. A conditional point of compliance applies for shallow soil at the MasterPark Facility because even with the preferred alternative, shallow soil may still contain residual contamination. Any residual contamination greater than the MTCA Cleanup Levels in the shallow soils shall not be a risk because of the institutional controls that are in place since the 2001 cleanup efforts.
- Groundwater cleanup levels will meet MTCA Method A. The points of compliance established for groundwater will be everywhere on the whole Site. Figure 9 depicts the locations where compliance monitoring for groundwater will take place.
- Specific monitoring plans, the number and locations of wells, sampling frequencies, and data analysis and evaluation procedures will be defined in the Compliance Monitoring Plan (Attachment E). The Compliance Monitoring Plan is reviewed and approved by Ecology.

5.0 SEATAC DEVELOPMENT SITE REMEDIAL ACTION

5.1 Summary of the FS Remedial Alternatives

The FS for the Site consisted of the following primary elements:

- **Development of remedial action objectives.** Remedial action objectives were established that provided the basis for developing and evaluating alternatives for remediation of the Site.
- **Identification and screening of remediation technologies.** Candidate technologies were screened to obtain a list of feasible technologies for use in assembling remediation alternatives.
- **Identification and screening of remediation alternatives.** Remediation technologies were assembled into a wide range of alternatives for remedial action at the Site. The alternatives were then screened to obtain a focused list of alternatives for further detailed consideration.
- **Development and evaluation of remediation alternatives.** Alternatives remaining after screening were further developed and subjected to detailed evaluation. Consideration of the evaluation resulted in a preferred alternative for the Site.

5.1.1 Cleanup Action Objectives

Cleanup action objectives (CAOs) are site-specific goals based on acceptable exposure levels that are protective of human health and the environment and consider ARARs. CAOs identify risk pathways that remedial actions should address, and identify acceptable exposure levels for residual constituents of concern. The CAOs identified for this Site are:

- Eliminate potential exposure to potential future human residents to contaminated near-surface source soils at the MasterPark Facility via direct contact exposure pathways.
- Eliminate potential exposure to humans from vapor intrusion into future commercial buildings from vadose zone source soils at the MasterPark Facility near well MW-18 and MW-13.
- Eliminate potential Site-impacted groundwater to migrate and impact additional Qva aquifer in the future.

5.1.2 Identification and Initial Screening of Remediation Technologies

Potentially applicable remediation technologies were identified for each of the following general response action categories:

- No action
- Institutional controls (including monitoring)
- Monitored Natural Attenuation (MNA)
- Containment
- Removal
- Ex-Situ Treatment (including reuse and recycling)

- In-Situ Treatment
- On-Site Disposal
- Off-Site Disposal

The technologies were screened based on effectiveness, implementability, and cost to obtain a set of technologies that could be applied at the Site.

5.1.3 Identification of Remediation Alternatives

Remediation technologies retained following the initial screening process were then assembled into remediation alternatives. The technologies were combined to create a wide range of alternatives that represent various approaches to achieving CAOs. Remediation alternatives were developed to meet the following MTCA requirements:

- Protect human health and the environment
- Comply with cleanup standards
- Comply with applicable laws and regulations
- Provide for compliance monitoring
- Use permanent solutions to the maximum extent practicable
- Provide for a reasonable restoration time frame
- Address public concerns

Consideration of public concerns is performed by Ecology after the FS is completed and is based on public comments on the DCAP. Public concerns may result in modifications to the remedial action proposed in the DCAP. Any modifications would be incorporated into the Final (F)CAP.

All of the alternatives that were developed included a combination of technologies. A detailed description of each of the remediation technologies is included in the RI/FS report. The following is a summary of the alternatives that were developed for remediation of the Site:

Alternative A: Focused In-situ Air Sparging / Soil Vapor Extraction with Source Area Cap. This alternative would incorporate a number of the remediation technologies as follows:

- Institutional controls
- Monitoring
- Asphalt cap over the source area
- Cap maintenance
- In-situ Air Sparging (IAS)-Soil Vapor Extraction (SVE) for the MasterPark Facility
- Operation and maintenance of the system (assumed to take 5 years)
- Enhanced biodegradation and attenuation for groundwater outside the Facility (assumed to take 15 years)

Alternative A focuses on VOC removal from the area of highest concentrations within the MasterPark Facility. It would remove VOCs from the groundwater by IAS and capture them by SVE. The SVE system would be a combination of extraction wells and trenches. The oxygenation of the groundwater would stimulate natural microbial degradation, providing enhanced biodegradation for the down-gradient plume. The SVE would also remove VOCs from soil in the vadose zone. By removing contaminated subsurface vapors, this SVE would alleviate potential vapor intrusion concerns. SVE off-gas would be treated by carbon adsorption before discharge to the atmosphere.

Alternative B: Focused In-Situ Chemical Oxidation (ISCO) with Cap and SVE for the Source Area. Alternative B will include the following technologies:

- Institutional controls
- Monitoring
- Asphalt cap over the source area
- Cap maintenance
- ISCO for the MasterPark Facility portion of the groundwater plume (completed in 1 to 2 years)
- SVE for the vadose source area (assumed to take 5 years) if liquid oxidant is used (not needed for ozone sparging)
- Enhanced biodegradation and attenuation for Site groundwater (assumed to take between 15 years for ozone sparging and 20 years for liquid oxidant)

Alternative B would destroy the COCs in place by chemical oxidation. A total of approximately 46 ISCO wells are anticipated for ozone sparging, and 66 ISCO wells for liquid oxidant (Fenton's reagent). The oxygenation of the groundwater would stimulate natural microbial degradation, providing enhanced biodegradation for the down-gradient plume. Similar to Alternative A, additional wells in the northwest portion of the plume will be required in order to conduct MNA in the down-gradient portion of the plume.

Alternative C: Focused Groundwater Pump-and-Treat with Cap and SVE for the Source Area. This alternative would have the following components:

- Institutional controls
- Monitoring
- Asphalt cap over the source area
- Cap maintenance
- Pump-and-treat for the MasterPark Facility portion of the groundwater plume (assumed to take 30 years)
- SVE for the vadose source area (assumed to take 5 years)
- Monitored natural attenuation for Site groundwater (assumed to take 30 years)

Alternative C will contain and remove contaminated groundwater within the MasterPark Facility. Extracted groundwater is treated by liquid-phase carbon absorption and will be discharged to the local Metro sanitary sewer system. The extraction wells will have dedicated submersible pumps and will be placed along the MasterPark Facility's western property boundary with a spacing of 25 feet. If this alternative is selected, the actual extraction well spacing and pumping rate will be refined through an aquifer pump test.

The restoration time frame is anticipated to be long. The operation of Alternative C at the MasterPark Facility would be expected for about 30 years, with natural attenuation for the remaining down-gradient plume assumed to take about 30 years also. Similar to Alternative A, additional wells in the northwest portion of the plume will be required in order to conduct MNA in the down-gradient portion of the plume.

Alternative D: IAS-SVE for Entire Plume with Cap and SVE for the Source Area. This alternative would have the following components:

- Institutional controls
- Monitoring
- Asphalt cap over the source area
- Cap maintenance
- IAS-SVE for the entire Site groundwater plume
- Enhanced biodegradation of the down-gradient plume in addition to IAS-SVE
- Operation and maintenance of the system (assumed to take 5 years on the MasterPark Facility and 10 years for the down-gradient Site plume)

Alternative D would use IAS and SVE, similar as Alternative A, but would also use combined IAS and SVE at a second location near the down-gradient limit of the groundwater plume. This alternative would remove VOCs from the groundwater by IAS and capture them by SVE. The SVE would also remove VOCs from soil in the vadose zone. Among other benefits, by removing contaminated subsurface vapors, this SVE would alleviate potential vapor intrusion concerns. SVE off-gas would be treated by carbon adsorption before discharge to the atmosphere. In order to design a IAS-SVE system for the down-gradient portion of the plume, additional well installation will be required in order to characterize the plume northwest of MW-22. However, these wells cannot be installed until after the Port of Seattle completes construction on this property or until the Port of Seattle provides the necessary access to their property.

The down-gradient IAS-SVE system would be independent and would have the same components as the system on the MasterPark Facility. The array of IAS and SVE wells would be spaced at 50-foot centers, but arranged in two lines creating a treatment zone approximately 100 feet wide near the downgradient limit of the plume. The second combined IAS and SVE location would not be operated continuously, but will be used intermittently to remove contaminants from the groundwater as the plume passes over the

second combined IAS and SVE location. In this manner, COCs in the area of highest concentrations within the MasterPark Facility are removed in a relatively short time period, but the cleanup of the remaining down-gradient Site plume would take more time. The down-gradient plume would be subjected to enhanced biodegradation of the petroleum hydrocarbons as oxygenated groundwater flows into the plume at the same time the second IAS-SVE system would capture or degrade any plume constituents before they pass. The intermittent operation of the down-gradient IAS-SVE system is assumed to be operational for one year, followed by two to three years of monitoring as the plume migrates into the IAS-SVE zone.

Alternative E: Groundwater Pump-and-Treat for Entire Plume with Cap and SVE for the Source Area. This alternative would have the following components:

- Institutional controls
- Monitoring
- Asphalt cap over the source area
- Cap maintenance
- Pump-and-treat for the entire Site groundwater plume (estimated to take 30 years)
- SVE for the vadose source area (assumed to take 5 years).

Alternative E would use the same system as Alternative C on the MasterPark Facility, but would also use a separate pump-and-treat system at a second location on the Site near the down-gradient limit of the groundwater plume. The pump-and-treat system for the down-gradient portion of the plume would only be designed and installed after additional characterization of the down-gradient plume occurs. The groundwater extraction wells at both locations would be spaced about 25 feet along a perpendicular line to the groundwater flow direction. Site groundwater extraction wells (those located down-gradient of the MasterPark Facility) are expected to be on average about 130 feet deep, because of the increased elevation of land surface compared to the MasterPark Facility. The purpose of the second extraction location is to contain the existing plume, with eventual removal of the existing plume that is not captured (down-gradient) by the MasterPark Facility pump-and-treat system. The total operational extraction rate from both Alternative E extraction locations is estimated between 20 and 50 gpm. For costing, an extraction rate of 40 gpm was assumed. The restoration time required for complete cleanup of the entire plume in Alternative E is long and estimated to be 30 years.

5.1.4 Screening of Alternatives

Under MTCA, remediation alternatives must meet the following threshold requirements [WAC 173-340-360(2)(a)]:

- Protection of human health and the environment
- Compliance with cleanup standards

- Compliance with ARARs
- Provision for compliance monitoring

All of the alternatives meet the minimum requirements of the MTCA threshold criteria and therefore will be evaluated further.

5.2 Evaluation of Remediation Alternatives

5.2.1 Reasonable Restoration Time Frame

Remedial actions under MTCA are required to provide a "reasonable restoration time frame." All of the alternatives developed for the Site would provide a reasonable restoration time frame considering the factors specified in WAC 173-340-360(4)(b).

- Alternative A – Installation and operation is estimated to be 5 years. Enhanced biodegradation on the Site (in the down-gradient portion of the plume) will be approximately 15 years after installation.
- Alternative B - Installation and operation is estimated to be 5 years. Enhanced biodegradation on the Site (in the down-gradient portion of the plume) will be approximately 15 to 20 years after installation.
- Alternative C – Installation and operation is estimated to be 30 years with monitored natural attenuation for approximately 30 years.
- Alternative D – Installation and operation is estimated to be 10 years, which is also the total restoration time frame because the entire plume will receive active treatment.
- Alternative E – Installation and operation is estimated to be 30 years, which is also the total restoration time frame because the entire plume will receive active treatment.

On this basis, the alternatives rank as follows for restoration time frame (shortest to longest):

1. Alternative D
2. Alternative A
3. Alternative B
4. Alternative C
5. Alternative E[1]

5.2.2 Evaluation Criteria

WAC 173-340-360 specifies that the remediation alternatives must use permanent solutions to the maximum extent practicable. WAC 173-340-360(2) specifies that "Ecology recognizes that permanent solutions [defined at WAC 173-340-360(3)(c)] may not be practicable for all sites. A determination that a cleanup action satisfies the requirement to use permanent solutions to the maximum extent practicable is based on consideration of a number of factors." The specified factors, or criteria, are:

[1] However, Alternative C may take longer than Alternative E due to the uncertainty in restoration time using natural attenuation.

- Overall protectiveness
- Long-term effectiveness and reliability
- Short-term effectiveness
- Reduction in toxicity, mobility, and volume
- Implementability
- Cost
- Community acceptance

These criteria are defined in the sections below.

5.2.2.1 Overall Protectiveness

Overall protectiveness addresses the degree to which each alternative attains cleanup standards and is protective of human health and the environment, considering both long-term and short-term risks. This criterion is derived from the evaluation of the other criteria. It is not an independent criterion, but more of a summary of the overall evaluation. Therefore, the overall comparative evaluation (net benefit) of the other non-cost criteria is taken as the overall protectiveness of the alternative. In addition, overall protectiveness is evaluated as a threshold criterion.

5.2.2.2 Long-Term Effectiveness and Reliability

This criterion addresses risks remaining at the Site after the remediation alternative has been implemented, and the reliability of the alternative at reducing risks over an extended period of time. Risks during the implementation period are addressed under short-term effectiveness. Evaluation of long-term effectiveness involves estimation of the residual risk associated with each alternative in comparison to baseline risk, and can be measured by the degree to which remedial action objectives are met. Reliability involves estimating the longevity of the remedy, (e.g., the life span of institutional controls or containment) and the chances of remedy failure.

This criterion was evaluated using the two sub-criteria of long-term effectiveness and reliability. The overall score for this criterion was obtained by giving equal weight to the two sub-criteria.

5.2.2.3 Short-Term Effectiveness

This criterion addresses short-term effects on human health and the environment while the alternative is being implemented. The evaluation included consideration of the following factors:

- Risk to Site workers
- Risk to the community
- Risk to the environment (short-term ecological risk)
- Time needed to complete remedial action

Short-term effectiveness was primarily scored based on evaluation of the degree of risk to Site workers. The primary risk to Site workers would be due to construction accidents. In addition, for cap alternatives, the relative complexity of the cap was a measure of the relative man-hours required, and therefore the relative worker risk.

Because remedial action would include controls as necessary to ensure that the remedy does not create an unacceptable risk to the community, risk to the community was not as significant in distinguishing between alternatives as worker risk.

Time to complete the remedial action includes preparation of MTCA planning documents, remedial design, Ecology and public review, and implementation. Time estimates were from completion of the FCAP.

The alternatives that involve construction of a treatment system on the Site down-gradient of the MasterPark Facility, Alternatives D and E, generally have greater short-term risks to the community as well as Site workers than alternatives with treatment restricted to the MasterPark Facility (Alternatives A, B, and C) because of the more limited ability to control public access to the Site remediation equipment.

Pump-and-treat has less construction and less complexity than IAS-SVE, and would not have above-ground rotating equipment (i.e., blowers). However, pump and treat alternatives would have connections made to the Metro sewer system within South 160th Street and would have buried active electrical wiring throughout the remediation area. Therefore, Alternative C has somewhat more short-term risk to workers than Alternative A, and Alternative D has somewhat less short-term risk to workers than Alternative E.

On this basis, the alternatives are ranked as follows for short-term risk (least to most potential risks):

1. Alternative A
2. Alternative C
3. Alternative D
4. Alternative E
5. Alternative B

5.2.2.4 Reduction of Toxicity, Mobility, and Volume

This criterion addresses the degree to which a remediation alternative reduces the inherent toxicity, ability of contaminants to migrate in the environment, or the quantity of contaminated material. This criterion is also used to express the preference hierarchy for cleanup technologies under 173-340-360(4), and the use of recycling or treatment under WAC 173-340-360(5). Effectiveness and reliability of the treatment,

which were addressed under long-term effectiveness and permanence, were not addressed under this criterion.

Although all alternatives would remove VOCs in the source area, Alternatives A and D provide more extensive VOC removal in vadose zone soils by directly removing VOCs with subsequent treatment and destruction.

On this basis, the alternatives are ranked as follows for this criterion (most to least reduction in toxicity, mobility, and volume):

1. Alternative B
2. Alternative D
3. Alternative A
4. Alternative C
5. Alternative E

5.2.2.5 Implementability

This criterion addresses the degree of difficulty in implementing each alternative. Implementability issues are important because they address the potential for delays, cost overruns, and failure. Known implementation difficulties with quantifiable cost impacts were included in the cost estimates. The implementability criterion focuses on less quantifiable known and potential difficulties. Implementability was evaluated considering the following:

- **Technical Feasibility.** Technical feasibility addresses the potential for problems during implementation of the alternative and related uncertainties. The evaluation includes the likelihood of delays due to technical problems and the ease of modifying the alternative, if required.
- **Availability of Services and Materials.** The availability of experienced contractors and personnel, equipment, and materials needed to implement the alternative. Availability of disposal capacity is also included in the evaluation.
- **Administrative Feasibility.** The degree of difficulty anticipated due to regulatory constraints and the degree of coordination required between various agencies.
- **Scheduling.** The time required until remedial action would be complete, and any difficulties associated with scheduling.
- **Complexity and Size.** The more complex or larger a remedial action, the more difficult it is to construct or implement. In addition, the chance of failure that could affect remedy effectiveness increases with the complexity of the remedial action.
- **Other Considerations.** Monitoring requirements, access for construction and operation and maintenance, integration with existing operations and current or potential remedial action, and other factors were considered.

All of the alternatives would require air permitting for discharge of treated SVE off-gas (except ISCO using ozone), but Alternative D has the highest SVE flow, followed by Alternative A, with relatively more difficulty in air permitting (although such permitting is not expected to be particularly difficult).

Alternatives C and E would require permission from Metro to discharge treated groundwater to its sewer system. This permitting could be more difficult than permitting SVE off-gas, due to reluctance to accept groundwater flows and thus decrease their available capacity.

The alternatives that involve construction of treatment system on-Site down-gradient of the MasterPark Facility, Alternatives D and E, have more construction and greater complexity, and are therefore more difficult to implement than alternatives with treatment restricted to the MasterPark Facility (Alternatives A, B, and C). Because Alternatives D and E require installation and operation of the cleanup action on-Site, down-gradient of the MasterPark Facility, permission from the other Site property owners would be required and could be very difficult to implement. One adjacent property owner has refused such access to in the past during investigation activities.

Alternative B using ozone is considered the easiest to implement because there is the least treatment equipment to install and an air discharge permit is not required. Alternative B (using either ozone or Fenton's reagent) would require permission from Ecology for injecting either a gaseous or liquid oxidant into the groundwater. Alternative B using Fenton's reagent would be more difficult because of the difficulty in mixing the reagents properly, and specialized contractors are typically required.

On this basis, the alternatives are ranked as follows for implementability (easiest to hardest to implement):

1. Alternative B (using ozone)
2. Alternative A
3. Alternative B (using Fenton's reagent)
4. Alternative C
5. Alternative D
6. Alternative E

5.2.2.6 Cost

This criterion was used to consider the costs of performing each alternative, including capital, operation, and maintenance, and monitoring costs. Alternative costs were compared on a net present value basis. Known implementation difficulties with quantifiable cost impacts were included in the cost estimates. Additional details on the cost comparison for alternatives are provided in the RI/FS.

The estimates were prepared to allow comparative evaluation of alternatives, not for budgeting purposes. The design basis is subject to change during final, detailed design of the selected alternative, and these changes would affect the cost of the remedy. The uncertainties in the FS designs and associated cost estimates are such that actual costs could vary significantly from these estimates. However, the uncertainty in the *relative* cost of the alternatives is much less than the uncertainty in the magnitude of the costs, and these cost estimates are suitable for comparative evaluation of the alternatives.

On the basis of these cost estimates, the alternatives are ranked as follows for cost (lowest to highest cost):

1. Alternative A
2. Alternative B
3. Alternative C
4. Alternative D
5. Alternative E

5.2.2.7 Community Acceptance

After the FS is finalized, an alternative is selected as the proposed remedial action in this DCAP. Determination of community concerns is based on public comments on this DCAP. Ecology evaluates community acceptance after DCAP comments are received. The public comments will be addressed in the Responsiveness Summary (Appendix C). The proposed remedial action may be modified to address community concerns based on public comments and Responsiveness Summary on the DCAP.

5.2.3 Evaluation of Alternatives and Selection of a Site Remedy

Selection of a remediation alternative was based on a comparative evaluation of the alternatives (that satisfy the threshold criteria) using five of the permanence criteria: 1) long-term effectiveness and reliability, 2) short-term effectiveness, 3) reduction in toxicity, mobility, and volume, 4) implementability, and 5) cost. Overall protectiveness and community concerns were not included in the comparative evaluation as indicated in the definitions above.

Each alternative was scored relative to the other alternatives for the four non-cost permanence criteria. Because of the nature of the criteria and the uncertainties in the evaluation, the scores for these four criteria were expressions of relative qualitative or semi-quantitative professional judgments. A scale of 0 (worst) to 10 (best) was used. The evaluation scores are shown in Table 1.

The relative values of the non-cost criteria were then determined. The relative criteria values were expressions of what a scoring unit of one criterion is worth compared to a scoring unit of another criterion. The assigned relative values were converted to criteria weightings, i.e., percentage of the overall score. The scores for the six non-cost criteria were combined using the criteria weightings to give overall

alternative scores. These scores express the net benefit of the alternatives. The net benefit, or overall non-cost scores, is given in Table 1. Using these scores, the preference ranking of the alternatives before consideration of cost is as follows (most to least preferred):

1. Alternative D (IAS-SVE for entire plume)
2. Alternative A (Focused IAS-SVE)
3. Alternative B1 (Focused ISCO using ozone)
4. Alternative B2 (Focused ISCO using Fenton's)
5. Alternative C (Focused groundwater pump-and-treat)
6. Alternative E (Groundwater pump-and-treat for entire plume)

After the non-cost evaluation, a comparison of the cost and benefit of the alternatives was made. Under WAC 173-340-360(3)(e)(ii)(c), "a cleanup action shall not be considered practicable if the incremental cost of the cleanup action is substantial and disproportionate to the incremental degree of protection it would achieve over a lower preference cleanup action." Thus, the alternative with the highest ratio of incremental benefit to incremental cost is the preferred alternative. Alternative A has the best cost-effectiveness of the alternatives, as well as the second-best net benefit.

Alternative A achieves cleanup levels in the entire groundwater plume by using IAS-SVE at the MasterPark Facility to also enhance natural biodegradation in the remainder of the groundwater plume. Alternative A also virtually eliminates the potential for vapor intrusion into nearby residences and commercial buildings with extensive SVE within the MasterPark Facility where the contaminant soil vapors are the highest. The mass in the down-gradient portion of the Site plume is many times less than at the mass on the MasterPark Facility, but it more than doubles the cost to add active treatment for the down-gradient Site area. The comparison of the evaluation of Alternatives D and A clearly shows that the marginal extra benefit from active treatment of the plume (Alternative D) has a disproportionate cost. Table 1, Alternative A (Focused IAS-SVE) provides the best incremental cost-effectiveness of the alternatives. Alternative A also meets the threshold criteria, and has an acceptable restoration time frame (estimated 15 years compared to 10 years for Alternative D). Therefore, Alternative A (Focused IAS-SVE with Source Area Cap) is the preferred alternative.

5.3 Proposed Cleanup Action Plan

The remedy proposed for the Site is Alternative A (Focused IAS-SVE). A conceptual design of this alternative is shown in Figure 10. Essentially, Alternative A is source area contaminant destruction and natural attenuation of the remainder of the plume. Alternative A achieves cleanup levels in the entire Site groundwater plume by using IAS-SVE at the MasterPark Facility to also enhance natural biodegradation in the remainder of the Site groundwater plume. Alternative A also virtually eliminates the potential for

vapor intrusion into nearby residences and commercial buildings with extensive SVE within the MasterPark Facility where the contaminant soil vapors are the highest.

Alternative A also meets the threshold criteria, and has an acceptable restoration time frame (estimated 15 years). The major steps in this alternative are:

1. Install, when possible, additional well(s) northwest of MW-22 (on Port of Seattle property) for monitoring purposes, or access wells, if available, that are installed in this vicinity.
2. Install IAS wells within the plume on the MasterPark Facility. Install SVE wells along the western perimeter of the treatment area and SVE trenches along the north, east, and southern perimeters on the Facility.
3. Operate IAS-SVE system for 5 years and re-evaluate the need for continued IAS-SVE remediation.
4. Monitor natural attenuation of the plume quarterly for one year after the shut-down of the remediation system. The activities associated with this step will be guided by Ecology's guidance document on natural attenuation (Ecology, 2005) and are discussed further in the Compliance Monitoring Plan.
5. Maintain the MasterPark Facility cap until residual hazardous substance concentrations no longer exceed cleanup or remediation levels under MTCA.
6. Implement and maintain institutional controls and monitoring (as described below).

5.3.1 Additional Well Installation

At least one monitoring well will be installed on the Port property to the northwest of MW-22 to further characterize the down-gradient portion of the plume and to monitor natural attenuation. This might be done by the Port of Seattle as part of its on-going construction project. This well will also act as the northern, down-gradient point of compliance for the Site. This well may be installed once the Port of Seattle construction is complete or when the Port of Seattle either installs or authorizes the well installation on their property. After the well is installed, it will be routinely monitored with access approval from the Port of Seattle, as part of the Compliance Monitoring Program to evaluate the natural attenuation occurring down-gradient of the remediation system.

5.3.2 Additional Air Sample Collection

Ecology noted that vapor intrusion into the crawlspace of the residence on the cemetery property may be higher during the winter months and that the PLP Group may consider conducting a round of crawlspace air sampling during the winter "heating season" when vapor intrusion may be at its highest. Currently, the cemetery house is not occupied (and has not been for over 9 months) and its parcel is under an application to change its zoning. If the zoning is approved, the house will be demolished and the parcel will be used for parking or other commercial activities. The PLP Group will wait until it has been determined whether the zoning for the residential property will change. If the zoning does change, then

re-sampling will not occur. If the current zoning remains, then one additional round of soil gas samples will be collected from the crawlspace during the 2011 winter months.

5.3.3 IAS System

IAS is a treatment process whereby air is injected into the groundwater below the contamination. As the air moves up through the contamination, the air strips VOCs from the groundwater based on the partitioning of the VOCs between air and water or soil. In addition, the oxygen introduced with the air typically stimulates aerobic microbial activity, resulting in increased microbial degradation of petroleum compounds within the groundwater and the vadose zone soil.

IAS for this Site will be targeted for groundwater treatment. However, the injected air will continue to strip VOCs from vadose zone soils as it works towards the surface. In addition, IAS will be used in conjunction with SVE.

Microbial degradation occurs as the VOC-laden air works its way towards the surface. The microbial degradation reduces introduction of VOCs into the ambient air. However, at the Site it was assumed that SVE will be necessary to collect vapor from IAS to ensure that VOC-laden air does not reach ground surface.

The spacing of IAS wells is determined by the radius of influence (ROI) of the injected air. For the FS, a ROI of 25 feet (50 feet between wells) was assumed. The air injection is assumed to be introduced 30 feet below the water table and allowed to disperse upward. The agitation of the aquifer by IAS creates turbulence that increases the mixing and effectiveness of contact laterally within the aquifer. Anisotropy, that exists in most aquifers where the hydraulic conductivity is greater horizontally than vertically, also promotes lateral spreading of the sparged air while migrating vertically toward the surface of the water table. A pilot test to determine the actual ROI will be necessary prior to design of a full-scale system.

Another advantage of IAS is oxygenation of the groundwater, thereby stimulating biodegradation by naturally occurring microbes. Because groundwater is migrating in a down-gradient direction faster than the petroleum plume (due to contaminant retardation), the oxygenated groundwater will flow into the down-gradient portions of the petroleum plume beyond the zone of IAS direct injection. In addition, oxygen will diffuse in groundwater beyond the injection zone. With time, the biodegradation of the down-gradient plume is enhanced over existing natural attenuation processes.

In order to quantify the monitored natural attenuation occurring in the down-gradient portion of the plume, additional wells will be installed to the northwest of MW-22 (see Section 5.3.1 for details).

5.3.4 SVE System

SVE is a treatment process whereby a vacuum is induced in subsurface trenches or wells using a vacuum blower. VOCs from the soil are thereby extracted for treatment at the surface. VOCs in the vadose soil vapor are extracted directly. The vacuum induces VOCs in the vadose soil to volatilize into the vapor phase. While some VOCs in groundwater will be extracted by the vacuum, SVE is primarily for treatment of unsaturated soils (vadose zone). SVE is typically used in conjunction with IAS, because as VOCs are stripped from the water table by IAS, from which the volatilized VOCs can be extracted by the SVE system.

SVE increases circulation of air in the subsurface, bringing additional oxygen to the treatment area. This additional oxygen typically stimulates microbial activity, resulting in increased microbial degradation of petroleum compounds.

The spacing of SVE trenches or wells is determined by their ROI and the extent of the surface seal. Where there is asphalt over the treatment area, SVE trenches can be limited to the center of the area and around the edges. For areas without a surface seal, a ROI of 50 feet has been assumed. The depth of SVE wells and trenches is assumed to be five (5) feet above the high groundwater table level.

The soil vapors extracted by the SVE system will contain Site COCs and will need to be treated before discharge to the atmosphere. Various processes are available to treat COCs in the SVE off-gas. Two common systems are catalytic oxidation and vapor-phase carbon absorption. Because of COC concentrations in the off-gas are expected to be relatively low, this FS assumes vapor-phase carbon adsorption would be used. Treated SVE vapors would be discharged under and air permit to the atmosphere.

5.3.5 Monitoring

Separate monitoring programs will be used for the protection and performance monitoring (during remedial action) and the confirmational monitoring (following completion of remediation). Detailed monitoring plans will be developed for the selected remedy and presented in the Compliance Monitoring Plan (Attachment E) for approval by Ecology.

5.3.5.1 Protection Monitoring

Protection monitoring is conducted during remediation to confirm that there are no adverse effects to human health or the environment from remediation activities. This includes during construction and operation period of the remedy. Because impacted shallow sub-surface soils may remain below the asphalt cap at the MasterPark Facility, there is the potential for remediation construction workers to be exposed through accidental ingestion of impacted soil and also through inhalation of vapors. To protect remediation construction workers, a Site-specific health and safety plan (HASP) was developed for the

remedial action that addresses ways that worker health will be protected. The HASP is included as Appendix E of the Compliance Monitoring Plan (Attachment E of the DCAP). In short, worker protection includes continual breathing zone monitoring using a photoionization detector (PID), personal protective equipment (PPE) to be worn during the remediation action, and decontamination protocol.

5.3.5.2 Performance Monitoring

Performance monitoring confirms that the remedial action has attained cleanup standards. The performance monitoring program for the Site provides quarterly monitoring for the first year and semi-annual (twice yearly) groundwater monitoring for the remaining years that the IAS-SVE system is operational. The performance monitoring program will be conducted throughout the period of operation of the IAS-SVE system, which is estimated to be in operation for 5 years. The performance monitoring wells are located throughout the Site and include: MW-6, MW-7, MW-9, MW-12, MW-13, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22, and the new well to be installed on the Port property (MW-X). See Attachment E – Compliance Monitoring Plan for detailed information on the performance monitoring program.

Also included in performance monitoring is the routine evaluation of the IAS-SVE system. This includes monitoring pressure drop, flow rate, vacuum pressure of the IAS-SVE system, as well as sampling the SVE influent and effluent for analysis. This monitoring and sampling program will ensure the optimal operation of the remediation system.

Performance monitoring is also conducted during remediation to provide quality control to construction specifications (cap thickness and permeability requirements). Construction quality assurance specifications will be included as part of the EDR to be submitted to Ecology for approval prior to beginning the remedial action.

5.3.5.3 Confirmational Monitoring

Confirmational monitoring is conducted 1) to verify that the remedy performs as expected over time, and 2) to allow timely maintenance of the cap or IAS-SVE wells and other physical components of the alternative. Additionally, confirmational monitoring evaluates the long-term effectiveness of the remediation action once cleanup standards have been attained. Periodic Site inspections and surveys would be sufficient for determining maintenance needs and monitoring the IAS-SVE system performance. IAS-SVE performance is also monitored by groundwater monitoring. Confirmational monitoring begins after the IAS-SVE system is turned off and will continue for five years thereafter, or until four consecutive events of groundwater monitoring results demonstrate that residual hazardous substance concentrations at the Site no longer exceed cleanup levels, whichever comes first. After 5 years since shut-off of the system have elapsed, Ecology will conduct their 5-year periodic review of the Site, at which time it will be

identified whether additional long-term groundwater monitoring or other actions are warranted, with Ecology approval.

Groundwater Monitoring. Groundwater monitoring will include semi-annual (twice yearly) groundwater sampling and analysis at the points of compliance to confirm that the groundwater at the Site meets cleanup levels. Additional groundwater sampling quarterly for one year following shutdown of the IAS/SVE system will be conducted to monitor the progress of natural attenuation and calculate biodecay rates and restoration times in the down-gradient portion of the plume. The points of compliance used for compliance monitoring to ensure that contaminants above cleanup levels are not leaving the Site or confirm that the IAS/SVE system is effective will include: MW-6, MW-7, MW-9, MW-12, MW-13, MW-15, MW-16, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22, and MW-X the new well to be installed on the Port property. In addition, natural attenuation parameters will be collected quarterly in the first year of confirmational monitoring in wells: MW-6, MW-12, MW-16, MW-18, MW-22, and MW-X. Further details on the groundwater monitoring program, including the well sampling matrix and sampling schedule for each well, are provided in the CMP and CMP Table 1.

Cap Monitoring. Cap monitoring would consist primarily of visual inspections for damage and subsidence caused by the operation of the IAS-SVE system. The cap would be periodically examined for the presence of offsets, low-points, ponded water, odd changes in grade, and excessive erosion. For the first year, such inspections may be performed on a semi-annual basis and would eventually be reduced to once a year until the end of the post-closure period (when confirmational groundwater monitoring is terminated) or when residual hazardous substance concentrations no longer exceed cleanup/remediation levels under MTCA, whichever comes first.

5.3.5.4 Groundwater Monitoring Program Summary

The sampling program will have two components: 1) short-term, frequent monitoring [Protection Monitoring; WAC 173-340-410 (1)(a)] during installation and operation of the remediation system; and 2) Confirmational Monitoring for five years after the IAS-SVE system is shut-off, or until four consecutive events of groundwater monitoring results demonstrate that residual hazardous substance concentrations at the Site no longer exceed cleanup levels, whichever comes first. [WAC 173-340-410 (1)(c)].

After 5 years since shut-off of the system have elapsed, Ecology will conduct their 5-year periodic review of the Site, at which time it will be identified whether additional long-term groundwater monitoring or other actions are warranted, with Ecology approval. If Ecology's 5-year review at the Site finds that the implemented remedy and natural attenuation are not protective of human health and the environment, the PLP Group will provide to Ecology a plan for continuing long term groundwater monitoring as well as a plan for a contingent remedy.

Details of the groundwater monitoring are presented in the CMP (Attachment E).

5.3.6 Institutional Controls

Under the selected remedy, contaminated material will remain on-Site underneath the cap. Under WAC 173-340-440(1)(a) institutional controls are therefore required. Institutional controls are a key component of the alternatives for maintaining long-term effectiveness. Institutional controls would include land use restrictions and prohibition of use of Site groundwater as a source of potable water. Institutional controls will be enforced to ensure that the Site use remains restricted, regardless of the property owner, and to notify any prospective purchasers of the presence of subsurface waste. Land use restrictions would prohibit land use inconsistent with maintaining the integrity of the MasterPark Facility asphalt cap as long as COCs remain above cleanup levels under the cap. For the selected remedy, these restrictions will prohibit penetrating the cap and any Site use that could damage the cap or IAS-SVE system or significantly reduce its effectiveness. Any structures or buildings (such as maintenance equipment sheds) would be allowable as long as the structures do not jeopardize the integrity of the remediation systems. Structures placed over the plume where IAS-SVE systems are in place will not be used for residence or overnight human occupancy. Land use restrictions are expected to continue indefinitely.

Groundwater use restrictions would prohibit drinking water wells at the Site, preventing contact with or ingestion of contaminated groundwater. Restrictions on Site groundwater (down-gradient of the MasterPark Facility) would require negotiations with the affected landowners. Groundwater use restrictions would remain in force until COC concentrations decrease to below groundwater cleanup levels. Whether by active treatment, enhanced biodegradation, or monitored natural attenuation, all Site groundwater is expected to eventually meet cleanup levels.

Periodic Site inspections and maintenance of the cap, IAS-SVE system, fencing, warning signs, and any other physical components of the institutional controls will be included in the deed restrictions. Financial assurances will be established, as appropriate for remedial actions at the Site.

5.4 Evaluation of Cleanup Action With Respect to MTCA Criteria

5.4.1 Proposed Alternative Evaluation

Alternative A meets all threshold criteria specified in WAC 173-340-360(2) (protection of human health and the environment, eventual compliance with cleanup standards (through active remediation and natural attenuation), compliance with ARARs, and provision for compliance monitoring). It provides the best combination of long-term effectiveness and reliability, short-term effectiveness, implementability, and reduction of toxicity, mobility, and volume. In addition, this alternative provides good cost-effectiveness [WAC 173-340-360(3)(e)].

Alternative A relies on the treatment of hazardous substances in groundwater through IAS and SVE, which have a high preference under MTCA. Remedial actions involving ex-situ groundwater treatment would require extraction of the contaminated groundwater, which presents a long operational period (on the order of 30 years), low overall protectiveness (in comparison to the other remedial alternatives), and higher cost. The net benefit for ex-situ groundwater treatment alternatives is low.

Alternative A provides a substantial surficial physical barrier (maintaining the existing asphalt cap) and reduces groundwater concentrations in the plume located on the MasterPark Facility, which will ultimately reduce the groundwater concentrations on portions of the Site down-gradient of the Facility as well. Furthermore, the introduction of the SVE system will further limit the potential for vapor intrusion because the soil gas will preferentially be picked-up by the SVE system and ultimately treated. Additionally, institutional controls will limit land and groundwater uses.

Compliance monitoring will provide assurance that the concentrations of COCs within the groundwater plume are declining and that additional down-gradient areas are not being impacted by COCs at concentrations above cleanup levels. The points of compliance for groundwater will be the entire Site. Cleanup levels for groundwater will be MCTA Method A and B cleanup levels. Cleanup levels are appropriate for the highest beneficial use of groundwater as a potential drinking water source.

In order to protect groundwater, the point of compliance for soils is throughout the Site, as provided in WAC 173-340-740(6)(b). Ecology recognizes that the cleanup action involves containment of hazardous substances. This cleanup action is determined to comply with cleanup standards so long as: 1) all hazardous substances remain contained below the asphalt cap, 2) the compliance monitoring program ensures the long-term integrity of the cap by providing for cap maintenance and repair and for groundwater monitoring, and 3) requirements for containment technologies in WAC 173-340-740(6)(f) are met.

5.4.2 Contingency Plans

If it is observed during compliance monitoring that concentrations of COCs in wells close to the source area are declining, but concentrations of COCs in wells adjacent to and down-gradient of the Louden property are not declining or are increasing, another source contributing to the Site groundwater plume will need to be investigated. The necessary action to investigate a secondary source may require Ecology to take action to pursue investigation to take place at this property.

The PLP Group will rely on Ecology to exercise its authority to determine the status of a secondary potentially liable person (for example the Louden property), if groundwater monitoring results indicate the potential for a secondary source outside of the MasterPark Facility.

Ecology will conduct 5-year reviews at the Site beginning five years after the shut-down of the IAS/SVE remediation system. The 5-year reviews are used to evaluate the performance of the remedial action to determine if they are protective of human health and the environment. Further, the 5-year reviews are used to evaluate if immediate threats to receptors have been eliminated. At the completion of the 5-year reviews, Ecology will provide recommended actions to improve performance of the remedy if it is not performing as designed. If Ecology's 5-year review at the Site finds that the implemented remedy and natural attenuation are not protective of human health and the environment, the PLP Group will provide to Ecology a plan for a contingent remedy. A specific contingent remedy cannot be proposed in this document because it is impossible to know what the conditions may be like at that time. Furthermore, treatment technologies are ever evolving and improving, so a treatment system designed now may not be the best available technology if it is not applied for 10 years or more.

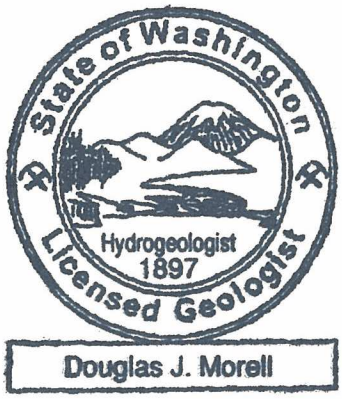
6.0 IMPLEMENTATION SCHEDULE

The preliminary CAP implementation schedule is in Attachment C. The final implementation schedule will be defined in the Agreed Order between Ecology and the PLP Group.

Douglas J. Morell, PhD, L G, L.HY
Principal Hydrogeologist

Kirsi S. Longley
Project Environmental Scientist

DJM/KSL/sb



7.0 REFERENCES

City of SeaTac, 2009. *City of SeaTac Zoning Map.* City of SeaTac Geographic Information System. February 2009. http://www.ci.seatac.wa.us/Modules/ShowDocument.aspx?documentid=108

Deming, David. 2002. *Introduction to Hydrogeology*. New York: McGraw-Hill Higher Education.

EA Engineering, Science, and Technology, Inc., 2006. SeaTac Development Site, Summary of June *2006 Groundwater Monitoring Results* – Work Order #17079, Contract Number: 30700 - Prepared for Washington Department of Ecology. September 6, 2006.

Golder Associates Inc. (Golder). 2000. *Phase I Environmental Site Assessment, SunReal Inc., SeaTac Airport Site, SeaTac, Washington*, October 12, 2000.

Golder. 2001a. *Final Phase II Environmental Site Assessment Report, SeaTac Parking Garage Development Site, SeaTac, Washington*, April 5, 2001.

Golder. 2001b. *Final Report for Extended Phase II Extended Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, Washington*, April 5, 2001.

Golder. 2001c. *Final Report for the Phase III Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, Washington*, April 5, 2001.

Golder. 2001d. *Final Field Sampling Plan for Limited Remedial Actions at the Sea-Tac Parking Lot Development Site, 16000 Block International Boulevard, SeaTac, Washington (Rev.0)*, June 25, 2001.

Golder. 2001e. *Collection and Analytical Results of Groundwater Sample from Washington Memorial Park Cemetery, Private Well Letter Report Addressed to SeaTac Investments.* Attention Mr. Douglas Rigoni, September 27, 2001.

Golder. 2001f. *Site Assessment Conducted for the Closure of a 3,000- and 10,000-Gallon Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, Washington*, October 4, 2001.

Golder. 2001g. *Site Assessment Conducted for the Closure of a 1,000-Gallon Gasoline Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, Washington*, October 4, 2001.

Golder. 2001h. *Site Assessment Conduct for the Closure of a 1,000-Gallon Heating Oil Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, Washington*, October 4, 2001.

Golder. 2001i. *Site Assessment for the Closure of a 300-Gallon Underground Storage Tank, Master Park Lot C 16000 Block International Boulevard, SeaTac, Washington*, October 24, 2001.

Golder. 2002. *Final Independent Remedial Action Report SeaTac Parking Garage Development Site SeaTac, Washington (MasterPark Lot C)*. Prepared for: SeaTac Investments LLC. January 24, 2002.

Golder. 2008a. *On-Site Source and Groundwater Investigation Summary – June to November 2007*. Prepared for Riddell Williams P.S. January 14, 2008.

Golder. 2008b. Addendum to On-Site Source and Groundwater Investigation Summary – June to November 2007 Report (Dated January 14, 2008). Prepared for Riddell Williams P.S. March13, 2008.

Golder. 2009. *Remedial Investigation / Feasibility Study (RI/FS) Work Plan For Sea-Tac Development Site, SeaTac, Washington*. Prepared for Riddell Williams P.S. April 21, 2009.

Golder. 2010. *Remedial Investigation / Feasibility Study (RI/FS) For Sea-Tac Development Site, SeaTac, Washington*. Prepared for Riddell Williams P.S. April 30, 2010.

King County iMAP, 2010. Interactive Mapping Tool. http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx. Accessed March 2010.

United States Geological Survey (USGS). 2004. *Geologic Map of the Des Moines 7.5' Quadrangle*, King County, Washington. By Derek B. Booth and Howard H. Waldron.

Washington State Department of Ecology. 1997. *Washington State Department of Ecology Analytical Methods for Petroleum Hydrocarbons.* Pub.No. ECY 97-602, June, 1997.

Washington State Department of Ecology. 2002. (Revised November 2007). *Model Toxics Control Act Regulations (WAC 173-340)*. Olympia, Washington. WAC 173-340.

Washington State Department of Ecology. *2009. Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action – Review Draft*. Publication No. 09-09-047. Olympia, Washington.

Washington Department of Ecology. 2009. *Agreed Order No. DE6844*. Issued By the Washington State Department of Ecology to Sea-Tac Investments LLC, ANSCO Properties, LLC, and Scarsella Bros. Inc., July 10, 2009. Washington State Department of Ecology. Olympia, Washington.

Washington Department of Fish and Wildlife. 2010 *Habitats And Species Map In The Vicinity Of T23R04E Section 28*. March 2, 2010.

TABLES

Table 1: Summary of The Comparative Evaluation of The Alternatives

Criteria	Criteria Weights	Alternative Scores						
		A	B1	B2	B	C	D	E
		Focused IAS-SVE	Focused ISCO using Ozone	Focused ISCO using Fenton's	Average of B1 & B2	Focused Groundwater Pump-and-Treat	IAS-SVE for Entire Plume	Groundwater Pump-and-Treat for Entire Plume
Overall Protectiveness	20%	7	5	5	5	1	10	3
Long-Term Effectiveness and Reliability	20%	6	4	7	5.5	1	10	3
Restoration Time Frame (years)		15	15	20	17.5	30	10	30
score	20%	8	8	6	7	1	10	1
Short-Term Risk	10%	10	4	3	3.5	8	5	1
Reduction in Toxicity, Mobility, and Volume	10%	6	10	9	9.5	1	7	2
Implementability	20%	9	10	8	9	7	3	1
Net Benefit	100%	7.6	6.8	6.4	6.6	2.9	7.8	1.9
Cost (present value, millions)		$1.9	$1.8	$2.3	$2.0	$3.4	$4.2	$6.1
Benefit : cost (i.e., cost-effectiveness)		3.9	3.8	2.8	3.2	0.9	1.9	0.3

Table 2: Site COCs

Soil		Soil Vapor		Groundwater	
COPC	**Maximum Detected Concentration (µg/kg)**	**COPC**	**Maximum Detected Concentration (µg/m3)**	**COPC**	**Maximum Detected Concentration (µg/L)**
Gasoline	3,800,000	At Source		Diesel	7,300
Benzene	2,900	Benzene	21,000	Gasoline	110,000
Toluene	74,000	Ethylbenzene	64,000	Benzene	3,000
Ethylbenzene	35,000	Total Xylene	132,000	Toluene	11,000
Total Xylene	215,000	At Washington Park Cemetery Residence		Ethylbenzene	2,600
		Benzene	16	Total Xylenes	16,000
				Naphthalene	640
				EDB	1.9

Golder Associates

FIGURES

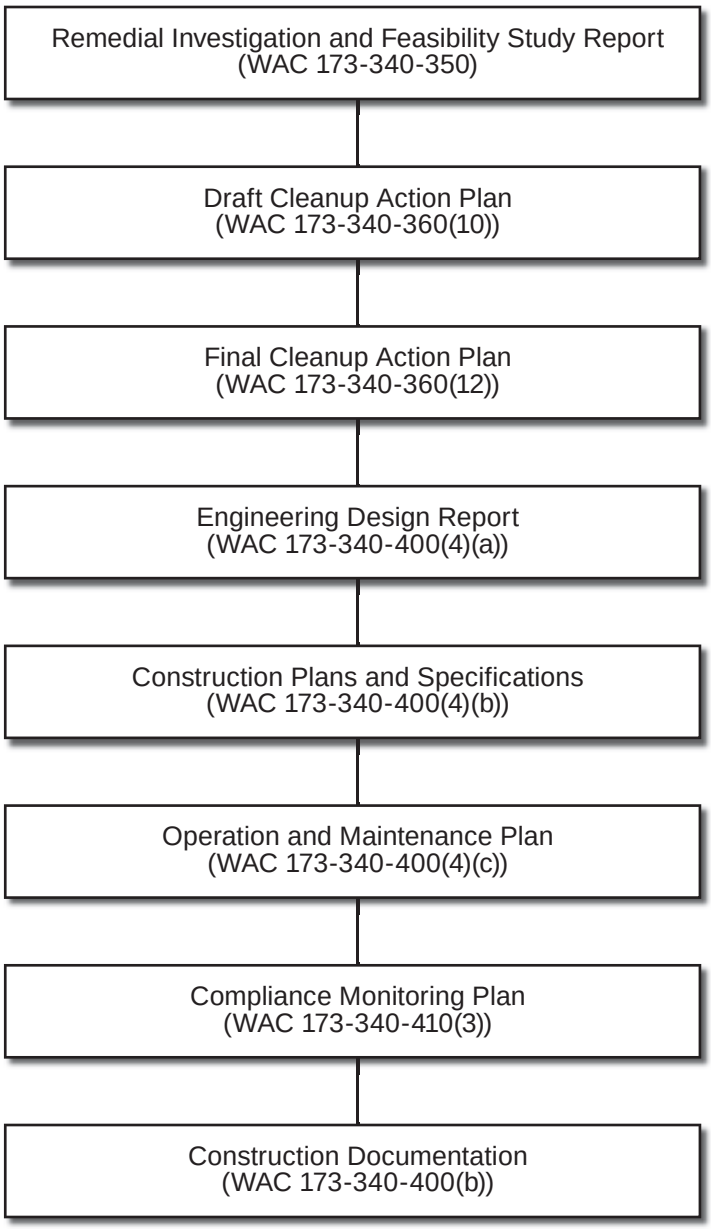


FIGURE **1**

DOCUMENTS REQUIRED UNDER MTCA (CHAPTER 173-340 WAC)

SEATAC DEVELOPMENT SITE/CAP/WA

0 2000

SCALE IN FEET

Source: Google Earth Pro

FIGURE **2**

SITE LOCATION MAP

SEATAC DEVELOPMENT SITE/CAP/WA

LEGEND

- Approximate Site Boundary
- 2003 Restrictive Covenant Boundary & Asphalt Cap Institutional Control
- Approximate Groundwater Plume

0 4000

SCALE IN FEET

Source: Google Earth Pro

FIGURE **3**

APPROXIMATE SITE BOUNDARY

SEATAC DEVELOPMENT SITE/CAP/WA

LEGEND:

MW-5	QVA AQUIFER MONITORING WELL LOCATIONS
MW-2	MONITORING WELLS SCREENED IN PERCHED AQUIFER
PORT MW-1	PORT OF SEATTLE (QVA) MONITORING WELLS (ABANDONED)
TACO TIME D	TACO TIME (QVA) MONITORING WELL (ABANDONED)

0 100 200

SCALE IN FEET

FIGURE **4**

MONITORING WELL LOCATIONS

SEATAC DEVELOPMENT SITE/RI/FS/WA

Golder Associates

LEGEND

- 310.70 — GROUNDWATER ELEVATION CONTOUR (FEET ABOVE MEAN SEA LEVEL ON MARCH 2010)
- MW-11 310.04 — APPROXIMATE MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW

0 100 200

SCALE IN FEET

FIGURE **5**

GROUNDWATER ELEVATION CONTOUR - MARCH 2010

SEATAC DEVELOPMENT SITE/RI/FS/WA

K:\CAD\Projects\2007\07393368\05\04\Exhibit B - CAP\073_93368_05_04_F05.dwg | Fig 5 | Mod: 01/24/2011, 11:19 | Plotted: 01/24/2011, 13:06 | Aforcier

Golder Associates

LEGEND:

MW-5	QVA AQUIFER MONITORING WELL LOCATIONS
MW-2	MONITORING WELLS SCREENED IN PERCHED AQUIFER
PORT MW-1	PORT OF SEATTLE (QVA) MONITORING WELLS (ABANDONED)
TACO TIME D	TACO TIME (QVA) MONITORING WELL (ABANDONED)
NS	NOT SAMPLED
<100	GASOLINE CONCENTRATION VALUE (ug/L)
	GASOLINE CONCENTRATION CONTOUR (ug/L)

0 100 200

SCALE IN FEET

FIGURE **6**

GASOLINE ISOCONCENTRATION CONTOURS MARCH 2010

SEATAC DEVELOPMENT SITE/RI/FS/WA

LEGEND:

MW-5	QVA AQUIFER MONITORING WELL LOCATIONS
MW-2	MONITORING WELLS SCREENED IN PERCHED AQUIFER
PORT MW-1	PORT OF SEATTLE (QVA) MONITORING WELLS (ABANDONED)
TACO TIME D	TACO TIME (QVA) MONITORING WELL (ABANDONED)
NS	NOT SAMPLED
<0.1	BENZENE CONCENTRATION VALUE (ug/L)
	BENZENE CONCENTRATION CONTOUR (ug/L)

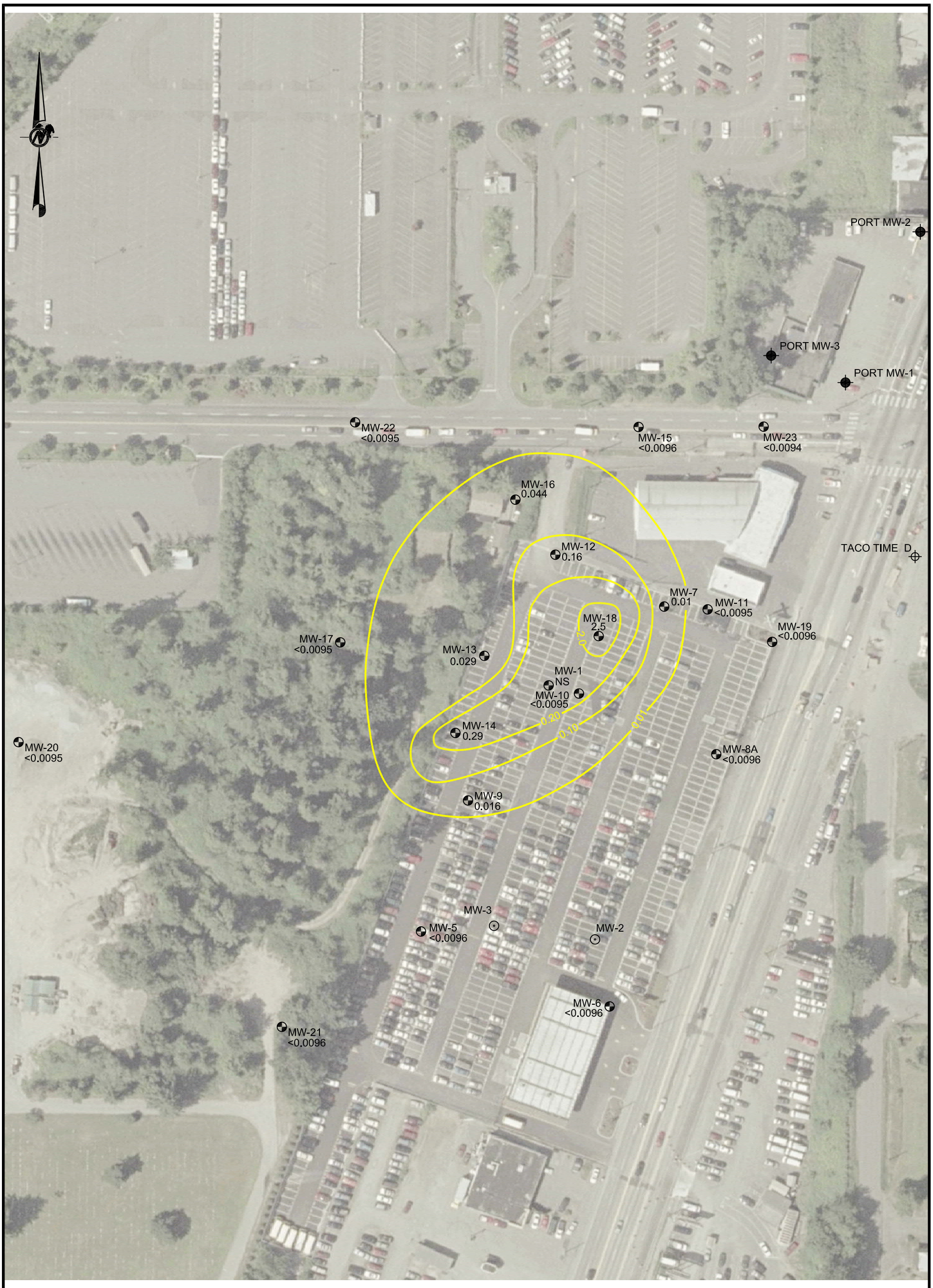
0 100 200

SCALE IN FEET

FIGURE **7**

BENZENE ISOCONCENTRATION CONTOURS MARCH 2010

SEATAC DEVELOPMENT SITE/RI/FS/WA



LEGEND:

1.0	EDB CONCENTRATION CONTOUR (ug/L)
MW-5	QVA AQUIFER MONITORING WELL LOCATIONS
MW-2	MONITORING WELLS SCREENED IN PERCHED AQUIFER
PORT MW-1	PORT OF SEATTLE (QVA) MONITORING WELLS (ABANDONED)
TACO TIME D	TACO TIME (QVA) MONITORING WELL (ABANDONED)
NS	NOT SAMPLED

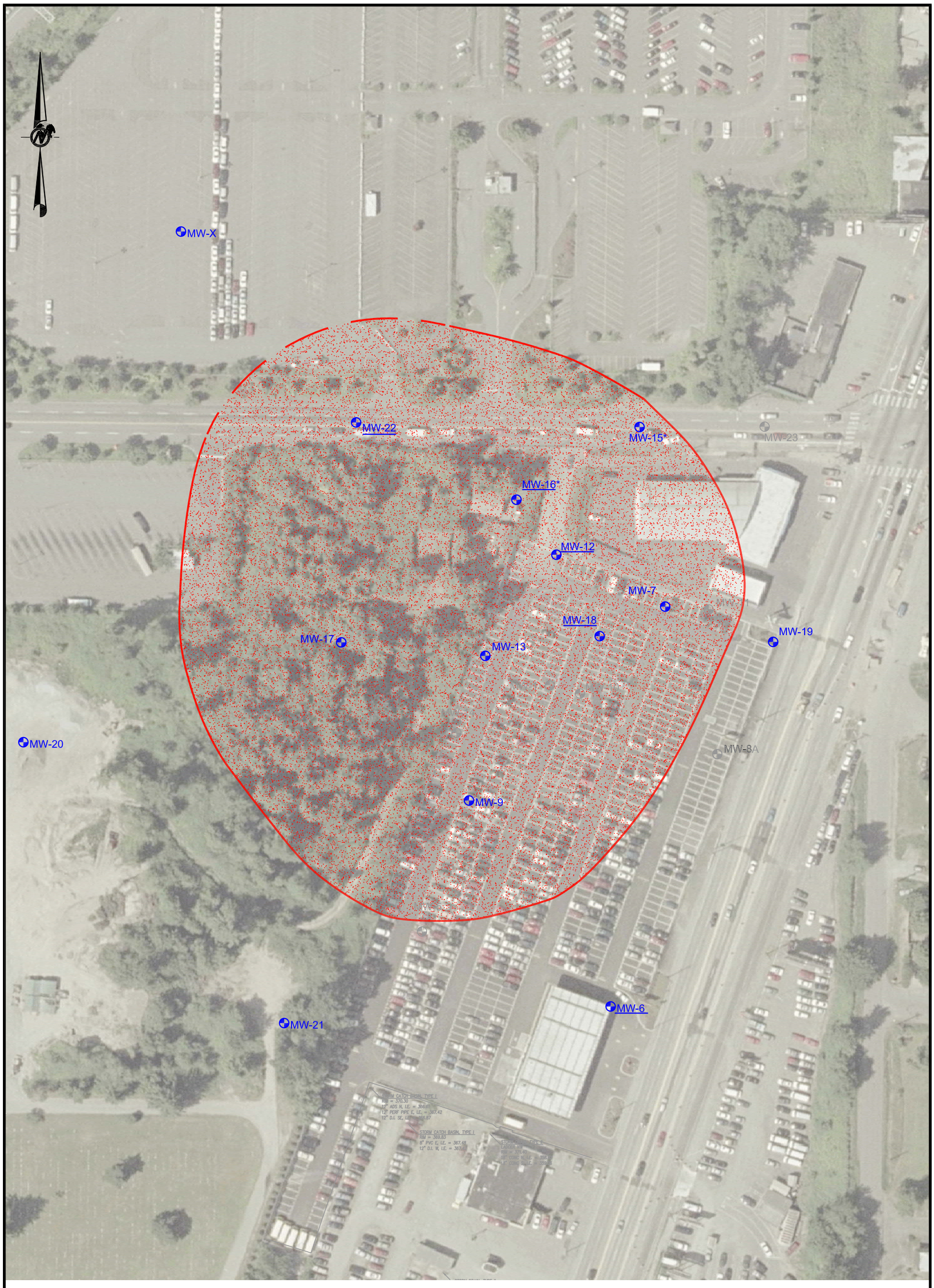
0 100 200

SCALE IN FEET

FIGURE **8**

EDB ISOCONCENTRATION CONTOURS - MARCH 2010

SEATAC DEVELOPMENT SITE/RI/FS/WA



LEGEND:

MW-17	COMPLIANCE MONITORING WELLS
MW-6	NATURAL ATTENTION WELL
	APPROXIMATE GW PLUME BOUNDARY

0 100 200

SCALE IN FEET

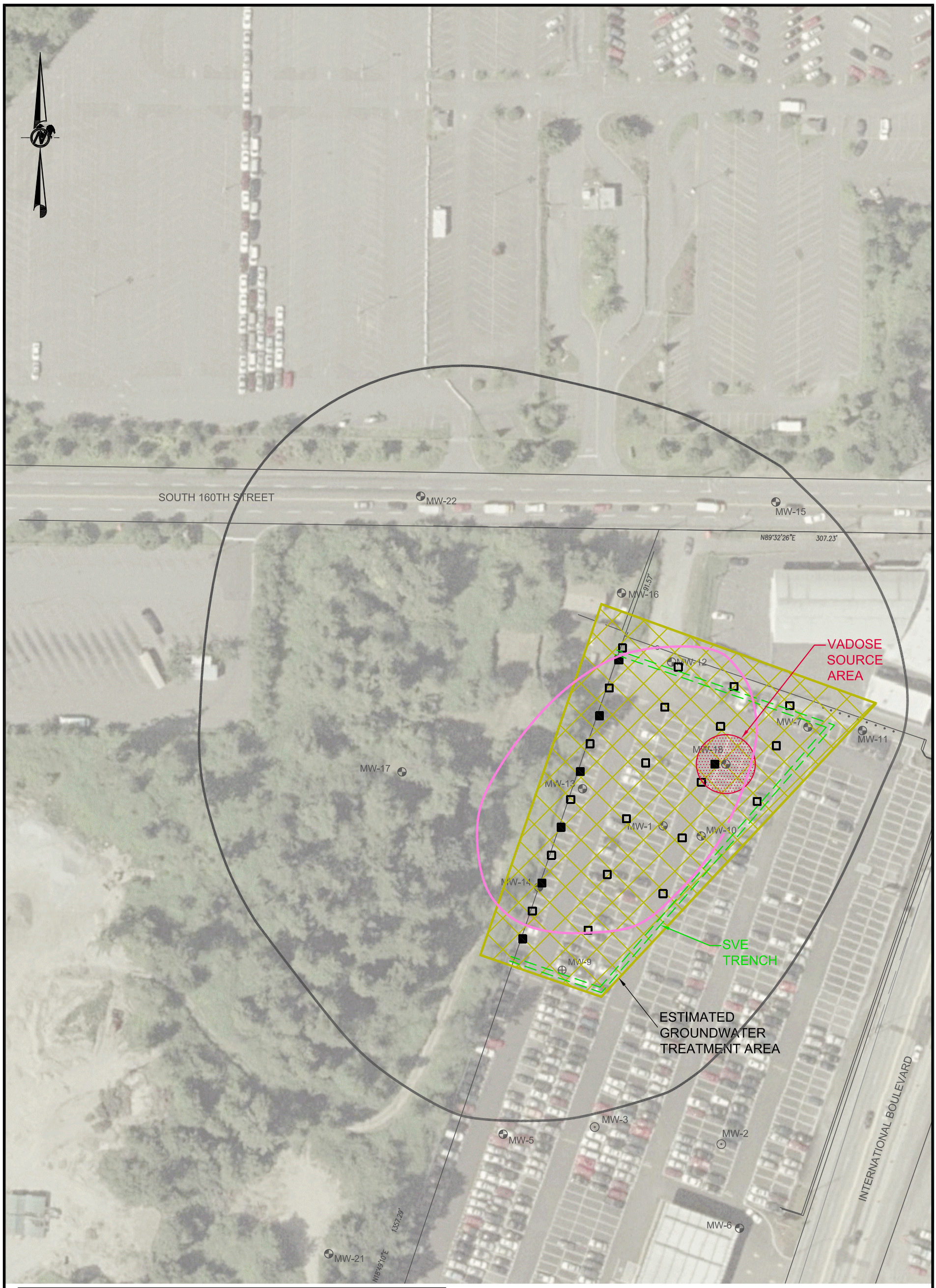
NOTE:

1. PLUME BOUNDARY BASED ON GROUNDWATER SAMPLE RESULTS EXCEEDING MTCA METHOD A CLEAN UP LEVELS FOR GASOLINE RANGE PETROLEUM HYDROCRABONS (800 UG/L)
2. * = ONLY WELLS THAT ARE NOT PERFORMANCE MONITORING WELLS

FIGURE **9**

LOCATION OF COMPLIANCE MONITORING WELLS

SEATAC DEVELOPMENT SITE/RI/FS/WA



NOTES:
PLUME BOUNDARY BASED ON GROUNDWATER SAMPLE RESULTS EXCEEDING MTCA METHOD A CLEANUP LEVEL FOR GASOLINE RANGE PETROLEUM HYDROCARBONS (800ug/L)

FIGURE **10**

FOCUSED IAS-SVE LAYOUT FOR ALTERNATIVE A

SEATAC DEVELOPMENT SITE/RI/FS/WA

K:\CAD\Projects\2007\07393368\05\04\Exhibit B - CAP\073_93368_05_04_F10.dwg | Fig 10 | Mod: 07/29/2010, 08:30 | Plotted: 07/29/2010, 08:58 | aforcier

Golder Associates

APPENDIX A
SEATAC DEVELOPMENT SITE ARARS

Pertinent Federal and State Laws and Regulations

Safe Drinking Water Act of 1974, 42 USC 300, et seq. National Primary Drinking Water Standards, 40 CFR 141	Establishes maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) that are drinking water criteria designed to protect human health from the potential adverse effects of contaminants in drinking water.	Ground water at the Site is not a current drinking water source, but it is considered a potential future source of drinking water. MCLs and MCLGs should be considered in establishing cleanup levels that are protective of ground-water, points of compliance, and institutional controls.
National Secondary Drinking Water Standards, 40 CFR 143	Establishes secondary drinking water standards for use in establishing cleanup levels.	Federal secondary standards are not enforceable standards and are not typically applicable or relevant and appropriate requirements; however, the State of Washington Model Toxics Control Act requires that these standards be considered in establishing cleanup levels protective of ground-water.
Clean Water Act of 1977, 33 USC 1251, as amended Water Quality Standards, 40 CFR 131	Establishes the requirements and procedures for states to develop and adopt water quality standards based on federal water quality criteria that are at least as stringent as the federal standards. Provides USEPA authority to review and approve state standards. Washington State has received USEPA approval and has adopted more stringent standards under WAC 173-201A.	Not applicable (the requirement to develop standards applies to the states, not individual facilities) but relevant in establishing the basis for state regulations.
Resource Conservation and Recovery Act, 42 USC 6901, et seq. Criteria for Classification of Solid Waste Disposal Facilities and Practices, 40 CFR 257	Criteria specified under this standard are used to determine which solid waste disposal facilities and practices pose a reasonable possibility of adverse risk to human health and the environment.	Most of the provisions of this chapter have been delegated to the state. (See State Hazardous Waste Management Act.).

Clean Air Act of 1977, as amended 42 USC 7401, et seq. National Ambient Air Quality Standards, 40 CFR 50	Requirements of these regulations are applicable to airborne releases of criteria pollutants specified under the statute. Specific release limits for particulates are set at 50 µg/m 3 annually or 150 µg/m 3 per 24-hour period.	Applicable to airborne releases of criteria pollutants that might be generated during assessment or response actions.
Ambient Air Quality Monitoring, 40 CFR 58 areas.	This regulation presents the criteria and requirements for ambient air quality monitoring and reporting for local air pollution control agencies and operators of new sources of air pollutants.	Applicable to assessment or response actions that meet the regulatory definition of a new source. Also, these requirements may be considered relevant and appropriate to response actions that have the potential to emit air contaminants, even if they are not a new source.
Standards of Performance for New Stationary Sources, 40 CFR 60	These requirements provide standards for new stationary or modifications of existing sources.	Applicable if assessment or response actions include stationary sources.
National Emission Standard for Hazardous Air Pollutants (NESHAP), 40 CFR 61	40 CFR 61 provides general requirements and listings for actions that will generate regulated emissions at a regulated facility.	These requirements are applicable to assessment or response actions that release air emissions into unrestricted
Hazardous Materials Transportation Act, 49 USC 1801, et seq. Hazardous Materials Regulation, 49 CFR 171	These requirements state that no person may offer to accept hazardous material for transportation in commerce unless the material is properly classed, described, packaged, marked, labeled, and in condition for shipment.	These requirements are applicable to hazardous material generated during assessment or response actions, which is sent offsite for disposal.
Hazardous Materials Tables, Hazardous Materials Communications Requirements, and Emergency Response Information Requirements, 49 CFR 172	Tables are used to identify requirements for labeling, packaging, and transportation based on categories of waste types. Small quantities of radioactive wastes are not subject to the requirements of the standard if activity levels are below limits established in paragraph 173.421, 173.422, or 173.424. Specific performance requirements are established for packages used for shipping and transport of hazardous materials.	These requirements are applicable if hazardous materials are transported offsite during assessment or response actions. In the event of a discharge of hazardous waste during transportation from the treatment facility to the disposal facility, this section is applicable.

Hazardous Waste Clean Up/Model Toxics Control Act, Ch. 70.105D RCW Model Toxics Control Act, WAC 173-340-700	Establishes a process and requirements for cleanup of contaminated sites in the state. MTCA regulations have been authorized for use in implementing corrective action in the state. Specifies that all cleanup actions be protective of human health; comply with all applicable state and federal regulations; and provide for compliance monitoring. Identifies the methods used to develop cleanup standards and their use in selection of a cleanup action. Specifies cleanup goals, which implement the strictest federal or state cleanup criteria. In addition to meeting requirements of other regulations, MTCA uses three basic methods for establishing cleanup levels. These methods may be used to identify cleanup standards for ground-water, surface water, soils, and protection of air quality. Cleanup levels for soils may be calculated using Method A – routine; Method B - standard method; and Method C – conditional standards. MCLs, MCLGs, and secondary drinking water standards are identified in the regulation as ground-water cleanup criteria.	Requirements of MTCA are applicable to the Site. Remedial actions at the Site are being conducted pursuant to MTCA under an Agreed Order.
Hazardous Waste Management Act, 70.105 RCW Dangerous Waste Regulations, WAC 173-303	Establishes the design, operation, and monitoring requirements for managing dangerous waste.	Dangerous waste is not present at the Site.
Solid Waste Management, Recovery and Recycling Act, Ch. 70.95 RCW Minimum Functional Standards for Solid Waste Handling, WAC 173-304	These standards establish requirements to be met for the management of solid waste. Solid waste controlled by this Act includes garbage, industrial waste, construction waste, and ashes. Requirements for containerized storage, collection, transportation, treatment, and disposal of solid waste are included. These standards set ground-water MCLs at the same levels as the state drinking water standards.	These regulations are applicable when solid waste is generated during assessment or response actions, and may be relevant and appropriate to the Site.

Water Pollution Control/Water Resource Act of 1971, Ch. 90.48 RCW/Ch.90.54 RCW Surface Water Quality Standards, WAC 173-201A Protection of Upper Aquifer Zones, WAC 173-154	These standards set water quality standards at levels protective of aquatic life. This regulation directs Ecology to provide for protection of upper aquifers and upper aquifer zones to avoid depletions, excessive water level declines, or reductions in water quality.	Surface water quality criteria established under this chapter are not applicable in assessing risk and response actions. This regulation is not applicable because it establishes the policy and program for Ecology. However, the regulation is relevant and appropriate because protection of the aquifer from adverse impacts caused by solid waste is a primary goal.
State Waste Discharge Program, WAC 173-216	The regulation establishes requirements for industrial and commercial operations that discharge to the ground-water, surface waters, or municipal sewerage systems. Specific discharges prohibited under the program are identified. The intent of the regulation is to maintain the highest possible standards, and the law requires the use of all known available and reasonable methods to prevent and control the discharge of wastes into the waters of the state.	Requirements of this program are applicable to assessment or response actions that include discharges to the ground.
Department of Health Standards for Public Water Supplies, WAC 246-290	The rule established under WAC 246-290 defines the regulatory requirements necessary to protect consumers using public drinking water supplies. The rules are intended to conform with the federal SDWA, as amended. WAC 246-290-310 establishes MCLs that define the water quality requirements for public water supplies. WAC 246-290-310 establishes both primary and secondary MCLs and identifies that enforcement of the primary standards is the Department of Health's first priority.	The requirements of WAC 246-290-310 are relevant and appropriate. Although the ground-water at the Site is not a source of drinking water, groundwater at the Site has sufficient yield and quality to be considered a potential future resource.
State Environmental Policy Act, Chapter 43.21C RCW SEPA Rules, WAC 197-11	These requirements establish compliance with the State Environmental Policy Act.	These requirements are applicable for response or cleanup actions at the Site.
Water Quality Standards for Ground Waters of the State of Washington; WAC 173-200	Establishes ground-water quality standards to provide for protection of the environment and human health, as well as an antidegradation policy to protect existing and future beneficial uses of ground-water.	WAC 173-200 standards do not apply to cleanup actions undertaken pursuant to the Model Toxics Control Act (MTCA). Instead, MTCA establishes ground-water cleanup standards at such sites.

Ambient Air Quality Standards for Particulate Matter, WAC 173-470	These requirements set maximum acceptable levels for particulate matter in the ambient air and the 24-hour ambient air concentration standard for particles less than 10 μm in diameter (PM10). The section defines standards for particle fallout in industrial, commercial, and residential areas. Alternate levels are set for areas where natural dust levels are high.	These requirements are applicable to assessment and response actions (e.g., drilling) that might emit particulate matter to the air.
Washington Clean Air Act, Ch. 70.94 RCW and Ch. 43.21A RCW General Regulations for Air Pollution, WAC 173-400	The regulation requires that all sources of air contaminants meet emission standards for visible, particulate, fugitive, odors, and hazardous air emissions. This section requires that all emission units use reasonably available control technology, which may be determined for some source categories to be more stringent than the emission limitations listed in this chapter. The regulation requires that source testing and monitoring be performed. A new source would include any process or source that may increase emissions or ambient air concentration of any contaminant for which federal or state ambient or emission standards have been established.	Requirements of this standard are applicable to assessment and response actions that could result in the emission of hazardous air pollutants.
Controls for New Sources of Air Pollution, WAC 173-460	This standard requires that new sources of air emissions provide emission estimates for toxic air contaminants listed in the regulation. The standard requires that emissions be quantified and used in risk modeling to evaluate ambient impacts and to establish acceptable source impact levels. The standard establishes three major requirements for new sources of air pollutants: use of best available control technology; quantification of toxic emissions; and demonstration that human health is protected.	The standard is applicable to assessment and response actions where contaminants identified as toxic air pollutants are present and air emissions might be generated.
Water Well Construction, Ch. 18.104 RCW Minimum Standards for Construction and Maintenance of Water Wells, WAC 173-160	These requirements establish minimum standards for design, construction, capping, and sealing of all wells. The requirements set additional requirements, including disinfection of equipment, decommissioning of wells, and quality of drilling water.	These requirements are applicable because assessment or response actions include construction of wells for ground-water monitoring or for remediation purposes.

Rules and Regulations Governing the Licensing of Well Contractors and Operators, WAC 173-162	This regulation establishes training standards for well contractors and operators.	This regulation is relevant and appropriate because assessment or response actions could involve ground-water well installation or construction of geotechnical borings.

CFR = Code of Federal Regulations
Ecology = Washington Department of Ecology
MCL = maximum contaminant level
MCLG = maximum contaminant level goal
MTCA = Model Toxics Control Act
RCW = Revised Code of Washington
SEPA = State Environmental Policy Act
SDWA = Safe Drinking Water Act
WAC = Washington Administrative Code.

APPENDIX B
RESPONSIVENESS SUMMARY

DEPARTMENT OF ECOLOGY
State of Washington

Golder Associates

RESPONSIVENESS SUMMARY

SeaTac Development (aka MasterPark Lot C) Site Remedial Investigation/Feasibility Study Report, Draft Cleanup Action Plan, and SEPA Determination

Public Comment Period: April 29 – May 31, 2011

Prepared by
Washington State Department of Ecology
Northwest Regional Office
3190 160th Ave SE., Bellevue, WA 98008

October 2011

TABLE OF CONTENTS

1.0 INTRODUCTION

The SeaTac Development site (also known as MasterPark Lot C) is located at 16025-16223 International Boulevard in SeaTac, Washington. Currently, the property is being used as a commercial parking lot serving SeaTac Airport. Ground water beneath the site is contaminated with gasoline range petroleum hydrocarbons and associated chemical compounds. It is listed in Ecology's known and suspected contaminated sites list and in its databases under Facility Site ID number 38258847.

In July 2009, the Department of Ecology (Ecology) and Sea-Tac Investments LLC, ANSCO Properties, LLC, and Scarsella Brothers Inc. (Potential Liable Parties (PLPs)) entered into a legal agreement called an Agreed Order. Under the agreement, the responsible parties conducted a remedial investigation of contamination at the site, evaluated cleanup alternatives, and developed a plan to clean up contamination at the site according to state regulations and standards. The results of this work are provided in a draft Remedial Investigation/Feasibility Study Report (RI/FS Report) and Draft Cleanup Action Plan (DCAP). A State Environmental Policy Act (SEPA) Checklist and Determination of Non-Significance (DNS) on the CAP were also provided for public comment.

A public comment period was held April 29 – May 31, 2011 for the draft RI/FS Report, DCAP, and State Environmental Policy Act (SEPA) Determination. Ecology received four comments during the comment period. This responsiveness summary documents the comments received and Ecology's responses. Appropriate revisions will be made to the documents in the comment period in order to finalize them in fulfillment of the Agreed Order.

More details on the SeaTac Development site and related documents are available at the Washington State Department of Ecology website:

https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=5994

Section 2.0 of this Responsiveness Summary provides Ecology's specific responses comments received. In **Appendix A**, all the original comments are documented in their entirety and as close as possible to original format. **Appendix B** consists of an Addendum to the RI/FS and Draft CAP that was made in response to substantive comments from the Port of Seattle.

2.0 COMMENTS RECEIVED AND ECOLOGY'S RESPONSES

2.1 Rachelle Goda: Email Sent to Ecology Site Manager Jerome Cruz on Friday, April 22, 2011 7:21 PM

How far from the site area are contaminated?

Ecology's Response: Past investigations revealed that soil contamination is within the property boundary. The area of contaminated groundwater is wider, extending north past south 160th Street, and also west onto the adjoining property to the MasterPark Lot C Facility. However, groundwater is at least 50 feet deep beneath the site. The attached maps should help with the more detailed description provided below.

For soil, a source of gasoline impacted soils exists within the MasterPark Facility near the location of the former gasoline USTs at the northwest corner of the property. Relative concentrations of gasoline (and BTEX) in the source area are highest at depths between 10 feet and 40 feet below ground surface and decrease in concentration as you go deeper. It is limited to a zone with an area of approximately 50 to 60 foot diameter. There are some smaller limited spots of petroleum hydrocarbon impacted soil beneath the asphalt parking lot in the MasterPark Facility.

The property which is further north of the MasterPark property may contain its own subsurface contamination source. However, the property owner has not agreed to give access to their property. The approach adopted will be to observe the groundwater concentrations in nearby wells while groundwater cleanup at the MasterPark Facility is carried out to see if it will indicate a source at this nearby property that impacts groundwater.

Ground water is a key medium of contamination at the site. Groundwater is between 45 and 115 feet below land surface. Groundwater analytical results confirm that the source of impact is bounded by MW-12 to the north, MW-14 to the south, MW-18 to the east, and MW-13 to the west. This is demonstrated by gasoline isoconcentration contour maps that were developed for the 2007-2008 (Figure 4-3) and May 2009 (Figure 4-4) groundwater sampling events, attached as a file to this message. These figures show that the highest concentrations of gasoline were detected in MW-12, MW-13, MW-14, and MW-18. With distance from these wells, the concentration of gasoline in groundwater steadily decreases.

The plume is roughly 640 feet across.

The plume is well delineated. The groundwater gasoline plume was estimated in the RI/FS to have migrated no more than 140 feet beyond MW-22, which is depicted in Figure 4-6.

The gasoline plume will eventually be further delineated northwest of MW-22 through the installation of an additional well(s).

How was it determined that no drinking source is contaminated?

Ecology's Response: There are no potable groundwater supply wells within a mile of the Site in the general down gradient direction (west, southwest or northwest) from the Site. The closest groundwater supply well is in the Washington Memorial Park Cemetery, south of the Site, and is used for watering. However, this cemetery well has not been impacted by Site releases (as per results from Ecology's 2006 and Golder's 2001 sampling events). Therefore, there are no current groundwater exposure pathways to off-Site humans from drinking water impacted by Site release.

There is no known discharge of Site groundwater to surface water in the area, including the potential wetland area and man-made pond on the cemetery property south of the Site.

Ground water samples collected from monitoring wells surrounding the site show no petroleum hydrocarbon compounds above cleanup levels in the water. This helped establish the limits of most of the plume in relationship to the nearest potable groundwater supply well, which is over a mile away.

What health risks are there now, because of the contamination?

Ecology's Response: Future MasterPark Facility construction/remediation workers could become exposed by direct contact and incidental ingestion to Site near-surface soils (<15 feet) during construction excavation or impacted soil removal activities in the vicinity of the source area (former gasoline USTs at the MasterPark Facility).

There is a potential risk from vapor intrusion; however, based on soil gas studies conducted, there is little if any risk because the levels are very low, as low or lower than air borne levels measured from nearby street traffic (ambient air).

Who will oversee and manage the cleanup process from the contaminated site?

Ecology's Response: The Department of Ecology and the Potentially Liable parties (PLPs) are presently under an Agreed Order to conduct a Remedial Investigation and Feasibility Study. Ecology is the state lead that ensures that the cleanup process follows the Model Toxics Control Act (MTCA). Technical work is paid for by the PLPs.

What are the risk for any residents nearby when the cleanup process occur?

Ecology's Response: There should be little if any risk when the preferred remedial alternative is carried out to clean up the groundwater contamination.

The air sparging system and soil vapor extraction systems will be on the property and off limits to the public. There is a Health and Safety, a Performance and Compliance Monitoring Plan, and a Quality Assurance Project Plan to ensure the systems are implemented safely and that the remediation is effective and protective. Groundwater and air will be monitored during and after the operations to ensure the systems are performing and that existing hazards to people at the site are minimized.

How was it known that the area was contaminated?

Ecology's Response: During development of the property in 2000, Sea-Tac Investments found petroleum contamination in soil and groundwater. High levels of gasoline were found in the groundwater aquifer 50-60 ft. beneath the property. Contamination seemed to be from equipment operations and old underground storage tanks used by the former owner or former tenants. In 2001, Sea-Tac Investments entered into Ecology's Voluntary Cleanup Program to investigate and clean up some of the contamination. Ecology gave Sea-Tac Investments a "No Further Action" letter for cleanup of the soil. The gasoline contamination in the aquifer extends beyond property boundaries and was not cleaned up at that time.

There were later investigations to find the source of contamination in the aquifer. A series of investigations and remedial actions were conducted starting in September 2000 with a Phase I Environmental Site Assessment (ESA) followed by Phase II ESA investigations and culminating in September 2001 with an independent remedial action (IRA) conducted in coordination with property development. Ecology performed groundwater sampling at the Site in 2006, and remedial Site investigations resumed in 2007. The activities and results of these investigations are reported in the RI/FS report that is available to the public for review and comment.

How is the clean-up being funded?

Ecology's Response: It is being paid for by the Potentially Liable Parties or PLPs (Sea-Tac Investments LLC, Scarsella Bros. Inc., and ANSCO Properties, LLC.). Public funds are not being used for the cleanup effort.

Are there enough funding to clean-up the contamination?

Ecology's Response: It is the PLPs responsibility to ensure they have sufficient funding under Model Toxics Control Act administrative orders. To actually carry out the cleanup, we will see what mechanism will be used to execute the cleanup, such as a consent decree or agreed order. For the present Agreed Order, the PLPs have been funding the investigations that produced the RI/FS report and DCAP. Ecology has been billing the PLPs for Ecology's direct oversight on the project. An agreed order or consent decree would obligate the PLPs to fund the cleanup.

What is the role of SeaTac Investment LLC, ANSCO Properties LLC, and other businesses that caused the contamination in regarding to funding and clean-up?

Ecology's Response: They are the PLPs and are under an Agreed Order to complete an RI/FS and DCAP. An Agreed Order is a legal document that formalizes the agreement between the PLPs and Ecology for actions needed at the site.

Are those businesses listed above involve in clean-up and funding?

Ecology's Response: It is being paid for by the Potentially Liable Parties or PLP's (Sea-Tac Investments LLC, Scarsella Bros. Inc., and ANSCO Properties, LLC). You can download a copy of the Agreed Order as well as the Fact Sheets on the website at: https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=599

2.2 Lena Kuliczkowska: Email Sent to Ecology Site Manager Jerome Cruz dated Friday, April 29, 2011 11:12 AM

Hi Jerome,

A new SeaTac development, called Master Park Lot C Expansion, is located west from the existing Master Park on International Blvd and S 160th St. (except Mr. Loudon property). The area for the proposed Surface Parking is in lease, and is part of Washington Memorial Cemetery.

Could you please give us more information how the Cleanup Program ID# 5994 will affect the design and construction of the new parking area?

Thank you,

Lena

Lena Kuliczkowska
Senior Engineering Technician
City of SeaTac
Engineering Division

206.973.4737

Ecology's Response: Ecology responded by email to Ms. Kuliczkowska on April 29, 2011. Ecology provided a page from the Draft Cleanup Action Plan showing the map of the proposed air sparging and soil vapor extraction (SVE) wells. Ecology noted that they are within the original property boundaries of MasterPark Lot C, so it was Ecology's opinion that it should not affect the construction activities for the Expansion. Golder Associates, the technical consultants for the potentially liable parties, was cc'd on the message so that they could confirm or follow up to the question.

Ecology noted that it looks like the groundwater plume is beneath the Lot C expansion, and there are monitoring wells (MW-17 and MW-16) located there, so Ecology was sure that Golder Associates will request that these wells not be destroyed. The cleanup will remediate the plume source and the plume.

Ecology indicated that it is not sure when the new construction will start, but suggested that all parties should probably communicate more so each will be aware of their respective construction schedules, especially when work starts at the western property boundary of Lot

C. This area will probably require some construction coordination and information exchange.

2.3 Ronny Seldal: Letter to Ecology Site Manager Jerome Cruz dated May 3, 2011

(Excerpts from Mr. Seldal's letter follow)

"My comment has to do with a business just across the street, less than ½ block away from the site you are asking for comments about.

Address Carlos Paint Shop-Formerly: M and M Finishing 16600 International Blvd, SeaTac, WA 98188."

"So to sum up, this property at 16600 International Blvd is hazardous property to the public both in the Air quality and in the ground soil from blocks around so my comment would be: Is there some way of get with the property owner and see what it would take to cleanup the hazardous soil and maybe work with him to find funding for this cleanup."

Ecology's Response: On May 5, 2011, Site Manager Jerome Cruz left a voicemail to Mr. Seldal thanking him for his interest in the site and stating that his letter was referred to Donna Musa, who coordinates the Initial Investigations/Site Hazard Assessment Team in Ecology's Toxics Cleanup Program. The property referred to in Mr. Seldal's letter is not part of the SeaTac Development site. However, by referring it to Initial Investigations and Site Hazard Assessment, the property can be evaluated to see if there is contamination that will require listing in Ecology's Confirmed and Suspected Contaminated Sites List, following regulatory process under the Model Toxics Control Act (MTCA).

2.4 Don Robbins with Port of Seattle: Letter to Ecology Site Manager Jerome Cruz dated May 27, 2011; Email dated Wednesday, October 5, 2011 3:34 PM

Comments by the Port may be found in their entirety in **Appendix A.4** of this Responsiveness Summary.

Golder Associates, the technical consultant for the SeaTac Development PLP Group, prepared an Addendum to the SeaTac Development Site RI/FS and Draft CAP in response to the Port of Seattle comments from May 27, 2011. Ecology reviewed the Addendum and approved its contents for incorporation in the RI/FS Report and Draft Cleanup Plan. The Addendum is included as **Appendix B** of this Responsiveness Summary and has been updated to address the Port's October 5, 2011 comments.

Ecology's response to the Port's October 5, 2011 email follows.

Don Robbins with Port of Seattle: Email dated Wednesday, October 5, 2010 3:34 PM

Jerome,

Thank you for the opportunity to comment on the September 15, 2011, Addendum to the Sea-Tac Development Site RI/FS and DCAP. A spreadsheet with detailed comments is attached, but our primary concerns are as follows:

Vapor Intrusion Analysis

The vapor intrusion analysis is still inadequate to determine whether future users of Port property will be protected from health risks. First, the text on soil vapor issues addressed only buildings north of South 160th Street. The Addendum also needs to address soil vapor issues for usage of the Port's property located south of South 160th Street. Second, the analysis looked only at commercial use. While the Port's property is currently used for parking, the future use is not known at this time and could well involve residential uses. Therefore we think the analysis should be based on unrestricted usage.

As you know, in June we met with you and SeaTac Development to discuss this concern (among other things). At that time, the Port was advocating that additional sampling be conducted on the parking lot property. Instead of installation of an additional well, we agreed to accept that the level of contaminant concentrations depicted on isoconcentration maps created for the remedial investigation is a reasonable approximation of what sampling would establish. We would like to point out that these maps show concentrations of benzene in groundwater greater than 20 ug/liter at this location. This significantly exceeds the Method B groundwater screening level of 2.4 ug/liter for benzene contained in table B-1 of Ecology's Draft Vapor Intrusion Guidance. In addition, soil vapor measurements near the Cemetery residence exceeded the Method B soil gas, sub-slab screening level of 3.2 ug/liter for benzene. A further evaluation of the vapor intrusion pathway must be completed for that area of the benzene plume beneath Port property using unrestricted land use screening criteria.

Sufficiency of Delineation

The Addendum concludes that the plume has been sufficiently delineated. Given increases in TPH-G and benzene at MW-22 during the last two sampling rounds, the Port believes a "wait and see" position is more appropriate. The Addendum should include a thorough review of the plume stability after a year of quarterly data has been acquired. At that time, if concentrations of TPH-G and/or benzene show an upward trend in nearby wells, then MW-A should be re-sampled. We believe providing for this contingency is a more protective approach to the potential risks.

Thanks again for the opportunity to comment, please give me a call if you have any questions,

Don Robbins
Port of Seattle
Aviation/Environmental
(206) 787-4918
robbins.d@portseattle.org

All email to or from this account
is public and may be subject to disclosure.

Contents of Attached File "Copy of Addendum_Comments_093011 (3).xlsx"

Port of Seattle Comments 9/30/11 on:

Golder Associates, Inc., 2011, Technical memorandum, Addendum to SeaTac Development Site RI/FS and Draft CAP, September 15, 2011.

Table Items	Page	Item	Comment
ITEM 1	2	1	Statement is in error. The Port has provided an aerial photograph that is shown in Addendum figures.
ITEM 2	2	2	Please specify the vertical datum.
ITEM 3	2	3, 4, & Figure 1	Till was logged in wells MW-4, Port MW-1, and Port MW-2 and should be shown on the figure.
ITEM 4	3, §3	5	The Addendum should state that the next round of water level measurements will include MW-A and MW-B in the groundwater flow path analysis. Port will provide survey data when available.
ITEM 5	3, §6	5	When is sampling scheduled to begin under the Compliance Monitoring Plan? Was March 2010 the most recent sampling event?
ITEM 6	4	6	Short-term increases in TPH-G and benzene values were reported at MW-22. The Port believes collection of additional groundwater monitoring data is necessary to determine whether contaminant concentrations are stable or declining in wells closest to Port property, especially near MW-B. A contingent task should be added to the addendum to increase the scope of sampling to include MW-A if nearby wells begin to show an upward trend.
ITEM 7	6	14	The Port understood at our June 2011 meeting that all data would be presented graphically as an aid to interpretation and results of all sampling events would be included. Also, TPH-G concentration above MTCA in March 2010 indicates that MW-19 should be included in the plots.

ITEM 8	7, 8, 9, & 12	Soil Vapor 1, 2, 3, & 4; Section 3.0 2nd bullet	The potential for vapor intrusion must be evaluated for the least restrictive property uses on the Port owned parking lot property south of South 160th Street. The RI/FS has only evaluated this pathway using a "commercial building" scenario.
ITEM 9	11	25, 26	The Port will review and comment on the Engineering Design Report and the Compliance Monitoring Plan data and conclusions.
ITEM 10	12	Section 3.0, 1st bullet	MW-B is on the South 160th Street right-of-way.
ITEM 11		Table B-1	Groundwater MTCA A table value should be 800 ug/L since benzene was detected in MW-B.
ITEM 12		Figure 4	What criteria were used to define the plume boundary, particularly near MW-B and MW-A? MW-19 should be included within the plume boundary, given the TPH-G increase to 1300 ug/L in 3/10, the most recent data available.

Ecology's Response:

General: Further input from the Port has been very productive and has included the installation of two additional wells as well as additional ground water quality information independently obtained by the Port at areas north and northwest of the site before or during the Port's redevelopment of its adjoining property (see attached Addendum in Section 3).

The Port conducted two investigations of groundwater during the mid to late 2000s. A 2004 groundwater investigation, in which three wells were installed, was conducted on Port property near the intersection of International Boulevard and S. 160th Street (northwest quadrant of intersection). Petroleum hydrocarbons were not detected in groundwater samples from these three wells that were subsequently decommissioned. The Port also conducted a baseline groundwater study, in which five borings were extended to the groundwater table and grab samples were obtained from temporary wells. The Port provided Ecology the results of its ground water grab samples obtained in September and October 2008 from temporary wells it installed on its property north and northwest of the Site plume. Results also showed nondetects for petroleum hydrocarbon compounds.

Two additional wells (Port MW-A and Port MW-B) were installed and sampled by the Port and the PLPs in August 2011. Port well MW-A, located north of the site and on Port property, yielded nondetects for any contaminants of concern that could be associated with the SeaTac Development site plume. Port well MW-B, located northwest of the site on South 160th Street right-of-way, detected gasoline and diesel and several gasoline petroleum compounds below MTCA cleanup Levels.

Ecology concludes that these preliminary results indicate the plume is not extensively on Port property and that the northwest sector of the plume may be beginning to migrate toward Port property in the vicinity just north of S. 160th Street. However, based on nearby concentrations in wells MW-22 and MW-17, the west edge of the plume above MTCA Cleanup Levels is expected to be below the Port's parking lot property west of the MasterPark parking lot and South of S. 160th Street. As pointed out by the Port, benzene concentrations may be expected to be in the order of 20 μg/L or greater in ground water in this area.

With the operation of the Soil Vapor Extraction and Air Sparging remedial alternative, concentrations in this area are expected to drop much lower than what preliminary ground water results are showing, decreasing the size of the plume and removing or mitigating the risks associated with the ground water plume, including vapor intrusion risks (please see our response below to Table Item 8). The DCAP and Compliance Monitoring Plan (CMP) provide an adequate monitoring network and schedule to monitor the plume's behavior, assess system performance, and natural attenuation processes. It will include the new well at the northwest, MW-B. The DCAP contains contingencies to install additional wells, assess corrective actions, and modify monitoring regimes if the plume for some reason is larger or if well concentrations increase.

Ecology believes that the preferred cleanup alternative should be implemented without any further delay in order to will reduce the site COCs, prevent further migration of the plume onto Port property, and remediate COCs to protect human health and the environment following MTCA requirements. Ecology does not foresee substantial gaps in characterization of the plume extent and risks once remediation is underway. Source and plume treatment is expected to reduce the footprint of the existing petroleum hydrocarbon contamination, especially the more volatile compounds like benzene, to the point that it no longer impacts adjoining properties, including the Port's.

Specific Responses to Table Items

ITEM 1 - Page 2, Item 1: Statement is in error. The Port has provided an aerial photograph that is shown in Addendum figures.

Ecology's Response: Ecology agrees. Due to incorporation of new Port structures in Addendum figures, the original comment has been addressed.

ITEM 2 - Page 2, Item 2: Please specify the vertical datum.

Ecology's Response: The vertical datum is the City of SeaTac, NAVD 88.

ITEM 3 - Page 2, Items 3, 4, & Figure 1: Till was logged in wells MW-4, Port_MW-1, and Port_MW-2 and should be shown on the figure.

Ecology's Response: Golder did not log the Port MW-1, Port MW-2 or Port MW-3 boreholes and will not extend their interpretation of the till on Port's property. The MasterPark well MW-4 borehole/well has been entered on the figure in the Addendum that is provided in Section 3.

ITEM 4 - Page 3, §3, Item 5: The Addendum should state that the next round of water level measurements will include MW-A and MW-B in the groundwater flow path analysis. Port will provide survey data when available.

Ecology's Response: Agreed. Port MW-B will be incorporated in the compliance monitoring plan. Port MW-A will not be included due to nondetects in this well and in previous ground water investigations in this area north of the site. Groundwater from Port MW-A well may be sampled after the remediation system is turned off for confirmation.

ITEM 5 - Page 3, §6, Item 5: When is sampling scheduled to begin under the Compliance Monitoring Plan? Was March 2010 the most recent sampling event?

Ecology's Response: Yes, March 2010 was the last time the MasterPark well network was sampled. Compliance monitoring will begin once the remedial system is installed and becomes operational. We have no interim groundwater monitoring plan right now.

ITEM 6 - Page 4, Item 6: Short-term increases in TPH-G and benzene values were reported at MW-22. The Port believes collection of additional groundwater monitoring data is necessary to determine whether contaminant concentrations are stable or declining in wells closest to Port property, especially near MW-B. A contingent task should be added to the addendum to increase the scope of sampling to include MW-A if nearby wells begin to show an upward trend.

Ecology's Response: The DCAP and CMP, through the Addendum, already incorporates compliance monitoring and trends determination using Monitored Natural Attenuation protocols, for groundwater from the Port MW-B well. Groundwater from Port MW-A well may be sampled after the remediation system is turned off for confirmation.

ITEM 7 - Page 6, Item 14: The Port understood at our June 2011 meeting that all data would be presented graphically as an aid to interpretation and results of all sampling events would be included. Also, TPH-G concentration above MTCA in March 2010 indicates that MW-19 should be included in the plots.

Ecology's Response: The Addendum appends a table with more data and details why all data could not be presented as a time series. The Tables in the RI/FS Report contain all the analytical data for groundwater in well MW-19 that could be plotted by anybody for aiding interpretation. Golder Associates will make a time series plot of MW-19 for TPH-Gasoline and send the plot directly to the Port.

ITEM 8 - Pages 7, 8, 9, & 12, Soil Vapor 1, 2, 3, & 4; Section 3.0 2nd bullet: The potential for vapor intrusion must be evaluated for the least restrictive property uses on the Port owned parking lot property south of South 160th Street. The RI/FS has only evaluated this pathway using a "commercial building" scenario.

Ecology's Response: The Port-owned property south of South 160th Street and adjacent west of the site is paved and zoned AVO (Aviation Operations). At the time of the RI/FS, it was undeveloped property and was completed as a parking lot in 2010. Currently, there is only a taxi dispatcher office building on the parcel that conservatively represents commercial land use. The Port property is presently not being used for residential land use, nor has the Port indicated that it has plans to develop the parcel for residential use in the near future within their Comprehensive Plan for the Airport area.

As part of the RI/FS, a (second) soil vapor investigation was conducted in 2009 at a residential building (Cemetery house) on the Washington Memorial Park Cemetery property. At that time the building was located immediately east of the newly constructed Port parking lot and closer to the center of the petroleum hydrocarbon plume. The potential for vapor intrusion was assessed due to a

concern that benzene or other petroleum-related VOCs might be volatilizing from the water table,[1] contaminating soil gas, and leading to unacceptable indoor air impacts.

Benzene was the only COC detected in the 2009 soil vapor samples which exceeded conservative soil vapor screening levels. The maximum concentration detected (16 $\mu g/m^3$) was less than the industrial (equivalent commercial) screening levels, but was about five times higher than the $1X10^{-6}$ unrestricted-use screening level (3.2 $\mu g/m^3$). Benzene levels in crawlspace air samples were no higher than ambient air concentrations. Based on these findings Ecology determined that the cemetery house did not require mitigation.

The cemetery house has subsequently been torn down and there are no buildings located in the nearby area. So there is no current vapor intrusion exposure pathway for this part of the site. It is true, though, that this could change in the future. If buildings were constructed in the area before the cleanup action had successfully reduced benzene concentrations at the water table to cleanup levels, it is possible that vapor intrusion could potentially threaten indoor air quality inside those new residential buildings. Should residential building construction occur, the PLPs will be responsible *at that time* for further assessing vapor intrusion to determine the potential for unacceptable indoor impacts.

The 2.4 μg/L Method B benzene groundwater screening level in Table B-1 of Ecology's Draft Vapor Intrusion Guidance (Publication No. 09-09-047 October 2009) is not a site-specific value. Nor is it intended for use as a Cleanup Level. It is a value that essentially determines whether vapor intrusion should or should not be further assessed. Since MasterPark groundwater levels of benzene exceeded this value, follow-up vapor intrusion assessment (primarily soil gas sampling) was performed during the RI. The assessment determined that even though groundwater concentrations of benzene significantly exceeded the Guidance screening level,[2] soil gas at 10 feet was only marginally above conservative screening levels, and crawlspace air was no more contaminated than ambient air. The groundwater benzene concentration protective of residential indoor air (via vapor intrusion), therefore, is likely to be considerably higher than 2.4 μg/l at the MasterPark site.

Reduced benzene concentrations at the saturated zone source and attenuation and biodegradation through 66 feet of vadose zone should, over time, reduce soil vapor concentrations considerably at the site. The Port property is located downgradient of the locations where soil gas samples were collected in 2009. It is over a part of the plume with benzene concentrations expected to be lower

---

[1] The water table is at a depth of over 66 feet below ground in this area (MW-16).

[2] Dissolved ground water benzene in MW-16 (nearest to the building) ranged from 51 μg/L to 160 μg/L, 20 to 60 times the Method B benzene groundwater screening level for vapor intrusion.

than those in the area where vapor intrusion measurements were taken during the RI/FS. The presence of the asphalt parking lot cap, and application of the SVE and Air sparging system should reduce ground water contaminant levels to a point where soil vapor risks are virtually eliminated at the Port's parking lot.[3]

The Port has noted that "While the Port's property is currently used for parking, the future use is not known at this time and could well involve residential uses. Therefore we think the analysis should be based on unrestricted usage. A further evaluation of the vapor intrusion pathway must be completed for that area of the benzene plume beneath Port property using unrestricted land use screening criteria."

Ecology agrees; it is possible that the property could be further developed, buildings could be constructed, and some or all of the buildings could be used for residential purposes. But based on Ecology's assessment of the 2009 sampling results near the cemetery building, it does not appear likely that vapor intrusion would need to be mitigated in any newly constructed building. The likelihood should become more remote with time, as the cleanup action reduces groundwater and soil gas benzene levels. Nevertheless, if the Port decides to construct residential buildings and convert the parking lot property to residential use before the preferred remedial alternative has achieved vapor intrusion-related remedial objectives, the PLPs will be responsible for further assessing the vapor intrusion threat associated with the new residential structures.

ITEM 9 - Page 11, Item 25, 26: The Port will review and comment on the Engineering Design Report and the Compliance Monitoring Plan data and conclusions.

Ecology's Response: Ecology agrees.

ITEM 10 - Page 12, Item Section 3.0, 1st bullet: MW-B is on the South 160th Street right-of-way.

Ecology's Response: Sentence will be revised.

ITEM 11 - Table B-1: Groundwater MTCA A table value should be 800 ug/L since benzene was detected in MW-B.

---

[3] The MTCA Method A ground water cleanup level for benzene at the site is 5 μg/L. This is only twice the vapor intrusion Guidance's Method B ground water screening level of 2.4 μg/L for unrestricted land use, which, as noted above, appears to be overly conservative for this site.

Ecology's Response: Ecology agrees. Entry in Table B-1 will be revised to show a MTCA Method A value of 800 μg/L for TPH-Gx.

ITEM 12 - Figure 4: What criteria were used to define the plume boundary, particularly near MW-B and MW-A? MW-19 should be included within the plume boundary, given the TPH-G increase to 1300 ug/L in 3/10, the most recent data available.

Ecology's Response: The plume boundary in Figure 4 is estimated based on hydrogeologic and geochemical principles using the applicable MTCA Method A ground water cleanup level for dissolved gasoline (TPH-Gx) and petroleum related compounds. The Addendum will be revised to use the March 2010 plume footprint for TPH-Gx (Figure 4-6 in the RI/FS Report) for Figure 4. This will include MW-19 in the plume boundary.

APPENDIX A. ORIGINAL COMMENTS

(NEXT PAGE)

APPENDIX A. ORIGINAL COMMENTS

A.1 Rachelle Goda: Email Sent to Ecology Site Manager Jerome Cruz on Friday, April 22, 2011 7:21 PM:

-----Original Message-----
From: rachellegoda@yahoo.com [mailto:rachellegoda@yahoo.com]
Sent: Friday, April 22, 2011 7:21 PM
To: Cruz, Jerome (ECY)
Subject: SeaTac Development Site

Hi,
Thank you for sending out information about SeaTac Development site. I just have a few question?
-How far from the site area are contaminated?
-How was it determined that no drinking source is contaminated?
-What health risks are there now, because of the contamination?
-Who will oversee and manage the cleanup process from the contaminated site?
-What are the risk for any residents nearby when the cleanup process occur?
-How was it known that the area was contaminated?

Thank you for your time and answering these questions?

Rachelle Goda

-----Original Message-----
From: rachellegoda@yahoo.com [mailto:rachellegoda@yahoo.com]
Sent: Tuesday, April 26, 2011 8:27 AM
To: Cruz, Jerome (ECY)
Subject: Re: SeaTac Development Site

Thank you! I hope your having a good day. I would like to add a few more questions.
-How is the clean-up being funded?
-Are there enough funding to clean-up the contamination?
-What is the role of SeaTac Investment LLC, ANSCO Properties LLC, and other businesses that caused the contamination in regarding to funding and clean-up?
-Are those businesses listed above involve in clean-up and funding?

Thank you again for your time,

Rachelle Goda

On Apr 25, 2011, at 8:13 AM, "Cruz, Jerome (ECY)" <JCRU461@ECY.WA.GOV> wrote:

Good morning Ms. Goda,
I will get back to you to answer your questions about the SeaTac Development site.
Thank you,
Jerome

Jerome B. Cruz, Ph.D.
Toxics Cleanup Program, Northwest Regional Office
3190 - 160th SE Bellevue, WA 98008
Tel: (425) 649-7094 Fax: (425) 649-7098
Jerome.Cruz@ecy.wa.gov
http://www.ecy.wa.gov/programs/tcp/cleanup.html
-----Original Message-----
From: rachellegoda@yahoo.com [mailto:rachellegoda@yahoo.com]
Sent: Tuesday, April 26, 2011 4:35 PM
To: Cruz, Jerome (ECY)
Subject: Re: SeaTac Development Site
Thank you for your reply and answer.
Rachelle Goda

On Apr 26, 2011, at 8:44 AM, "Cruz, Jerome (ECY)" <JCRU461@ECY.WA.GOV> wrote:

Good morning Rachelle,
To save me some time, I will answer your latest questions.

-How is the clean-up being funded?
ANSWER:
It is being paid for by the Potentially Liable Parties or PLPs (Sea-Tac Investments LLC, Scarsella Bros. Inc., and ANSCO Properties, LLC).

-Are there enough funding to clean-up the contamination?
ANSWER:
It is the PLPs responsibility to ensure they have sufficient funding under Model Toxics Control Act administrative orders. To actually carry out the cleanup, we will see what mechanism will be used to execute the cleanup, such as a consent decree or agreed order. For the present agreed order, the PLPs has been funding the investigations that produced the RI/FS report and DCAP.

-What is the role of SeaTac Investment LLC, ANSCO Properties LLC, and other businesses that caused the contamination in regarding to funding and clean-up?
ANSWER:
They are the PLPs and are under an Agreed Order to complete an RI/FS and DCAP. An Agreed Order is a legal document that formalizes the agreement between the PLPs and Ecology for actions needed at the site.

-Are those businesses listed above involve in clean-up and funding?
ANSWER:
Yes (see answer to first question for complete list).

You can download a copy of the Agreed Order as well as Fact sheets on the site at:
http://www.ecy.wa.gov/programs/tcp/sites/seaTacDev/seaTacDev_hp.html

I hope to get back to you with the answers to questions from your first email soon.

Thanks,
Jerome

Jerome B. Cruz, Ph.D.
Toxics Cleanup Program, Northwest Regional Office
3190 - 160th SE Bellevue, WA 98008

Tel: (425) 649-7094 Fax: (425) 649-7098
Jerome.Cruz@ecy.wa.gov
http://www.ecy.wa.gov/programs/tcp/cleanup.html

-----Original Message-----
From: rachellegoda@yahoo.com [mailto:rachellegoda@yahoo.com]
Sent: Tuesday, May 17, 2011 8:15 AM
To: Cruz, Jerome (ECY)
Cc: <DMorell@golder.com>; Longley, Kirsi; Lui, Nancy (ECY)
Subject: Re: SeaTac Development Site

Hello Mr. Cruz,
I hope you are enjoying this day. I am appreciative of your time and researching to answer the questions. Please keep me posted of any new information. Thank you again and continue doing and excellent job of overseeing this project. Have a wonderful day.
Rachelle Goda

On May 16, 2011, at 10:29 AM, "Cruz, Jerome (ECY)" <JCRU461@ECY.WA.GOV> wrote:
Hello, Ms. Goda,
I apologize for the delay in getting back to you on your first set of questions. Here are the answers to your questions. Please feel free to contact me again if I can explain further.
Jerome

QUESTION
-How far from the site area are contaminated?
ANSWER
Past investigations revealed that soil contamination is within the property boundary. The area of contaminated groundwater is wider, extending north past south 160th Street, and also west onto the adjoining property to the MasterPark Facility. However, groundwater is at least 50 feet deep beneath the site. The attached maps should help with the more detailed description provided below.

For soil, a source of gasoline impacted soils exists within the MasterPark Facility near the location of the former gasoline USTs at the northwest corner of the property. Relative concentrations of gasoline (and BTEX) in the source area are highest at depths between 10 feet and 40 feet below ground surface and decrease in concentration as you go deeper. It is limited to a zone with an area of approximately 50 to 60 foot diameter. There are some smaller limited spots of petroleum

hydrocarbon impacted soil beneath the asphalt parking lot in the Masterpark Facility.

The property which is further north of the MasterPark property may contain its own subsurface contamination source. However, the property owner has not agreed to accessing their property and so the approach adopted will be to observe the groundwater concentrations in nearby wells while groundwater cleanup at the MasterPark Facility is carried out to see if it will indicate a source at this nearby property that impacts groundwater.

Ground water is a key medium of contamination at the site. Groundwater is between 45 and 115 feet below land surface. Groundwater analytical results confirm that the source of impact is bounded by MW-12 to the north, MW-14 to the south, MW-18 to the east, and MW-13 to the west. This is demonstrated by gasoline isoconcentration contour maps that were developed for the 2007-2008 (Figure 4-3) and May 2009 (Figure 4-4) groundwater sampling events, attached as a file to this message. These figures show that the highest concentrations of gasoline were detected in MW-12, MW-13, MW-14, and MW-18. With distance from these wells, the concentration of gasoline in groundwater steadily decreases.

The plume is roughly 640 feet across.

The plume is well delineated, except for the area to the northwest where heavy construction by the Port of Seattle north of South 160th Street has prevented further investigation. The groundwater gasoline plume is estimated to have migrated about 140 feet beyond MW-22, which is depicted in Figure 4-6. The gasoline plume will eventually be further delineated northwest of MW-22 through the installation of an additional well(s).

QUESTION
-How was it determined that no drinking source is contaminated?
ANSWER
There are no potable groundwater supply wells within a mile of the Site in the general downgradient direction (west, southwest or northwest) from the Site. The closest groundwater supply well is in the Washington Memorial Park Cemetery, south of the Site, and is used for watering. However, this cemetery well has not been impacted by Site releases (as per results from Ecology's 2006 and Golder's 2001 sampling events). Therefore, there are no current groundwater exposure pathways to off-Site humans from drinking water impacted by Site release.

There is no known discharge of Site groundwater to surface water in the area, including the potential
wetland area and man-made pond on the cemetery property south of the Site.

Ground water samples collected from monitoring wells surrounding the site show no petroleum hydrocarbon compounds above cleanup levels in the water. This helped establish the limits of most of the plume in relationship to the nearest potable groundwater supply well, which is over a mile away.

QUESTION
-What health risks are there now, because of the contamination?
ANSWER
Future MasterPark Facility construction/remediation workers could become exposed by direct contact and
incidental ingestion to Site near-surface soils (<15 feet) during construction excavation or impacted soil
removal activities in the vicinity of the source area (former gasoline USTs at the MasterPark Facility).

There is a potential risk from vapor intrusion, however, based on some soil gas studies conducted, there is little if any risk because the levels are very low, as low or lower than air borne levels measured from nearby street traffic (ambient air).

QUESTION
-Who will oversee and manage the cleanup process from the contaminated site?
ANSWER
The Department of Ecology and the Potentially Liable parties are presently under an Agreed Order to conduct an remedial investigation and feasibility study. Ecology is the state lead that ensures that the cleanup process follows the Model Toxics Control Act (MTCA). Technical work is paid for by the PLPs.

QUESTION
-What are the risk for any residents nearby when the cleanup process occur?
ANSWER
There should be little if any risk when the preferred remedial alternative is carried out to clean up the groundwater contamination. The air sparging system and soil vapor extraction systems will be on the property and off limits to the public. There is a Health and Safety, a

Performance and Compliance Monitoring Plan, and a Confirmational Monitoring Plan to ensure the systems are implemented safely and that the remediation is effective and protective. Groundwater and air will be monitored during and after the operations to ensure the systems are performing and that existing hazards to people at the site are minimized.

QUESTION
-How was it known that the area was contaminated?
ANSWER
In 2000 during development of the property, Sea-Tac Investments found petroleum contamination in soil and groundwater. High levels of gasoline were found in the groundwater aquifer 50-60 ft. beneath the property. Contamination seemed to be from equipment operations and old underground storage tanks used by the former owner or former tenants. In 2001 Sea-Tac Investments entered into Ecology's Voluntary Cleanup Program to investigate and clean up some of the contamination. Ecology gave Sea-Tac Investments a "No Further Action" letter for cleanup of the soil. The gasoline contamination in the aquifer extends beyond property boundaries and was not cleaned up at that time.

There were later investigations to find the source of contamination in the aquifer. A series of investigations and remedial actions were conducted starting in September 2000 with a Phase I Environmental Site Assessment (ESA) followed by Phase II ESA investigations and culminating in September 2001 with an independent remedial action (IRA) conducted in coordination with property development. Ecology performed groundwater sampling at the Site in 2006, and remedial Site investigations resumed in 2007. The activities and results of these investigations are reported in the RI/FS report that is available to the public for review and comment.

Jerome B. Cruz, Ph.D.
Toxics Cleanup Program, Northwest Regional Office
3190 - 160th SE Bellevue, WA 98008
Tel: (425) 649-7094 Fax: (425) 649-7098
Jerome.Cruz@ecy.wa.gov
http://www.ecy.wa.gov/programs/tcp/cleanup.html

-----Original Message-----
From: rachellegoda@yahoo.com [mailto:rachellegoda@yahoo.com]
Sent: Friday, April 22, 2011 7:21 PM
To: Cruz, Jerome (ECY)
Subject: SeaTac Development Site

Hi,
Thank you for sending out information about SeaTac Development site. I just have a few question?
-How far from the site area are contaminated?
-How was it determined that no drinking source is contaminated?
-What health risks are there now, because of the contamination?
-Who will oversee and manage the cleanup process from the contaminated site?
-What are the risk for any residents nearby when the cleanup process occur?
-How was it known that the area was contaminated?

Thank you for your time and answering these questions?

Rachelle Goda
<SeaTacDevt RI-FS Final Report Fig4-3.jpg>
<SeaTacDevt RI-FS Final Report Fig4-4.jpg>
<SeaTacDevt RI-FS Final Report Figs4-6.jpg>

A.2 Lena Kuliczkowska: Email Sent to Ecology Site Manager Jerome Cruz dated Friday, April 29, 2011 11:12 AM

-----Original Message-----

From: Lena Kuliczkowska [mailto:lkuliczkowska@ci.seatac.wa.us]
Sent: Friday, April 29, 2011 11:12 AM
To: Cruz, Jerome (ECY)
Subject: new development project v cleanup

Hi Jerome,

A new SeaTac development, called Master Park Lot C Expansion, is located west from the existing Master Park on International Blvd and S 160th St. (except Mr. Loudon property). The area for the proposed Surface Parking is in lease, and is part of Washington Memorial Cemetery.

Could you please give us more information how the Cleanup Program ID# 5994 will affect the design and construction of the new parking area?

Thank you,

Lena

Lena Kuliczkowska
Senior Engineering Technician
City of SeaTac
Engineering Division
206.973.4737

A.3 Ronny Seldal: Letter to Ecology Site Manager Jerome Cruz dated May 3, 2011:

Facility Site ID #: 3825 8847
Cleanup ID #: 5994

Page: 1 of 3

5/3/2011

From: Ronny SELDAL
3115 So. 166th St.
SeaTac, WA 98188
Ph. 206-431-1041

RECEIVED
MAY 04 2011
DEPT OF ECOLOGY
TCP-NWRO

My Comment has to do with a business just across the street, less than ½ block away from the site you are asking for comments about. Address below.

Address: "Carlos' Paint Shop" – Formerly: "M and M Finishing"
16600 International BLVD
SeaTac, WA 98188

The owner of the propety has been trying to sell it for the last two – three years because he was being visited by Enviromental Health Investigators from Hazardous Waste Management Program for Exhausting Hazardous Fumes into the neighborhood just East of the business at 16600 International BLvd.

Now, the owner is renting to a Paint Shop which is venting Fumes into the neighborhood. There has been a Ramada Hotel and a Bank of America built very close to this paint Shop, Which as you know had to move there to make room for the new Light Rail system. I did a little research and come to find out the old business, M+M Finishing, was told they had to upgrade their paint fume exhaust System, which included a 30 foot high vent that would vent the fumes 30 feet above the

roof of the buildng. But, because of the restrictions in this area the city would not issue a permit to allow such a structure. ALso, the cost of upgrading the Finishing companies exhaust system inside the building was too much for the Owner of the Property and that's why he was trying to sell it. I also Learned that the ground under the building is Completely saturated with hazarous material and to remove it would cost over two times the Value of the property because of the new regulations reguarding soil with hazarous material. It's my understanding it goes very deep under the building.

As you know there is a well up on top the hill which helps supply the City of SeaTac with water. I have had a sink hole in my driveway that was about 3½ feet and about 4 or 5 inches around at the top that I filled in with gravel from my driveway. My neighbor drained his pool and a week later he asked me if I noticed any excess water in my yard and I said NO. My point is that this whole hill side has a lot of undergroun water and it be pushing all that hazarous materia under the building at 16600 International Blvd righ into your Site of concern for a long time, as wel as right now.

So, to sum up, this property at 16600 Int. Blvd is hazarous property to the Public both in the Air quality and in the ground soil for Blocks Around

So, my comment would be:

Is there some way of get with the property owner and see what it would take to clean up the hazarous soil and maybe work with him to find funding for this cleanup. If he is still selling it maybe the city can purchase it in order to get federal funding. The city could even purchase the property and put a road through it, 166th, right to International BLV. I'm just brain storming here; But if this property could be cleaned up some way it would make it safer for the public and the animals in the pond across the street in the Cemetery and of course your site for the parking lot just across and down from it.

P.S. I'm sorry about being hand written. I'm getting a laptop pretty soon so, please forgive me for the punctuation, spelling and sentence structure.

Sincerely,

Ramy Abdel

* P.P.S.S. There is already a sink hole starting in the middle of International BLVD. There is an arrow board directing traffic around it.

Transcribed Letter follows:

My comment has to do with a business just across the street, less than ½ block away from the site you are asking for comments about. Address below.

Address: Carlos Paint Shop-Formerly: M and M Finishing 16600 International Blvd, SeaTac, WA 98188.

The owner of the property has been trying to sell it for the last two-three years because he was being visited by Environmental Health Investigators from Hazardous Waste Management Program for exhausting hazardous fumes into the neighborhood just east of the business at 16600 International Blvd.

Now, the owner is renting to a Paint Shop which is venting fumes into the neighborhood. There has been a Ramada Hotel and a Bank of America built very close to this paint shop, which as you know had to move there to make room from the new Light Rail System. I did a little research and come to find out the old business, M&M Finishing, was told they had to upgrade their paint fumes exhaust system, which included a 30 foot high vent that would vent the fumes 30 feet above the roof of the building. But, because of the restrictions in this area the city would not issue a permit to allow such a structure. Also, the cost of upgrading the finishing companies exhaust system inside the building was too much for the owner of the Property and that's why he was trying to sell it. I also learned that the ground under the building is completely saturated with hazardous material and to remove it would cost over two times the value of the property because of the new regulations reguarding [sic] soil with hazardous material. It's my understanding it goes very deep under the building.

As you know there is a well up on the top the hill which helps supply the city of seatac with water. I have had a sink hole in my driveway that was about 3 ½ feet and about 4 or 5 inches around the top that I filled in with gravel from my driveway. My neighbor drained his pool and a week later he asked me if I noticed any excess water in my yard and I said No. My point is that this whole hill side has a lot of underground water and it be pushing all that hazardous material under the building at 16600 Int. BLvd right into your site of concern for a long time, as well as right now.

So, my comment would be:

Is there some way of get with the property owner and see what it would take to cleanup the hazardous soil and maybe work with him to find funding for this cleanup. If he is still selling it maybe the city can purchase it in order to get federal funding. The city could even purchase the property and put a road through it, 166th, right to International BLV. I'm just brain storming here; But if this property could be cleaned up some way it would make it safer for the public and the animals in the pond across the street in the cemetery and of course your site for the parking lot just across and down from it.

P.S. I'm sorry about being hand written. I'm getting a laptop pretty soon so, please forgive me for the punctuation, spelling and sentence structure.

*P.P.S.S. There is already a sink hole starting in the middle of International BLVD. There is an arrow board directing traffic around it.

A.4 Don Robbins with Port Of Seattle: Letter to Ecology Site Manager Jerome Cruz dated May 27, 2011

Port of Seattle

May 27, 2011

Jerome Cruz
Site Manager
Washington State Department of Ecology
Northwest Regional Office
3190 160th Ave SE Bellevue, WA 98008

Dear Mr. Cruz:

Thank you for the opportunity to provide comments on the SeaTac Development (MasterPark Lot C) site's Remedial Investigation/Feasibility Study (RI/FS) report, and Draft Cleanup Action Plan (DCAP). Attached you will find the Port of Seattle's technical comments on these documents.

As you know, the Port of Seattle owns the property directly to the north of the SeaTac Development site, and has provided SeaTac Development access to Port monitoring wells as part of its data collection activity for this RI/FS. Currently under construction on this property is a large consolidated rental car facility (CRCF) that is scheduled to open in early 2012. The major structural elements of that facility are already in place, as can be seen in the attached aerial photo.

The findings of the SeaTac RI strongly suggests that gasoline- and benzene-impacted groundwater have migrated from the SeaTac Development site to the adjacent Port of Seattle property at levels exceeding cleanup standards.

The Port has two overarching concerns about the RI/FS and DCAP:

- Lack of evaluation of the vapor intrusion pathway on Port property at the new CRCF,
- The proposed use of monitored natural attenuation (MNA) to address cleanup of the groundwater plume on Port of Seattle property in the absence of details on how this will be monitored and evaluated, particularly in light of the location of the new structure relative to otherwise logical monitoring locations.

The Port will work with the Department of Ecology and SeaTac Development to facilitate the increased level of monitoring required to demonstrate the effectiveness of MNA, and to assure that the PLP's evaluation the risk of vapor intrusion has no impact on buildings on Port property.

Port of Seattle

We request that Ecology and SeaTac Development maintain close communication and coordination with the Port to enable a timely site remediation consistent with the actual use of the Port's adjacent property. Such remediation should include elements that actively manage any existing groundwater contamination conditions on the Port's property, prevent any new or additional migration of groundwater contamination to the Port's property, and assess and as necessary the potential for vapor intrusion and human exposures at the Port's property.

With these specific requests in mind, the Port further requests the Ecology provide to the Port all draft and final documents associated with plans for and results of additional investigations needed to resolve data gaps identified in the attached comments, and development and implementation of the final DCAP.

Thank you again, we look forward to hearing from you on this matter.

Sincerely,

Donald A. Robbins
Senior Environmental Program Manager
Port of Seattle — Seattle-Tacoma International Airport

Documents Referenced

Golder Associates (RIFS), 2010, Remedial Investigation/Feasibility Study, Sea-Tac Development Site, Seatac, Washington, September 17, 2010.

Golder Associates (DCAP), 2011, Draft Cleanup Action Plan, Sea-Tac Development Site, Seatac, Washington, April 14, 2011.

Washington State Department of Ecology (Ecology), 2005, Guidance on Remediation of Petroleum-Contaminated Ground Water by Natural Attenuation, Toxics Cleanup Program, Publication No. 05-09-091 (Version 1.0), July 2005.

Washington State Department of Ecology (Ecology), 2009, Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action, Review DRAFT, Toxics Cleanup Program, Publication No. 09-09-047, October 2009.

Site Mapping

1. An outline of new Port RCF structures (Port property), north of South 160th Street, on figures would be useful to show current land use and adjacent site conditions.
2. Identification of survey datums (not specified in RIFS §3.4) would be helpful for comparisons with Port data.

Hydrogeology

3. Preparation of geologic cross sections is highly recommended for hydrogeologic evaluation and for review of conclusions and proposed remediation alternatives. No geologic cross sections were presented in the RIFS or DCAP.
4. The presence or absence of glacial till could affect contaminant migration and soil vapor pathways. Preliminary review indicates that the till unit appears to be discontinuous within the identified boundaries of the contaminant plumes[1]. A map of till thickness, and identification of any other confining units, would be very helpful for interpretations and evaluations.
5. About thirteen wells were used to define groundwater flow directions south of South 160th Street. However, there are no monitoring wells north of South 160th Street to define local flow directions on the Port property. Since the groundwater contours in this area are relatively flat (i.e. hydraulic gradients are small), there is no guarantee that flow directions on the Port property are the same as on the MasterPark site. Item 6, below, notes that there are logistical constraints in locating wells on the Port property.

[1] Absence of till is noted at MasterPark well MW-22 and Port borings (RCF baseline study) located about 90 feet north and 200 feet north-northwest of MasterPark well MW-16. Till has been interpreted on the site (e.g. MW-9, MW-1, and MW-7) and also on Port property (at the southeast corner and thence north along International Blvd).

Groundwater Monitoring

6. The Compliance Monitoring Plan (CMP) (Attachment E to DCAP) proposes only one new monitoring well on Port property; MW-X was positioned about 270 feet northwest of MW-22, which appears to fall within an RCF structure. Logistical constraints, due to access issues associated with the new Rental Car Facility, are not addressed for locating monitoring well(s) on or near the Port property.
7. Would one well be sufficient for defining plume boundaries and monitoring natural attenuation on Port property?
8. Well MW-23, located 130 feet east of MW-15, appears to have been removed from the monitoring well network (e.g. DCAP Figure 9 and Attachment E, Compliance Monitoring Plan §5.1). No monitoring well(s) is proposed to bound contaminant plumes on Port property north or east of MW-15. Should MW-23 be retained in the groundwater monitoring network?

Contaminant Plumes in the Regional Qva Aquifer

9. Gasoline and benzene plumes were estimated to be migrating to the northwest onto Port property (RIFS §4.4.2.1, pg 38). The methodology used (RIFS §4.4.2.1) assumed only an advective (bulk movement) process and further assumed a northwest groundwater flow direction. Contamination migration by diffusion and dispersion processes does not appear to have been addressed. The actual extent of gasoline and benzene plumes onto Port property has not been determined.
10. Have the groundwater contaminant plumes been demonstrated to be shrinking, stable, or growing? Gasoline concentration data at MW-22, for example, may indicate an expanding plume.
11. As noted in the RIFS, opportunities for monitoring wells are limited north of South 160th Street. One monitoring well was proposed on Port property, but see Item 6 related to logistical constraints.
12. As groundwater flow directions on Port property have not been determined (Item 5), the assumption of northwest flow from MW-22 requires further investigation.
13. Analysis of diffusion and dispersion effects on contaminant migration would improve estimates of the extent of contamination plumes onto Port property.
14. For interpretation, it would be helpful to extend the time scale of groundwater COC time series (trend) plots to cover all available historical data. The plots currently show data from August 2007 to March 2010, while it appears that the first regional groundwater monitoring wells were installed and sampled in 2001.
15. The extent of vertical migration of contaminants into the Qva aquifer should be more closely evaluated. Statements in the RIFS suggest no vertical migration has occurred (RIFS §4.4.2.1, pg 39 and §4.4.2.2, pg 40). However, deep well MW-10 was screened about 95 below ground surface (bgs), about 40 feet into the aquifer, and had initial detections of gasoline at 1,600 µg/L and benzene at 31 µg/L after well installation in 2001. The boring log indicated

petroleum odors and elevated PID readings to a depth of 60 feet below ground surface, or 15 feet into the aquifer saturated zone.

Soil Vapor Issues

16. Vapor intrusion screening levels were exceeded near South 160th Street for groundwater (above Method B and very close to Method C) and for shallow soil (above Method B but below Method C). Assessment of vapor intrusion exposure pathways for any new RCF structures may be appropriate.
17. The DCAP does not propose soil vapor monitoring or further vapor intrusion evaluation. The RIFS (§4.3.2) implies that a risk analysis for benzene using Method C, shallow soil, screening level (32 µg/L) found no risk to indoor commercial workers. The DCAP (§3.5.3) indicates that a vapor intrusion "Tier I preliminary assessment"[2] was performed with the conclusion that since "soil vapors are below shallow soil screening levels at the property boundary, there is no unacceptable risk from vapor intrusion into current commercial buildings to workers on the Site (but off of the MasterPark Facility)." The basis for stating that "soil vapors are below shallow soil screening levels" evidently refers to the benzene Method C, shallow soil, screening level of 32 µg/L. However, the benzene concentration in groundwater at MW-22 was 23 µg/L, which is very close to the MTCA C groundwater screening level of 24 µg/L. The elevated benzene concentration indicates that a vapor intrusion pathway from groundwater may need to be further evaluated under areas of the contaminant plume outside of the source area. Have off-site, potential vapor intrusion issues related to high benzene concentration in MW-22, observed during March 2010 sampling, been addressed?
18. The vapor intrusion risk analysis (RIFS §4.3.2) and "Tier I preliminary assessment" (DCAP §3.5.3) mentioned in the RIFS and DCAP, respectively, were not referenced and therefore not reviewed. Can these studies be provided for review? Did these studies evaluate the 2009 shallow soil vapor results near the Cemetery residence and the groundwater benzene concentrations in MW-22?
19. Vapor migration pathways, such as subsurface utility line (SUL) trenches, have not been considered.

Preferred Remediation Alternative

Monitored Natural Attenuation in Groundwater

20. The RIFS and DCAP propose monitored natural attenuation (MNA) of the contaminant plumes, outside the treatment area and including off-site properties. The MNA process requires multiple lines of evidence for reaching a determination that natural attenuation is

[2] This terminology is not clear. Ecology (2009, pg 3-1) states that the recommended vapor intrusion evaluation process consists of three steps: Preliminary Assessment, Tier I Assessment, and Tier II Assessment.

occurring, including (1) long-term decrease of contaminant concentrations, (2) assessment of geochemical parameters, and (3) microbial studies. Evaluation of monitored natural attenuation (MNA) was not addressed in the RIFS (§7.1.2, pg 55) and appears to be described only by reference to the Ecology (2005) guidance document in the DCAP (Attachment E, CMP §5.1.3). Please provide additional details on the proposed MNA assessment process.

22. The DCAP does not appear to have specified a feasible plan for groundwater monitoring north of South 160th Street.
23. The CMP lists contaminants and geochemical parameters (DCAP, Attachment E, CMP Table 1 footnotes) and sampling parameters (DCAP, Attachment E, CMP §6.2.2) for MNA. Redox (Eh) and dissolved oxygen (DO) are commonly measured sampling parameters that should be included.

Active Remediation

24. Does the proposed remediation Alternative A provide for effective capture of vapors generated by air sparging? The air sparging will occur at about 50 feet below ground surface and 10 to 20 below the till layer, where present. How will the combination of extraction wells and trenching work given these two features may be separated by a till layer? Can lateral migration of vapors occur such that vapors bypass the capture zone?
25. At what depth in the regional aquifer will the sparging wells be completed? See Item 15 above regarding vertical migration of contaminants deeper into the water table.
26. What depths are proposed for the extraction wells and trenching?
27. Does the proposed plan adequately provide for monitored natural attenuation of off-site plumes, especially for the Port property north of South 160th Street? See related comments above under *Groundwater Monitoring* and *Contaminant Plumes in the Regional Qva Aquifer*.
28. In the discussion of remediation alternatives, it would be helpful if scores, weighting values, and alternatives B1 and B2 were included in the RIFS §8 subsections. The list in RIFS §8.3.4 appears to have Alternatives B and E reversed.
29. A pre-design evaluation does not appear to have been performed to estimate radius of influence of the sparging or extraction wells. A radius of influence for air injection wells was assumed to be 25 feet (50-foot well separation).

Don Robbins with Port of Seattle: Email dated Wednesday, October 5, 2010 3:34 PM

From: Robbins, Don [mailto:Robbins.D@portseattle.org]
Sent: Wednesday, October 05, 2011 3:34 PM
To: Cruz, Jerome (ECY)
Subject: SeaTac Development RI/FS Addendum Comments

Jerome,

Thank you for the opportunity to comment on the September 15, 2011, Addendum to the Sea-Tac Development Site RI/FS and DCAP. A spreadsheet with detailed comments is attached, but our primary concerns are as follows:

Vapor Intrusion Analysis

The vapor intrusion analysis is still inadequate to determine whether future users of Port property will be protected from health risks. First, the text on soil vapor issues addressed only buildings north of South 160th Street. The Addendum also needs to address soil vapor issues for usage of the Port's property located south of South 160th Street. Second, the analysis looked only at commercial use. While the Port's property is currently used for parking, the future use is not known at this time and could well involve residential uses. Therefore we think the analysis should be based on unrestricted usage.

As you know, in June we met with you and SeaTac Development to discuss this concern (among other things). At that time, the Port was advocating that additional sampling be conducted on the parking lot property. Instead of installation of an additional well, we agreed to accept that the level of contaminant concentrations depicted on isoconcentration maps created for the remedial investigation is a reasonable approximation of what sampling would establish. We would like to point out that these maps show concentrations of benzene in groundwater greater than 20 ug/liter at this location. This significantly exceeds the Method B groundwater screening level of 2.4 ug/liter for benzene contained in table B-1 of Ecology's Draft Vapor Intrusion Guidance. In addition, soil vapor measurements near the Cemetery residence exceeded the Method B soil gas, sub-slab screening level of 3.2 ug/liter for benzene. A further evaluation of the vapor intrusion pathway must be completed for that area of the benzene plume beneath Port property using unrestricted land use screening criteria.

Sufficiency of Delineation

The Addendum concludes that the plume has been sufficiently delineated. Given increases in TPH-G and benzene at MW-22 during the last two sampling rounds, the Port believes a "wait and see" position is more appropriate. The Addendum should include a thorough review of the plume stability after a year of quarterly data has been acquired. At that time, if concentrations of TPH-G and/or benzene show an upward trend in nearby wells, then MW-A should be re-sampled. We believe providing for this contingency is a more protective approach to the potential risks.

Thanks again for the opportunity to comment, please give me a call if you have any questions,

Don Robbins
Port of Seattle
Aviation/Environmental
(206) **787**-4918

robbins.d@portseattle.org

All email to or from this account
is public and may be subject to disclosure.

Contents of Attached File "Copy of Addendum_Comments_093011 (3).xlsx"

Port of Seattle Comments 9/30/11 on:

Golder Associates, Inc., 2011, Technical memorandum, Addendum to SeaTac Development Site RI/FS and Draft CAP, September 15, 2011.

Page	Item	Comment
2	1	Statement is in error. The Port has provided an aerial photograph that is shown in Addendum figures.
2	2	Please specify the vertical datum.
2	3, 4, & Figure 1	Till was logged in wells MW-4, Port_MW-1, and Port_MW-2 and should be shown on the figure.
3, §3	5	The Addendum should state that the next round of water level measurements will include MW-A and MW-B in the groundwater flow path analysis. Port will provide survey data when available.
3, §6	5	When is sampling scheduled to begin under the Compliance Monitoring Plan? Was March 2010 the most recent sampling event?
4	6	Short-term increases in TPH-G and benzene values were reported at MW-22. The Port believes collection of additional groundwater monitoring data is necessary to determine whether contaminant concentrations are stable or declining in wells closest to Port property, especially near MW-B. A contingent task should be added to the addendum to increase the scope of sampling to include MW-A if nearby wells begin to show an upward trend.
6	14	The Port understood at our June 2011 meeting that all data would be presented graphically as an aid to interpretation and results of all sampling events would be included. Also, TPH-G concentration above MTCA in March 2010 indicates that MW-19 should be included in the plots.
7, 8, 9, & 12	Soil Vapor 1, 2, 3, & 4; Section 3.0 2nd bullet	The potential for vapor intrusion must be evaluated for the least restrictive property uses on the Port owned parking lot property south of South 160th Street. The RI/FS has only evaluted this pathway using a "commercial building" scenario.
11	25, 26	The Port will review and comment on the Engineering Design Report and the Compliance Monitoring Plan data and conclusions.
12	Section 3.0, 1st bullet	MW-B is on the South 160th Street right-of-way.
	Table B-1	Groundwater MTCA A table value should be 800 ug/L since benzene was detected in MW-B.
	Figure 4	What criteria were used to define the plume boundary, particularly near MW-B and MW-A? MW-19 should be included within the plume boundary, given the TPH-G increase to 1300 ug/L in 3/10, the most recent data available.

APPENDIX B. TECHNICAL MEMORANDUM

RE: ADDENDUM TO SEATAC DEVELOPMENT SITE RI/FS AND DRAFT CAP

(NEXT PAGE)

TECHNICAL MEMORANDUM

Date:	October 11, 2011	**Project No.:**	073-93368-05.03
To:	Jerome Cruz	**Company:**	Washington State Department of Ecology
From:	Douglas Morell & Kirsi Longley		
cc:	Donald A. Robbins, Port of Seattle	**Email:**	DMorell@golder.com KLongley@golder.com

RE: ADDENDUM TO SEATAC DEVELOPMENT SITE RI/FS AND DRAFT CAP

1.0 INTRODUCTION

This Golder Associates Inc. (Golder) Technical Memorandum is an Addendum to the SeaTac Development Site's Remedial Investigation/Feasibility Study (RI/FS) and Draft Cleanup Action Plan (CAP) (Golder 2011a) that were submitted to the Washington Department of Ecology (Ecology) on April 14, 2011 and underwent a public comment period during May 2011. This addendum will be attached to Ecology's Responsiveness Summary to the Final CAP. The Port of Seattle comments (presented in a letter dated May 27, 2011) represented the bulk of comments received by Ecology. A conference call with Ecology, the Port of Seattle and the SeaTac Development Site's PLP Group (PLP Group) representatives was held on June 14, 2011 and a follow-up meeting was conducted on June 27, 2011 to discuss the Port of Seattle's comments. Based on the conference call and meeting with Ecology and the Port of Seattle, each comment was discussed and categorized according to the four following criteria:

- Category 1: Important issue to revise and re-issue the RI/FS or Draft CAP
- Category 2: Requires a written explanation as a response in the Responsiveness Summary or an amendment to the RI/FS or Draft CAP without re-issuing either document for public review
- Category 3: Requires a written explanation as a response in the Responsiveness Summary, does not require re-issuing of either the RI/FS or DCAP
- Category 4: Requires discussion among experts to further resolve during a meeting

An earlier Golder Technical Memorandum (dated June 16, 2011) (Golder 2011b) identified the appropriate category for each Port of Seattle comment based on discussions and agreements during the conference call on June 14, 2011 by the participants. There were no Category 1 issues identified and thus it is not necessary to revise and re-issue the RI/FS or the Draft CAP. Comments identified as Category 4 were discussed with experts representing Ecology, the Port of Seattle, and Golder. The meeting resolved Port of Seattle Category 4 comments. The intent of this document is that it be included as an Addendum to the SeaTac Development Site's RI/FS and CAP and included in the site administrative record at Ecology. This Addendum follows the general format of the Port of Seattle's May 27, 2011 letter.

Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA
Tel: (425) 883-0777 Fax: (425) 882-5498 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

2.0 PORT OF SEATTLE WRITTEN COMMENTS & PRP GROUP RESPONSES

1. An outline of new Port RCF structures (Port property), north of South 160th Street, on figures would be useful to show current land use and adjacent site conditions.

   RESPONSE: The construction of the Port of Seattle facility north of South 160th Street has been continually changing and thus has not been included on any figures in the RI/FS and DCAP. However, all future figures will include the final layout of the new Port facility. To facilitate this update to base maps, the Port provided their most current aerial photographs of the Port property.

2. Identification of survey datums (not specified in RIFS §3.4) would be helpful for comparisons with Port data.

   RESPONSE: The survey datum used for the survey data in RI/FS Appendix E was NAD83 Washington State Planes, North Zone, US Foot for horizontal and City of SeaTac-NAVD 88 for vertical.

3. Preparation of geologic cross sections is highly recommended for hydrogeologic evaluation and for review of conclusions and proposed remediation alternatives. No geologic cross sections were presented in the RIFS or DCAP.

   RESPONSE: Geologic cross-sections are typically provided in RI/FS documents to illustrate complex geologic stratification. The geologic stratification at the site is not complex and therefore does not require detailed geologic cross-sections for illustration, but attached Figure 1 identifies the extent of the till discovered during site investigations.

4. The presence or absence of glacial till could affect contaminant migration and soil vapor pathways. Preliminary review indicates that the till unit appears to be discontinuous within the identified boundaries of the contaminant plumes[1]. A map of till thickness, and identification of any other confining units, would be very helpful for interpretations and evaluations.

   RESPONSE: The till at the site is present in the eastern, central and southern portions of the facility. However, the till is absent in the northwestern portion of the facility and was not observed in off-site borings within South 160th Street or in borings on the cemetery property to the west of the site where groundwater impacts are present. Figure 1 shows the limits where till was observed during borehole drilling. There were no other confining units of any extent or continuity observed during borehole drilling at the site.

5. About thirteen wells were used to define groundwater flow directions south of South 160th Street. However, there are no monitoring wells north of South 160th Street to define local flow directions on the Port property. Since the groundwater contours in this area are relatively flat (i.e. hydraulic gradients are small), there is no guarantee that flow directions on the Port property are the same as on the MasterPark site. Item 6, below, notes that there are logistical constraints in locating wells on the Port property.

   RESPONSE: A previous groundwater investigation by the Port of Seattle in 2004 was conducted north of South 160th Street near the intersection of South 160th Street and International Boulevard (EMS 2004). The Port of Seattle installed monitoring wells Port MW-1, Port MW-2, and Port MW-3 shown on the attached Figure 2 (as also depicted on Figure 4 of the Draft CAP). The Port of Seattle

[1] Absence of till is noted at MasterPark well MW-22 and Port borings (RCF baseline study) located about 90 feet north and 200 feet north-northwest of MasterPark well MW-16. Till has been interpreted on the site (e.g. MW-9, MW-1, and MW-7) and also on Port property (at the southeast corner and thence north along International Blvd).

concluded that groundwater within the Qva Aquifer was flowing toward the west, based on groundwater levels measured in their monitoring wells. Golder monitored water levels in these Port of Seattle wells and also concluded that the groundwater was flowing westerly on Port property north of South 160th Street. The analytical results of groundwater from the Port of Seattle wells did not detect any petroleum hydrocarbons or associated gasoline compounds in 2004 (EMS 2004).

The Port of Seattle also conducted baseline soil and groundwater investigations during 2008 at the beginning of the construction for the Rental Car Facility (RCF) (Aspect 2008). One borehole (designated NON-GW-DV) north of South 160th Street located north of the MasterPark Lot C Well MW-15 and two other boreholes (designated GTS-GW-TF and GTS-GW-FD) located north and northwest of MasterPark Lot C MW-22 were completed during this 2008 baseline study (see attached Figure 3). Soil and groundwater samples from these borings did not detect any petroleum compounds or gasoline compounds or additives. There was only a temporary well placed within each borehole for groundwater sampling. These were abandoned after one groundwater sampling event. Therefore, in 2008 there was no indication of groundwater impacts from MasterPark Lot C sources north of South 160th Street.

As noted, the groundwater hydraulic gradients are low, but there is no reason to suspect that the hydraulic gradients north of South 160th Street are significantly different than hydraulic gradients south of the South 160th Street. In the past, land north of South 160th Street was a large asphalt paved parking lot that prevented any significant area recharge via infiltration of meteoric rainfall. The currently constructed Port of Seattle facility is also expected to prevent significant area recharge from occurring due to the land being covered by impervious surfaces. Thus, there should be no significant change in groundwater flow pattern as a result of the new Port of Seattle facility.

In our meeting with Ecology and the Port of Seattle representatives on June 27, 2011, it was agreed that additional permanent monitoring wells will be installed at two locations on Port of Seattle property north of South 160th Street. The additional monitoring wells are designated Port MW-A and Port MW-B as shown on Figure 4 and was meant to better delineate any petroleum hydrocarbon plume north of South 160th Street (on Port of Seattle property) originating from the MasterPark Lot C facility.

Port MW-A and Port MW-B monitoring wells were installed during early August 2011. The borehole and monitoring logs for Port MW-A and Port MW-B are provided in Appendix A to this Addendum. The results of groundwater quality analysis from these two new monitoring wells are provided in Appendix B. No gasoline, diesel, or oil was detected in groundwater samples from Port MW-A well. Groundwater from the Port MW-B well had low level detects of gasoline, diesel, and BTEX in groundwater (benzene was 1.3 µg/L) detected; however, there were no organic compounds related to petroleum fuels detected above their respective MTCA Cleanup Levels. These groundwater quality results indicate that the gasoline plume originating from the MasterPark Facility is delineated to the north of the MW-15 well and northwest of MW-22.

The Port of Seattle will survey the geodetic X, Y, and Z locations for groundwater elevations and re-sample groundwater from Port MW-A and Port MW-B wells

again during Autumn, 2011. This information will be used to determine groundwater elevations at the new wells and confirm groundwater quality results from the first sampling event.

Groundwater Monitoring

6. The Compliance Monitoring Plan (CMP) (Attachment E to DCAP) proposes only one new monitoring well on Port property; MW-X was positioned about 270 feet northwest of MW-22, which appears to fall within an RCF structure. Logistical constraints, due to access issues associated with the new Rental Car Facility, are not addressed for locating monitoring well(s) on or near the Port property.

   RESPONSE: The location of MW-X was not a proposed exact location, but rather an approximate position. The layout of the facility under construction had to be considered for the final placement of MW-X.

   Based on our meeting with Ecology and the Port of Seattle representatives on June 27, 2011, the two additional permanent monitoring wells (Port MW-A and Port MW-B) were installed at two locations on Port of Seattle RFC property and within the S. 16th Street right-of-way, respectively, as shown on attached Figure 4. The results of groundwater quality analysis after well installation have been received and evaluated in response to Port of Seattle Comment #5 above. It is Golder's determination that the gasoline plume originating from the MasterPark Lot C facility is sufficiently delineated in the north direction. Preliminary results (Table B-1 in Appendix B) show that the Port MW-B monitoring well is detecting petroleum hydrocarbon contaminants below cleanup levels. Therefore, the plume's northwest extent appear to have been sufficiently characterized and unless these levels are exceeded in subsequent measurements from this well, MW-X will not be needed.

7. Would one well be sufficient for defining plume boundaries and monitoring natural attenuation on Port property?

   RESPONSE: We believe that one well would be sufficient to bound the groundwater petroleum hydrocarbon plume in the northeast direction from the source on the MasterPark Lot C facility with the data and information obtained by the Port of Seattle from earlier investigations they conducted on their property. Nevertheless, two additional wells (Port MW-A and Port MW-B) now have been installed and sampled, as agreed upon during a meeting with the Port of Seattle on June 27, 2011 (please see our response to Port of Seattle comment No. 5 above) and have provided data that helped delineate the MasterPark Lot C petroleum hydrocarbon plume to the north and northwest.

8. Well MW-23, located 130 feet east of MW-15, appears to have been removed from the monitoring well network (e.g. DCAP Figure 9 and Attachment E, Compliance Monitoring Plan §5.1). No monitoring well(s) is proposed to bound contaminant plumes on Port property north or east of MW-15. Should MW-23 be retained in the groundwater monitoring network?

   RESPONSE: MW-23 is a well up-gradient from the source on the MasterPark Lot C facility and was installed to confirm the non-detect results from the Port of Seattle's temporary Port MW-1, Port MW-2, and Port MW-3, formerly located on the RCF property at the northwest corner of the South 160th Street and

International Boulevard. Furthermore, installation and initial sampling of MW-23 was to confirm the non-detect results from other investigations conducted on the east side of International Boulevard that are also up-gradient to the MasterPark Lot C facility. Results collected from MW-23 confirmed there were no detections of contaminants from up-gradient potential sources. Because MW-23 is located up-gradient from the MasterPark Lot C source, Ecology and Golder determined this well no longer needs additional monitoring.

A monitoring well (designated Port MW-A on attached Figure 4) north of monitoring well MW-15 has been installed and sampled, as agreed during the June 27, 2011 meeting. Port MW-A well did bound the petroleum hydrocarbon plume north of MW-15.

Contaminant Plumes in the Regional Qva Aquifer

9. Gasoline and benzene plumes were estimated to be migrating to the northwest onto Port property (RIFS §4.4.2.1, pg 38). The methodology used (RIFS §4.4.2.1) assumed only an advective (bulk movement) process and further assumed a northwest groundwater flow direction. Contamination migration by diffusion and dispersion processes does not appear to have been addressed. The actual extent of gasoline and benzene plumes onto Port property has not been determined.

   RESPONSE: The actual extent of gasoline and benzene impacts within the Port of Seattle property north of South 160th Street is not fully delineated. As agreed during the June 27, 2011 meeting two additional monitoring wells (Port MW-A and Port MW-B) were installed to delineate the petroleum hydrocarbon plume migrating onto Port of Seattle property as discussed in our response to Port of Seattle comment No. 5. Preliminary results from these wells have provided a better picture of the plume's north and northwest extents.

   Diffusion is a solute migration process that results in very little actual migration of solutes in a groundwater flow system. Diffusion only needs to be considered as a solute migration mechanism through very low conductivity materials, such as clays, where groundwater advection is extremely slow with time. Dispersion processes can be estimated by installation and monitoring of the Port MW-B well together with groundwater monitoring results from MW-22, MW-16, and MW-12 for longitudinal dispersion. Because the hydraulic gradient is not uniform and does vary from northwest to southwest, transverse dispersion will not be able to be estimated from groundwater concentration profiles, but can be estimated based on longitudinal dispersivity.

10. Have the groundwater contaminant plumes been demonstrated to be shrinking, stable, or growing? Gasoline concentration data at MW-22, for example, may indicate an expanding plume.

    RESPONSE: Most of the on-site monitoring wells show groundwater concentrations to be declining, while the concentrations in groundwater from MW-22 location are increasing. We feel that the destruction of the source concentrations within the MasterPark Lot C facility groundwater will stabilize and start to reduce groundwater concentration off-site. The graph shown on Figure 4-1 of the RI/FS Report shows a declining concentration trends for groundwater at the SeaTac Development Site, except for MW-22. Further northwest of MW-22, preliminary results from Port MW-B well show contaminant concentrations

below MTCA Method A cleanup levels. The DCAP Compliance Monitoring Plan will use these and other wells along a centerline axis to determine plume stability under the natural attenuation component of the DCAP.

11. As noted in the RIFS, opportunities for monitoring wells are limited north of South 160th Street. One monitoring well was proposed on Port property, but see Item 6 related to logistical constraints.

    RESPONSE: This comment was addressed in our response to Port of Seattle Comment No. 5.

12. As groundwater flow directions on Port property have not been determined (Item 5), the assumption of northwest flow from MW-22 requires further investigation.

    RESPONSE: This comment was addressed in our response to Port of Seattle Comment No. 5

13. Analysis of diffusion and dispersion effects on contaminant migration would improve estimates of the extent of contamination plumes onto Port property.

    RESPONSE: Please see our response to Port of Seattle Comment No. 9.

14. For interpretation, it would be helpful to extend the time scale of groundwater COC time series (trend) plots to cover all available historical data. The plots currently show data from August 2007 to March 2010, while it appears that the first regional groundwater monitoring wells were installed and sampled in 2001.

    RESPONSE: We have provided the concentrations of gasoline and BTEX in wells that existed prior to 2007 in the appended table. This data was originally presented in the *Phase III Environmental Site Assessment SeaTac Parking Garage Development Site* report (Golder 2001) and was included in Appendix B of the RI/FS report (Golder 2010). The 2000 and 2001 data was not added to trend graphs because the data is limited in nature and does not provide a meaningful analysis when displayed on the time series graph alongside the more recent groundwater sampling data (2007-2010) for the following reasons:

    - MW-1 was the only well sampled in November 2000 that is still an active well on the site. However, MW-1 has not been sampled since 2001 because during each of the successive sampling events (2007, 2009, and 2010) this well has not had a sufficient volume of water to collect a sample. Sample results from MW-13 and MW-18 are sufficient to characterize this area of the site and thus MW-1 sample results are not necessary. Given that only two data points exist for MW-1, there is not enough data to display on a time series (trend) graph.
    - During the January 2001 sampling event, samples were collected from MW-1, MW-5, MW-6, MW-7, MW-8a, MW-9, and MW-10, as they were the only wells installed at the site at that time.
    - There were no sampling events between 2001 and 2007. It is difficult to display any sort of trend overtime when there are so few data points and such large gaps between sampling events.

    The gasoline and benzene data from 2000 and 2001 indicate that concentrations were generally higher than exist currently.

15. The extent of vertical migration of contaminants into the Qva aquifer should be more closely evaluated. Statements in the RIFS suggest no vertical migration has occurred (RIFS §4.4.2.1, pg 39 and §4.4.2.2, pg 40). However, deep well MW-10 was screened

about 95 below ground surface (bgs), about 40 feet into the aquifer, and had initial detections of gasoline at 1,600 µg/L and benzene at 31 µg/L after well installation in 2001. The boring log indicated petroleum odors and elevated PID readings to a depth of 60 feet below ground surface, or 15 feet into the aquifer saturated zone.

RESPONSE: Monitoring well MW-10 was drilled and installed in 2001 in a deeper portion of the aquifer in close proximity to MW-1, to determine the vertical hydraulic gradient in the regional aquifer at MW-1. In addition to establishing the vertical hydraulic gradient, MW-10 was utilized to determine if deeper portions of the aquifer had been impacted by petroleum hydrocarbon contamination. The groundwater concentrations from monitoring well MW-10 are much lower than the groundwater concentrations in MW-1 that is near MW-10 and received groundwater from the surface of the water table. As noted in the comment, the PID measurements obtained on soil samples during MW-10 borehole drilling indicated that petroleum impacts dramatically reduced below 60 feet. The impacts locally near the source are expected to have penetrated the surface of the water table by approximately 10 to 15 feet. After MW-10 installation, groundwater concentrations in 2001 slightly exceeded MTCA Levels in MW-10 (see the table below). However, subsequent sampling events in 2009 (two events) and 2010 (one event) have not detected gasoline in groundwater at MW-10 above the laboratory PQL (see below table of results). Furthermore, detections of benzene in MW-10 have steadily decreased over time and the last two sampling events have resulted in detections of benzene less than the MTCA Method A cleanup level. This detection could have been the result of contaminant carry-down during borehole drilling. These results from MW-10 indicate that vertical migration of COCs is not of concern; rather detections in MW-10 are due to carry-down of contamination during borehole drilling. As such, MW-10 will not be included in the compliance monitoring program.

Sampling Event Date	Gasoline Concentration (µg/L)	Benzene Concentration (µg/L)
January 8, 2001	**1,600**	**31**
May 20, 2009	<100	**8.7**
December 7, 2009	<100	2.9
March 2010	<100	1.1
MTCA Cleanup Level	800	5

Soil Vapor Issues

1. Vapor intrusion screening levels were exceeded near South 160th Street for groundwater (above Method B and very close to Method C) and for shallow soil (above Method B but below Method C). Assessment of vapor intrusion exposure pathways for any new RCF structures may be appropriate.

RESPONSE: The soil vapor sampling results indicate there is no risk from vapor intrusion into commercial buildings that are immediately adjacent to the source area within the MasterPark Lot C facility. There is no reason to suspect that there is a vapor intrusion concern further away from the source where groundwater concentrations are much less and the depth to groundwater is much greater. The groundwater quality results from the two additional monitoring wells (Port MW-A and Port MW-B) that were installed and sampled north of South

160th Street on Port of Seattle property indicate that there is no potential risk from vapor intrusion into the RCF building from vapors emanating from the groundwater.

2. The DCAP does not propose soil vapor monitoring or further vapor intrusion evaluation. The RIFS (§4.3.2) implies that a risk analysis for benzene using Method C, shallow soil, screening level (32 µg/L) found no risk to indoor commercial workers. The DCAP (§3.5.3) indicates that a vapor intrusion "Tier I preliminary assessment"[2] was performed with the conclusion that since "soil vapors are below shallow soil screening levels at the property boundary, there is no unacceptable risk from vapor intrusion into current commercial buildings to workers on the Site (but off of the MasterPark Facility)." The basis for stating that "soil vapors are below shallow soil screening levels" evidently refers to the benzene Method C, shallow-soil screening level of 32 µg/L. However, the benzene concentration in groundwater at MW-22 was 23 µg/L, which is very close to the MTCA C groundwater screening level of 24 µg/L. The elevated benzene concentration indicates that a vapor intrusion pathway from groundwater may need to be further evaluated under areas of the contaminant plume outside of the source area. Have off-site, potential vapor intrusion issues related to high benzene concentration in MW-22, observed during March 2010 sampling, been addressed?

   RESPONSE: The groundwater concentration of 24 µg/L is a conservative screening concentration in the Ecology guidance document based on shallow groundwater, not groundwater over 50 feet deep. The soil gas concentrations measured at 10 foot depths are a more direct indication of potential vapor intrusion risks than the use of underlying groundwater concentrations, because it directly measures the soil gas concentrations, rather than calculating a potential soil vapor concentration emanating from groundwater using many assumptions. In 2007, the soil vapor concentrations were all below the MTCA screening level for commercial buildings along MasterPark's northern property boundary where the underlying groundwater is less than 50 feet below land surface and has much higher benzene concentrations than those detected in MW-22. The measured soil gas concentrations in 2009 were again below the Ecology screening levels for commercial buildings near the source area along the MasterPark Lot C northern property boundary, where again the groundwater has much higher benzene concentrations and is shallower than at MW-22. The expected groundwater depths and groundwater concentrations within the Port of Seattle property north of South 160th Street are anticipated to also be deeper and at much lower concentrations than what exists at the MasterPark Lot C facility. The soil gas sampling results are a better indicator of potential vapor intrusion than groundwater concentrations and were the basis for our conclusions that no risk from vapor intrusion exists into adjacent commercial buildings and other commercial buildings at further distances from the MasterPark Lot C source area.

   We do not believe there is a potential threat from vapor intrusion in the RCF from groundwater. The groundwater quality results from the two additional monitoring wells (Port MW-A and Port MW-B) that were installed and sampled north of South 160th Street indicate volatile organic compounds concentrations are too low to be of concern for vapor intrusion into a commercial building.

[2] This terminology is not clear. Ecology (2009, pg 3-1) states that the recommended vapor intrusion evaluation process consists of three steps: Preliminary Assessment, Tier I Assessment, and Tier II Assessment.

3. The vapor intrusion risk analysis (RIFS §4.3.2) and "Tier I preliminary assessment" (DCAP§3.5.3) mentioned in the RIFS and DCAP, respectively, were not referenced and therefore not reviewed. Can these studies be provided for review? Did these studies evaluate the 2009 shallow soil vapor results near the Cemetery residence and the groundwater benzene concentrations in MW-22?

   RESPONSE: We did not do a formal Preliminary Assessment, because the existing groundwater impacts would require a Tier 1 Assessment at a minimum. The Tier 1 Assessment is based on the Ecology document "Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action" (Ecology, October 2009, Publication No. 09-09-047) as referenced in the introduction to Section 4.3. The Tier 1 approach asks basic questions and provides off-ramps for situations where it is apparent that subsurface contamination is very unlikely to pose a vapor intrusion threat. The vadose zone source area does not have a building in close proximity; therefore, the pathway of volatilization from groundwater and migration through the vadose zone is the only pathway off the MasterPark Lot C property to neighboring buildings and properties. To evaluate whether there is a potential threat from vapor intrusion, on-site soil gas concentrations were compared with Table B-1 of the Ecology referenced document. The locations, where soil vapor sampling was conducted in 2009 and many of the 2007 sampling locations, do not have a till stratum present that would impede vertical migration of soil vapors. Since the soil gas concentrations are below screening values in Table B-1 for soil gas immediately below a commercial/industrial building (although our samples were at 10 foot depths), the Tier 1 Assessment shows that there is no threat from vapor intrusion of site contaminants to off-site commercial or industrial buildings using either the 2007 or 2009 soil gas data.

   Vapor intrusion to the residence on the cemetery property was evaluated from the analytical results of soil vapor samples surrounding the house and the house crawl space atmosphere sample. The results and evaluation are presented in the RI/FS. The subject residential house has recently been demolished and the land will not be used for residential use in the foreseeable future.

4. Vapor migration pathways, such as subsurface utility line (SUL) trenches, have not been considered.

   RESPONSE: Our soil gas monitoring results represent a depth of 10 feet that is below typical utility installations. Therefore, the soil gas concentrations are lower than screening levels beneath anticipated utility corridors.

20. The RIFS and DCAP propose monitored natural attenuation (MNA) of the contaminant plumes, outside the treatment area and including off-site properties. The MNA process requires multiple lines of evidence for reaching a determination that natural attenuation is occurring, including (1) long-term decrease of contaminant concentrations, (2) assessment of geochemical parameters, and (3) microbial studies. Evaluation of monitored natural attenuation (MNA) was not addressed in the RIFS (§7.1.2, pg 55) and appears to be described only by reference to the Ecology (2005) guidance document in the DCAP (Attachment E, CMP §5.1.3). Please provide additional details on the proposed MNA assessment process.

RESPONSE: Evaluation of MNA is proposed during post remediation confirmational monitoring. Details are presented in the Compliance Monitoring Plan Table 1 and the referenced Ecology document on MNA evaluations (Ecology 2005, Publication No. 05-09-091). Table 1 of the Compliance Monitoring Plan lists the wells involved in the MNA evaluation, the sampling frequency, and the MNA parameters that will be analyzed.

21. **RESPONSE:** The Port of Seattle is missing a comment enumerated as 21.

22. The DCAP does not appear to have specified a feasible plan for groundwater monitoring north of South 160th Street.

RESPONSE: In the Draft CAP, compliance groundwater monitoring is proposed north of South 160th Street by monitoring MW-X (or the additional Port of Seattle Port MW-B well), MW-22, and MW-15. Compliance monitoring will replace well MW-X with the newly installed Port MW-B well. If well MW-X becomes required to install, it will replace compliance monitoring of Port MW-B well.

The newly installed Port MW-A monitoring well will be monitored after the remedial system is turned off for confirmational monitoring. If the results are below MTCA Cleanup Levels, Port MW-A well will not be sampled again.

The changes in groundwater concentrations with time from these compliance monitoring wells will provide adequate indication of MNA and plume strengths in the Qva aquifer north of South 160th Street.

23. The CMP lists contaminants and geochemical parameters (DCAP, Attachment E, CMP Table 1 footnotes) and sampling parameters (DCAP, Attachment E, CMP §6.2.2) for MNA. Redox (Eh) and dissolved oxygen (DO) are commonly measured sampling parameters that should be included.

RESPONSE: If Eh (indicator of REDOX conditions) was left out of the field parameters, we will include this measurement. Dissolved oxygen (DO) is included as a natural attenuation parameter in the Table 1 footnotes of the Compliance Monitoring Plan. The REDOX condition, even without Eh field measurements, will be understood from DO field measurements and the laboratory results for valance specific analytes proposed for MNA evaluations.

24. Does the proposed remediation Alternative A provide for effective capture of vapors generated by air sparging? The air sparging will occur at about 50 feet below ground surface and 10 to 20 below the till layer, where present. How will the combination of extraction wells and trenching work given these two features may be separated by a till layer? Can lateral migration of vapors occur such that vapors bypass the capture zone?

RESPONSE: We believe that the trenches in the locations proposed will be effective in capturing the soil vapors as long as the till layer is not present. The presence of till will be evaluated during the installation of air sparing wells. If till is encountered, then soil gas extraction wells that extend below the till can be employed. The trenches are proposed in areas covered by asphalt, which should provide a barrier to atmospheric intrusion. The area not completely covered by asphalt is the MasterPark Lot C western property boundary that will use soil

vapor extraction wells just above the groundwater table. As mentioned in earlier responses, the northwest area of MasterPark Lot C being subjected to air-sparging and soil vapor extraction did not observe a till layer in the subsurface geology during borehole drilling.

25. At what depth in the regional aquifer will the sparging wells be completed? See Item 15 above regarding vertical migration of contaminants deeper into the water table.

RESPONSE: We are planning on setting the air-sparging wells at a depth of 15 feet below the low groundwater table. Specifications for the remediation system will be detailed in the Engineering Design Report.

26. What depths are proposed for the extraction wells and trenching?

RESPONSE: The soil vapor extraction wells along the western property boundary are planned to be 40 to 45 feet in depth (5 to 10 feet above the water table) at the well bottom. The soil vapor extraction trenches are anticipated to be five to ten feet deep. Specifications for the remediation system will be detailed in the Engineering Design Report.

27. Does the proposed plan adequately provide for monitored natural attenuation of off-site plumes, especially for the Port property north of South 160th Street? See related comments above under *Groundwater Monitoring* and *Contaminant Plumes in the Regional Qva Aquifer*.

RESPONSE: This comment was addressed in our response to Port of Seattle Comment Nos. 9, 20, 22, and 23.

28. In the discussion of remediation alternatives, it would be helpful if scores, weighting values, and alternatives B1 and B2 were included in the RIFS §8 subsections. The list in RIFS §8.3.4 appears to have Alternatives B and E reversed.

RESPONSE: Table 8-7 in the RI/FS and Table 1 of the Draft CAP provide the remedial alternative scores and weighting factors. The table also presents the overall evaluation ranking for the remedial alternatives. The listed remedial alternatives in the RI/FS within Section 8.3.4 do not have Alternatives B and E reversed. The list is the same relative order that was used in Table 8-7 for scoring and ranking the remedial alternatives.

29. A pre-design evaluation does not appear to have been performed to estimate radius of influence of the sparging or extraction wells. A radius of influence for air injection wells was assumed to be 25 feet (50-foot well separation).

RESPONSE: We have planned for a pre-design test for evaluating the radius of influence for air-sparging. However, conducting such tests may have limited value because of local heterogeneity and variability of results. We are currently evaluating whether instead of conducting the pre-design test, the funds for the pre-design test could be used to instead install the air-sparging well system with a closer radius.

3.0 POINTS FOR CLARIFICATION

During the June 27, 2011 meeting with Ecology and the Port of Seattle, several points of clarification were suggested by the Port of Seattle's consultant. The points of clarification are as follows:

- **Add the new Port of Seattle property wells to the Compliance Monitoring Plan.**

  During the June 27, 2011 meeting among the Port of Seattle, Ecology and PLP Group representatives, the decision was made to install two new monitoring wells north of South 160th Street. The new wells will be included on all future maps depicting the site (see the attached Figure 4). The monitoring well, designated as Port MW-B, is within the S. 160th Street right-of-way and will be monitored in accordance with the Compliance Monitoring Plan as a replacement for well MW-X, unless well MW-X is required to be installed. Furthermore, the well, designated MW-X in the Draft CAP, does not need to be installed based on the preliminary analytical results of groundwater from Port-MW-B monitoring well. As such, the new well Port MW-B will be sampled during performance monitoring events (quarterly for year 1 and semi-annually for years 2 through the end of IAS/SVE operation) and during confirmational monitoring events (quarterly for year 1 and semi-annually for years 2 through the closure of the site). The new Port MW-B well will also be sampled for natural attenuation parameters quarterly during the first year of confirmational monitoring (unless it is eventually replaced with a new well MW-X).

  The new well, Port MW-A, is within the Port of Seattle property north of S. 160th Street and may be sampled after the remedial system is turned off for confirmation. If monitoring for Port MW-A has groundwater petroleum fuel-related analytes below MTCA Cleanup Levels, Port MW-A will not be further sampled.

- **Port of Seattle Property vapor intrusion potential.**

  Based upon the sampling results of groundwater from monitoring wells Port MW-A and Port MW-B, the VOC concentrations in groundwater are too low to be a threat to human health in a commercial building from vapor intrusion on the Port of Seattle property. Groundwater concentrations from these two new wells are below screening levels in Ecology's draft guidance document for Vapor Intrusion (Ecology, 2009). This evaluation provides a conservative estimate that vapor intrusion into commercial buildings is not a potential threat given the existing groundwater concentrations and the depth of groundwater.

4.0 DOCUMENTS REFERENCED

Aspect Consulting, LLC. 2008. Environmental Baseline Report – Remote Consolidated Rental Car Facility. Prepared for the Port of Seattle. April 7.

EMS Consultants, Inc., 2004. Results of Groundwater Monitoring Well Installation and Sampling – Bai Tong Restaurant Site, 15859 International Boulevard, Seatac, WA. Prepared for Port of Seattle. May 21.

Golder Associates Inc. (Golder). 2001. Final Report for the Phase III Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, Washington, April 5.

Golder. 2010. Remedial Investigation/Feasibility Study, SeaTac Development Site, SeaTac, Washington, September 17.

Golder 2011a. Draft Cleanup Action Plan, SeaTac Development Site, SeaTac, Washington, April 14.

Golder. 2011b. Technical Memorandum. Responses to Port of Seattle Comments on the RI/FS and Draft CAP, June 16.

Washington State Department of Ecology (Ecology). 2005. Guidance on Remediation of Petroleum-Contaminated Ground Water by Natural Attenuation, Toxics Cleanup Program, Publication No. 05-09-091 (Version 1.0), July.

Washington State Department of Ecology (Ecology). 2009. Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action, Review DRAFT, Toxics Cleanup Program, Publication No. 09-09-047, October.

FIGURES

LEGEND:

MW-5	QVA AQUIFER MONITORING WELL LOCATIONS
MW-2	MONITORING WELLS SCREENED IN PERCHED AQUIFER
PORT MW-1	PORT OF SEATTLE (QVA) MONITORING WELLS (ABANDONED)
TACO TIME D	TACO TIME (QVA) MONITORING WELL (ABANDONED)
	TILL LAYER PRESENT

0 100 200

SCALE IN FEET

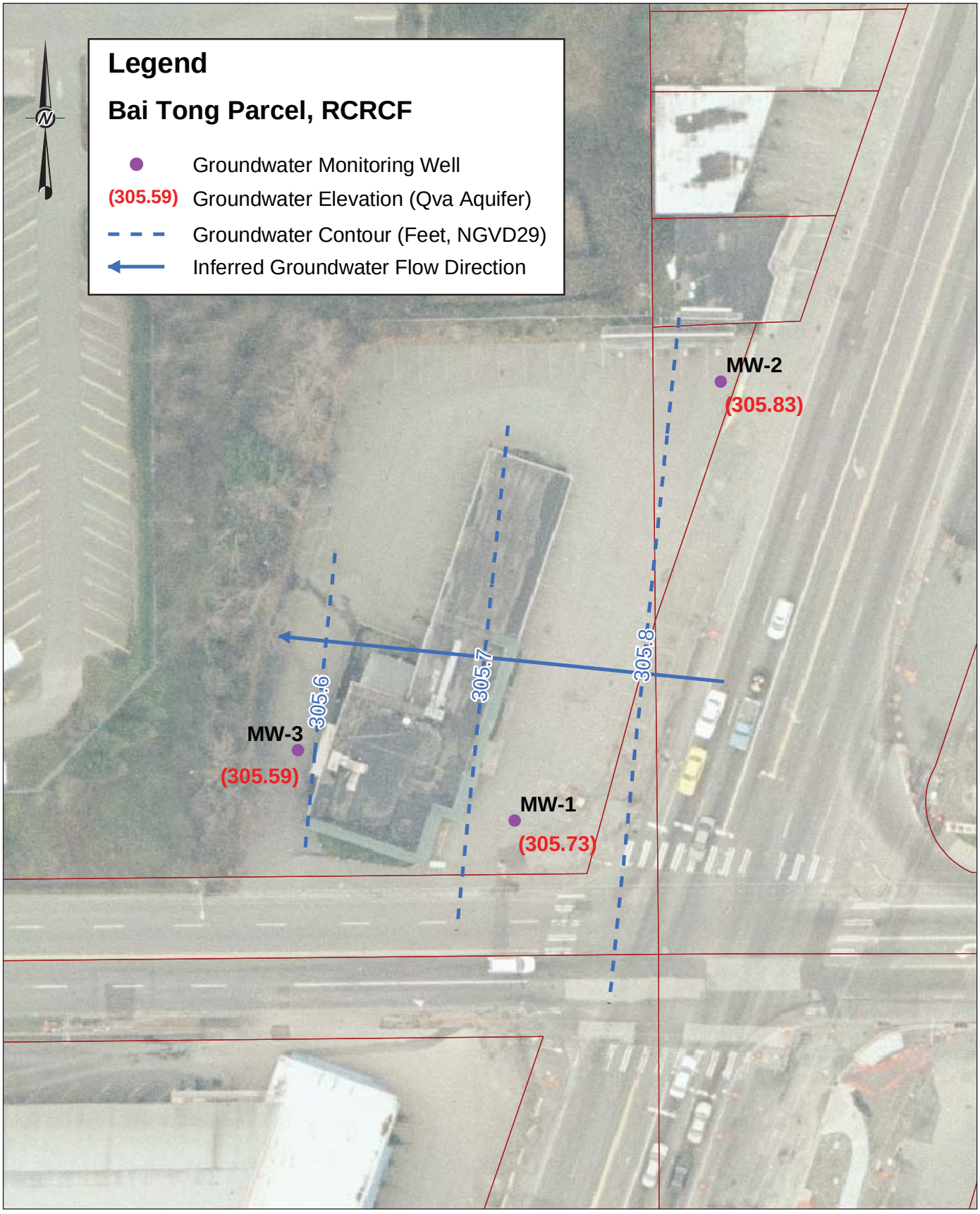
FIGURE **1**

TILL LAYER OBSERVED IN BOREHOLES

SEATAC DEVELOPMENT SITE/RI/FS/WA

K:\CAD\Projects\2007\07393368\05\04\CAP - Addendum\073_93368_05_04_F01_r1.dwg | Fig 1 | Mod: 10/12/2011, 09:14 | Plotted: 10/12/2011, 09:14 | SSimmons

Golder Associates



0 50

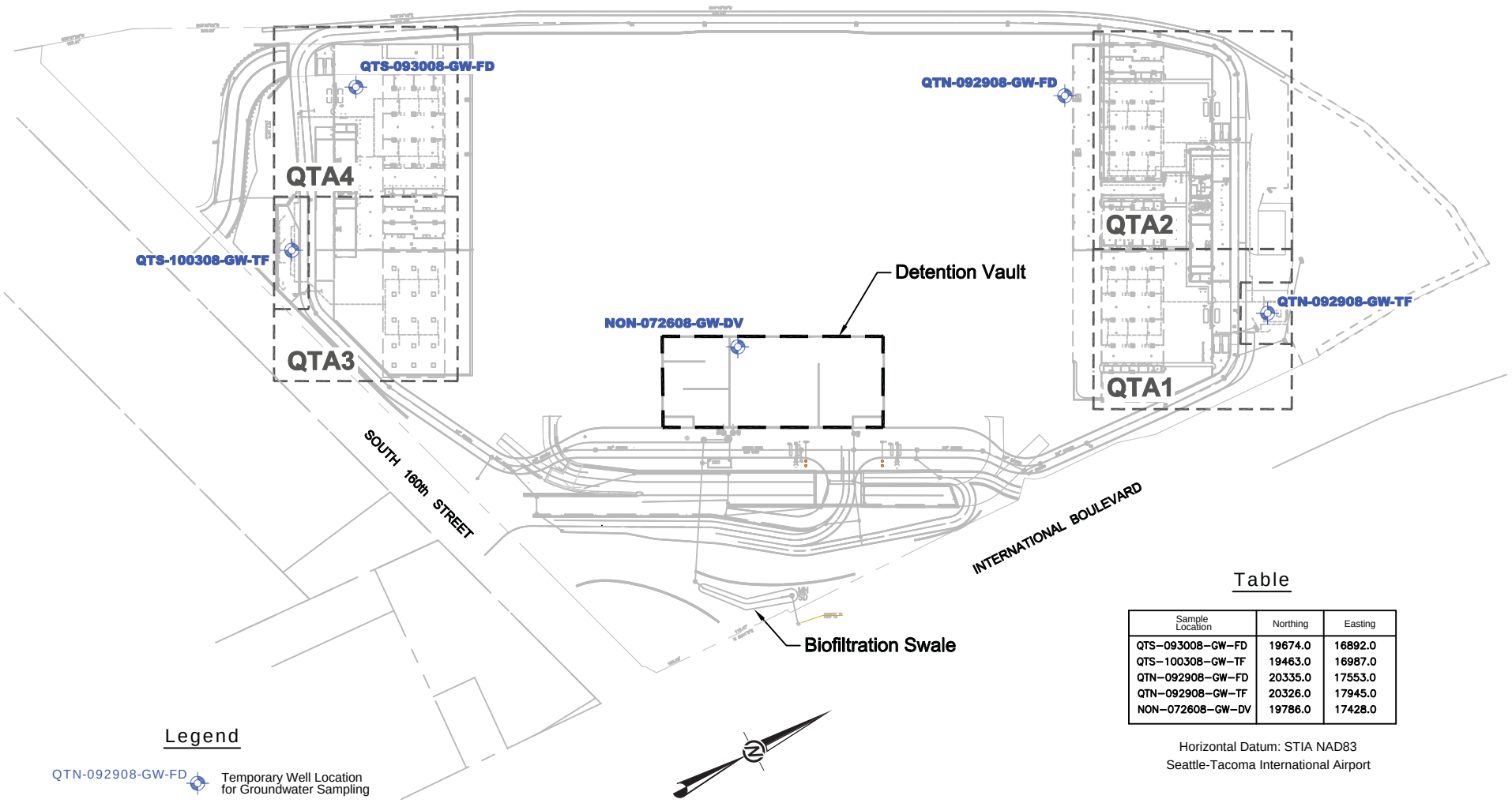
APPROXIMATE SCALE IN FEET

FIGURE **2**

GROUNDWATER FLOW DIRECTION ON THE PORT OF SEATTLE PROPERTY IN 2004

RW/MASTERPARK LOT C RI/FS &REMED/WA

Source: EMS, May 2004



Table

Sample Location	Northing	Easting
QTS-093008-GW-FD	19674.0	16892.0
QTS-100308-GW-TF	19463.0	16987.0
QTN-092908-GW-FD	20335.0	17553.0
QTN-092908-GW-TF	20326.0	17945.0
NON-072608-GW-DV	19786.0	17428.0

Horizontal Datum: STIA NAD83
Seattle-Tacoma International Airport

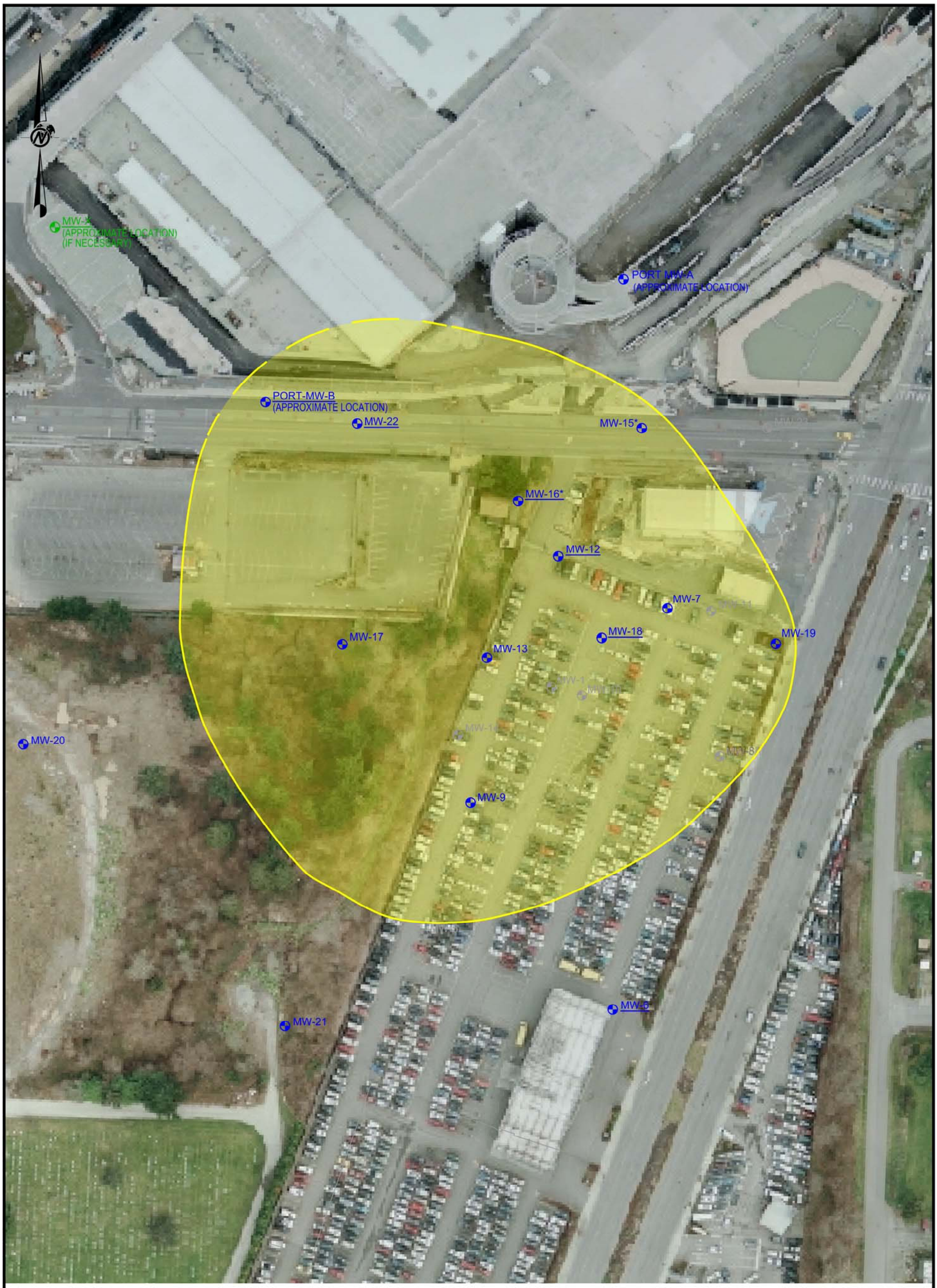
Source: Aspect Consulting, June 2011

FIGURE **3**

GROUNDWATER SAMPLING LOCATIONS AT THE PORT OF SEATTLE PROPERTY IN 2008

RW/MASTERPARK LOT C RI/FS &REMED/WA

Golder Associates



LEGEND:

- MW-17 — COMPLIANCE MONITORING WELLS
- MW-6 — NATURAL ATTENTION WELL
- MW-XX — WELL ONLY INSTALLED IF DEEMED NECESSARY. IF INSTALLED, MONITORING WILL REPLACE PORT-XX.
- APPROXIMATE GW PLUME BOUNDARY

0 100 200

SCALE IN FEET

NOTE:

1. PLUME BOUNDARY BASED ON GROUNDWATER SAMPLE RESULTS EXCEEDING MTCA METHOD A CLEAN UP LEVELS FOR GASOLINE RANGE PETROLEUM HYDROCRABONS (800 UG/L)
2. * = ONLY WELLS THAT ARE NOT PERFORMANCE MONITORING WELLS

FIGURE **4**

LOCATION OF COMPLIANCE MONITORING WELLS

SEATAC DEVELOPMENT SITE/RI/FS/WA

K:\CAD\Projects\2007\07393368\05\04\CAP - Addendum\073-93368-05_04_F04_r2.dwg | F04 | Mod: 10/12/2011, 09:16 | Plotted: 10/12/2011, 09:25 | SSimmons

Golder Associates

APPENDIX A
WELL INSTALLATION LOGS
(MW A and MW B)

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
090134	MW-A	1 of 3

Project Name: STIA Rental Car Facility
Location: Sea-Tac, WA
Driller/Method: Cascade Drilling / Hollow Stem Auger, 300-lb Jars
Sampling Method: D&M

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 53.88
Start/Finish Date: 8/3/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Blows/ 6"	Material Type	Description	Depth (ft)
0	8" Flush-mount monument set in concrete					Asphalt	Asphalt	0
1							Very dense, slightly moist, brown to gray, silty, gravelly, SAND (SM); fine to medium sand	1
2								2
3	Concrete							3
4								4
5								5
6		S1		0.1	29 35 40			6
7								7
8			NWTPH-Gx, NWTPH-Dx, Vocs, PAHs, RCRA 8 Metals, PCB					8
9		S2		0.1	42 50		Very gravelly	9
10								10
11								11
12								12
13								13
14								14
15	19 50-lb bags of hydrated Cetco bentonite chips	S3		0.1	46 50			15
16								16
17								17
18								18
19								19
20		S4		0.2	50			20
21								21
22								22
23								23
24								24
25	2" SCH 40 PVC Casing	S5		0.2	43 50		Very dense, slightly moist, brown to gray SAND (SP); trace silt, fine to medium sand	25
26								26
27								27
28								28
29								29

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector
- Static Water Level
- Water Level (ATD)

Logged by: MAR
Approved by: RRH
Figure No. B -

_MONITORING WELL_STIA CAR RENTAL FACILITY.GPJ August 24, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
090134	MW-A	2 of 3

Project Name:	STIA Rental Car Facility	Ground Surface Elev	
Location:	Sea-Tac, WA	Top of Casing Elev.	
Driller/Method:	Cascade Drilling / Hollow Stem Auger, 300-lb Jars	Depth to Water (ft BGS)	53.88
Sampling Method:	D&M	Start/Finish Date	8/3/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Blows/ 6"	Material Type	Description	Depth (ft)
31		S6		0.0	36 50			31
32								32
33								33
34								34
35	Hydrated bentonite chips	S7		0.0	37 50		Gravelly	35
36								36
37								37
38								38
39								39
40		S8		0.2	26 30 35		Slightly gravelly	40
41								41
42	12 50-lb bags of #2/12 Monterey Sand filter pack							42
43								43
44								44
45		S9		0.3	32 38 45		Trace gravel	45
46								46
47								47
48								48
49								49
50	2" SCH 40 PVC 10-slot screen	S10		0.2	42 32 37		Trace silt	50
51								51
52								52
53								53
54	▼						Wet	54
55								55
56		S11		0.0	23 28 34			56
57								57
58								58
59								59

Sampler Type:

- ○ No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector

- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: MAR

Approved by: RRH

Figure No. B -

_MONITORING WELL_STIA CAR RENTAL FACILITY.GPJ August 24, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
090134	MW-A	3 of 3

Project Name: STIA Rental Car Facility
Location: Sea-Tac, WA
Driller/Method: Cascade Drilling / Hollow Stem Auger, 300-lb Jars
Sampling Method: D&M

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 53.88
Start/Finish Date: 8/3/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Blows/ 6"	Material Type	Description	Depth (ft)
61		S12		0.3	20 23 27			61
62								62
63								63
64	Threaded PVC Endcap							64
65	Sluff	S13		0.5	16 23 27		Silt lamina at 65'	65
66							Bottom of Boring at 65.5' BGS	66
67								67
68								68
69								69
70								70
71								71
72								72
73								73
74								74
75								75
76								76
77								77
78								78
79								79
80								80
81								81
82								82
83								83
84								84
85								85
86								86
87								87
88								88
89								89

Sampler Type:
○ No Recovery
◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector
▼ Static Water Level
▽ Water Level (ATD)

Logged by: MAR
Approved by: RRH
Figure No. B -

_MONITORING WELL_STIA CAR RENTAL FACILITY.GPJ August 24, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
090134	MW-B	1 of 4

Project Name: STIA Rental Car Facility
Location: Sea-Tac, WA
Driller/Method: Cascade Drilling / Hollow Stem Auger, 300-lb Jars
Sampling Method: D&M

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 84.33
Start/Finish Date: 8/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Blows/ 6"	Material Type	Description	Depth (ft)
1	8" Flush-mount monument set in concrete						Asphalt	
2							Very dense, slightly moist, brown, gravelly, silty SAND (SM); fine to medium sand	1
3	Concrete							2
4								3
5		S1		0.3	50/6			4
6								5
7								6
8								7
9		S2	NWTPH-Gx, NWTPH-Dx, Vocs, PAHs, RCRA 8 Metals, PCB		42 50		Very dense, slightly moist, brown, slightly gravelly, slightly silty SAND (SP); fine to medium sand	8
10								9
11								10
12								11
13								12
14								13
15	40 50-lb bags of hydrated Cetco bentonite chips	S3		0.1	43 50		Very dense, slightly moist, brown, silty, very gravelly SAND (SM); fine to medium sand	14
16								15
17								16
18								17
19								18
20		S4			34			19
21				0.3	36		Very dense, slightly moist, brown, slightly gravelly SAND (SP); fine to medium sand	20
22					40			21
23								22
24								23
25		S5			15		Brown-gray; trace gravel	24
26				0.4	28 30			25
27								26
28								27
29								28
								29

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector
- Static Water Level
- Water Level (ATD)

Logged by: MAR
Approved by: RRH
Figure No. B -

_MONITORING WELL_STIA CAR RENTAL FACILITY.GPJ August 24, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
090134	MW-B	2 of 4

Project Name:	STIA Rental Car Facility	Ground Surface Elev	
Location:	Sea-Tac, WA	Top of Casing Elev.	
Driller/Method:	Cascade Drilling / Hollow Stem Auger, 300-lb Jars	Depth to Water (ft BGS)	84.33
Sampling Method:	D&M	Start/Finish Date	8/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Blows/ 6"	Material Type	Description	Depth (ft)
31		S6		0.4	15 27 31			31
32								32
33								33
34								34
35		S7		0.4	16 27 31			35
36								36
37								37
38								38
39								39
40	2" SCH 40 PVC Casing	S8		0.5	18 23 31			40
41								41
42								42
43								43
44								44
45		S9		0.4	28 35 40			45
46								46
47								47
48								48
49								49
50	Hydrated bentonite chips	S10		0.4	35 50		No gravel	50
51								51
52								52
53								53
54								54
55		S11			31 50			55
56								56
57								57
58								58
59								59

Sampler Type:

- ○ No Recovery
- 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector

- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: MAR

Approved by: RRH

Figure No. B -

_MONITORING WELL_STIA CAR RENTAL FACILITY.GPJ August 24, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
090134	MW-B	3 of 4

Project Name:	STIA Rental Car Facility	Ground Surface Elev	
Location:	Sea-Tac, WA	Top of Casing Elev.	
Driller/Method:	Cascade Drilling / Hollow Stem Auger, 300-lb Jars	Depth to Water (ft BGS)	84.33
Sampling Method:	D&M	Start/Finish Date	8/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Blows/ 6"	Material Type	Description	Depth (ft)
61		S12		0.5	20 35 41		Scattered thin silt lamina	61
62								62
63								63
64								64
65		S13			24		Trace gravel	65
66				0.5	34 39			66
67								67
68								68
69								69
70		S14			38		Slightly gravelly	70
71				0.4	50			71
72								72
73								73
74								74
75		S15			32			75
76				0.4	50			76
77	12 50-lb bags of #2/12 Monterey Sand filter pack							77
78								78
79								79
80		S16			48			80
81					50/4			81
82								82
83								83
84	▼							84
85		S17			46			85
86	2" SCH 40 PVC 10-slot screen			0.4	50/4			86
87								87
88								88
89	▽						Wet	89

Sampler Type:

- ○ No Recovery
- ◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector

- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: MAR

Approved by: RRH

Figure No. B -

_MONITORING WELL_STIA CAR RENTAL FACILITY.GPJ August 24, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
090134	MW-B	4 of 4

Project Name: STIA Rental Car Facility
Location: Sea-Tac, WA
Driller/Method: Cascade Drilling / Hollow Stem Auger, 300-lb Jars
Sampling Method: D&M

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 84.33
Start/Finish Date: 8/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Blows/ 6"	Material Type	Description	Depth (ft)
91		S18		0.4	30 35 41			91
92								92
93								93
94								94
95		S19			12 15 18			95
96								96
97								97
98								98
99	Threaded PVC Endcap Sluff							99
100		S20		5.5	12 17 19		Trace gravel	100
101								101
102							Bottom of boring at 101.5' BGS	102
103								103
104								104
105								105
106								106
107								107
108								108
109								109
110								110
111								111
112								112
113								113
114								114
115								115
116								116
117								117
118								118
119								119

Sampler Type:
○ No Recovery
◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector
▼ Static Water Level
▽ Water Level (ATD)

Logged by: MAR
Approved by: RRH
Figure No. B -

_MONITORING WELL_STIA CAR RENTAL FACILITY.GPJ August 24, 2011

APPENDIX B
PORT MW-A and PORT MW-B GROUNDWATER ANALYTICAL RESULTS

Table B-1: Rental Car Facility
August 2011 Groundwater Data from New Well Locations

Chemical Name	Ground Water, Method A, Table Value (µg/L)		Ground Water, Method B, Most Restrictive Standard Formula Value (µg/L)		MW-A 08/04/11		MW-B 08/03/11	
Total Petroleum Hydrocarbons								
Gasoline Range Hydrocarbons in ug/l	800				50	U	200	
Diesel Range Hydrocarbons in ug/l	500				50	U	280	
Residual Range Organics in ug/l					250	U	250	U
Metals								
Dissolved Arsenic in ug/l	5		0.058		1	U	1	U
Dissolved Barium in ug/l			3,200		43.9		43.7	
Dissolved Cadmium in ug/l	5		8		1	U	1	U
Dissolved Chromium in ug/l	50				1.51		1	U
Dissolved Lead in ug/l	15				1	U	1	U
Dissolved Mercury in ug/l	2		4.8		0.1	U	0.1	U
Dissolved Selenium in ug/l			80		1.82		1.21	
Dissolved Silver in ug/l			80		1	U	1	U
Polycyclic Aromatic Hydrocarbons (PAHs)								
Acenaphthene in ug/l			960		0.1	U	0.1	U
Acenaphthylene in ug/l					0.1	U	0.1	U
Anthracene in ug/l			4,800		0.1	U	0.1	U
Benzo(g,h,i)perylene in ug/l					0.1	U	0.1	U
Fluoranthene in ug/l			640		0.1	U	0.1	U
Fluorene in ug/l			640		0.1	U	0.1	U
Phenanthrene in ug/l					0.1	U	0.1	U
Pyrene in ug/l			480		0.1	U	0.1	U
Naphthalene in ug/l	160		160		0.05	U	12	
Benz(a)anthracene in ug/l					0.1	U	0.1	U
Benzo(a)pyrene in ug/l	0.1		0.012		0.1	U	0.1	U
Benzo(b)fluoranthene in ug/l					0.1	U	0.1	U
Benzo(k)fluoranthene in ug/l					0.1	U	0.1	U
Chrysene in ug/l					0.1	U	0.1	U
Dibenzo(a,h)anthracene in ug/l					0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene in ug/l					0.1	U	0.1	U
Volatile Organic Compounds								
1,1,1,2-Tetrachloroethane in ug/l			1.7		1	U	1	U
1,1,1-Trichloroethane in ug/l	200		16,000		1	U	1	U
1,1,2,2-Tetrachloroethane in ug/l			0.22		1	U	1	U
1,1,2-Trichloroethane in ug/l			0.77		1	U	1	U
1,1-Dichloroethane in ug/l			1,600		1	U	1	U
1,1-Dichloroethene in ug/l			400		1	U	1	U
1,1-Dichloropropene in ug/l					1	U	1	U
1,2,3-Trichlorobenzene in ug/l					1	U	1	U
1,2,3-Trichloropropane in ug/l			0.0063		1	U	1	U
1,2,4-Trichlorobenzene in ug/l			80		1	U	1	U
1,2,4-Trimethylbenzene in ug/l			400		1	U	1	U
1,2-Dibromo-3-chloropropane in ug/l			0.031		10	U	10	U
1,2-Dibromoethane (EDB) in ug/l	0.01		0.022		1	U	1	U
1,2-Dichlorobenzene in ug/l			720		1	U	1	U
1,2-Dichloroethane (EDC) in ug/l	5		0.48		1	U	1	U
1,2-Dichloropropane in ug/l			0.64		1	U	1	U
1,3,5-Trimethylbenzene in ug/l			400		1	U	4.4	

Golder Associates

Table B-1: Rental Car Facility
August 2011 Groundwater Data from New Well Locations

Chemical Name	Ground Water, Method A, Table Value (µg/L)		Ground Water, Method B, Most Restrictive Standard Formula Value (µg/L)		MW-A 08/04/11		MW-B 08/03/11	
1,3-Dichlorobenzene in ug/l					1	U	1	U
1,3-Dichloropropane in ug/l					1	U	1	U
1,4-Dichlorobenzene in ug/l			1.8		1	U	1	U
2,2-Dichloropropane in ug/l					1	U	1	U
2-Butanone in ug/l			4,800		10	U	10	U
2-Chlorotoluene in ug/l			160		1	U	1	U
2-Hexanone in ug/l					10	U	10	U
4-Chlorotoluene in ug/l					1	U	1	U
4-Methyl-2-pentanone in ug/l			640		10	U	10	U
Acetone in ug/l			800		10	U	10	U
Benzene in ug/l	5		0.8		0.35	U	1.3	*
Bromobenzene in ug/l					1	U	1	U
Bromodichloromethane in ug/l			0.71		1	U	1	U
Bromoform in ug/l			5.5		1	U	1	U
Bromomethane in ug/l			11		1	U	1	U
Carbon tetrachloride in ug/l			0.34		1	U	1	U
Chlorobenzene in ug/l			160		1	U	1	U
Chloroethane in ug/l			15		1	U	1	U
Chloroform in ug/l			7.2		1	U	1	U
Chloromethane in ug/l			3.4		10	U	10	U
cis-1,2-Dichloroethene in ug/l			80		1	U	1	U
cis-1,3-Dichloropropene in ug/l					1	U	1	U
Dibromochloromethane in ug/l			0.52		1	U	1	U
Dibromomethane in ug/l			80		1	U	1	U
Dichlorodifluoromethane in ug/l			1,600		1	U	1	U
Ethylbenzene in ug/l	700		800		1	U	13	
Hexachlorobutadiene in ug/l			0.56		1	U	1	U
Isopropylbenzene in ug/l			800		1	U	1	U
m,p-Xylenes in ug/l					2	U	3.4	
Methyl tert-butyl ether (MTBE) in ug/l	20		24		1	U	1	U
Methylene chloride in ug/l	5		5.8		5	U	5	U
n-Hexane in ug/l			480		1	U	1	U
n-Propylbenzene in ug/l					1	U	1	U
o-Xylene in ug/l			16,000		1	U	1	U
p-Isopropyltoluene in ug/l					1	U	1	U
sec-Butylbenzene in ug/l					1	U	1	U
Styrene in ug/l			1.5		1	U	1	U
tert-Butylbenzene in ug/l					1	U	1	U
Tetrachloroethene (PCE) in ug/l	5		0.081		1	U	1	U
Toluene in ug/l	1,000		640		1	U	1	U
trans-1,2-Dichloroethene in ug/l			160		1	U	1	U
trans-1,3-Dichloropropene in ug/l					1	U	1	U
Trichloroethene (TCE) in ug/l	5		0.49		1	U	1	U
Trichlorofluoromethane in ug/l			2,400		1	U	1	U
Vinyl chloride in ug/l	0.2		0.029		0.2	U	0.2	U
Naphthalene in ug/l	160		160		1	U	13	

Golder Associates

Table B-1: Rental Car Facility
August 2011 Groundwater Data from New Well Locations

Chemical Name	Ground Water, Method A, Table Value (µg/L)		Ground Water, Method B, Most Restrictive Standard Formula Value (µg/L)		MW-A 08/04/11		MW-B 08/03/11	
EDB by 8011								
1,2-Dibromoethane (EDB) in ug/l	0.01		0.022		0.01	U	0.01	U
Polychlorinated Biphenyls (PCBs)								
Aroclor 1016 in ug/l			1.1		0.1	U	0.1	U
Aroclor 1221 in ug/l					0.1	U	0.1	U
Aroclor 1232 in ug/l					0.1	U	0.1	U
Aroclor 1242 in ug/l					0.1	U	0.1	U
Aroclor 1248 in ug/l					0.1	U	0.1	U
Aroclor 1254 in ug/l			0.32		0.1	U	0.1	U
Aroclor 1260 in ug/l					0.1	U	0.1	U

Notes
*MTCA Method A and B for Benzene are both 5 µg/L in accordance with WAC 173-340-705 (5)
U - Analyte was not detected at or above the reported result.
Source : Aspect Consulting 08/24/11

ATTACHMENT A
LEGAL DESCRIPTION

REPORT

Attachment A

Legal Description
Sea-Tac Development Site
SeaTac, Washington

Submitted To: Riddell Williams P.S.
1001 Fourth Avenue, Suite 4500
Seattle, Washington 98154

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, Washington 98052 USA

November 2, 2011 **Project No. 073-93368-05.04**

A world of capabilities delivered locally

Golder Associates

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

Table of Contents

List of Tables

List of Figures

1.0 LEGAL DESCRIPTION

The following sections provide general information regarding the Site and MasterPark Facility including the location and legal description. The Site and Facility are located in SeaTac, Washington, within Section 28, Township 23 North, Range 4 East (Figure 1).

1.1 Site

The Site currently includes portions, or all of the following contiguous properties:

- MasterPark Lot C (the MasterPark Facility- parcel # 940940-0135 and 940940-0140)
- Louden Property (parcel # 940940-0115 and 940940-0126)
- City of SeaTac, South 160th Street right-of-way
- Washington Memorial Cemetery (parcel # 282304-9016, 424780-0075, and 282304-9052)
- Port of Seattle Property (north of South 160th Street- parcel # 282304-9016)

The Site is defined, for purposes of this document, as the area of land that is impacted by the MasterPark Facility's contamination. Figure 2 depicts the Site location as defined by the plume boundary as well as the contiguous properties included within the Site. The Site extends beyond South 160th Street to the north onto Port of Seattle Property, is bound by International Boulevard to the east, and extends onto Washington Memorial Cemetery to the west. The X and Y coordinates for the location of the Site are included in Table 1.

1.2 Facility

The MasterPark Facility is approximately 7 acres, located at 16025 International Boulevard, SeaTac, Washington and is called MasterPark Lot C. The MasterPark Facility is bounded by the Louden property to the north, International Boulevard to the east, and Washington Memorial Cemetery to the west and south. Current data indicates that the known soil contamination, the highest levels of groundwater contamination, and possibly the primary source of contamination (former underground storage tanks) are located on the MasterPark Facility property, but groundwater impacts extend beyond the Facility property boundaries. Thus, the area where groundwater has been impacted above MTCA cleanup levels is defined as the Site. The X and Y coordinates for the location of the MasterPark Facility are included in Table 2. According to the King County Assessor's website, the legal description for the MasterPark Facility is:

> Parcel # 940940-0135. WILDON UNREC PAR B OF SEATAC LLA SUB05-00003 REC #20050816900008 SD LLA LOCATED IN NE 1/4 OF NE 1/4 OF 28-23-04 ALSO BEING A POR OF UNREC PLAT OF WILDON UNREC.
>
> Parcel #940940-0140. WILDON UNREC LESS ST RD.

Parcel # 940940-0195. WILDON UNREC PAR A OF SEATAC LLA SUB05-00003 REC #20050816900008 SD LLA LOCATED IN NE 1/4 OF NE 1/4 OF 28-23-04 ALSO BEING A POR OF UNREC PLAT OF WILDON UNREC.

Parcel # 940940-0225. WILDON UNREC POR NE 1/4 OF NE 1/4 OF SEC 28-23-04 DAF - BEG INTSN OF NWLY LN OF ST HWY NO 1 & LN 30 FT S OF N LN OF SD SUBD TH S 18-49-10 W 1000 FT TH N 71-10-50 W 250 FT TO TPOB TH N 71-10-50 W 60 FT TH S 18-49-10 W TO S LN OF NE 1/4 OF NE 1/4 TH E ALG S LN TO WLY MGN OF STATE RD NO 1 AS ESTAB MARCH 26, 1925, TH N 18-49-10 E TAP S 18-49-10 W 1100 FT FR SD BEG INTSN TH N 71-10-50 W 250 FT TH N 18-49-10 E 100 FT TO TPOB LESS STATE RD NO 1 - AKA LOTS 44 THRU 54 LESS STATE RD NO 1 OF WILDON UNRECORDED PLAT TGW POR 31ST AVE S & OF S 164TH ST.

TABLES

TABLE 1
COMPLIANCE BOUNDARY SITE LOCATION

King County Tax Parcels #: (portions of each)	940940-0135 940940-0140 940940-0115 940940-0126 282304-9016 424780-0075 282304-9052 282304-9016
Sections 28, Township 23 N, Range 4 E	

X Coordinate	Y Coordinate
1278919.898	171325.5008
1278967.921	171338.8588
1279017.696	171343.2923
1279067.684	171343.5141
1279117.441	171338.8523
1279166.778	171330.758
1279215.553	171319.8194
1279263.026	171304.227
1279307.654	171281.7822
1279347.566	171251.8054
1279382.748	171216.305
1279413.962	171177.2793
1279441.847	171135.7854
1279466.713	171092.422
1279487.305	171046.9947
1279497.921	170998.1483
1279501.882	170948.361
1279502.908	170898.3719
1279499.561	170848.6305
1279486.913	170800.2635
1279472.081	170752.5195
1279453.563	170706.1079
1279428.014	170663.2166
1279396.343	170624.5541
1279361.42	170588.7941
1279323.644	170556.0637
1279283.107	170526.8253
1279240.063	170501.4242
1279194.753	170480.3349
1279147.384	170464.4477
1279098.219	170455.5848
1279048.339	170452.3103
1278998.57	170455.8814

TABLE 1
COMPLIANCE BOUNDARY SITE LOCATION

King County Tax Parcels #: (portions of each)	940940-0135 940940-0140 940940-0115 940940-0126 282304-9016 424780-0075 282304-9052 282304-9016
Sections 28, Township 23 N, Range 4 E	

X Coordinate	Y Coordinate
1278951.502	170472.2268
1278908.718	170498.0175
1278870.148	170529.7581
1278835.856	170566.1232
1278804.002	170604.6553
1278773.741	170644.4572
1278744.747	170685.1853
1278719.499	170728.3031
1278703.247	170775.427
1278698.28	170825.1238
1278698.343	170875.1178
1278700.837	170925.0411
1278709.467	170974.2568
1278722.135	171022.6207
1278735.961	171070.6709
1278751.361	171118.232
1278770.868	171164.2464
1278794.275	171208.4144
1278823.149	171249.1591
1278857.507	171285.4458

Coordinates correspond to locations along the Compliance Boundary depicted in Figure 2, at 50 foot intervals.

Horizontal Datum: NAD 83 Washington State Planes, North Zone, US Foot.

TABLE 2

MASTERPARK LOT C "FACILITY" LOCATION COORDINATES

King County Tax Parcels #: (portions of each)	940940-0135 940940-0195 940940-0225
Sections 28, Township 23 N, Range 4 E	

X Coordinates	Y Coordinates
9786.0649	10023.5447
9880.8042	9991.5373
9950.8538	10009.5292
9983.0343	10104.2098
10015.2149	10198.8903
10047.3954	10293.5709
10079.576	10388.2515
10111.7565	10482.9321
10143.9371	10577.6127
10176.1177	10672.2932
10208.2982	10766.9738
10198.874	10841.181
10104.2231	10873.4487
10009.5722	10905.7164
9929.5784	10908.3029
9897.6603	10813.5335
9865.7422	10718.7641
9833.8241	10623.9947
9801.906	10529.2253
9769.9879	10434.456
9738.0699	10339.6866
9706.1518	10244.9172
9674.2337	10150.1478
9642.3156	10055.3784
9610.3975	9960.6091
9578.4794	9865.8397
9546.5613	9771.0703
9631.8204	9741.7247
9696.6932	9795.8589
9728.8413	9890.5505
9760.9894	9985.2421

Coordinates correspond to locations along the Facility boundary at 100 foot intervals.

Horizontal Datum: NAD 83 Washington State Planes, North Zone, US Foot.

FIGURES

LEGEND

Approximate Site Boundary

0 4000

SCALE IN FEET

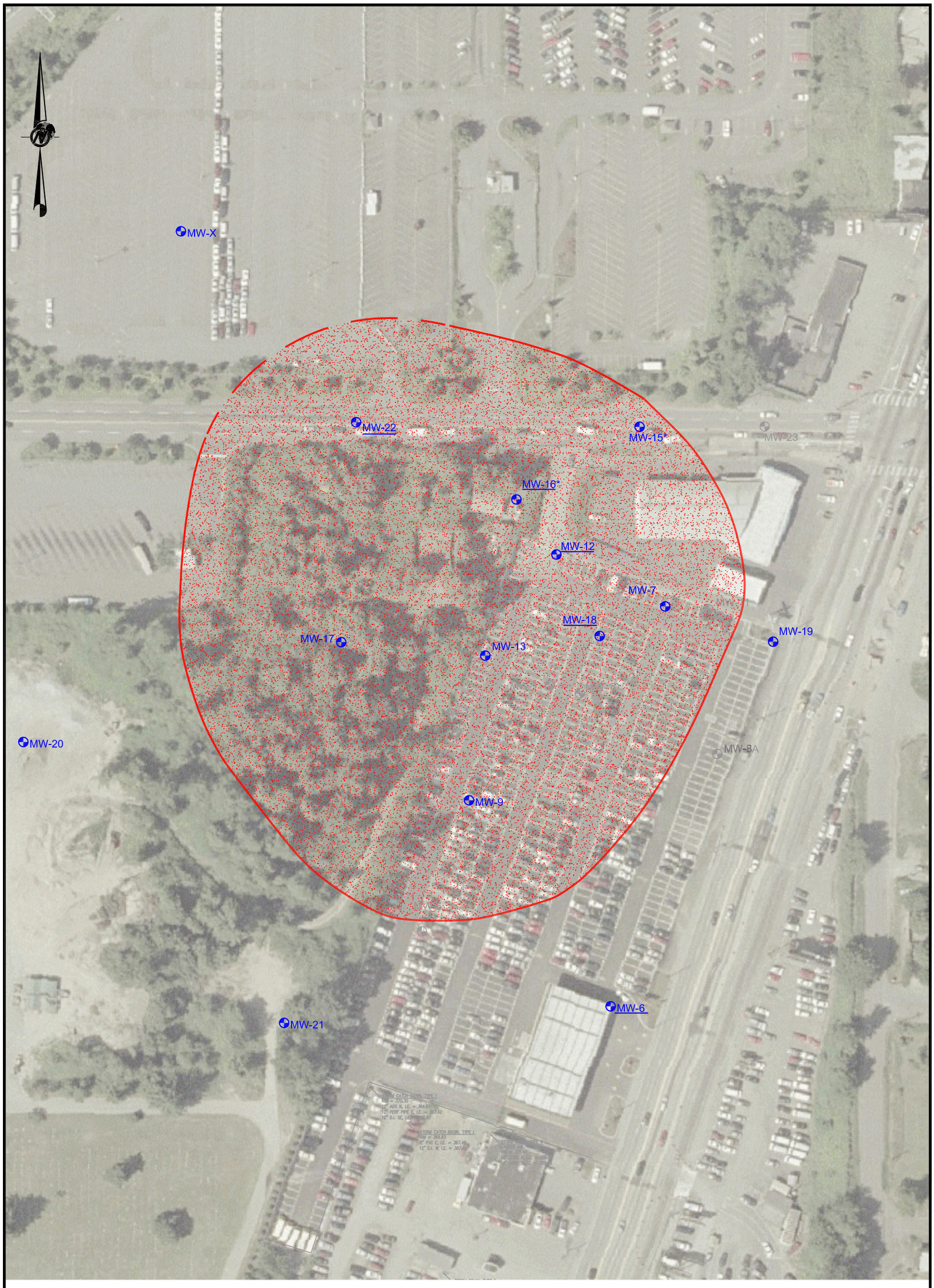
Source: Google Earth Pro

FIGURE **1**

APPROXIMATE SITE BOUNDARY

SEATAC DEVELOPMENT SITE/CAP/WA

Golder Associates



LEGEND:

MW-17	COMPLIANCE MONITORING WELLS
MW-6	NATURAL ATTENTION WELL
	APPROXIMATE GW PLUME BOUNDARY

0 100 200

SCALE IN FEET

NOTE:

1. PLUME BOUNDARY BASED ON GROUNDWATER SAMPLE RESULTS EXCEEDING MTCA METHOD A CLEAN UP LEVELS FOR GASOLINE RANGE PETROLEUM HYDROCRABONS (800 UG/L)
2. * = ONLY WELLS THAT ARE NOT PERFORMANCE MONITORING WELLS

FIGURE **2**

LOCATION OF COMPLIANCE MONITORING WELLS

SEATAC DEVELOPMENT SITE/RI/FS/WA

ATTACHMENT B
SEPA CHECKLIST AND DETERMINATION

REPORT

Attachment B

SEPA Environmental Checklist Sea-Tac Development Site SeaTac, Washington

Submitted To: Riddell Williams P.S.
1001 Fourth Avenue, Suite 4500
Seattle, Washington 98154

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, Washington 98052 USA

November 2, 2011

Project No. 073-93368-05.04

A world of capabilities delivered locally

Golder Associates

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

1.0 BACKGROUND

1. Name of proposed project, if applicable:

Focused In-Situ Air Sparging-Soil Vapor Extraction (IAS-SVE) with Source Area Cap Remediation
Sea-Tac Development Site
MasterPark Lot C facility (MasterPark Facility)
SeaTac, Washington

See Figure 1 for the location of the project.

2. Name of applicant:

SeaTac Investments LLC (SeaTac Investments),
Scarsella Brothers Inc.
ANSCO Properties, LLC

3. Address and phone number of applicant and contact person:

Doug Rigoni – SeaTac Investments LLC – 206-826-2715 - 2003 Western Avenue, Suite 500, Seattle, Washington 98121

Tamarah Knapp Hancock – Scarsella Brothers Inc. - PO Box 68697, Seattle, WA 98168-0697

Kevin Collette – Attorney for ANSCO Properties, LLC - Ryan, Swanson & Cleveland, PPLC, 1201 Third Avenue, Suite 3400, Seattle, Washington 98101.3034-

4. Date checklist prepared:

July 28, 2010

5. Agency requesting checklist:

Washington State Department of Ecology (cc to City of SeaTac)

6. Proposed timing or schedule (including phasing, if applicable):

Implementation is expected fall of 2011; no phasing.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

A series of investigations and remedial actions were conducted at the site starting in September 2000 (Phase I and II Environmental Site Assessment (ESA) investigations culminating in September 2001 with an independent remedial action (IRA) conducted in coordination with property development. Ecology performed groundwater sampling at the Site in 2006, and remedial Site investigations resumed in 2007 and were completed in early 2010.

Documentation prepared for the site includes the following:

- Golder Associates Inc., 2000. Phase I Environmental Site Assessment, SunReal Inc., SeaTac Airport Site, SeaTac, Washington, October 12, 2000.
- _____ 2001a. Final Phase II Environmental Site Assessment Report, SeaTac Parking Garage Development Site, SeaTac, Washington, April 5.
- _____ 2001b. Final Report for Extended Phase II Extended Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, Washington, April 5.
- _____ 2001c. Final Report for the Phase III Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, Washington, April 5.
- _____ 2001d. Final Field Sampling Plan for Limited Remedial Actions at the Sea-Tac Parking Lot Development Site, 16000 Block International Boulevard, Sea-Tac, Washington (Rev.0), June 25, 2001.
- _____ 2001e. Collection and Analytical Results of Groundwater Sample from Washington Memorial Park Cemetery, Private Well Letter Report Addressed to SeaTac Investments, Attention Mr. Douglas Rigoni, September 27, 2001.
- _____ 2001f. Site Assessment Conducted for the Closure of a 3,000- and 10,000-Gallon Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, Washington, October 4, 2001.
- _____ 2001g. Site Assessment Conducted for the Closure of a 1,000-Gallon Gasoline Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, Washington. October 4, 2001.
- _____ 2001h. Site Assessment Conduct For the Closure of a 1,000-Gallon Heating Oil Underground Storage Tank, Master Park Lot C 16000 Block International Boulevard, SeaTac, Washington. October 4, 2001.
- _____ 2001i. Site Assessment for the Closure of a 300-Gallon Underground Storage Tank, Master Park Lot C 16000 Block International Boulevard, SeaTac, Washington, October 24, 2001.
- _____ 2002. Final Independent Remedial Action Report SeaTac Parking Garage Development Site SeaTac, Washington (MasterPark Lot C). Prepared for: SeaTac Investments LLC. January 24, 2002.
- EA Engineering, Science, and Technology, Inc., 2006. SeaTac Development Site, Summary of June 2006 Groundwater Monitoring Results – Work Order #17079, Contract Number: 30700 - Prepared for Washington Department of Ecology. September 6, 2006.
- Golder Associates Inc. 2008a. On-Site Source and Groundwater Investigation Summary – June to November 2007. Prepared for Riddell Williams P.S. January 14, 2008.
- _____ 2008b. Addendum to On-Site Source and Groundwater Investigation Summary – June to November 2007 Report (Dated January 14, 2008). Prepared for Riddell Williams P.S. March 13, 2008.
- _____ 2010. Remedial Investigation/Feasibility Study Sea-Tac Development Site. Prepared for Riddell Williams P.S. September 17, 2010.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No.

10. List any government approvals or permits that will be needed for your proposal, if known.

- Agreed Order under the Model Toxics Control Act (MTCA). SeaTac Investments entered into an Agreed Order (No. DE 6844 with the Washington State Department of Ecology (Ecology) to complete a RI/FS and Draft Cleanup Action Plan (Draft CAP) for the SeaTac Development Site (Site).
- Air Quality Permit; Puget Sound Clean Air Agency
- A restrictive covenant was established with Ecology for the asphalt cap that requires notification to Ecology prior to cap disturbance and excavation into the underlying Site soils. Additional use restrictions may be established at the completion of the remedial action.
- Right-of-way Permit; city of SeaTac

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The proposed project is a remedial action to remove a contaminant [gasoline range petroleum hydrocarbons (gasoline) and associated constituents] from the sub-surface. A release from an underground gasoline storage tank has impacted underlying soils and groundwater at the MasterPark Facility and has impacted groundwater under adjacent properties.

The remediation would have the following components, which are described in further detail in Section 7 of the Golder 2010 RI/FS Report and Section 5.3 of the Draft Cleanup Action Plan:

- Institutional controls
- Monitoring
- Asphalt cap over the source area
- Cap maintenance
- IAS-SVE for the MasterPark Facility
- Operation and maintenance of the system (assumed to take approximately 5 years)
- Enhanced biodegradation and attenuation for groundwater down-gradient of the MasterPark Facility (assumed to take 10 to 15 years from the time of remediation system installation).

The proposed remedial action (depicted in Figure 2) will be source area destruction and natural attenuation of the remainder of the plume. This will be implemented through a combination of in-situ air sparging (IAS) and soil vapor extraction (SVE). IAS is a treatment process whereby air is injected into the groundwater below the contamination. A schematic of IAS is shown in Figure 3. As the air moves up through the contamination, the air strips VOCs from the groundwater based on the partitioning of the VOCs between air and water or soil. In addition, the oxygen introduced with the air typically stimulates aerobic microbial activity, resulting in increased microbial degradation of petroleum compounds within the groundwater and the vadose zone soil. IAS for this Site will be targeted for groundwater treatment. However, the injected air will continue to strip VOCs from vadose zone soils as it works towards the surface. In addition, IAS will be used in conjunction with SVE (discussed below).

Microbial degradation occurs as the VOC-laden air works its way towards the surface. The microbial degradation reduces introduction of VOCs into ambient air. However, at the Site it has been assumed that SVE will be necessary to collect vapor from IAS to ensure that VOC-laden air does not reach the surface.

Another advantage of IAS is oxygenation of the groundwater, thereby stimulating biodegradation by naturally occurring microbes. Because groundwater is migrating in a downgradient direction faster than the

petroleum plume (due to retardation), the oxygenated groundwater will flow into the petroleum plume beyond the zone of IAS direct injection. In addition, oxygen will diffuse in groundwater beyond the injection zone. With time, the biodegradation of the downgradient plume is enhanced over existing natural attenuation processes.

SVE is a treatment process whereby a vacuum is induced in subsurface trenches or wells using a vacuum blower. A schematic of SVE is shown in Figure 4. VOCs from the soil are thereby extracted for treatment at the surface. VOCs in the vadose soil vapor are extracted directly. The vacuum induces VOCs in the vadose soil to volatilize into the vapor phase. While some VOCs in groundwater will be extracted by the vacuum, SVE is primarily for treatment of unsaturated soils (vadose zone). SVE is typically used in conjunction with IAS, because as VOCs are stripped from the water table by IAS, the volatilized VOCs can be extracted by the SVE system.

SVE increases circulation of air in the subsurface, bringing additional oxygen to the treatment area. This additional oxygen typically stimulates microbial activity, resulting in increased microbial degradation of petroleum compounds.

The soil vapors extracted by the SVE system will contain Site COCs and will need to be treated before emission to the atmosphere. Various processes are available to treat COCs in the SVE off-gas. Two common systems are catalytic oxidation and vapor-phase carbon absorption. Because of COC concentrations in the off-gas are expected to be relatively low, it is assumed that vapor-phase carbon adsorption would be used. Treated SVE vapors would be discharged under an air permit to the atmosphere.

This remediation process focuses on VOC removal from the area of highest concentrations within the MasterPark Facility. It would remove VOCs from the groundwater by IAS and capture them by SVE. The layout of this process is shown in Figure 2. The SVE would also remove VOCs from soil in the vadose zone. Among other benefits, by removing contaminated subsurface vapors, this SVE would alleviate any potential vapor intrusion concerns into neighboring buildings. SVE off-gas would be treated by carbon adsorption before discharge to the atmosphere. The oxygenation of the groundwater would stimulate natural microbial degradation, providing enhanced biodegradation for the downgradient plume.

The project would include the disturbance (trenching) of asphalt and soils to install the remedial equipment. Construction details will be included in the future design of the remedial system.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

Installation of the clean-up action will occur at the MasterPark Facility which is located at 16025 International Boulevard, SeaTac, Washington within Section 28, Township 23 North, Range 4 East (see Figure 1). The MasterPark Facility is bound by the Louden property to the north (followed by South 160th Street), International Boulevard to the east, and Washington Memorial Cemetery to the west and south. The legal description of the MasterPark Facility is included as Attachment A of the draft Cleanup Action Plan (DCAP). The MasterPark Facility is approximately 7 acres in size, but the cleanup action will only be conducted on a fraction of that property. The entire MasterPark Facility is a parking lot and an administration building used to run the business (valet parking). Current data indicate the known soil contamination, the highest levels of groundwater contamination, and possible primary source of contamination are located on the MasterPark Facility property, but groundwater impacts extend beyond the MasterPark Facility property boundaries. The Site (defined as the area of land that is impacted by the MasterPark Facility's contamination) is comprised of the following contiguous areas:

- MasterPark Lot C (the MasterPark Facility)
- Louden Property
- City of SeaTac (South 160th Street) right-of-way
- Washington Memorial Cemetery
- Port of Seattle Property (west of the MasterPark Facility and north of South 160th Street)

The Site extends beyond South 160th Street to the north, is bound by International Boulevard to the east, and extends onto Washington Memorial Cemetery to the west. A legal description of the Site is included as Attachment A of the DCAP.

2.0 ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other.

Presently, the eastern majority of the Site, where the MasterPark Facility is operated, consists of relatively flat ground covered by asphalt. The western portion of the Site is owned and operated as a cemetery. The northern portion of the Site includes the Louden property and South 160th Street.

b. What is the steepest slope on the site (approximate percent slope)?

No steep slopes exist on the Site. The Site ground surface elevation generally declines from the southwest to the northeast with a maximum elevation near 400 feet above mean sea level (amsl) at the southwest corner of the Site and a minimum elevation of approximately 350 feet amsl near the northeast corner. The elevation along the west MasterPark Facility boundary rises abruptly (approximately 8 to 12 feet) and is stabilized by a retaining wall. The proposed remedial action will not impact or affect the existing retaining wall.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Near surface soils consist of a layer of fill that may be up to approximately 10 feet thick in places. Beneath the fill, till and/or layers of outwash sand are encountered. In general, the till occurs in the range of 10 to 30 feet bgs. Below the till is dense to very dense advanced outwash (Qva) consisting of unstratified fine to coarse grained sandy deposits. Although the RI did not include boreholes deeper than the Qva stratum, regional geologic maps indicate the potential presence of lacustrine clayey silts and silty clay deposits beneath the Qva stratum at an unknown depth (USGS 2004).

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Asphalt and soil will be excavated (trenched) to install the remediation system (pipes, wells). The trenches will be backfilled and capped again with asphalt to allow continued use of the area for parking vehicles.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Trenching and excavation will be a temporary impact. Soil will be returned to the trench containing new laid pipe and covered with asphalt. The same percentage of area will be covered by impervious surfaces (asphalt) after installation of the remediation system.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Construction Best Management Practices (BMPs) will be implemented during construction to reduce and control potential erosion.

2. **Air**

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

During construction, typical exhaust emissions will be released to the air from light and heavy truck/drill rig activity and trenching equipment.

During operation, emissions associated with volatilized contaminants of concern will be treated and released to the atmosphere (under a permit). Emissions effluent will be analyzed in order to meet permit conditions/restrictions.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

No.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Construction activities shall be performed in such a manner that the emission level is minimal. All equipment and operation of equipment shall meet with all state and local regulations. All equipment shall be equipped with emission abatement devices with effectiveness equal or better than that supplied by the original manufacturer.

3. **Water**

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

There are no surface water features or wetlands on the Site or the MasterPark Facility. The nearest major surface water body is Bow Lake, located approximate 1.25 miles to the south of the Site. There is a potential wetland area (but not designated as a wetland by WDFW or King County [King County iMAP, 2010]) located adjacent south of the MasterPark Facility on the cemetery property. However, this potential wetland area is located more than 500 feet from the Site contamination and is not connected to the regional groundwater aquifer. Furthermore, the WDFW has not classified this as a wetland, according to their Habitats and Species Map (2010). There are no surface water impoundments, except for the wetland area and a man-made pond (on the cemetery property approximately 1,500 feet south and side-gradient to the Site contamination), or streams on or adjacent to the Site.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

No work would occur in or within 200 feet of any surface water or wetland.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

N/A

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

No groundwater will be withdrawn during remediation. Air will be delivered to and extracted from groundwater.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

N/A

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

The proposal will not alter existing volume, collection, or treatment of stormwater runoff generated by impervious surfaces at the MasterPark parking Facility.

2) Could waste materials enter ground or surface waters? If so, generally describe.

No.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

None are proposed.

4. **Plants**

a. Check or circle types of vegetation found on the site:

———— deciduous tree: alder, maple, aspen, other
———— evergreen tree: fir, cedar, pine, other
———— shrubs
———— grass
———— pasture
———— crop or grain
———— wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
———— water plants: water lily, eelgrass, milfoil, other
———— other types of vegetation

No vegetation exists where remedial construction will occur because the MasterPark Facility consists of asphalt. Forested area is located on the adjacent cemetery, and in the western portion of the Site.

b. What kind and amount of vegetation will be removed or altered?

None. There is a forested section of the Site that is located on the Washington Memorial Park Cemetery; however, the remediation system will be installed only in the area currently capped with asphalt.

c. List threatened or endangered species known to be on or near the site.

A request for a list of species within or in the vicinity of the Site was submitted to the Washington State Department of Fish and Wildlife (WDFW) on January 15, 2010. Golder received data from the WDFW on March 4, 2010, which included a habitats and species map and report. The WDFW map did not identify any priority habitat or species on or adjacent to the Site. The map indicated several urban natural open spaces and wetlands within five miles of the Site. Additionally, pileated woodpeckers, a state candidate species, were observed at a site 2 miles west of the Site in 1979. WDFW also identified several priority fish species that have been observed in streams within five miles of the Site. The priority fish include cutthroat trout, coho salmon, dolly varden/bull trout, Chinook salmon, chum salmon, pink salmon, sockeye salmon, and steelhead. However, these fish species do not have access to the Site due to lack of surface waters. The Western Washington U.S. Fish and Wildlife Office website (http://www.fws.gov/wafwo/speciesmap/KING.html) which includes King County, Washington, was queried for listed endangered and threatened species, and species of concern that are known to inhabit King County (November 1, 2007). No listed endangered or threatened species are documented or expected to exist at the Site. One species of concern, the bald eagle has the potential to be in the area, but there is no record of nests or roosting habitat at or near the Site.

Because of the Site's location within a historically urban area, it is not likely that the Site or surrounding adjacent properties provide necessary habitat for species other than infrequent transient visitors, such as birds and raptors.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

N/A.

5. **Animals**

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site.

No federal or state-listed threatened or endangered, or candidate for listing species have been identified on or near the Site.

c. Is the site part of a migration route? If so, explain.

The Site resides within the Pacific Flyway.

d. Proposed measures to preserve or enhance wildlife, if any:

N/A.

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Gasoline and/or diesel fuel will be used during construction. Electricity will be used to operate the remediation equipment.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

None are proposed.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Future MasterPark Facility construction/remediation workers could become exposed by direct contact and incidental ingestion to Site near-surface soils (<15 feet) during construction excavation or impacted soil removal activities in the vicinity of the source area (former gasoline USTs at the MasterPark Facility). Current or future construction/remediation excavations, trenches or boreholes would be conducted in the open ambient atmosphere for a short duration on the Site. Construction workers cannot be exposed off of the MasterPark Facility because near-surface soils on the rest of the Site are not contaminated. Construction/remediation worker exposure will be mitigated through the implementation of health protection procedures documented in the Site specific Health and Safety Plan. There are no other known environmental health hazards associated with the Site's contamination and the execution of the remediation proposal.

There is no known discharge of Site groundwater to surface water in the area, including the potential wetland area and man-made pond on the cemetery property south of the Site. There are no potable groundwater supply wells within a mile of the Site in the general downgradient direction (west, southwest or northwest) from the Site. The closest groundwater supply well is in the Washington Memorial Park Cemetery, south of the Site, and is used for watering. However, this cemetery well has not been impacted by Site releases (as per results from Ecology's 2006 and Golder's 2001 sampling events). Therefore, there are no current groundwater exposure pathways to off-Site humans from drinking water impacted by Site release.

Exposures to surface water by releases from the Site are not an operable pathway for human receptors since there are no perennial surface water bodies within 500 feet of the Site contamination.

Restrictive Covenants (dated 2002) are currently recorded for the MasterPark Facility and will also be recorded for the Site in relation to this proposed remedial action. The restrictive covenants pertain to the use of the property and its contaminated media in an effort to control the potential exposure of humans and the environment to Site contamination.

1) Describe special emergency services that might be required.

In the event of vapor or soil ingestion, Medic One (emergency ambulance) may be required to transport a construction worker to a treatment facility or hospital. If construction occurs during summer, potential construction accidents could occur and possible heat stroke from working over asphalt could also require the same emergency service. These issues are discussed in the site-specific Health and Safety Plan

2) Proposed measures to reduce or control environmental health hazards, if any:

Control measures to reduce health hazard risks include the restrictive use covenants included in the agreement with Ecology, along with any additional conditions that may be included with future permits. In addition, a health and safety plan (HASP) will be implemented during all construction and field efforts associated with the remediation.

After remedial actions are completed, media within the MasterPark Facility boundaries will be at acceptable levels for commercial land uses. Some groundwater outside the MasterPark Facility boundaries (but within the Site, will remain impacted for a period of time until natural and enhanced biological degradation of the petroleum plume reduces to acceptable concentrations for future use. Additionally, a restrictive covenant will be recorded pertaining to use of the MasterPark Lot C Facility in order to reduce and control the exposure of humans and the environment to groundwater contamination. Groundwater will be monitored during and after remediation to ensure groundwater supplies do not become contaminated.

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Existing noise levels in the vicinity of the Site will not affect the project. Traffic and typical urban commercial and light industry noise, along with noise generated by airplane traffic at Sea-Tac International Airport exists in the area of the Site.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Short-term noise would be generated by heavy construction equipment (e.g. excavator, dump trucks) during construction activities. Long-term noise would be generated by the blower (air injector) and vacuum equipment, which will be abated by being located in a noise-insulated trailer or building. The contractor would limit the on-site construction work hours to the time between 7:00 AM and 6:00 PM.

3) Proposed measures to reduce or control noise impacts, if any:

Construction activities shall be performed in such a manner that the noise level is minimal. All equipment and operation of equipment shall meet with all State and local regulations. All equipment shall be equipped with mufflers or other noise abatement devices with effectiveness equal or better than that supplied by the original manufacturer.

8. **Land and shoreline use**

a. What is the current use of the site and adjacent properties?

The Site resides within the city limits of SeaTac, Washington. The entire MasterPark Facility property is a paved parking lot with a single administrative building supporting the business. The Louden property and SE 160th Street lie to the north. The Louden property contains an office building utilized by a real estate business and a warehouse building. The warehouse building has been utilized for the storage of goods and materials by various businesses. The Port of Seattle has major construction occurring north of SE 160th Street for commercial buildings and infrastructure to support light rail transportation. To the east is Pacific Highway South (State Route 99) with numerous commercial businesses and buildings. A residential neighborhood exists further east of the MasterPark Facility (about 0.25 mile). To the west and south of the MasterPark Facility is land owned by the Washington Memorial Cemetery. Further west of the cemetery is Port of Seattle parking and commercial office buildings, followed by the airport access highway and SeaTac Airport.

b. Has the site been used for agriculture? If so, describe.

No.

c. Describe any structures on the site.

There are no buildings or other structures located in the area where construction and placement of remediation equipment will occur. This area is currently covered by an asphalt cap (parking lot).

d. Will any structures be demolished? If so, what?

The parking lot will be trenched in the areas where pipe will be laid.

e. What is the current zoning classification of the site?

According to a City of SeaTac zoning map (February 2009, see Figure 2-3), the MasterPark Facility (and the adjacent north Louden property) is zoned as CB-C or “Community Business in Urban Center”. Washington Park Cemetery and the associated cemetery residence are zoned as “Park.” To the north of Washington Park Cemetery the land is zoned AVO or “Aviation Operations.” The property north of the MasterPark Facility on the north side of South 160th Street is zoned as AVC or “Aviation Commercial.” To the east of the MasterPark Facility, on the east side of International Boulevard, the land has mixed zoning including “Community Business in Urban Center,” followed by “Urban High Density Residential,” and “Urban Medium Density Residential

f. What is the current comprehensive plan designation of the site?

Commercial High Density.

g. If applicable, what is the current shoreline master program designation of the site?

N/A

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No.

i. Approximately how many people would reside or work in the completed project?

N/A

j. Approximately how many people would the completed project displace?

N/A

k. Proposed measures to avoid or reduce displacement impacts, if any:

N/A

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

N/A. The project is a temporary remedial action.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

N/A

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

N/A

c. Proposed measures to reduce or control housing impacts, if any:

N/A

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

The trailer used to house the blower, filters, and vacuum will be the tallest structure on the site; approximately 12 feet in height. The trailer will likely have a metal exterior.

b. What views in the immediate vicinity would be altered or obstructed?

N/A

c. Proposed measures to reduce or control aesthetic impacts, if any:

Aesthetic impacts will be reduced by having all piping within the ground and all above-ground remedial equipment housed in a trailer. If appropriate, the trailer could be painted to blend with the surrounding area.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

The trailer will exist on the property the entire time the remedial action is occurring. A dull, non-reflective paint could be applied to the trailer to reduce any potential glare.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

N/A

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

As noted above, a conservative, non-reflective paint could be applied to the trailer to reduce any potential glare.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?

The cemetery is zoned as Park.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

N/A

13. **Historic and cultural preservation**

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

No.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

It is suspected that portions of the Washington Park Cemetery may have been developed prior to 1936 as indicated by the presence of some of the current cemetery roads (to the south of the MasterPark Facility) in a 1936 aerial photograph. The Site showed the first development in a 1946 aerial photograph with a single building. Major development of the MasterPark Facility and surrounding properties was evident in a 1956 aerial photograph. Since the 1960s, the Facility was mainly a construction staging area that supported the construction of Interstate 5. The currently existing Louden property buildings were constructed at some point between 1960 and 1969 as indicated by aerial photographs of this vintage. More recently a number of small manufacturing and warehousing facilities operated at the Facility including public parking. Today, the entire Facility is a paved parking lot with a single administrative building supporting the business

c. Proposed measures to reduce or control impacts, if any:

N/A

14. **Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

The site is served via South 160th and Highway 99. Access to the existing street system will not be modified or restricted during the proposed remedial action.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Yes.

c. How many parking spaces would the completed project have? How many would the project eliminate?

Some parking spaces will be displaced during the construction phase of the project. As many of these parking spaces as possible will be returned to usable parking after construction since this is the exclusive business operated at the site where construction is occurring.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

No.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

There would be no appreciable increase in traffic due to this project.

g. Proposed measures to reduce or control transportation impacts, if any:

Any impact to traffic on adjacent arterials would occur during the construction phase of the project. Construction traffic will occur in compliance with a Traffic Control Plan and permit.

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

No.

b. Proposed measures to reduce or control direct impacts on public services, if any.

None are proposed.

16. **Utilities**

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

Given the urban nature of the area, all utilities are likely accessible to the property.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Electricity will be required to operate the remediation equipment housed in the trailer. As such, a transformer may be required to be installed at the site.

3.0 SIGNATURE

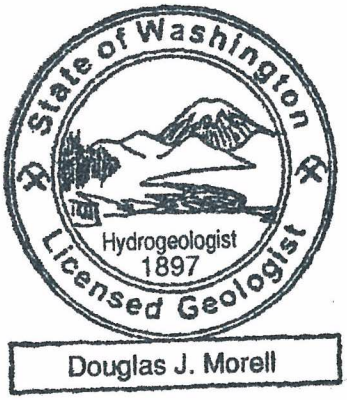
The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Project Proponent (Golder Associates, Inc.)

Printed Name: Douglas J. Morell

Signature: Douglas J. Morell

Date: November 2, 2011



WAC 197-11-970 Determination of nonsignificance (DNS).

DETERMINATION OF NONSIGNIFICANCE

Description of proposal: The proposed project is a remedial action to remove a contaminant [gasoline range petroleum hydrocarbons (gasoline) and associated constituents] from the sub-surface. A release from an underground gasoline storage tank has impacted underlying soils and groundwater at the SeaTac Development Site (MasterPark Facility) and has impacted groundwater under adjacent properties. The proposed remedial action will be source area destruction and natural attenuation of the remainder of the plume. This will be implemented through a combination of in-situ air sparging (IAS) and soil vapor extraction (SVE). IAS is a treatment process whereby air is injected into the groundwater below the contamination. SVE is a treatment process whereby a vacuum is induced in subsurface trenches or wells using a vacuum blower. In combination, both processes remove volatile compounds from contaminated soil and groundwater while oxygenating these zones resulting in increased microbial degradation of petroleum compounds. A program of compliance monitoring and institutional controls is also provided in the DCAP.

Proponent: SeaTac Investments LLC (SeaTac Investments), Scarsella Brothers Inc., ANSCO Properties, LLC

Location of proposal, including street address, if any: Installation of the clean-up action will occur at the MasterPark Facility located at 16025 International Boulevard, SeaTac, Washington within Section 28, Township 23 North, Range 4 East. The Facility is bound by the Louden property to the north (followed by South 160th Street), International Boulevard to the east, and Washington Memorial Cemetery to the west and south. The legal description of the MasterPark Facility is included as Attachment A of the draft Cleanup Action Plan (DCAP) for the SeaTac Development Site. The cleanup action will only be conducted on a fraction of the MasterPark Facility property. The entire MasterPark Facility is a parking lot and an administration building used to run the business (valet parking). Current data indicate the known soil contamination, the highest levels of groundwater contamination, and possible primary source of contamination are located on the MasterPark Facility property, but groundwater impacts extend beyond the MasterPark Facility property boundaries. The Site boundaries (defined as the area of land that is impacted by the MasterPark Facility's contamination) are described in detail in the DCAP.

Lead agency: Washington State Department of Ecology

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030 (2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

☐ There is no comment period for this DNS.

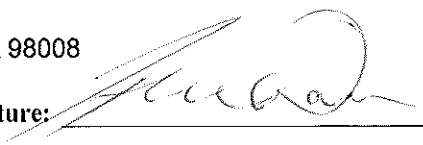
☐ This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

☑ This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 30 days from the date below. Comments must be submitted by May 31, 2011 to Jerome Cruz, 3190 - 160th SE Bellevue, WA 98008, Tel. 425-649-7094.

Responsible official: Robert W. Warren

Position/title: Northwest Regional Office Section Manager, Toxics Cleanup Program **Phone:** (425)649-7054

Address: 3190 - 160th SE Bellevue, WA 98008

Date: October 31, 2011 **Signature:** 

FIGURES

LEGEND

- Approximate Site Boundary
- 2003 Restrictive Covenant Boundary & Asphalt Cap Institutional Control
- Approximate Groundwater Plume

0 4000

SCALE IN FEET

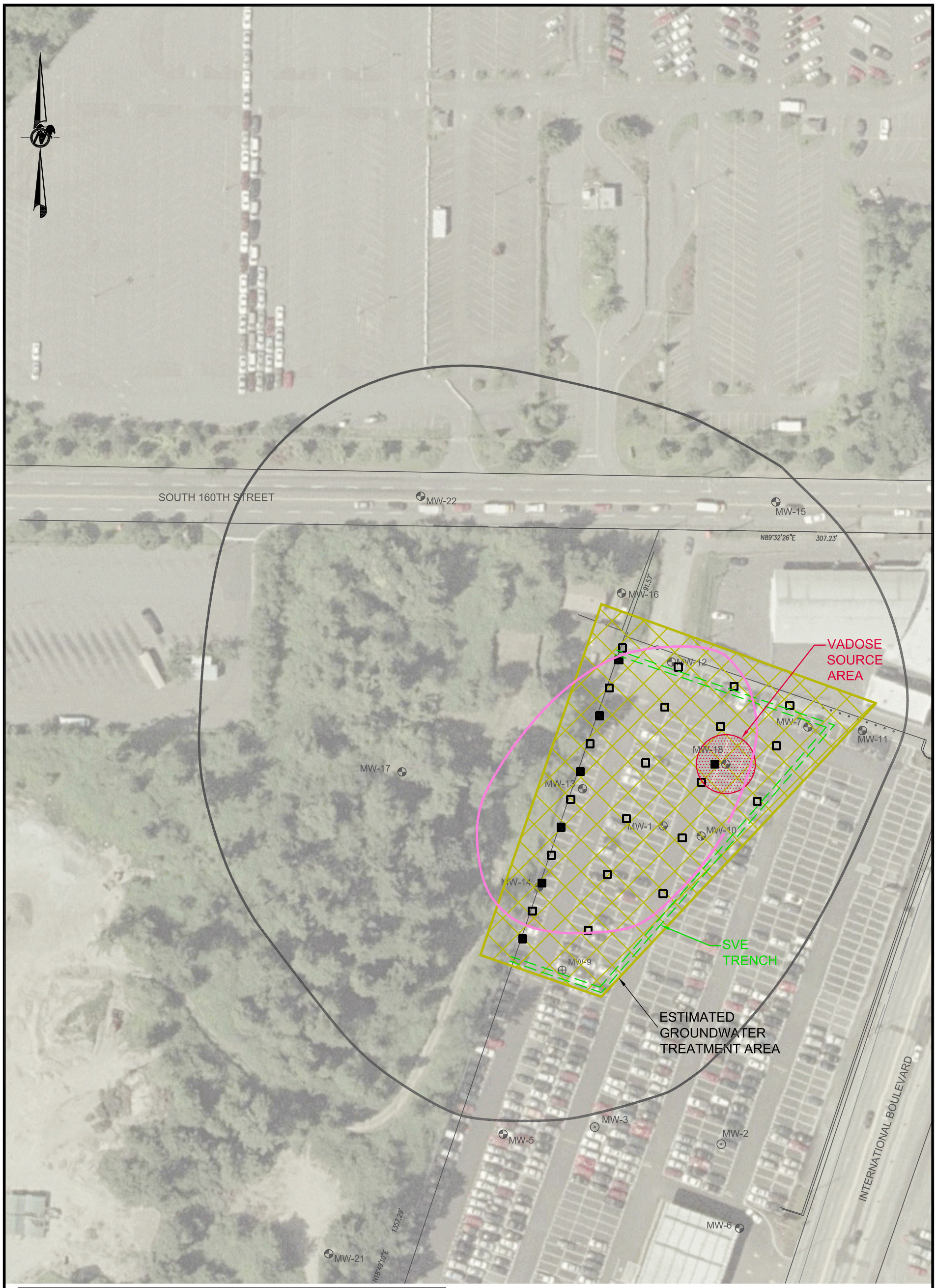
Source: Google Earth Pro

FIGURE **1**

APPROXIMATE SITE BOUNDARY

SEATAC DEVELOPMENT SITE/CAP/WA

Golder Associates



NOTES:
PLUME BOUNDARY BASED ON GROUNDWATER SAMPLE RESULTS EXCEEDING MTCA METHOD A CLEANUP LEVEL FOR GASOLINE RANGE PETROLEUM HYDROCARBONS (800ug/L)

FIGURE **2**

FOCUSED IAS-SVE LAYOUT FOR ALTERNATIVE A

SEATAC DEVELOPMENT SITE/RI/FS/WA

K:\CAD\Projects\2007\07393368\05\04\Exhisting B -SEPA\073_93368_05_04_F02.dwg | Fig 2 | Mod: 07/29/2010, 08:31 | Plotted: 07/29/2010, 08:47 | aforcier

Golder Associates

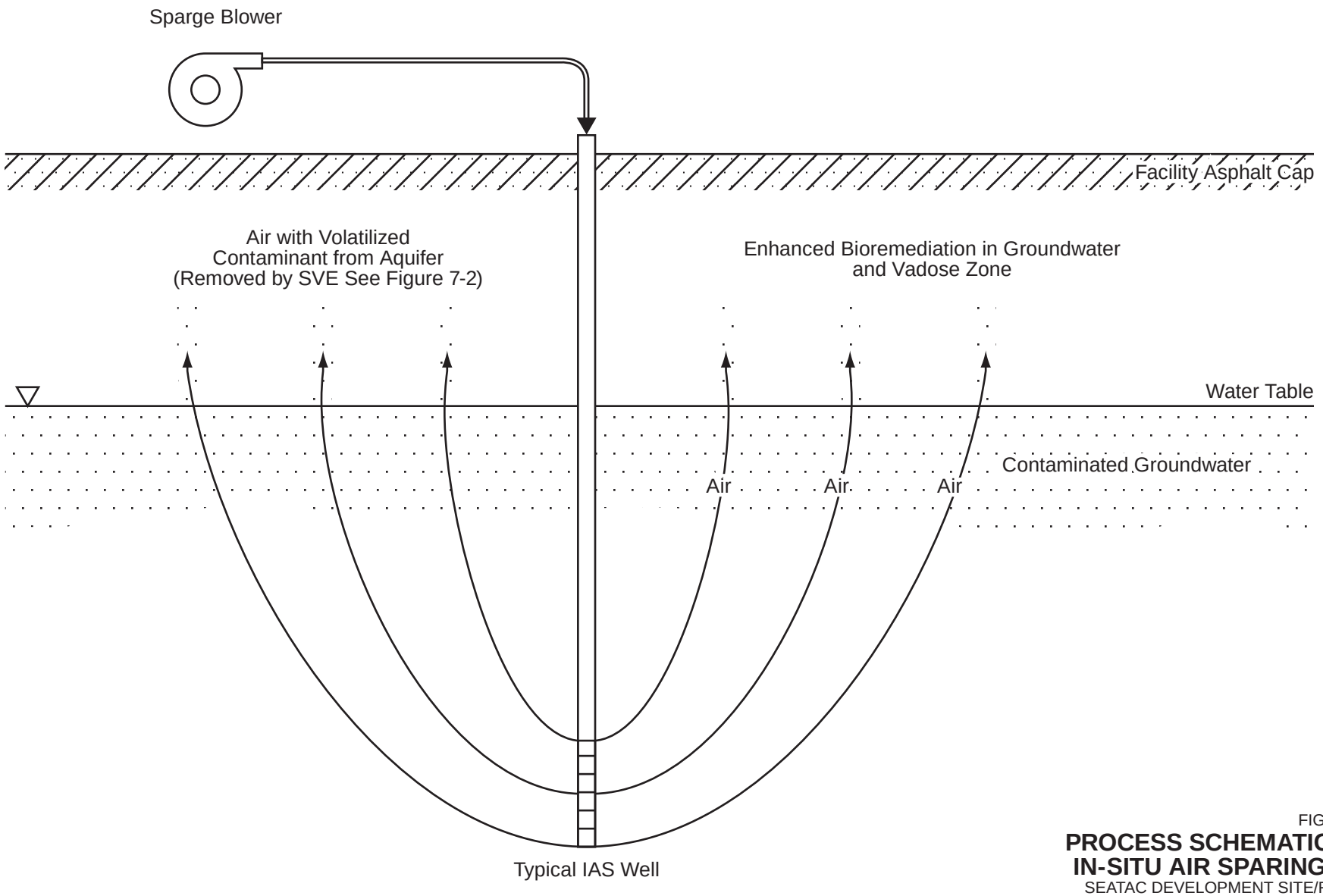


FIGURE **3**

PROCESS SCHEMATIC FOR IN-SITU AIR SPARING (IAS)

SEATAC DEVELOPMENT SITE/RI/FS/WA

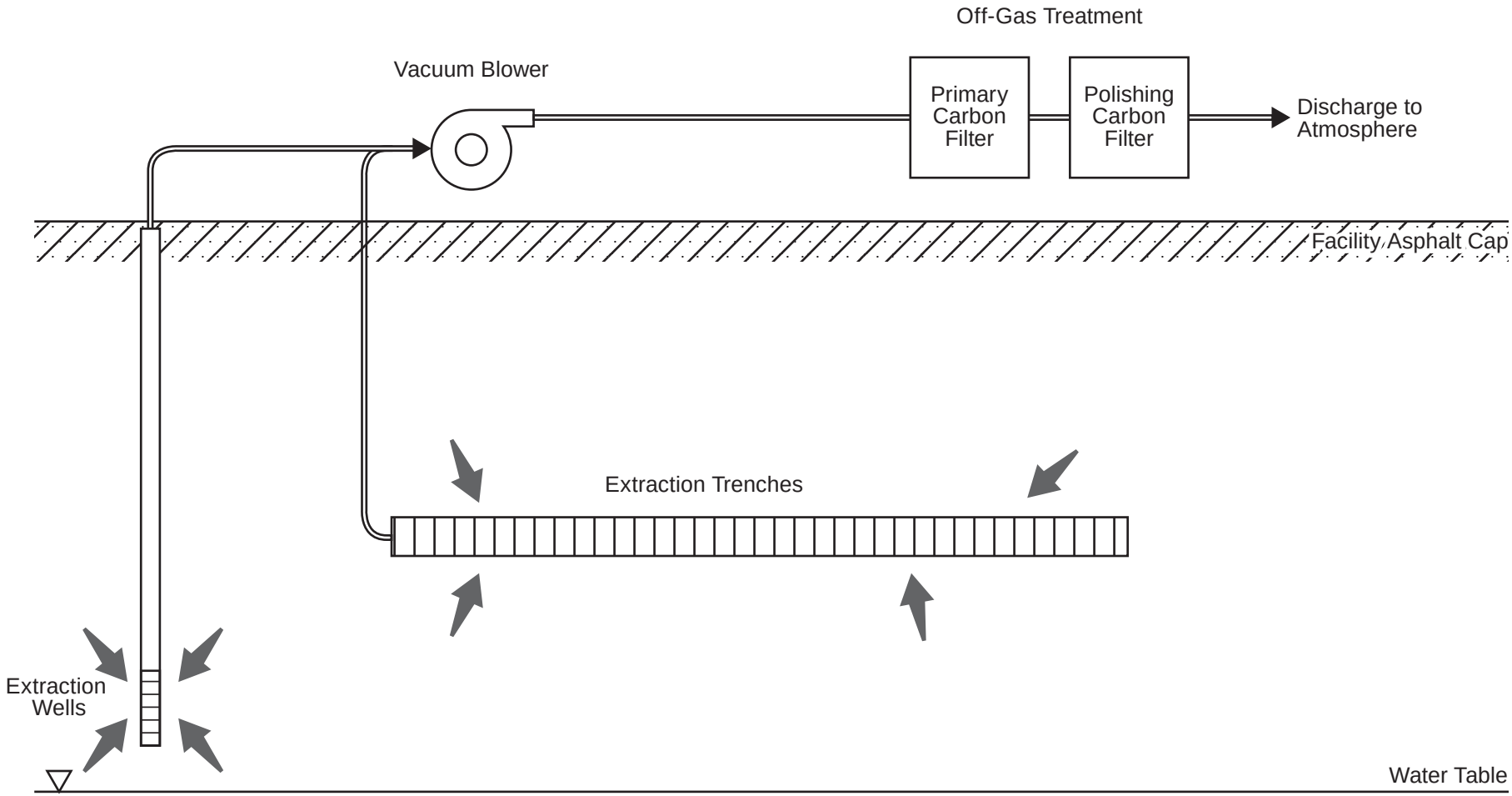


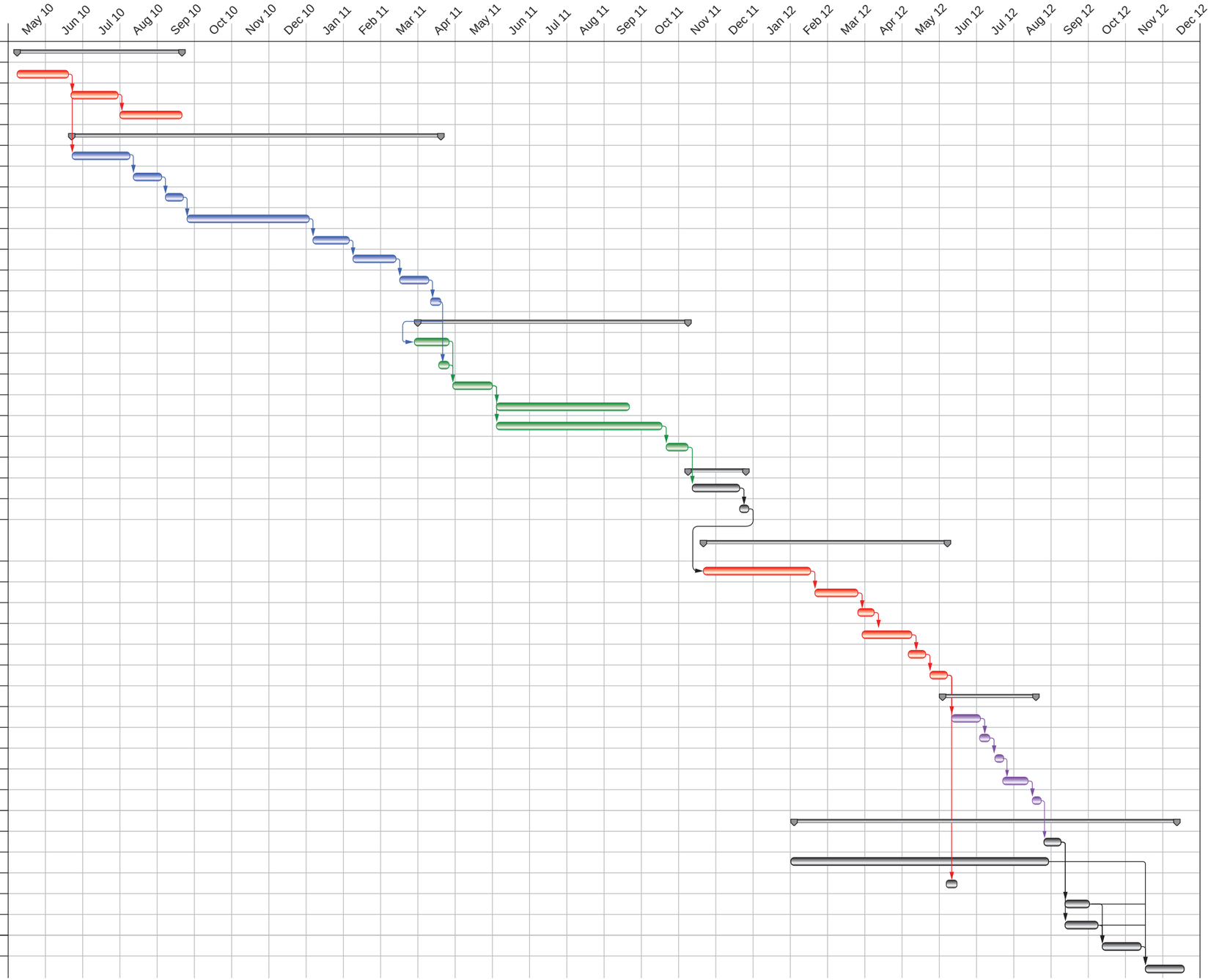
FIGURE **4**

PROCESS SCHEMATIC FOR SOIL VAPOR EXTRACTION (SVE)

SEATAC DEVELOPMENT SITE/RI/FS/WA

ATTACHMENT C
SCHEDULE

ID	Task Name	Duration
1	**RI/FS REPORT**	**98 days**
2	Ecology Review of Draft RI/FS Report	30 days
3	Ecology Comment Resolution and Revise Draft RI/FS Report	30 days
4	**Submit Final RI/FS Report to Ecology**	38 days
5	**CLEANUP ACTION PLAN (CAP)**	**217 days**
6	Prepare Draft Clean Action Plan (DCAP)	35 days
7	Team Review of DCAP	20 days
8	Team Comment Resolution and Revise DCA	12 days
9	Ecology Review of DCAP	75 days
10	Ecology Comment Resolution, Revise and Submit DCAP to Ecology	25 days
11	Ecology Review of Revised DCAP	25 days
12	Ecology Comment Resolution and Revise DCAP	20 days
13	**Submit DCAP to Ecology**	5 days
14	**PUBLIC PARTICIPATION AND REVIEW PROCESS**	**162 days**
15	Ecology Process and Provide DCAP to Public Repository	20 days
16	State Submits Draft Consent Decree for Public Comment	7 days
17	Public Review of Consent Decree & DCAP	25 days
18	Prepare RI/FS and CAP Addendum	80 days
19	Comment Resolution and Responsiveness Summary	100 days
20	**Submit Final CAP to Ecology with Responsiveness Summary**	15 days
21	**AGREED ORDER/CONSENT DECREE**	**33 days**
22	Negotiation With Ecology	30 days
23	Agreed Oder/Consent Decree Filed	3 days
24	**ENGINEERING DESIGN REPORT (EDR) AND OPERATION & MAINTENANCE PLAN (OMP)**	**140 days**
25	Prepare Draft EDR & Support Plans to Client	60 days
26	Client review of EDR & Support Plans	15 days
27	Prepare and Submit Draft EDR & Support Plans to Ecology	15 days
28	Ecology and Agencies Review of Draft EDR & Support Plans	30 days
29	Comment Resolution of Ecology and Agencies Comments	10 days
30	**Finalize EDR and Support Plans to Ecology and Agencies**	10 days
31	**CONTRACTOR BID PROCESS**	**55 days**
32	Prepare Draft Bid Package to Clients	20 days
33	Client Review	5 days
34	Finalize Bid Package	5 days
35	Contractor Bidding Period	20 days
36	**Bid Award**	5 days
37	**REMEDIAL ACTION IMPLEMENTATION**	**225 days**
38	Mobilization	10 days
39	PSE Transformer Application	150 days
40	Ordering Equipment	5 days
41	Well Installation	20 days
42	Treatment System Installation	25 days
43	Underground header Connections	25 days
44	**System Testing**	20 days



Project: Project2
Date: Thu 11/3/11

LEGEND

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

FIGURE **1**
SEATAC DEVELOPMENT
SITE REMEDIATION SCHEDULE
SEATAC DEVELOPMENT SITE/CAP/WA

Golder Associates

ATTACHMENT D
PUBLIC PARTICIPATION PLAN

DEPARTMENT OF ECOLOGY
State of Washington

SeaTac Development Site
Public Participation Plan
2009

Prepared by
Washington State Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008-5452

TABLE OF CONTENTS

1.0 INTRODUCTION

The Washington State Department of Ecology (Ecology) has developed this public participation plan pursuant to the **Model Toxics Control Act (MTCA)**, to promote meaningful community involvement prior to implementation of remedial action at the **SeaTac Development site (Site).** This Site is located at 16025-16223 International Boulevard, SeaTac, Washington. It is listed in Ecology's known and suspected contaminated sites list with **Facility Site ID number** 38258847.

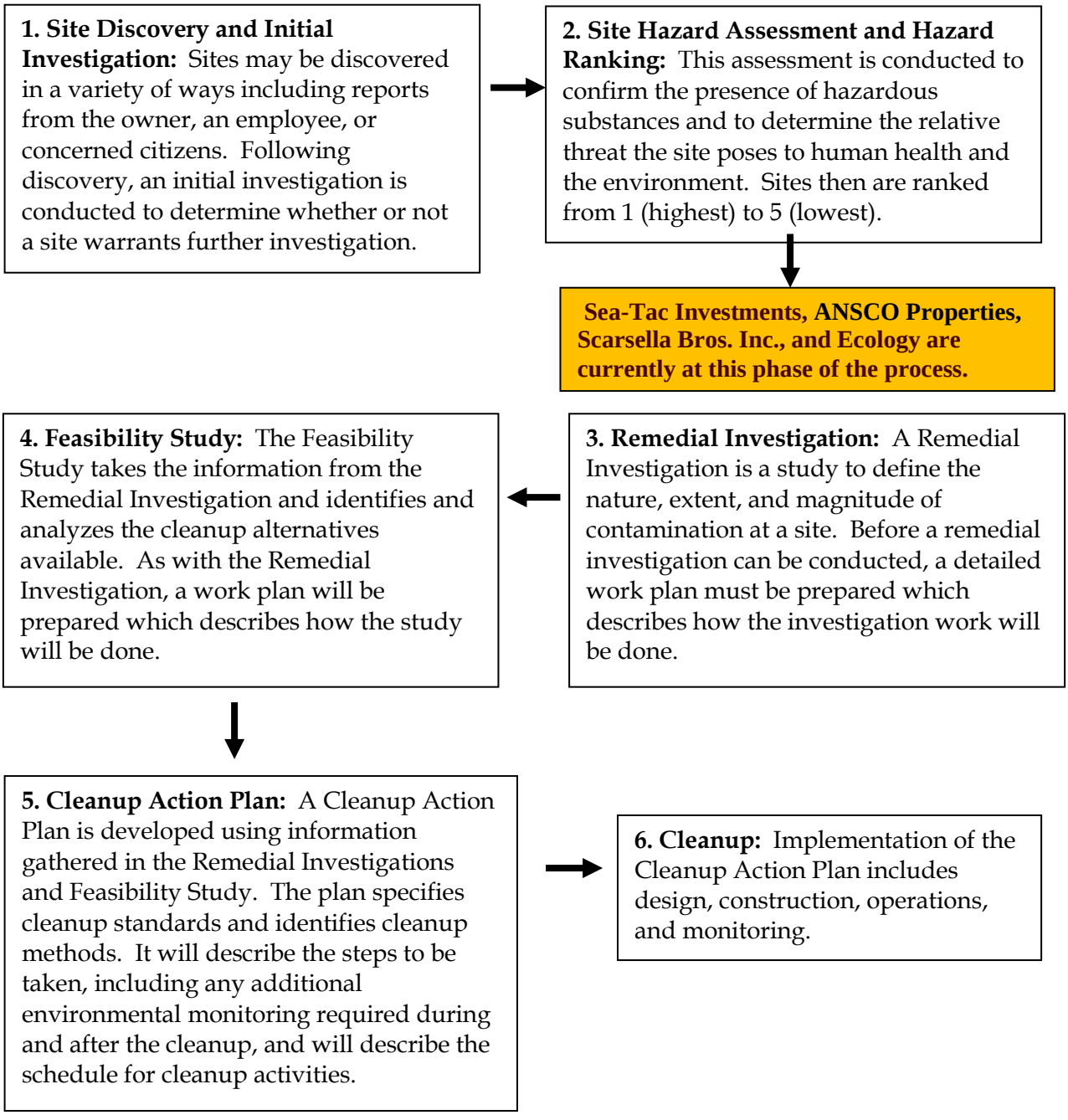
This **Public Participation Plan (PPP)** outlines and describes the tools and approaches that Ecology uses to inform the public about site activities and identifies opportunities for the community to become involved. This Plan aims at addressing potential community concerns regarding the remedial action and defines the types of public participation activities that will take place as a part of the cleanup process. It is based on Ecology's Model Toxic's Control Act (MTCA) regulations (WAC 173-340-600 Public Participation). Ecology is committed to an open dialogue with the community to ensure that interested parties receive information as well as the opportunity to provide input during the decision-making process.

Sea-Tac Investments LLC, ANSCO Properties LLC, and **Scarsella Bros. Inc. (Potentially Liable Persons or PLPs)** have negotiated a legal agreement with Ecology called an **Agreed Order.** The Agreed Order describes the working relationship among the three parties and outlines the scope of work to be implemented. The PLP will complete the remedial action outlined in the Agreed Order. The remedial action tasks are to complete the **Remedial Investigation (RI)**, to develop a **Feasibility Study (FS)**, and prepare a **Draft Cleanup Action Plan (DCAP)** for the Site. The purpose of the RI is to determine the nature and extent of contamination on the site. The FS will use the results of the RI to evaluate and select effective measures to prevent releases of contamination from the site. The DCAP will propose the cleanup alternatives for this site. The Cleanup Action Plan will create a plan for cleaning up any contamination using the preferred alternative from the FS.

Following the completion of the draft RI/FS report and DCAP, additional public involvement activities may be scheduled. A public comment period will be held prior to implementing the proposed CAP. The public involvement activities will be tailored based on the public comments received for this site and MTCA requirements. This will include public notifications and comment periods where appropriate.

Steps in the Cleanup Process

The MTCA rules detail each step in the cleanup process to ensure that cleanups are thorough and protective of human health and the environment. The chart below defines these steps and how they apply to the project site. Legal documents such as "**Agreed Orders**" or "**Consent Decrees**" further define some of the steps and associated time frames. The cleanup process can be complex. During the process, issues often arise that need more scrutiny or evaluation, and may lead to changes in the scope or timing of the project. At the same time, it is in everyone's interest to complete a cleanup as quickly as possible.



Agreed Order and Public Participation Schedule at SeaTac Development Site

Activity	Public Participation/Communications Activity
Agreed Order prepared for public notice	• Fact Sheet mailed to citizens around the affected area and posted on Ecology's webpage. • Community/interest group briefings if requested.
30 Day Public Comment Period	• Public comment period for draft Agreed Order and draft Public Participation Plan (PPP). • Review and evaluate public comments. • Prepare a Responsiveness Summary for public comments received and Ecology's reply if Ecology determines this is necessary. • Revise Agreed Order and PPP if recommended after Ecology's review.
Updates/Public Notifications	• As needed.
30 Day Public Comment Period	• Fact Sheet and public comment period for draft Remedial Investigation and Feasibility Study Report, and draft Cleanup Action Plan. • Review and evaluate public comments. • Prepare a Responsiveness Summary for public comments received and Ecology's reply if Ecology determines this is necessary. • Revise the RI/FS and DCAP if recommended after Ecology's review.

Site Background

Sea-Tac Investments LLC currently leases the property from ANSCO Properties LLC, and developed it for use as an airport parking lot. Previously, various companies operated businesses there, some of which utilized fuel products and underground storage tanks. Scarsella Bros. Inc. once owned the property and operated a construction yard on the property until the 1970s.

In 2000, during development of the property, Sea-Tac Investments found petroleum contamination in soil and groundwater. High levels of gasoline were found in the groundwater **aquifer** 50-60 ft. beneath the property. Contamination seemed to be from equipment operations and old underground storage tanks used by the former owner or former tenants.

In 2001, Sea-Tac Investments entered into Ecology's Voluntary Cleanup Program to investigate and clean up some of the contamination. Ecology gave Sea-Tac Investments a "No Further Action" letter for cleanup of the soil. Ecology later rescinded this letter in 2007. The gasoline contamination in the aquifer extends beyond property boundaries and was not cleaned up at that time.

There were later investigations to find the source of contamination in the aquifer at some locations in the surrounding area where former gas stations were located. No source of the contamination was found at those locations.

Further sampling both on the property and outside the property gave evidence that the gasoline contamination in the aquifer may have originated on the site. The full extent of the contamination in the aquifer is still unknown. The entire contaminated site, not limited to property lines, will be addressed under this Agreed Order. The contamination at this site is not related to the SeaTac International Airport or the SeaTac Groundwater Study.

Site Map

SeaTac Development site located at 16025-16223 International Boulevard, SeaTac, Washington. The site boundary will be defined at the conclusion of the RI/FS.

The SeaTac Development site is located at 16025-16223 International Blvd, SeaTac, Washington. The Site is bordered to the east by International Blvd, to the west by the Washington Memorial Park Cemetery, to the north by other properties and South 160th

Street, and to the south by other Master Park facilities and further south by the Washington Memorial Park Mortuary.

Cleanup Work to be Performed

The proposed work tasks under this Agreed Order are to complete the Remedial Investigation (RI) and Feasibility Study (FS) and prepare a Draft Cleanup Action Plan (DCAP). The work plan for the RI/FS is part of the Agreed Order. These documents will be reviewed and revised as necessary for approval by Ecology. With Ecology's approval, the next step will be public review of the draft RI/FS report and DCAP. Future actions may include a new proposed legal agreement to implement the Ecology approved final CAP.

The proposed actions to be conducted under the Agreed Order include the following:

- Remedial Investigation to find the nature and extent of the contamination. This will allow Ecology to define the entire area needing cleanup, known as the "site".
- Feasibility Study to find the possible cleanup alternatives for the site.
- Draft Cleanup Action Plan to outline how the cleanup of the site will operate and what the timeline will be.

2.0 CONTAMINANTS OF CONCERN

The contaminants of concern in soil and groundwater are gasoline, BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), and potential related gasoline constituents and additives lead, naphthalene, 1,2-dibromoethane (EDB), 1,2-dichloroethane (EDC), and methyl tertiary-butyl ether (MTBE).

3.0 PUBLIC PARTICIPATION ACTIVITIES AND RESPONSIBILITY

The purpose of this Public Participation Plan is to promote public understanding and participation in the cleanup process for this site. The goals of this plan are:

- To identify people and organizations with an interest or potential interest in the site.
- To promote public understanding and to identify community concerns related to the:
    - Agreed Order.
    - Remedial Investigation and Feasibility Study Report.
    - Draft Cleanup Action Plan.
    - Public Participation Plan.

- Implementation of the Cleanup Action Plan after approval by Ecology.

- To encourage interactive communication and collaboration between Ecology, SeaTac Investments LLC, ANSCO Properties LLC, Scarsella Bros. Inc., and the community.
- To meet the public participation requirements under MTCA.

This section addresses how Ecology will keep the public informed about site activity and provide opportunities for being involved in the cleanup.

Ecology will continue to use a variety of tools to facilitate public participation in the planning and cleanup of this site. These tools are:

- Formal comment periods.
- Responsiveness Summary summarizing public comments and Ecology's reply to these comments.
- Fact sheets.
- Public meeting (if requested by 10 or more persons).
- Information repositories.
- Site register notices.
- Web tools including a web-based Events calendar.
- Newspaper advertisements

Ecology will consider and implement constructive input provided by the community whenever possible.

Ecology urges the public to become involved in the cleanup process. Information will be provided regularly to provide many opportunities to review materials and provide comments. This plan is intended to be a flexible working document that will be updated as community concerns emerge and/or more information becomes available during the cleanup process. To arrange for a briefing with project staff, ask questions, or provide comments on the plan or other aspects of the cleanup, please contact one of the persons listed below.

For technical questions, please contact:

Jerome Cruz, Site Manager
Washington State Department of Ecology
Toxics Cleanup Program – Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008
Phone: 425-649-7094
E-mail: jcru461@ecy.wa.gov

For community involvement questions, please contact:

Nancy Lui, Community Outreach
Washington State Department of Ecology
Toxics Cleanup Program – Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008
Phone: 425-649-7117
E-mail: nlui461@ecy.wa.gov

Roles and Responsibilities

Ecology maintains overall responsibility and approval authority for the activities outlined in this plan in accordance with MTCA requirements. Ecology conducts public comment periods as required by MTCA, which include reviewing comments and making decisions, preparing a Responsiveness Summary if comments are received, and revising documents if Ecology review and public comments recommend substantive changes to the documents. If substantial changes to the documents are approved by Ecology, then another public comment period will be held.

Public Outreach Activities

A 30-day public comment period will be scheduled for each major phase of the project. A formal public notice for each of the comment periods will include the following:

- A Fact Sheet will be distributed to the neighboring community and surrounding areas.
- A newspaper advertisement will be placed in the local area newspaper.
- A notice will be published in Ecology's Site Register and Ecology's Public Calendar.
- All public documents will be available at the neighborhood library or community center, Ecology's Northwest Regional Office, and on Ecology's website for public review.
- A public meeting will be held if 10 or more people request a meeting during the public comment period.
- The Ecology site manager and community outreach specialist will be available to discuss issues about the site.

Formal Public Comment Period

Comment periods are the primary method Ecology uses to get feedback from the public on proposed cleanup decisions, which Ecology presents as draft documents. Comment periods usually last for 30 days and are required at key points during the investigation and cleanup process before final decisions are made.

During a comment period, the public can comment in writing through letters or email. Verbal comments are taken if a public hearing is held. After a formal comment period, Ecology reviews all comments received and determines if a **Responsiveness Summary** is necessary. A Responsiveness Summary is a document which summarizes all comments received and Ecology's responses during the comment period.

During the comment period, please send your written comments by letter or email to:

Jerome Cruz, Site Manager
Washington State Department of Ecology
Toxics Cleanup Program – Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008
Phone: 425-649-7094
E-mail: jcru461@ecy.wa.gov

Ecology will consider the need for changes or revisions to draft documents based on input from the public comments and Ecology's review. If significant changes are made, then a second comment period will be held. If no significant changes are made, then the draft document(s) will be finalized.

Public Meetings and Hearings

Public meetings may be held at key points during the cleanup process. Ecology may also offer public meetings for actions expected to be of particular interest to the community. If ten or more people request a public meeting or hearing during the 30 day comment period, Ecology will hold a public meeting for the purpose of taking comments on the draft documents.

Information Repositories

Information repositories are convenient places where the public can go to read and review site information (see below). The information repositories are often at libraries or community centers to which the public has access. During the comment period, the site documents will be available for review at each repository that is listed below. Documents remain at the repositories for the entire duration of the project.

The entire site file is available for review at Ecology's Northwest Regional Office by appointment. For special accommodations or translation assistance, please contact Nancy Lui at nlui461@ecy.wa.gov or at 425-649-7117 and please indicate you would like assistance with the "**SeaTac Development site**". Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

The information repositories for the SeaTac Development site will be located at:

Valley View Library
17850 Military Road South
SeaTac, WA 98188
(206) 242-6044

Washington State Department of Ecology
3190 160th Ave. S.E.
Bellevue, WA 98008
Call for an appointment: Sally Perkins
425-649-7190
425-649-4450 FAX
E-mail: sper461@ecy.wa.gov
Hours: Tuesday – Thursday, 8 am–Noon and 1–4:30 pm

Site Register and Public Events Calendar

Ecology's Toxics Cleanup Program uses its bimonthly Site Register and web-based Public Involvement Calendar to announce all of its public meetings and comment periods as well as additional site activities. To receive the Site Register in electronic or paper format, contact Linda Thompson by email at ltho461@ecy.wa.gov or by telephone at 360-407-6069. The site register is available on Ecology's web site at **http://www.ecy.wa.gov/programs/tcp/pub_inv/pub_inv2.html**
The Public Involvement Calendar is available on Ecology's website at **http://apps.ecy.wa.gov/pubcalendar/calendar.asp**

Mailing List

Ecology has compiled and maintains a list of interested parties, organizations, businesses and residents living near the cleanup site. This list will be used to disseminate

information via mail (fact sheets, site updates, public notices, etc.). If you are not on the mailing list for this site and wish to be added, please contact Nancy Lui at nlui461@ecy.wa.gov or at 425-649-7117. In the subject line, please write "**SeaTac Development site mailing list**".

Ecology Website

Information on the cleanup is available online at Ecology's Website:
http://www.ecy.wa.gov/programs/tcp/sites/seaTacDev/seaTacDev_hp.htm

4.0 PUBLIC PARTICIPATION GRANTS AND TECHNICAL ASSISTANCE

Additionally, citizen groups living near contaminated sites may apply for public participation grants during open application periods. These grants help citizens receive technical assistance in understanding the cleanup process and create additional avenues for public participation.

NOTE: Ecology currently does not have a citizen technical advisor for providing technical assistance to citizens on issues related to the investigation and cleanup of the Site.

5.0 PUBLIC PARTICIPATION PLAN AMENDMENTS

The Plan was developed by Ecology and complies with the MTCA regulations (Chapter 173-340 WAC). This plan will be reviewed and updated as cleanup progresses and may be amended if necessary. Amendments may be submitted to Ecology's site manager, Jerome Cruz, for review and consideration. Ecology will determine final approval of the Plan as well as any amendments.

GLOSSARY

Agreed Order: A legal document issued by Ecology which formalizes an agreement between the department and potentially liable persons (PLPs) for cleanup actions needed at a site. Orders are subject to public comment. If an order is substantially changed, an additional comment period may occur.

Aquifer: A layer of water-bearing rock beneath the earth's surface.

Cleanup: The implementation of a cleanup action, or interim action.

Cleanup Action: Any remedial action, except interim actions, taken at a site to eliminate, render less toxic, stabilize, contain, immobilize, isolate, treat, destroy, or remove a hazardous substance that complies with WAC 173-340-350 through 173-340-390.

Chemicals of Concern (COCs): Hazardous substances that are of particular concern at this site.

Comment Period: A time period during which the public can review and comment on various documents and proposed actions. For example, a comment period may be provided to allow community members to review and comment on proposed cleanup action alternatives and proposed plans.

Consent Decree: A legal document approved and issued by a court which formalizes an agreement reached between the state and potentially liable persons (PLPs) on the actions needed at a site. A decree is subject to public comment. If a decree is substantially changed, an additional comment period is provided.

Containment: A container, vessel, barrier, or structure, whether natural or constructed, which confines a hazardous substance within a defined boundary and prevents or minimizes its release into the environment.

Contaminant: Any hazardous substance that does not occur naturally or occurs at greater than natural background levels.

Comment Period: A time period during which the public can review and comment on various documents and proposed actions.

Environment: Any plant, animal, natural resource, surface water (including underlying sediments), ground water, drinking water supply, land surface (including tidelands and shorelands) or subsurface strata, or ambient air within the state of Washington.

Facility: Any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly-owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, vessel, or aircraft; or any site or area where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed or, placed, or otherwise come to be located.

Facility Site ID #: Site specific number assigned by Ecology for the Ecology known and suspected contaminated sites database.

Feasibility Study: The Feasibility Study takes the information from the Remedial Investigation and identifies and analyzes the cleanup alternatives available. As with the Remedial Investigation, a workplan will be prepared which describes how the study will be done.

Groundwater: Water found beneath the earth's surface that fills pores between materials such as sand, soil, or gravel. In some aquifers, ground water occurs in sufficient quantities that it can be used for drinking water, irrigation and other purposes.

Hazardous Substance: Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.

Information Repository: A file containing current information, technical reports, and reference documents available for public review. The information repository is usually located in a public building that is convenient for local residents such as a public school, city hall, or library.

Interim Action: Any remedial action that partially addresses the cleanup of a site. It is an action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance at a facility; an action that corrects a problem that may become substantially worse or cost substantially more to address if the action is delayed; an action needed to provide for completion of a site hazard assessment, state remedial investigation/feasibility study, or design of a cleanup action.

Lead: A bluish-white soft malleable ductile plastic but inelastic heavy metallic element found mostly in combination and used especially in pipes, cable sheaths, batteries, solder, and shields against radioactivity. Lead may cause irreversible neurological damage as well as renal disease, cardiovascular effects, and reproductive toxicity.

Model Toxics Control Act (MTCA): Refers to RCW 70.105D approved by voters in the state of Washington in November 1988. The implementing regulation is WAC 173-340 and was amended in 2001.

Potentially Liable Person: Any individual(s) or company(s) potentially responsible for, or contributing to, the contamination problems at a site. Whenever possible, Ecology requires these PLPs, through administrative and legal actions, to clean up sites.

Public Notice: At a minimum, adequate notice mailed to all persons who have made a timely request to Ecology and notice to persons residing in the potentially affected vicinity of the proposed action; mailed to appropriate news media; published in the local (city or county) newspaper of largest circulation; and the opportunity for interested persons to comment.

Public Participation Plan: A plan prepared under the authority of WAC 173-340-600 to encourage coordinated and effective public involvement tailored to the public's needs at a particular site.

Remedial Investigation: A Remedial Investigation is a study to define the nature, extent, and magnitude of contamination at a site. Before a remedial investigation can be conducted, a detailed workplan must be prepared which describes how the investigation work will be done.

Responsiveness Summary: A compilation of all questions and comments into a document open for public comment and their respective answers/replies by Ecology. The responsiveness summary is mailed, at a minimum, to those who provided comments, and its availability is published in the Site Register.

Site: Any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, vessel, or aircraft; or any site or area where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed, or otherwise come to be located.

Site Discovery and Initial Investigation: Sites may be discovered in a variety of ways including reports from the owner, and employee, or concerned citizens. Following discovery, an initial investigation is conducted to determine whether or not a site warrants further investigation.

Site Hazard Assessment and Hazard Ranking: This assessment is conducted to confirm the presence of hazardous substances and to determine the relative threat the site poses to human health and the environment. Sites then are ranked from 1 (highest) to 5 (lowest).

Site Register: Publication issued every two weeks of major activities conducted statewide related to the study and cleanup of hazardous waste sites under the Model Toxics Control Act. To receive this publication, please call (360) 407-7200.

Total petroleum hydrocarbons (TPHs): Describes a large family of several hundred chemical compounds that originally come from crude oil. Crude oil is used to make

petroleum products, which can contaminate the environment. TPH is a mixture of chemicals, but they are all made mainly from hydrogen and carbon, called hydrocarbons. Scientists divide TPH into groups of petroleum hydrocarbons that act alike in soil or water. These groups are called petroleum hydrocarbon fractions. Each fraction contains many individual chemicals.

Toxicity: The degree to which a substance at a particular concentration is capable of causing harm to living organisms, including people, plants and animals.

Underground Storage Tank (UST) area: An area at a property that contains underground storage tank or tanks and connected underground piping for the storage and containment of liquids and as defined in the rules adopted under Chapter 90.76 RCW.

ATTACHMENT E
COMPLIANCE MONITORING PLAN

REPORT

Attachment E

Compliance Monitoring Plan
Sea-Tac Development Site
SeaTac, Washington

Submitted To: Riddell Williams P.S.
1001 Fourth Avenue, Suite 4500
Seattle, Washington 98154

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

November 2, 2011

Project No. 073-93368-05.04

A world of capabilities delivered locally

Golder Associates

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirements
ARI	Analytical Resources, Inc
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAO	cleanup action objectives
COC	contaminants of concern
CMP	Compliance Monitoring Plan
CQA	construction quality assurance
Ecology	Washington State Department of Ecology
EDB	1,2-dibromoethane (ethylene dibromide)
EPA	United States Environmental Protection Agency
ESA	Phase I Environmental Site Assessment
FCAP	Final Cleanup Action Plan
FS	feasibility study
HASP	Health and Safely Plan
HDPE	high density polyethylene
IAS	In-situ Air Sparging
IRA	independent remedial action
IDW	Investigation derived waste
MTCA	Model Toxics Control Act
O&M	operation and maintenance
PLP	Potentially Liable Party
QAPP	Quality Assurance Project Plan
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
SAP	Sampling and Analysis Plan
SEPA	State Environmental Policy Act
SMCL	Secondary Maximum Contaminant Level
SPCC	spill prevention, control and countermeasure
SVE	soil vapor extraction
UST	underground storage tank
VOC	volatile organic compound
WAC	Washington Administrative Code
WDOH	Washington State Department of Health

1.0 INTRODUCTION

This document is the Compliance Monitoring Plan (CMP) for the Sea-Tac Development Site (the location of which is depicted in Figures 1 and 2) located in SeaTac, Washington. The purpose of this plan is to describe environmental monitoring for the Sea-Tac Development Site (the Site) to be performed during remedial action (performance) and following completion of the cleanup action (confirmational). This CMP is comprised of the Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP), the Data Management Plan (DMP), and the Health and Safety Plan (HASP). The SAP is contained within the main text of this report and defines the sampling and analysis methods that will be used for data acquisition during the remedial action. The QAPP is included as Appendix C of this report and documents the planning, implementation, and assessment procedures for quality assurance and quality control activities as applied to remedial action sample collection. The DMP is included as Appendix D of this report and documents the procedures to be implemented for data storage and analysis for this project. The HASP is included as Appendix E of this report and documents the Site specific hazards, the procedures for mitigating those hazards, and the steps to take in an emergency. This CMP is prepared in accordance with the Remedial Investigation/Feasibility Study Work Plan (Golder 2009); as required by the Agreed Order (No. DE 6844; Ecology 2009a) under the Model Toxics Control Act (MTCA) with the Washington State Department of Ecology (Ecology).

1.1 General

Under WAC 173-340-410, compliance monitoring consists of protection monitoring, performance monitoring, and confirmational monitoring, as described below. The Sampling and Analysis Plan required in conjunction with the CMP, which applies to both performance and confirmational groundwater monitoring, is provided in Section 4.

1.1.1 Protection Monitoring

Protection monitoring is conducted to confirm “that human health and the environment are adequately protected during future construction and operation of an interim action or cleanup action as described in the safety and health plan” [WAC 173-340-410(a)]. Monitoring for protection of human health is addressed in the site- specific Remediation Health and Safety Plan that was completed and included as Appendix E of this report.

1.1.2 Performance Monitoring

Performance monitoring confirms that the cleanup standard or other performance standards have been attained [see WAC 173-340-410(b)]. Because removal is not part of the selected remedy, and no media are exposed above cleanup levels, performance monitoring will consist of construction quality assurance (CQA) for the IAS-SVE system, groundwater monitoring, and monitoring of the operating IAS-SVE system. A more detailed CQA Plan will be provided in conjunction with the Engineering Design Report

and the Construction Plans and Specifications, which will be submitted to Ecology as part of the detailed design process.

1.1.3 Confirmational Monitoring

Confirmational monitoring is performed to confirm the long-term effectiveness of the remedy, following completion of remedial action [see WAC 173-340-410(c)]. Long-term maintenance inspections of the cap are described in the O&M Plan, which will be submitted with the Engineering Design Report. Confirmation monitoring in this Compliance Monitoring Plan specifically addresses long-term monitoring of groundwater.

1.2 Objective and Scope

The objective of this CMP and the appended supporting documents are to describe the sampling methods and quality assurance procedures that will be performed to meet the Cleanup Action Objectives (CAOs) during data collection activities performed during implementation of the remedial action.

Data collection activities that will be conducted during implementation of the remedial action include:

- Air sampling and vacuum readings conducted in association with the SVE system
- Monitoring of groundwater to evaluate changes in groundwater COC concentrations by the installation of the IAS-SVE system
- Inspection of the MasterPark Facility cap for damage
- Monitoring of groundwater to establish temporal changes in groundwater COC concentrations, and evaluate down-gradient plume attenuation

The data collection activities presented in this CMP are associated with the collection of data necessary to evaluate meeting the performance criteria for the site remedial actions.

1.3 CMP Content and Organization

This document is organized as follows:

- Section 1 – Introduction
- Section 2 – Site Background
- Section 3 – Protection, Performance, and Confirmational Monitoring
- Section 4 – Sampling and Analysis Plan
- Section 5 – References

2.0 BACKGROUND

The Site is located in SeaTac, Washington, within Section 28, Township 23 North, Range 4 East (Figure 1). The Site currently includes portions, or all of the following contiguous properties:

- MasterPark Lot C (the MasterPark Facility)
- Louden Property
- City of SeaTac (South 160th Street) right-of-way
- Washington Memorial Cemetery
- Port of Seattle Property (north of South 160th Street)

The Site is defined, for purposes of this document, as the area of land that is impacted by the MasterPark Facility's contamination. Figure 2 depicts the Site location as defined by the plume boundary as well as the contiguous properties included within the Site.

The MasterPark Facility is approximately 7 acres, located at 16025 International Boulevard, SeaTac, Washington and is called MasterPark Lot C. Current data indicates that the known soil contamination, the highest levels of groundwater contamination, and possibly the primary source of contamination (former underground storage tanks) are located on the MasterPark Facility property, but groundwater impacts extend beyond the Facility property boundaries. Thus, the area where groundwater has been impacted above MTCA cleanup levels is defined as the Site.

2.1 Site Summary

A series of investigations and remedial actions were conducted at MasterPark Lot C due to historical underground storage tanks located at the MasterPark Facility that impacted soil and groundwater. The MasterPark Facility investigations started in September 2000 with a Phase I Environmental Site Assessment (ESA) followed by Phase II ESA investigations and culminating in September 2001 with an independent remedial action (IRA) conducted at the MasterPark Facility in coordination with property redevelopment. The activities and results of these investigations are reported in documents that are briefly summarized in the RI/FS report (Golder 2010).

A Restrictive Covenant was recorded in 2002 as the result of the IRA conducted at the MasterPark Facility because residual concentrations of diesel and oil range petroleum hydrocarbons in soil and gasoline range petroleum hydrocarbons remain in groundwater exceeding MTCA Method A cleanup levels. The restrictions and property use limitations specified by the Restrictive Covenant include the following:

- Groundwater at the MasterPark Facility cannot be used for any purpose other than remedial actions.

- Activities resulting in the release or exposure of capped contaminated materials are prohibited, without prior approval from Ecology.
- Activities interfering with the integrity of the remedial action are prohibited.
- Ecology must receive 30 day written notice of the Owner's intent to convey interest in the MasterPark Facility.
- Leases of the MasterPark Facility property must be for uses and activities consistent with the restrictive covenant.
- Ecology must be notified prior to the use of the MasterPark Facility property that is inconsistent with the restrictive covenant.
- Ecology is authorized by the owner to enter the MasterPark Facility property for the purpose of evaluating the remedial action.
- The owner of the MasterPark Facility property has the right to record an instrument that provides that the restrictive covenant no longer limits the use of the MasterPark Facility property.

Ecology performed groundwater sampling at the Site in 2006, and remedial Site investigations resumed in 2007 to further define gasoline contamination in the groundwater. Ultimately, the results of the additional investigations in 2007-2008 lead to an Agreed Order between the SeaTac Development potentially liable parties (PLPs) and Ecology. Under the terms of the Agreed Order, an RI/FS was conducted using a phased approach. The phased approach was implemented because previous investigations had collected a significant amount of site data. The first phase of the RI conducted in 2007 and 2008 delineated much of the extent of the groundwater gasoline plume on the MasterPark Facility (Golder 2008a and 2008b). The second phase of the RI, conducted in 2009 and 2010 focused on data gaps that were identified with respect to the major potential exposure pathways for the Site releases and groundwater and also included further characterization and delineation of the down-gradient extent of the gasoline plume. The RI/FS document that was prepared for the SeaTac Development Site PLP Group (the PLP Group), therefore, represents a complete and final RI and FS set of documents sufficient to enable Ecology to identify and evaluate cleanup alternatives.

2.2 Nature and Extent of Contamination

The soil gas, soil, and groundwater analytical data collected as part of the RI, as well as other data collected during the preliminary investigations, were evaluated in the RI to assess the nature and extent of chemical constituents in environmental media at the Site. The primary purpose of this evaluation was to identify the chemical compounds potentially posing a human or environmental health risk and/or which exceed potential regulatory criteria, and by which media they pose a potential risk. Such compounds are termed the Contaminants of Concern (COC).

2.2.1 Air

The COCs at the Site have high volatility and pose a potential risk of human inhalation by vapor intrusion into Site buildings. Benzene was detected in soil vapor samples obtained during the 2007 and 2009

events at concentrations above the MTCA Method B screening level. The only other constituents detected that were detected above the MTCA Method B screening levels were ethylbenzene, toluene, and xylenes, which were detected in 2007 and were associated with sample a that was collected from the vadose zone source soils area near well MW-18.

2.2.2 Soil

A source of gasoline impacted soils exists within the MasterPark Facility near the location of the former gasoline underground storage tanks (UST)s. Available data or information do not suggest near surface soils are impacted elsewhere on the Site (off-the MasterPark Facility property), except for allegations that there were petroleum UST(s) on the Louden property in the past. The following constituents have been identified in near-surface and aquifer soils exceeding cleanup levels and therefore are considered COCs for the Site:

- Petroleum Hydrocarbons - Gasoline
- Volatile Organic Compounds – Benzene; toluene, ethylbenzene, and xylenes

Although no surface soil samples were collected during the RI, it is assumed that there are localized areas of surface soil beneath the asphalt cap outside of the source area at the MasterPark Facility that exceed cleanup levels for petroleum hydrocarbons. The presence of these localized impacted areas was identified through observation of the surface soil prior to MasterPark Facility redevelopment to its current condition, when vehicles were parked on top of bare soil. During MasterPark Facility remediation and redevelopment, the asphalt cap was placed over the entire property to prevent any potential direct contact with these surface soils that remained in place.

2.2.3 Groundwater

The RI in 2007 and 2009 defined the location of the groundwater plume, with the exception of the corner of the plume to the northwest of MW-22. Since the Port of Seattle has the entire area north of South 160th Street under heavy construction, it is not possible to confirm the extent of the gasoline plume to the northwest of MW-22 at this time; however it is the intention of the PLP Group to install an additional well in this location once they are permitted to do so by the Port of Seattle. The RI/FS report provides a detailed narrative of the groundwater sampling results over the course of the RI. The following is just a summary of the COCs for the Site groundwater:

- Gasoline range petroleum hydrocarbons were detected in groundwater samples collected at the MasterPark Facility and down-gradient portions of the Site at concentrations exceeding MTCA Method A cleanup levels. Diesel was also detected in groundwater at one well on the Facility and two down-gradient wells on adjacent properties (however only a select number of wells were analyzed for diesel in 2007). It is likely that the gasoline is mobilizing the diesel and carrying it down-gradient. Both diesel and gasoline are recognized as COCs for the Site groundwater.

- BTEX detections occurred in twelve wells on and adjacent to the MasterPark Facility and were at concentrations well above cleanup levels. BTEX therefore is considered a COC for the Site groundwater.
- Naphthalene was detected in eight wells at the Site and was detected at concentrations more than double the cleanup level. Naphthalene therefore is considered a COC for the Site groundwater.
- EDB was detected in seven wells at the Site and was at concentrations well above the cleanup level. EDB therefore is considered a COC for the Site groundwater.
- Lead was detected in only one well (MW-13) during the May 2009 sampling event at a concentration slightly exceeding the cleanup level. Lead was detected in three other wells, but at concentrations less than half the cleanup level. The other detections of lead were also in wells that are in and/or adjacent to the source area. The calculated average lead concentration for wells located within the source area is 9.5 µg/L, which is less than the cleanup level. Because lead was only detected in one well above the cleanup level, and the average lead concentration within the source area was less than the cleanup level during a sampling event that exhibited the highest gasoline concentrations to date, it is suspected that lead is not a COC for Site groundwater. However, since lead has only been measured during one sampling event, the next round of analysis will include lead in the monitoring wells within the source area to confirm that lead is not a site COC.

Groundwater analytical results confirm that the source of impact is bounded by MW-12 to the north, MW-14 to the south, MW-18 to the east, and MW-13 to the west based on the highest concentrations of COCs located within this area. This is demonstrated by gasoline isoconcentration contour maps depicted in the RI/FS report.

2.3 Summary of Cleanup Action Plan

The remedy proposed for the site is Alternative A - Focused In-Situ Air Sparging and Soil Vapor Extraction with a Source Area Cap. This cleanup action plan incorporates a number of remediation technologies as follows:

- Institutional controls
- Monitoring
- Asphalt cap over the source area
- Cap maintenance
- In-situ Air Sparging (IAS)-Soil Vapor Extraction (SVE) for the MasterPark Facility
- Operation and maintenance of the system (assumed to take 5 years)
- Enhanced biodegradation and attenuation for down-gradient Site groundwater (assumed to take 15 years)

The cleanup action plan focuses on VOC removal from the area of highest concentrations within the MasterPark Facility. It would remove VOCs from the groundwater by IAS and capture them by SVE. The oxygenation of the groundwater would stimulate natural microbial degradation, providing enhanced biodegradation for the down-gradient plume. The SVE would also remove VOCs from soil in the vadose zone. By removing contaminated subsurface vapors, this SVE would alleviate potential vapor intrusion

concerns. SVE off-gas would be treated by carbon adsorption before discharge to the atmosphere. A conceptual design of this alternative is shown in Figure 5. Alternative A achieves cleanup levels in the entire groundwater plume by using IAS-SVE at the MasterPark Facility to also enhance natural biodegradation in the remainder of the groundwater plume. Alternative A also virtually eliminates the potential for vapor intrusion into nearby residences and commercial buildings with extensive SVE within the MasterPark Facility where the contaminant soil vapors are the highest.

This remediation alternative was selected because it meets Ecology's threshold criteria, has an acceptable restoration time frame (estimated 15 years), and provides the best incremental cost-effectiveness. The major steps in this alternative are:

1. Install additional well(s) northwest of MW-22 (on Port of Seattle property) for monitoring purposes.
2. Install IAS wells within the plume on the MasterPark Facility. Install SVE wells along the western perimeter of the groundwater treatment area. Install SVE trenches along the northern, eastern, and southern perimeters of the groundwater treatment area.
3. Operate IAS-SVE system for 5 years and re-evaluate the need for continued IAS-SVE remediation.
4. Collect quarterly confirmational groundwater contamination and natural attenuation samples for one year after the shut-down of the remediation system to demonstrate lines of evidence for natural attenuation of the remaining down-gradient plume. Use natural attenuation parameter results to calculate approximate biodegradation rates and restoration times.
5. Conduct semi-annual confirmation groundwater monitoring throughout the site to determine the effectiveness of the remedial alternative, monitor progress of natural attenuation, maintain protectiveness, and determine compliance to cleanup levels for groundwater. Semi-annual confirmational groundwater monitoring will commence the second year after remediation system shut-down. Confirmational groundwater monitoring will continue for five years after IAS-SVE system shut-down, or until four consecutive events of groundwater monitoring results demonstrate that residual hazardous substance concentrations no longer exceed cleanup levels, whichever comes first.
6. If, during a five year periodic Ecology review, or at the end of the compliance (confirmational monitoring) period, it is determined that groundwater contaminants of concern remain above cleanup levels, the PLPs with Ecology approval will determine if additional long-term groundwater monitoring or other remedial actions are warranted.
7. Maintain the cap until residual hazardous substance concentrations no longer exceed cleanup or remediation levels under MTCA.
8. Implement and maintain institutional controls and monitoring.

The proposed cleanup action is described in detail in the Cleanup Action Plan.

2.4 Cleanup Levels

Cleanup levels are concentrations of COCs that determine at what level below which those particular hazardous substances no longer threaten human health or the environment (MTCA, 2007). A cleanup level is the maximum acceptable concentration of a COC to which the human or ecological receptors would be exposed via a specified exposure route (e.g., direct contact) under a specified exposure scenario (e.g., residential land use). In combination with points of compliance, cleanup levels typically help define the area or volume of soil, water, air or sediment at a site that must be addressed by the cleanup action.

Method A cleanup levels are generally used for routine cleanups with relatively few contaminants. Since the cleanup at the Site is considered routine, Method A for unrestricted land use is applicable to this site in regards to the groundwater cleanup levels. The objective for the cleanup is to protect the most beneficial use of the groundwater, which is as a source for drinking water. In order to meet that objective, the groundwater must meet Method A cleanup levels. All groundwater COCs have an associated Method A cleanup level.

Cleanup levels for soil and soil gas will be site-specific assuming commercial land-use (or park land-use in the case of the cemetery). Site-specific cleanup levels were calculated using standard risk calculation equations using default input parameters as specified in MTCA (WAC 173-340-750 and Ecology's Draft *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*, 2009b) and pertaining to a commercial worker. The exposure intake parameters for indoor air intrusion and soil ingestion for a commercial worker are basically the same as for an industrial worker, except most risk assessment guidance (EPA – RAGS) have commercial worker breathing rate less than an industrial worker, assuming that an industrial worker is breathing harder (higher breathing rate) due to more exhaustive work activities.

2.5 Cleanup Action Objectives

Cleanup action objectives (CAOs) are site-specific goals based on acceptable exposure levels that are protective of human health and the environment and consider ARARs. CAOs identify risk pathways that remedial actions should address, and identify acceptable exposure levels for residual constituents of concern. The CAOs identified for this site are:

- Eliminate potential exposure to potential future human residents to contaminated near-surface source soils at the MasterPark Facility via direct contact exposure pathways.
- Eliminate potential exposure to humans from vapor intrusion into future commercial buildings from vadose zone source soils at the MasterPark Facility near well MW-18 and MW-13.
- Eliminate potential Site-impacted groundwater to migrate and impact additional Qva aquifer in the future.

2.6 Points of Compliance

A point of compliance is defined as a location (or locations) where cleanup levels must be met. Under WAC 173-340-720(8)(b,c), "standard points of compliance" are established throughout the site and "conditional points of compliance" are set as close as practicable to the source of hazardous substances, not to exceed the property boundary. Standard points of compliance will initially be established for groundwater throughout the entire site, as defined by the Site boundary. Conditional points of compliance for groundwater will only be instituted if after remediation has been conducted it is apparent that cleanup levels cannot be achieved for the entire site.

The point of compliance for soil cleanup levels based on the protection of groundwater is to be achieved in all soils throughout the site. For soil cleanup levels based on human exposure via direct contact, a conditional point of compliance shall be established throughout the site from the ground surface to a depth of 15 feet. On the MasterPark Facility, these depths represent the extent that soils are located under an asphalt cap and are covered by a restrictive covenant due to potential areas of soil exceeding MTCA cleanup levels. This shallow depth range also represents the zone that may be potentially excavated or disturbed as a result of site development. For cleanup alternatives that involve containment, however, the soil cleanup levels are not required to be met at the points of compliance described above. WAC 173-340-720(8)(c) provides that where hazardous substances remain on-site as part of the cleanup action, Ecology may approve a conditional point of compliance which shall be as close as practicable to the source of hazardous substances, not to exceed the property boundary.

Therefore, cleanup levels and points of compliance at the site will consist of the following:

- Two points of compliance are established for soils at the Sea-Tac Development Site: (1) from 0-15 feet depth for the protection of humans, terrestrial ecology, and groundwater; and (2) a second for soils below 15 feet for the protection of groundwater. The cleanup action conducted in 2001 included containment of some impacted soils beneath an asphalt cap. The new cleanup action will comply with cleanup standards, but some residual impacted soil may remain contained under the asphalt pavement (past surface oil spills). Nevertheless, institutional controls specified in Section 5.3.4 and compliance monitoring and periodic reviews specified in Section 5.3.3.2 will ensure the long-term effectiveness of the remedy. A conditional point of compliance applies for shallow soil at the MasterPark Facility because even with the preferred alternative, shallow soil may still contain residual contamination. Any residual contamination greater than the MTCA Cleanup Levels in the shallow soils shall not be a risk because of the institutional controls that are in place since the 2001 cleanup efforts.
- Groundwater cleanup levels will meet MTCA Method A. The points of compliance established for groundwater will be the whole Site. Figure 4 depicts the locations where compliance monitoring for groundwater will take place.

The remainder of this document discusses the specific details of the Compliance Monitoring Plan including the number and locations of compliance wells, sampling frequencies, and data analysis and evaluation procedures.

3.0 PROTECTION MONITORING

Protection monitoring confirms that human health and the environment are adequately protected during remedial construction activities or cleanup actions.

3.1.1 Health & Safety Plan

A site-specific health and safety plan (HASP) was developed that specifies protective clothing, equipment, and monitoring that will be required for protection of human health during the remedial construction activities, and compliance monitoring activities. In short, worker protection monitoring will be conducted during the construction phase of the remediation. The site-specific Remediation HASP is included in Appendix E of this report.

3.1.2 Spill Prevention, Control, And Countermeasure Plan

A site-specific spill prevention, control and countermeasure (SPCC) plan will be established by the contractor (and ultimately approved by Ecology) for the hazardous substances and petroleum products used and stored on the site during construction. SPCC plans are required for certain facilities/projects for oil/fuel spill prevention, preparedness, and response to prevent oil discharges to navigable waters and adjoining shorelines. The site-specific SPCC will require routine inspections and monitoring procedures for the hazardous substances and petroleum products, which will be implemented by the contractor. The inspections and monitoring will continue until hazardous substances and petroleum products are no longer used or stored on the site.

3.1.3 Monitoring

The construction that will take place to install the remediation system is relatively shallow and will be located in an area of the plume that has been well characterized. As such, it is not necessary to conduct any groundwater monitoring during the construction phase of the remediation.

4.0 PERFORMANCE MONITORING

Performance monitoring will be used during active remediation to monitor the progress of the cleanup activity and to provide data that can be used to optimize the system settings. As the site becomes remediated, the performance monitoring will be used to confirm that remedial action objectives as established through performance criteria presented in Section 2 have been attained. Performance monitoring will consist of construction quality assurance (CQA) for the installation of the IAS-SVE system, groundwater monitoring, IAS system monitoring, and SVE system monitoring (once the system is operational).

4.1 CQA Monitoring

CQA monitoring will ensure that design drawings and specifications are adhered to. CQA activities performed by a Golder Engineer/Scientist will include:

- Visual inspection of IAS-SVE well installation
- Visual inspection of SVE trench installation
- Visual inspection of all IAS-SVE pipe installation
- Visual inspection of all soil or other material approved for IAS-SVE trench backfill
- Visual inspection of cap construction in IAS-SVE trenches
- Testing of materials (topsoil, soil for cap liner, other materials required for ditch construction)
- Cap layer thicknesses verification
- Attainment of design grades

A more detailed CQA Plan will be provided in conjunction with the Engineering Design Report and the Construction Plans and Specifications, which will be submitted to Ecology as part of the detailed design process. Soil material tests and frequency will be specified in the CQA Plan based on final design and will be provided in the Engineering Design Report. Such tests typically include gradation per ASTM D422 and a moisture-density curve per ASTM D698.

Field CQA for compaction and attainment of cap liner permeability will consist of measuring in-place density per ASTM D2922. Attainment of design grades will be verified by geodetic surveying during construction. A final “as built” survey will be performed for comparison to the results of geodetic surveys for confirmational monitoring/inspections conducted per the O&M Plan (see Part B).

4.2 IAS-SVE System Monitoring

IAS-SVE system performance monitoring is conducted to evaluate if the system is meeting the performance criteria and also to optimize system performance. Figure 5 depicts the general layout of IAS and SVE wells and the SVE trenches. IAS-SVE monitoring will be conducted in two stages of operation:

1) system startup, and 2) routine performance monitoring. Confirmational monitoring for IAS-SVE treatment (i.e., verification of cleanup after the treatment system is shut down) will be conducted via groundwater sampling. IAS-SVE wells have been spatially distributed throughout the aquifer source area on the MasterPark Facility based on aerial coverage and the expected soil permeability. IAS will be conducted by cycling between IAS wells across the entire treatment area. The SVE system will constantly be extracting vapors (off-gas) from the entire treatment area. The SVE system will discharge to the atmosphere through an off-gas treatment system. The SVE off-gas influent will be sampled and analyzed for operational monitoring. The SVE effluent will be sampled and analyzed to verify that the discharge to the air meets applicable standards. The off-gas sampling and analytical procedures for SVE monitoring are described in the SAP in Section 6. Sampling frequency is discussed in the following sections.

4.2.1 Startup Testing and Monitoring

The IAS-SVE startup sequence for wells and trenches will be defined in the Engineering Design Report. The following is a brief overview of the startup testing and monitoring. A more detailed set of procedures and schedule will be included in the Engineering Design Report. Initial monitoring of the treatment area will consist of:

- Vacuum monitoring at each SVE well or SVE trench riser and at the inlet to the SVE blower
- Pressure monitoring at each IAS well and the discharge from the IAS blower
- SVE off-gas analytical sampling at each SVE well, the SVE blower, and SVE treated effluent
- Flow rate on the discharge of the IAS and SVE blowers. Additional flow monitoring to allow flow balancing may be performed at individual IAS and/or SVE wells

Initial SVE vacuum monitoring will be conducted to demonstrate that SVE influence extends throughout the treatment area. Vacuum readings will be collected from the gauge connection point on SVE wells, trenches, headers, and the SVE blower. Pressure monitoring will be conducted at similar locations for the IAS system.

Throughout SVE operation, wellhead and trench vacuum measurements will be used to establish that inward pressure gradients are induced across the entire treatment area. Flow rates through the IAS system will be recorded concurrent with vacuum monitoring to establish appropriate operating conditions that meet performance goals. Blower output and valve adjustments may be necessary to achieve desired operating performance.

Vacuum readings will be recorded daily from all wells on each operational header for one week after startup of the IAS-SVE system. Frequent monitoring of vacuum readings during system start-up enables evaluation of how the system changes as it approaches steady-state. Once steady-state is achieved,

less frequent monitoring is sufficient. Vacuum readings will also be monitored during startup air sampling events. Flow rates will also be recorded to assist with calculation of mass removal.

Startup off-gas samples will be collected at day one (i.e., 24 hours after startup), daily for the first week, and weekly for four weeks after IAS-SVE startup. This sampling will be followed-up by quarterly performance monitoring. The sample locations for each sampling event are tabulated below:

	Initial	Daily for 7 days	Week 2	Week 3	Week 4	Quarterly
SVE Off-gas at each well/trench	X					
Combined Influent SVE Off-gas (before off-gas treatment)	X	X	X	X	X	X
SVE Effluent (treated off-gas)	X					X

The one-time only event during the first week of treatment will provide insight into the off-gas contribution from the individual wells/trenches in relation to the total off-gas. The initial frequent monitoring will observe how the off-gas concentration changes over time. After week 4, routine performance monitoring will commence.

4.2.2 Routine Performance Monitoring

Routine performance monitoring of the IAS-SVE system will be conducted to evaluate effectiveness of the treatment at meeting operation performance objectives during normal operations and to aid in determining how long the remediation system should operate.

Active treatment areas will be routinely monitored as follows:

- Quarterly SVE off-gas sampling at the SVE blower and the treated effluent
- Monthly vacuum monitoring
- Monthly pressure monitoring
- Monthly flow rate recording

Routine SVE off-gas monitoring will be performed quarterly to track COC removal and off-gas treatment. SVE off-gas will be sampled and analyzed at the following sample points:

- Influent (combined SVE off-gas after blower, and before off-gas treatment)
- Effluent (after off-gas treatment)

4.3 SVE Vacuum Measurements

Vacuum will be measured from SVE wells, trenches, headers, and the SVE blower on a quarterly basis. Vacuum at the blower inlet will be measured weekly. Each well will be fitted with a quick-connect fitting to allow the same vacuum gauge to be used at all of the monitoring locations. Using the same vacuum gauge allows more accurate comparison of the differences between wells. Vacuum readings will be recorded on the "SVE Vacuum Monitoring Log" form contained in Appendix A.

4.4 IAS Pressure Measurements

Pressure will be measured from IAS wells, headers, and the IAS blower on a quarterly basis. Pressure at the blower will be measured weekly. Each well will be fitted with a quick-connect fitting to allow the same pressure gauge to be used on all of the wells.

4.5 Flow Measurements

Flow meters will be installed on the discharge end of the IAS and SVE blowers to measure flows.

4.6 Performance Groundwater Monitoring

Groundwater monitoring is conducted to evaluate the effectiveness of remedial activities at meeting the performance objectives. Figure 3 depicts all of the current wells and Figure 4 depicts all of the performance monitoring wells. Performance monitoring for groundwater will be conducted on a quarterly basis for the first year and a semi-annual (twice yearly) basis for the remaining years that the IAS-SVE system is operational. Performance monitoring will include:

- Collection of depth to groundwater in all Site wells
- Collection of groundwater samples from performance monitoring wells containing sufficient water to permit sample collection

Performance monitoring will continue until the remediation system is shut-off, which is anticipated to be 5 years from the date of installation. Performance monitoring components are discussed in the following sections.

4.6.1 Groundwater Level Measurements

Following initial startup, water levels will be recorded in all wells on at least a semi-annual basis. Semi-annual water level measurements will help evaluate the direction of groundwater flow. The depth to water in feet below the top of the well casing shall be measured in all Site wells, even those that are not going to be sampled for groundwater. Measurements shall be made using an electronic water level indicator incremented to 0.01 feet. Water level measurement procedures are included in the SAP in Section 4 of this report.

4.6.2 Collection of Groundwater Samples

Groundwater samples will be collected from performance monitoring wells that contain sufficient water to permit collection of representative samples. The performance wells, located throughout the site, include MW-6, MW-7, MW-9, MW-12, MW-13, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22, and MW-X the new well to be installed northwest of MW-22. Wells containing less than 3 feet of water cannot be pumped, and bailing results may be very turbid, low quality samples from these low production wells. Therefore, groundwater sampling will only be attempted in wells containing at least 3 feet of water. If a performance monitoring well must be skipped due to low water, then an alternate well will be chosen for sampling. The process and procedures for collecting groundwater samples is discussed in the SAP in Section 6 of this document. Table 1 presents the compliance monitoring sampling matrix and includes a schedule for sampling and a list of the applicable performance monitoring wells.

5.0 CONFIRMATIONAL MONITORING

Confirmational monitoring is conducted to demonstrate that the remedy has achieved cleanup levels throughout the entire Site.

5.1 Confirmational Groundwater Monitoring

Confirmational groundwater monitoring will begin at the completion of the active remediation, when the IAS-SVE system is shut-down, and will continue for five years or until four consecutive events of groundwater monitoring results demonstrate that residual hazardous substance concentrations no longer exceed cleanup levels, whichever comes first. Confirmational groundwater monitoring is conducted to monitor for potential rebounds in contaminant concentrations. Confirmation monitoring of groundwater will include:

- Collection of depth to groundwater in all Site wells.
- Collection of groundwater samples from confirmational monitoring wells containing sufficient water to permit sample collection.
- Quarterly monitoring in the first year that includes parameters used to demonstrate natural attenuation, as per Ecology guidance. Data will be used to calculate approximate decay rates due to biodegradation and restoration time.
- Semi-annual (twice yearly) groundwater monitoring beginning in year two after the remediation system shut-down and continuing on a semi-annual basis until the conditions for termination of confirmational groundwater monitoring (as outlined above and in the DCAP) are met.

For the first year of confirmational monitoring, groundwater samples will be collected on a quarterly basis for analysis of COCs and natural attenuation parameters. Confirmational monitoring of COCs in the plume will be performed using monitoring wells MW-6, MW-7, MW-12, MW-13, MW-15, MW-16, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22, and MW-X the new well northwest of MW-22 on the Port of Seattle (yet to be installed). These monitoring points are strategically located within the plume delineation, and in the up-gradient, down-gradient, and along the approximate axis of the plume from the source area. Natural attenuation parameters will be monitored quarterly for the first year of confirmational monitoring using groundwater samples collected from wells MW-6, MW-12, MW-16, MW-18, MW-22, and MW-X. Natural attenuation parameters will be monitored to demonstrate lines of evidence for the attenuation of the down-gradient portion of the plume and to calculate approximate biodegradation rates and restoration timeframes using the results.

After the first year, confirmational monitoring of COCs in the plume will be performed on a semi-annual basis at MW-6, MW-7, MW-9, MW-12, MW-15, MW-16, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22, and MW-X.

Table 1 presents the compliance monitoring sampling matrix and summarizes the sampling schedule, analytical schedule, and the pertinent confirmational monitoring wells. The wells selected for confirmational monitoring are located through the axis of the plume in addition to cross and side gradient of the plume. Results from these strategically located wells will provide a cross-sectional view of concentrations within the plume and will also monitor for down-gradient migration of the plume. Confirmational monitoring will be continued for five years after the shut-down of the IAS-SVE system or until four consecutive events of groundwater monitoring results demonstrate that residual hazardous substance concentrations at the Site no longer exceed cleanup levels, whichever comes first. After 5 years since shut-off of the system have elapsed, Ecology will conduct their 5-year periodic review of the Site, at which time it will be identified whether additional long-term groundwater monitoring or other actions are warranted, with Ecology approval. If Ecology's 5-year review at the Site finds that the implemented remedy and natural attenuation are not protective of human health and the environment, the PLP Group will provide to Ecology a plan for continuing long term groundwater monitoring as well as a plan for a contingent remedy.

5.1.1 Groundwater Level Measurements

Groundwater levels will be recorded in all wells onsite on at least a semi-annual basis. Semi-annual water level measurements will help evaluate the direction of groundwater flow. Section 4 describes the pertinent process and procedures for collecting groundwater level measurements.

5.1.2 Collection of Groundwater Samples

Groundwater samples will be collected from the confirmational monitoring wells that contain sufficient water to permit collection of representative samples. Wells containing less than 3 feet of water cannot be pumped, and bailing results in very turbid, low quality samples from these low production wells. Therefore, groundwater sampling will only be attempted in wells containing at least 3 feet of water. The groundwater samples will be collected in a manner consistent with the procedures described in the SAP in Section 6 of this report.

5.1.3 Evaluation of Reduction of COCs and Natural Attenuation of Plume

The groundwater data collected during the confirmational monitoring period will be used to demonstrate that the remedial action has reduced the concentration of COCs within the source area and that natural attenuation is taking place in the down-gradient portions of the plume. Ecology's guidance document on natural attenuation for petroleum contaminated sites (July 2005) will be utilized to demonstrate the nature and rate that which natural attenuation is occurring within the plume. Lines of evidence of natural attenuation that may be evaluated will estimate degradation rates and restoration times.

5.1.4 Response If Cleanup Levels Are Not Achieved

If at any point during the confirmational monitoring cleanup levels are not being achieved in a reasonable timeframe in compliance wells, Ecology will be notified and the appropriate contingency actions will be determined in consultation with Ecology. Action could consist of continued monitoring or could include resuming IAS-SVE treatment. The appropriate contingency plan will be defined based on the data that has been collected at that point in time and will be appropriate for the existing conditions encountered at that time.

5.1.5 Contingency Plans

If it is observed during compliance monitoring that concentrations of COCs in wells close to the source area are declining, but concentrations of COCs in wells adjacent to and down-gradient of the Louden property are not declining or are increasing, another source contributing to the Site groundwater plume will need to be investigated. The necessary action to investigate a secondary source may require Ecology to take action to pursue investigation to take place at this property.

The PLP Group will rely on Ecology to exercise its authority to determine the status of a secondary potentially liable person (for example the Louden property), if groundwater monitoring results indicate the potential for a secondary source outside of the MasterPark Facility.

Ecology will conduct 5-year reviews at the Site beginning five years after the shut-down of the remediation sampling. The 5-year reviews are used to evaluate the performance of the remedial action to determine if they are protective of human health and the environment. Furthermore, the 5-year reviews are used to evaluate if immediate threats to receptors have been eliminated. At the completion of the 5-year reviews, Ecology will provide recommended actions to improve performance of the remedy if it is not performing as designed. If Ecology's 5-year review at the Site finds that the implemented remedy and natural attenuation are not protective of human health and the environment, the PLP Group will provide a plan for a contingent remedy. A specific contingent remedy cannot be proposed in this document because it is impossible to know what the conditions may be like at that time. Furthermore, treatment technologies are ever evolving and improving, so a treatment system designed now may not be the best available technology if it is not applied for 10 years or more.

6.0 SAMPLING AND ANALYSIS PLAN

The Quality Assurance Project Plan included in Appendix C of this report should be consulted with respect to the proper procedures required to complete the activities discussed in this sampling and analysis plan.

6.1.1 SVE Sampling Procedures

SVE off-gas samples will be collected for laboratory analysis pursuant to the following procedures. Sampling personnel will collect air samples from the ¼-inch quick-connect sampling valves using a summa canister and new high density polyethylene (HDPE) tubing.

Summa canisters will be used to collect the samples. These are stainless steel vacuum vessels which are pre-cleaned and delivered with a vacuum by the laboratory. The interior surface has been "passivated" to create an inert surface that will not adsorb or react with the vapor. When opened, the canister vacuum draws in the sample. The canister is closed while still under slight vacuum (as a means of detecting leakage during shipping to the laboratory). Canister vacuum before and after sample collection is measured using the vacuum gauge furnished by the laboratory, and recorded on the chain-of-custody form. Air samples will be analyzed for gasoline related volatile compounds (BTEX, n-hexane, and naphthalene) by EPA Method TO-15 SIM and EDB by EPA Method 8011. SVE off-gas samples will be sent to Air Toxics Ltd. (Folsom, CA) for analysis.

SVE off-gas sampling shall be conducted in the following order:

1. Record vacuum readings from gauges on the blowers, knock-out tank, and at each operable header (record all data on the SVE Sample Log Sheet contained in Appendix A).
2. Record flow readings from the magnehelic (inches H2O) and vacuum (inches Hg) at the flow sensor for total flow calculation
3. Collect effluent sample from the outlet pipe of the final carbon (under positive pressure).
4. Collect sample from the port located on the outlet after the first carbon (under positive pressure).
5. Collect undiluted influent sample from the port just prior to the carbon treatment (under positive pressure).
6. Collect SVE off-gas samples from each operable header as follows:
    a. Connect summa canister to each header.
    b. Open up summa canisters filling until canister vacuum equal to the header vacuum (likely 10 to 15 inches Hg); leave canisters open and connected to headers.
    c. Slowly open dilution valve on SVE blower manifold, which is downstream of the headers. This will lower the vacuum in all headers and permit the summa canisters to fill to the desired remaining vacuum of approximately 5 inches Hg. Close all summa canisters. Close dilution valve.

Not all of the above samples will be collected during every sampling event. Sampling frequencies were discussed above in startup sampling.

6.2 Groundwater Monitoring Well Sampling Procedures

Both performance and confirmational monitoring requires collection of representative groundwater samples from the monitoring wells identified on Table 1, the sampling matrix. Table 1 provides a summary of the sampling frequency for each of the monitoring wells included in the compliance monitoring program. Each sampling event will include the following:

- Measurement of static water levels
- Well purging to insure representative sampling with a portable, non-dedicated, submersible bladder pump
- Measurement of field parameters pH, specific conductance, dissolved oxygen, temperature, and turbidity
- Collection of all purge water in appropriate containers for on-site storage prior to disposal
- Collection of representative groundwater samples in appropriate containers
- Each of these activities will be subject to controls and strict QA protocols and procedures specified in the relevant technical procedures referenced in the attached QAPP

6.2.1 Groundwater Level Measurements

The static water level will be measured at each well prior to the initiation of any other activities. Water levels will be taken according to the specifications of procedure TP-1.4-6 “Water Level Measurements” and the site-specific water level measurement procedures described below. The depth to water in feet below the top of the well casing shall be measured in all Site wells, even those that are not going to be sampled for groundwater. Measurements shall be made from the elevation survey mark using an electronic water level indicator incremented to 0.01 feet. The sounder will be cleaned before and after each use by a process involving a detergent rinse, followed by an organic free distilled/deionized water rinse.

In order to minimize measurement errors, static water level measurement at each well will be based upon the average of three independent water level readings. Independent readings will be made by lowering the water level indicator tape down the well, recording the static water level to an accuracy of 0.01 feet, retrieving the tape from the well, and then repeating the process a total of three times. The three measurements will then be averaged to derive the static water level. The measurements are collected in triplicate at this site because the groundwater gradient is so flat that the average of three measurements is more accurate than taking a singular measurement.

Measurements shall be recorded in the site-dedicated field logbook indicating well identification, date and time of measurement, depth to water, the name of the person collecting the measurement, and any observations about the well made at the time of water level measurement.

6.2.2 Groundwater Sample Collection

Sample collection and handling will be performed as described in procedure TP-1.2-20 "Collection of Groundwater Quality Samples." All instruments used for field analysis will be calibrated in accordance with manufacturer's recommendations. Chain of custody will be maintained in accordance with the procedure TP-1.2-23, "Sample Handling and Chain of Custody." The monitoring well construction logs are included in Appendix B and should aid in sample collection.

Sampling will be conducted using submersible, portable bladder pump or equivalent or by using disposable bailers. The portable bladder pump will be fitted with the tubing that is dedicated for that well. The bladder pump will be slowly lowered into the well to the desired elevation. Caution must be taken when lowering the pump into a well because turbulence caused by rapid movement of the well can disturb sediment on the bottom of the well potentially causing the sample to be turbid and not representative of the true condition of the aquifer. The monitoring wells must be purged prior to sample collection. Purging will, when possible, be conducted using low flow purging and sampling techniques. The water quality parameters water level, pH, temperature, conductivity, and turbidity will be monitored periodically during purging. Purging will be considered complete when either the well has been pumped dry or the water quality parameters have stabilized in accordance with TP-1.2-20. All field parameter measurements and purge volumes will be recorded on Sample Integrity Data Sheets.

All purge water produced during sampling will be collected in suitable 55-gallon drums for temporary storage at the MasterPark Facility. The results of the groundwater sampling and analysis will be used to determine appropriate means of purge water disposal. The purge water will be disposed of in accordance with all applicable regulatory requirements. If the purge water is not considered to be contaminated (following receipt of laboratory analysis), this water will be discharged to the land surface in the area of each well.

6.3 Sample Containers, Preservatives, and Holding Times

Samples will be retained in proper labeled, laboratory-prepared containers, and transported (within the holding time) to the laboratory in a sealed, chilled ice chest maintained at 4o C under chain-of-custody procedures. Both performance and confirmational monitoring samples will be analyzed for COCs by Northwest Total Petroleum Hydrocarbons- Gasoline (NWTPH-Gx). The analysis will include gasoline, BTEX, naphthalene, and n-hexane. EDB will also be analyzed by using EPA Method 8011. For the first year of confirmational monitoring, samples from select wells (MW-6, MW-12, MW-16, MW-18, MW-22, and MW-X) will be analyzed quarterly for natural attenuation parameters recommended in Ecology's natural attenuation guidance document. Natural attenuation analysis will include nitrate (EPA Method 353.2), total dissolved iron and +2 valence iron, total dissolved manganese and +2 valence state manganese (methods to be determined), sulfate (ASTM D516-02), dissolved methane (EPA Method

8015M), alkalinity (EPA Method 310.2), total organic carbon (SM 5310B), and dissolved oxygen, in addition to gasoline, BTEX, and EDB.

6.4 Sample Handling, Shipping, and Custody Procedures

6.4.1 Sample Handling

Samples will be placed into appropriate containers supplied by the analytical laboratory. Samples will be collected in bottles of appropriate volume and type, including preservatives as appropriate, as detailed in the QAPP.

Each sample will be assigned a unique identification number that will be used on Chain of Custody sheets, sample labels, sample integrity data sheets, and field logbooks for identification and tracking purposes and for use in the database. The sample identification format consists of MPLOTC- followed by the monitoring well number and the date of sample collection. For example, MPLOTC-MW20-072110 would be the identification number for the sample collected from MW-20 on July 21, 2010. SVE samples will be labeled in a similar manner, with an abbreviated sample location instead of a well number.

The samples will be labeled immediately after collection in the field with the sample identification number, analytical parameters, date and time of sample collection, and any special handling instructions.

All analytical samples that will be used for risk assessment or regulatory compliance shall have associated field QC samples established and analyzed. Field duplicates, equipment blanks, or trip blanks will be established at a frequency of one QC sample per sampling event, or once every 20 samples, whichever is greater. During sample labeling, equipment blanks and trip blanks will be identified as “EB” or “TB” instead of a monitoring well number. One set of matrix spike (MS) and matrix spike duplicate (MSD) will be collected per sampling event. All field QC samples will be analyzed independently for the same analytes as the associated samples and will be used as an indication of gross errors in sampling or analytical techniques. All QA/QC samples will be submitted blind to the analytical laboratory, with the exception of samples submitted as a triplicate for MS and MSD analyses. For more detail on establishing field QC samples, refer to the QAPP.

Samples will be placed in a chilled cooler immediately after collection for shipment to the laboratory. Samples will be shipped in sealed plastic coolers with leak-proof ice-filled bags sufficient to maintain a temperature of approximately 4°C for 48 hours. Packing material will be used to prevent breakage of glass sample containers.

6.4.2 Sample Shipment

Groundwater samples will be transported to the analytical laboratory, no later than one day after they were collected. The analytical laboratory will be notified of each sample shipment when samples are

shipped. The selected analytical laboratory is Analytical Resources, Inc. (ARI) in Tukwila, Washington, or an equivalent certified laboratory. Air samples will be transported to Air Toxics Ltd.

6.4.3 Sample Custody

Chain-of-custody records will be maintained for each sample collected. The chain-of-custody form will provide an accurate written record verifying that the samples were under appropriate custody at all times prior to arrival at the laboratory and that can be used to trace the possession of samples from the time of collection through data analysis. Chain of Custody will be conducted in accordance with Golder Technical Procedure TP 1.2-23 “Chain of Custody”.

The chain-of-custody will be signed by each participant in the sampling and handling procedures. Each form will be placed in a water-tight plastic bag taped to the underside of the lid of the cooler. Upon arrival at the laboratory, samples will be received and inspected by a laboratory representative. Samples contained in the shipment will be compared to the chain-of-custody to ensure that all samples were received and that analytical instructions are clear. Documentation that samples were received by the analytical laboratory shall be obtained via fax or email the day of arrival at the laboratory.

6.4.4 Field Documentation

Documentation for sampling will include bottle labels, completion of Sample Integrity Data Sheets and Chain of Custody Records. In addition to completion of the chain-of-custody, sample integrity data sheets (SIDS) will be completed for each sample for project data management purposes with the following information:

- Sample Identification Number
- Sample Location: well designation
- Static Water Level
- Calculated Purge Volumes
- Field Parameter Readings
- Sample Type: collection method
- QA/QC Type (i.e., blank, duplicate, split)
- Individual collecting sample
- Date

In addition, detailed field logbooks will be used to document all data collection and general site activities during the performance monitoring. Field logbooks will consist of a bound field survey notebook. Information recorded in the logbook will include:

- Date of field activity
- Starting and finishing times for activities

- Weather
- Names of sampling and/or investigative personnel present
- Descriptions of sample location
- Descriptions of collected samples
- Time of sample collection

Logbook entries will be made in indelible ink. Each logbook page will be initialed and dated by the sampler(s).

6.5 Data Quality Review

For confirmational monitoring, laboratory analytical data will be subjected to a data quality review using the following criteria:

- Completeness: the data will be reviewed to ensure that all requested analyses are reported and that all required information has been provided
- Consistency: the data will be checked to ensure that redundant information is reported consistently throughout the laboratory reports
- Correctness: the data will be checked to ensure that samples reported using correctly applied algorithms for the calculation of sample concentrations (i.e., dilution factors applied properly)
- Compliance: the data will be checked to ensure that all required QC specifications have been met

Deficiencies identified during data quality review will require correction prior to conducting data analysis activities. A brief quality review report will be prepared after each sampling round and will be included in the data reports.

6.6 Data Management and Reporting

Analytical data shall be delivered from the laboratory in an electronic format and incorporated in the project database along with sample designation information recorded on the sample integrity data sheets. Data reduction, validation, and reporting requirements are presented in the QAPP. Results from groundwater sampling and SVE monitoring data will be presented in semi-annual reports. Capture zone analysis and trend analysis of the down-gradient plume will be provided in annual reports. Calculation of COC total mass removal and the percentage of the initial mass that has been removed will be presented in annual reports. Analytical data will be stored in a database. Data management is discussed in detail in the DMP in Appendix D of this report.

6.7 Decontamination of Sampling Equipment

All direct sampling equipment will be decontaminated between each use. The sampling equipment will be washed with a nonphosphate detergent (Alconox or equivalent) solution using brushes to remove all visible dirt and other matter. The final rinse will be distilled/deionized water to thoroughly remove all

detergent solution. Should soil or other visible matter remain on the sampling equipment after the detergent/water wash, a wet tap water towel will be used to remove material and the full-complement of decontamination procedures repeated. If the material cannot be removed, other equipment will be used. Further details on decontamination are provided in the QAPP.

6.8 Investigative Derived Waste

Investigation derived waste (IDW) will be generated at the Site during the construction of the remediation system, performance and confirmational monitoring. All well purge water, and decontamination rinsates will be containerized on-Site during investigation activities as they are generated. All waste will be contained and segregated in 55-gallon sealed drums (Type 17H) and stored on the MasterPark Facility at a remote location before off-site disposal. The drums will be labeled as outlined in the QAPP. Groundwater quality analytical data will be used to characterize the waste for proper disposal. All waste will be disposed of as “investigative derived wastes” at an appropriate disposal facility.

Used protective clothing, gloves, etc. will also be managed on the MasterPark Facility according to MTCA requirements. These will be placed in 55-gallon labeled drums, stored adjacent to the purge water drums, and disposed of at a later date according to its chemical characteristics. Additional IDW sampling may be required before disposal of IDW at a licensed facility. Golder will work with the Site owners to manage IDW and may be able to dispose of it during the remedial action, with Ecology approval.

7.0 REPORTING

The PLP Group will submit a letter report to Ecology within 60 days of receipt of analytical data for performance and compliance monitoring events. The report will summarize the sampling activity and provide a table of measurements (pressure, vacuum, groundwater level) and analytical results. For compliance monitoring events, the report will also include an evaluation of natural attenuation at the Site. The report will include the laboratory analytical reports and will be in accordance with Policy 840. The report will include a summary on page 1, with a checklist box that says:

- No parameters exceeded the MTCA cleanup levels used for screening;
- The following parameters exceeded the MTCA cleanup level used for screening (followed by a description of the parameters).

See Appendix C for more details on requirements.

8.0 REFERENCES

EPA. 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. Ground Water Issue. EPA/540/S-95/504. April 1996.

Golder Associates Inc. (Golder). 2009. *Remedial Investigation / Feasibility Study (RI/FS) Work Plan For Sea-Tac Development Site, SeaTac, Washington*. Prepared for Riddell Williams P.S. April 21, 2009.

Golder. 2010. *Remedial Investigation / Feasibility Study (RI/FS) For Sea-Tac Development Site, SeaTac, Washington*. Prepared for Riddell Williams P.S. April 30, 2010.

Washington State Department of Ecology, 2002 (Amended November 2007). *Model Toxics Control Act Regulations (WAC 173-340)*. Olympia, Washington. WAC 173-340.

Washington Department of Ecology. 2005. Guidance on Remediation of Petroleum-Contaminated Ground Water B Natural Attenuation. Publication No. 05-09-091 (Version 1.0), Olympia, Washington. July 2006.

Washington Department of Ecology. 2009a. *Agreed Order No. DE6844. Issued By the Washington State Department of Ecology to Sea-Tac Investments LLC, ANSCO Properties, LLC, and Scarsella Bros. Inc., July 10, 2009.* Washington State Department of Ecology. Olympia, Washington.

Washington Department of Ecology. 2009b. Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action (Review Draft). Publication No. 09-09-047, Olympia, Washington. October 2006.

Washington Administrative Code (WAC) 173-340-750. "Cleanup standards to protect air quality". Washington State Legislature.

TABLE
COMPLIANCE MONITORING SAMPLING MATRIX

Table 1: Compliance Monitoring Sampling Matrix

	Analysis	Frequency	MW-6	MW-7	MW-9	MW-12	MW-13	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22	MW-X
Performance Monitoring - Year 1	COCs	Quarterly	X	X	X	X	X			X	X	X	X	X	X	X
Performance Monitoring - Year 2-5*	COCs	Semi-annual	X	X	X	X	X			X	X	X	X	X	X	X
Confirmational Monitoring – Year 1	COCs	Quarterly	X	X		X	X	X	X	X	X	X	X	X	X	X
	Natural Attenuation	Quarterly	X			X			X		X				X	X
Confirmational Monitoring – Years 2- Completion**	COCs	Semi-annual	X	X	X	X		X	X	X	X	X	X	X	X	X

Notes:

*This is an estimated timeframe. The need for additional IAS/SVE will be determined after the system has been operating for 5 years.

**This timeframe will be determined based on sampling results. Confirmational monitoring will continue for five years after IAS-SVE system shut-down, or until four consecutive events of groundwater monitoring results demonstrate that residual hazardous substance concentrations no longer exceed cleanup levels.

-COCs parameters: gasoline, BTEX, naphthalene, n-hexane, and EDB.

-Natural Attenuation parameters: nitrate, total dissolved and +2 valence state iron and manganese, sulfate, dissolved methane, alkalinity, total organic carbon, dissolved oxygen, gasoline, BTEX, and EDB.

FIGURES

0 2000

SCALE IN FEET

Source: Google Earth Pro

FIGURE **1**

SITE LOCATION MAP

SEATAC DEVELOPMENT SITE/CAP/WA

LEGEND

- Approximate Site Boundary
- 2003 Restrictive Covenant Boundary & Asphalt Cap Institutional Control
- Approximate Groundwater Plume

Source: Google Earth Pro

0 4000

SCALE IN FEET

FIGURE **2**

APPROXIMATE SITE BOUNDARY

SEATAC DEVELOPMENT SITE/CAP/WA

Golder Associates

LEGEND:

MW-5	QVA AQUIFER MONITORING WELL LOCATIONS
MW-2	MONITORING WELLS SCREENED IN PERCHED AQUIFER
PORT MW-1	PORT OF SEATTLE (QVA) MONITORING WELLS (ABANDONED)
TACO TIME D	TACO TIME (QVA) MONITORING WELL (ABANDONED)

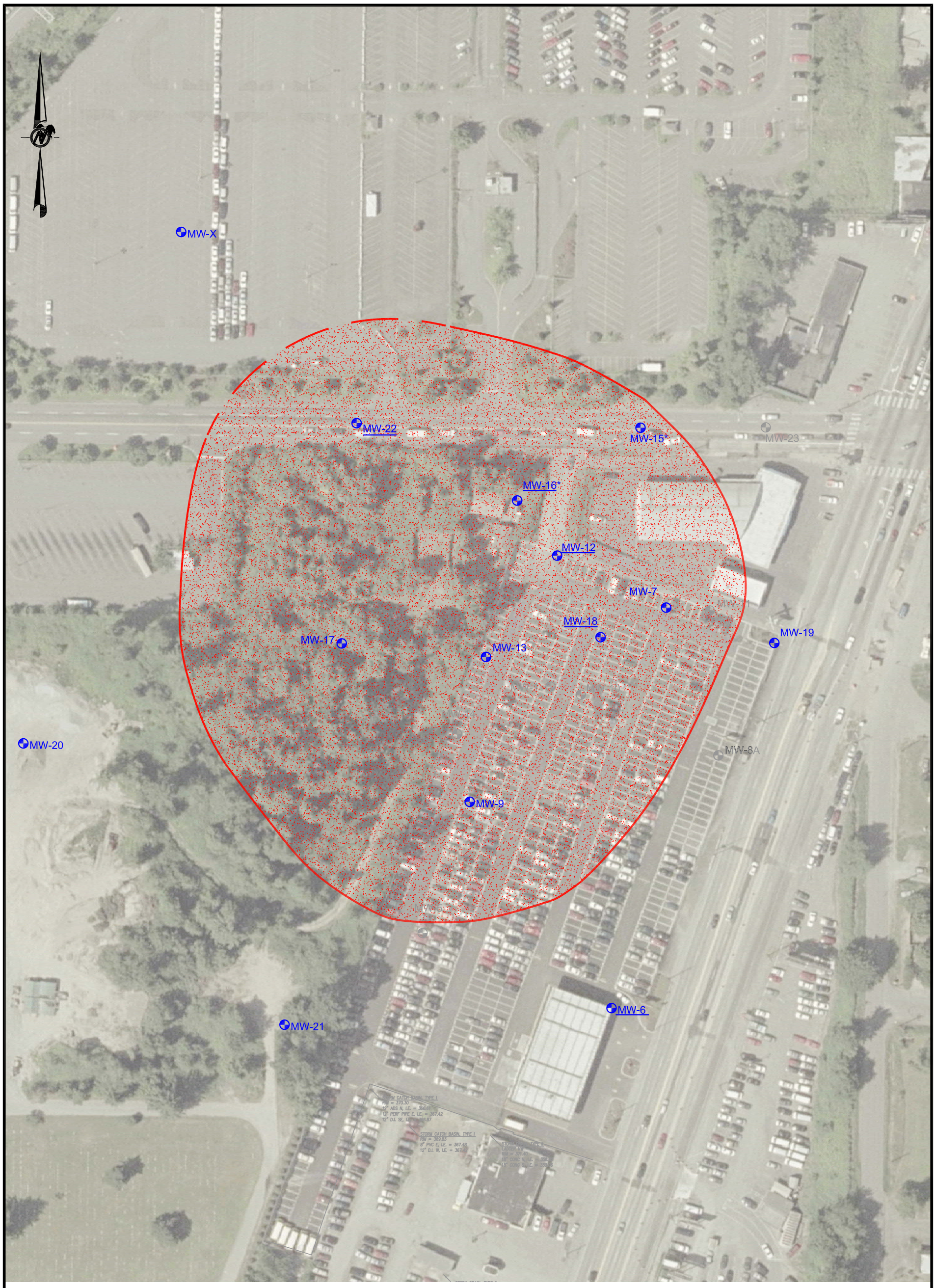
0 100 200

SCALE IN FEET

FIGURE **3**

MONITORING WELL LOCATIONS

SEATAC DEVELOPMENT SITE/RI/FS/WA



LEGEND:

MW-17	COMPLIANCE MONITORING WELLS
MW-6	NATURAL ATTENTION WELL
	APPROXIMATE GW PLUME BOUNDARY

0 100 200

SCALE IN FEET

NOTE:

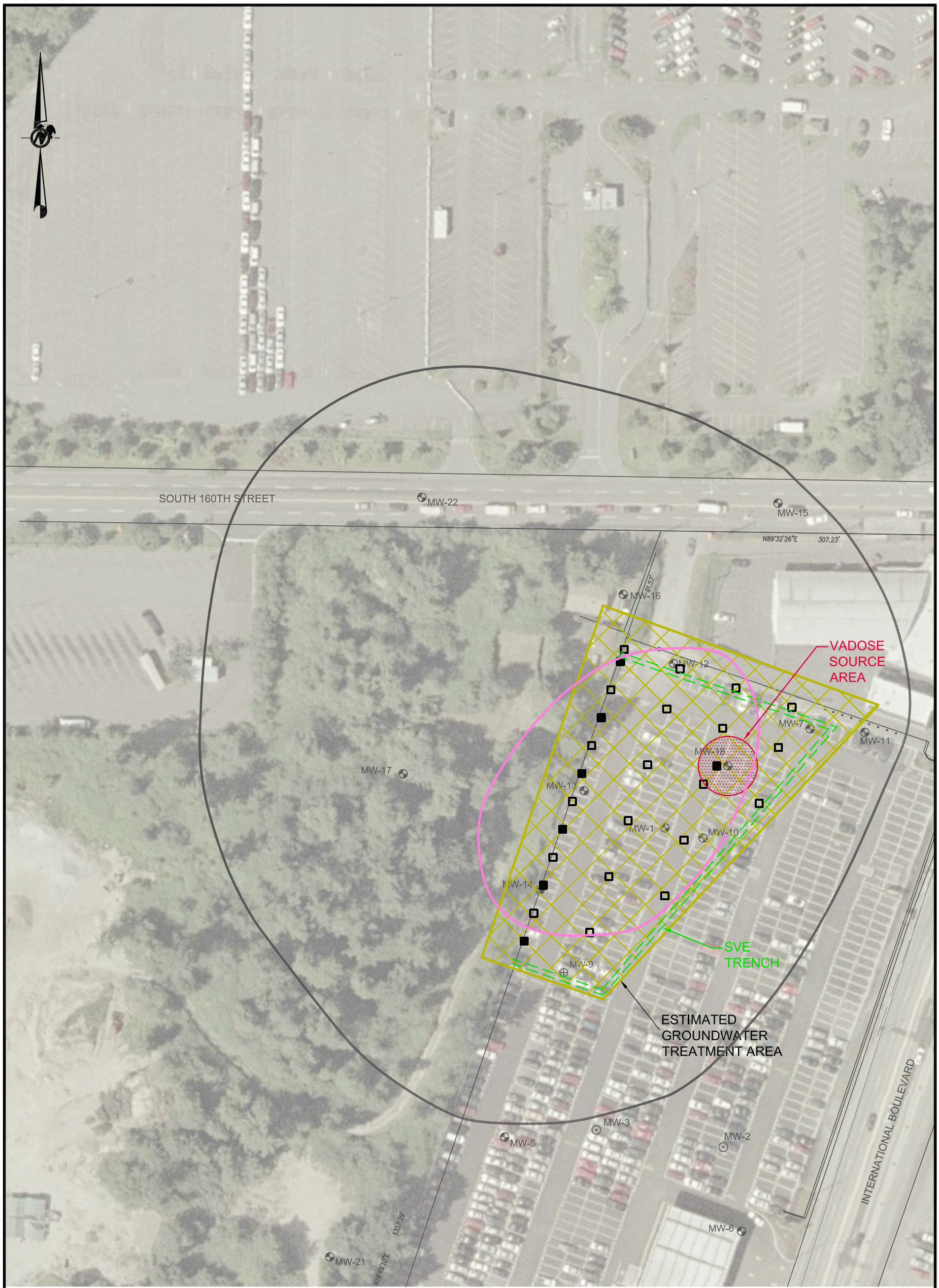
1. PLUME BOUNDARY BASED ON GROUNDWATER SAMPLE RESULTS EXCEEDING MTCA METHOD A CLEAN UP LEVELS FOR GASOLINE RANGE PETROLEUM HYDROCRABONS (800 UG/L)
2. * = ONLY WELLS THAT ARE NOT PERFORMANCE MONITORING WELLS

FIGURE **4**

LOCATION OF COMPLIANCE MONITORING WELLS

SEATAC DEVELOPMENT SITE/RI/FS/WA

Golder Associates



LEGEND:

- AIR SPARGE POINT
- SOIL VAPOR EXTRACTION POINT
- APPROXIMATE GROUNDWATER HOT SPOT BOUNDARY
- APPROXIMATE ENTIRE PLUME BOUNDARY
- SVE TRENCH
- ESTIMATED GROUNDWATER TREATMENT AREA
- MW-5 QVA AQUIFER MONITORING WELL LOCATIONS
- MW-2 MONITORING WELLS SCREENED IN PERCHED AQUIFER

0 80 160

SCALE IN FEET

NOTES:

PLUME BOUNDARY BASED ON GROUNDWATER SAMPLE RESULTS EXCEEDING MTCA METHOD A CLEANUP LEVEL FOR GASOLINE RANGE PETROLEUM HYDROCARBONS (800ug/L)

FIGURE **5**

FOCUSED IAS-SVE LAYOUT FOR ALTERNATIVE A

SEATAC DEVELOPMENT SITE/RI/FS/WA

K:\CAD\Projects\2007\07393368\05\04\Exhibit E -CMP\073_93368_05_04_F05.dwg | Fig 5 | Mod: 07/29/2010, 08:32 | Plotted: 07/29/2010, 08:50 | afordier

Golder Associates

APPENDIX A
TREATMENT SYSTEM MONITORING LOGS

VACUUM MONITORING LOG

DATE:	
INITIALS:	
BLOWER	in Hg
KNOCKOUT TANK	in Hg
FLOW PARAMETERS	in H2O (Magnehelic)
	in Hg

1. Record vacuum readings. Please include units and time
2. If Header is operational, record "operational" and record vacuum reading, time, and units.
3. If Header is not opeartional, record it as "n/a". Continue to record vacuum readings for wells if appropriate.

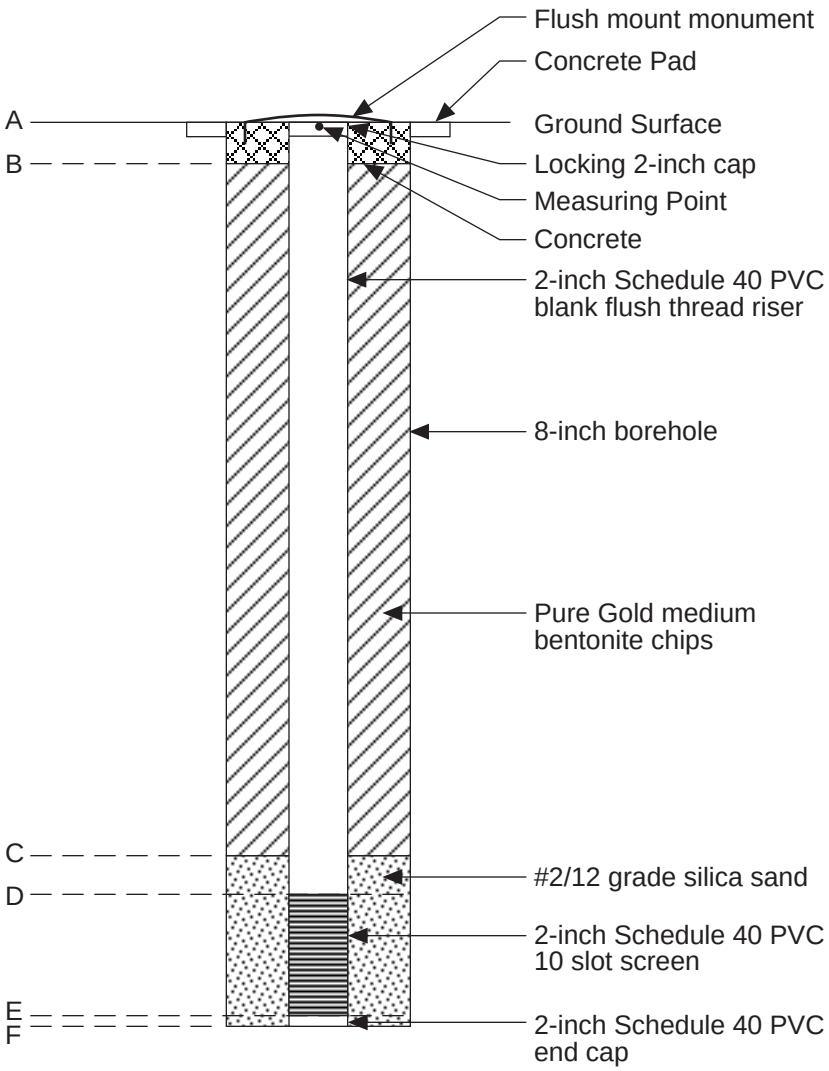
SVE SAMPLE LOG

DATE:			
INITIALS:			
PAGE:	of		
__HP BLOWER	in Hg	**SAMPLE ID**	
KNOCKOUT TANK	in Hg	**Sample Schedule**	
FLOW PARAMETERS	in H2O	**Sample Location**	
	in Hg	**Time**	
__HP BLOWER	in Hg	**Header Vacuum**	in Hg
		P_o	in Hg
FLOW PARAMETERS	in H2O	**P_f**	in Hg
	in Hg	**Notes**	
Dilution Valve			

EXAMPLE		**SAMPLE ID**	
SAMPLE ID	*MPLC-001*	**Sample Schedule**	
Sample Schedule	*Initial/Daily/Week 2/Week 3/ Week 4/Quarterly*	**Sample Location**	
Sample Location	*Well or Trench#/ Combined Influent/Effluent*	**Time**	
Header Vacuum	*if applicable, else enter "N/A"*	**Header Vacuum**	in Hg
P_o	*Sample canister initial reading*	**P_o**	in Hg
P_f	*Sample canister initial reading*	**P_f**	in Hg
		Notes	
		SAMPLE ID	
		Sample Schedule	
		Sample Location	
		Time	
		Header Vacuum	in Hg
		P_o	in Hg
		P_f	in Hg
		Notes	
		SAMPLE ID	
		Sample Schedule	
		Sample Location	
		Time	
		Header Vacuum	in Hg
		P_o	in Hg
		P_f	in Hg
		Notes	

Isolate header of concern prior to collecting sample.

APPENDIX B
WELL COMPLETION LOGS FOR SITE MONITORING WELLS



LEGEND

A	Measuring Point
B	Concrete
C	Top of Sand Pack
D	Top of Screened Interval
E	Bottom of Screened Interval
F	Total Depth

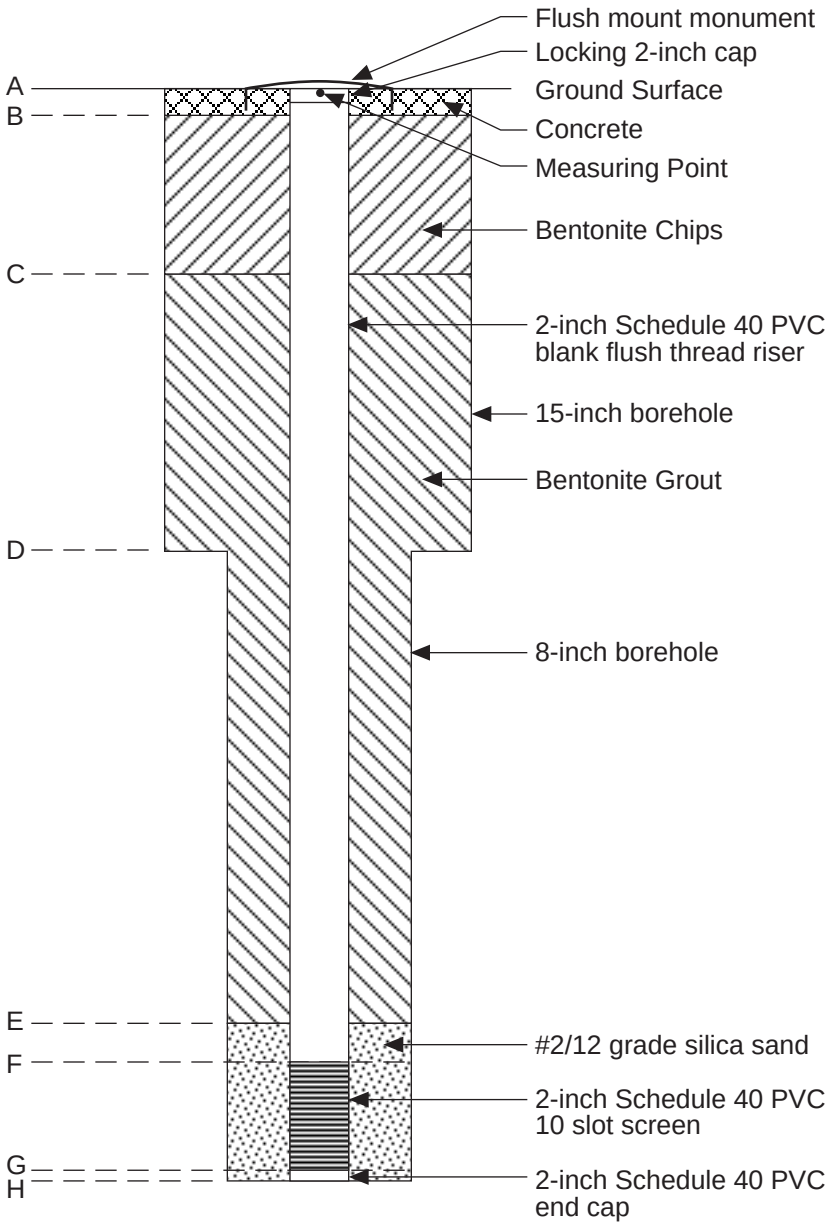
VARIATIONS

Well	A (ft amsl)	B	C	D (ft bgs)	E	F
MW1	363.30	3.0	38.0	41.0	51.0	52.0
MW2	362.96	3.0	13.0	15.0	20.0	21.5
MW3	363.97	3.0	14.0	17.0	27.0	28.0
MW5	364.17	4.0	45.0	48.0	58.0	58.0
MW6	367.10	4.0	48.0	50.0	60.0	60.0
MW7	358.65	3.5	41.0	43.5	53.5	53.5
MW9	363.64	4.0	45.9	47.5	57.0	58.0

FIGURE **C-1**
MONITORING WELL COMPLETION
SUNREAL/SEATAC PARKING PHASE III/WA

PROJECT NO. 003 1321.900 DRAWING NO. 11063 DATE 1/18/2001 DRAWN BY EA

Golder Associates



LEGEND

A	Measuring Point
B	Concrete
C	Bentonite Chips
D	Bottom of 15-inch Diameter Boring
E	Top of Sand Pack
F	Top of Screened Interval
G	Bottom of Screened Interval
H	Total Depth

VARIATIONS

Well	A (ft amsl)	B	C	D	E (ft bgs)	F	G	H
MW8a	359.79	3.0	NA	24.0	42.0	44.0	54.0	54.0
MW10	362.79	4.2	29.0	62.5	77.0	80.0	90.0	92.0

NOTE

The annulus in MW8A above the sand pack was backfilled with all chips to the concrete level

FIGURE **C-2**
TEMPORARY CASING MONITORING WELL COMPLETIONS
SUNREAL/SEATAC PARKING PHASE III/WA

PROJECT NO. 003 1321.800 DRAWING NO. 11064 DATE 1/18/2001 DRAWN BY EA

Golder Associates

RECORD OF BOREHOLE #MW-1

STA. MW-1 OFFSET L R
PROJECT NO. 003-1321.300
INCLINATION 90° AZIMUTH
ELEVATION
DRILLING DATE 11-13-00
SHEET 1 OF 3
DATUM
DRILL RIG CME-75

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	NUMBER	TYPE	BLOWS/ 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES / PIEZOMETER / STANDPIPE INSTALLATION
0	300 lb Hammer	Gravel							1355 1st attempt at 2.5ft 50-6" then stop. Move hole further from UST. No damage done to UST	
1		Loose, moderate Yellowish brown, Silty F-M SAND little f.-C. Gravel FILL								
3					1	HD	5-5-4 (9)	1.4 / 1.5	1400 2.5-4 Loose, Mod Yellowish Br Silty F-M SAND, little f-C. Gravel, FILL PID=0	
4	Auger Hammer	V. Loose, Mod. Yellowish Brown, Non-Stratified Silty F. SAND, little subrounded f-C. Gravel Post Glacial Sediments		SM	2	HD	1-1-1 (3)	.5 / 1.5	1412 5-6.5 V. Loose, Mod Yell Br. Non-Stratified Silty F. SAND, little subrounded f-C Gravel PID-2 non Stratified	
8	4" I.D. HSA	V. Dense, Brownish Gray Silty f-SAND to a F. Sandy SILT, trace subrounded f-C. Gravel ABLATION TILL		SM	3	HD	12-35-50 (85)	1.5 / 1.5	1416-7.5-9.0 V. Dense Brownish Gray Silty F. SAND, little subrounded f-C. Gravel, PID 0 ABLATION TILL non-Stratified	
10				SM	4	HD	25-50/6 >50	10 / 10	1422 10-11 V. Dense, Brownish Gray f-C. Sandy SILT trace subrounded f-C. Gravel PID-1 ABLATION TILL	
15		slight increase in fine Gravel		SM	5	HD	17-50/6 >50	10 / 10	1430 15-16 As Above increase in gravel to little PID-2	
20										

DEPTH SCALE 1"=2.5'
DRILLING CONTRACTOR Cascade
DRILLER

Golder Associates

LOGGED BY
CHECKED
DATE

RECORD OF BOREHOLE # MW-1

STA. MW-1 OFFSET L R
PROJECT NO. 003-1321
INCLINATION 90° AZIMUTH
ELEVATION
DRILLING DATE 11-13-00
SHEET 2 OF 3
DATUM
DRILL RIG

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES — PIEZOMETER — STANDPIPE INSTALLATION
20				SM	6		17-50/6 >50	1.0 1.0	1435 20-21 V. Dense, Brownish Gray, Non-stratified, f-c. Sandy SILT, trace f. Gravel PID-0	
21										
22										
23										
24										
25				SM	7		25-50/3	0.8 0.8	1445 25-25.8 Same as above PID-0	
26										
27										
28										
29										
30		Top of Silty f-c. SAND		SM	8		20-50/5	0.8 0.9	1455 30-30.9 V. Dense Brownish Gray Weakly Stratified, f-c. Sandy SILT	
31									Layer of Silty f-c. SAND at 30.4 → 30.6 moist, trace f-c. Gravel PID-0	
32										
33										
34										
35				SM VF	9		31-50/4	0.8 0.8	1505 35-35.8 V. Dense Olive Gray Non-stratified, Silty f-c. SAND trace f. Gravel, moist PID-0	
36		V. Dense, Olive Gray Non-stratified Silty f-c. SAND trace f. Gravel Advanced Outwash								
37										
38										
39										
40										

DEPTH SCALE 1" = 2.5'
DRILLING CONTRACTOR Cascade
DRILLER

Golder Associates

LOGGED BY
CHECKED
DATE

RECORD OF BOREHOLE # MW-1

SHEET 3 OF 3

STA. OFFSET L R ELEVATION DATUM

PROJECT NO. 003-1321 DRILLING DATE 11-13-00 DRILL RIG CME-75

INCLINATION 90° AZIMUTH

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES — PIEZOMETER — STANDPIPE INSTALLATION
40		Graded to F-M SAND		SP	10		50/6	5/5	1512 40-405 V. Damp, Olive Gray Non Stratified f-m SAND PID-4	
41										
42										
43										
44										
45		Petroleum odor increased moisture							Effervescence (gas) odor	
46				SP	11		22-50/6	1.0/1.0	1525 45-46 V. Damp, Olive Gray Non-Strat. f-m. SAND, trace Subangular Gravel, moist PID-350	
47										
48										
49										
50									1540 50-512 V. Damp, Olive Gray to	
51				SP	12		15-25-50/6	0.8/1.0	Mod Gray, Non-Stratified f-m SAND, moist wet PID-24	
52		EOH 52'							1550 ~0.2 ft water in hole Construct well from 51-41 ft	
									1703 Well Constructed Water @ 49.7 ft bgs	

DEPTH SCALE 1" = 2.5'

DRILLING CONTRACTOR Cascade

DRILLER

Golder Associates

LOGGED BY

CHECKED

DATE

RECORD OF BOREHOLE #MW 2

STA. MW-2 OFFSET L R
PROJECT NO. 003-1321.300
INCLINATION 90° AZIMUTH

ELEVATION
DRILLING DATE 10-13-00

SHEET 1 OF 2
DATUM
DRILL RIG CME-75

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	TYPE	BLOWS/ 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
0		Asphalt								
1		V. Loose-Loose Olive Gray, Mod. Brown SILT becoming Silty F-C SAND below 5.5 ft, little f-C Gravel. FILL								
2	300 lb Hammer								Olive gray Heton	
3					1	HD	3/3/2 (5)	1.4/1.5	1116 2.5-4 Loose PID 2.0 Clayey SILT, some f gravel, FILL	
5										
6	Dames & Moore				2	HD	1/1/2 (3)	1.5/1.5	1120 5-6.5 PID-20 V. Loose Heter. Silty f-C SAND, little f-C Gravel Fill	
7		Compact, Mod. Yellowish Brown, Homogeneous Silty F. SAND trace subrounded F Gravel Petroleum Odor Recessional OUTWASH								2nd Plug Bentonite Chips
8				SM	3	HD	8/6/7 (15)	1.5/1.5	1124 7.5-9 Faint gas smell. Compact Mod Yellowish Brown, Homogen. Silty f SAND, PID-20	
10	4¼ ID HSA									
11				SM	4		9-10-12 (22)	1.5/1.5	1133 10-11.5 Faint gas odor, Compact Mod Yellowish brown, Homogen. Silty f SAND, trace subrounded Gravel PID-0.0 Recessional OUTWASH	
13				SM	5		4-7-8 (15)	1.6/1.5	1137 12.5-14 PID=200 As above 10-11.5	
15		Color change @ 15 ft to Olive Gray Wet below 15 ft								
16				SM	6		9-7-11 (18)		1142 15-16.5 PID=20 Wet As above wet below 15 ft Olive Gray	5' Screen 20/40
17-20										

DEPTH SCALE 1" = 2.5'
DRILLING CONTRACTOR Cascade
DRILLER Cody

Golder Associates

LOGGED BY GLZ
CHECKED
DATE

RECORD OF BOREHOLE # MW-2

SHEET 2 OF 2

STA. MW-2 OFFSET L R ELEVATION DATUM

PROJECT NO. 003-1321 DRILLING DATE 11-13-00 DRILL RIG

INCLINATION 90° AZIMUTH

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES — PIEZOMETER — STANDPIPE INSTALLATION
20										
21				ML	7		4-6-13 (21)	1.4 / 1.5	~~1147 20-21.5~~ Compact, Dark grayish Gray, Homogenous, SILT, little C. SAND, little f. Subrounded gravel, imbedded, Damp Ablation Till PID-0	
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

DEPTH SCALE 1" = 2.5'

DRILLING CONTRACTOR Cascade

DRILLER

LOGGED BY GLZ

CHECKED

DATE

Golder Associates

RECORD OF BOREHOLE #MW-3

STA. MW-3 OFFSET L R
PROJECT NO. 003-1321.300
INCLINATION 90° AZIMUTH
ELEVATION
DRILLING DATE 11-13-00
SHEET 1 OF 2
DATUM
DRILL RIG CME-75

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	NUMBER	TYPE	BLOWS/ 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES — PIEZOMETER — STANDPIPE INSTALLATION
0		Gravel,								
1–2	300lb Hammer	Loose, Dusky Yellowish Brown, SILT, WOOD BARK little f. Gravel, FILL								
3–4		(Heterogeneous)			1	HD	5/3/4 (7)	1.3/1.5	0812 2.5-4 Loose, Dusky Yellowish brown, Heterogeneous, Silt, Wood Bark little f. Gravel, FILL PID-25 odor	
5–7	Dames & Moore	Loose-Compact, Dark Yellowish Brown, Silty F.-C. SAND, trace f. Gravel, Plastic debris, FILL			2	HD	3/5/8 (13)	1.5/1.5	0817 5-6.5 Compact, Dark Yellowish brown Heter., Silty F-C. SAND, trace f. Gravel Plastic debris material, FILL, odor PID=6	
8–9					3	HD	2/3/3 (6)	1.5/1.5	0820 7.5-9 Loose, Dark Yell. Brown Heter., Silty f-C. SAND, trace f. Gravel trace Organic roots. PID=6	
10–11	HSA 4" ID	Loose, Mod. Yellowish brown, Homogeneous, Silty F-M. SAND RECESSIONAL OUTWASH		SM	4	HD	2/2/3 (5)	1.5/1.5	0825 10-11.5 Loose, Mod Yellowish Brown Homogen. Silty f-M. SAND PID 1	
12										▽ 12.8' bgs
13–14		Compact-Dense, Olive Gray-Brownish Gray Nonstratified, Silty f-M. SAND, little to some subangular f-M. Gravel, trace Cobble Ablation Till or Advanced Outwash							1314 Drilling is harder (Till?)	
15–16				SM-GM	5	HD	8/16/13 (29)	0.5/1.5	0832 15-16.5 Compact, Olive Gray Heter. Silty f-M SAND, some f.-C. GRAVEL, 1 Cobble. Ablation Till or Advanced Outwash PID-0	
17–20										

Mod Chips, Pure Gold

DEPTH SCALE 1" = 2.5'
DRILLING CONTRACTOR Cascade
DRILLER Cody

Golder Associates

LOGGED BY
CHECKED
DATE

RECORD OF BOREHOLE # MW-3

SHEET 2 OF 2

STA. OFFSET L R
PROJECT NO. 003-1321
INCLINATION 90°
AZIMUTH
ELEVATION
DRILLING DATE 11-13-06
DATUM
DRILL RIG

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	TYPE	BLOWS/ 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES — PIEZOMETER — STANDPIPE INSTALLATION
20				SM GM	6		7/21/25 (46)	1.4 / 1.5	0840 20-21.4 Dense, Brownish Gray Stainfree, Silty f-M SAND, some little subround f Gravel, moist ABLATION TILL 800-0	
21		moist at 21 ft								
22										
23										
24										
25		wet at 25 ft		SM GM	7		50-6"	0.5 / 0.5	0847 25-25.5 V Dense, ← Cobble Brownish Gray Silty f-C SAND and f-C GRAVEL trace subangular Cobble, wet	
26										
27										
28		EOH 28'							0855 Auger 28 ft, pull up 3 ft	
29										
30										
									#2-12 Sand 28-14	
									BOS 27.0	
									Sand is bridging hard to add water	
									1015 Well Construction Completed	
									Water at ~21 ft bgs	

DEPTH SCALE 1" = 2.5'
DRILLING CONTRACTOR Cascade
DRILLER

Golder Associates

LOGGED BY
CHECKED
DATE

RECORD OF BOREHOLE # MW-4

STA. MW-4 OFFSET L R
PROJECT NO. 003-1321.300
INCLINATION 90° AZIMUTH
ELEVATION
DRILLING DATE 11-14-00
SHEET 1 OF 3
DATUM
DRILL RIG CME-75

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES — PIEZOMETER — STANDPIPE INSTALLATION
0	4" I.D. HSA Damas & Moore 300 lb Auto Hammer	Compact, Greenish Brown Non-Stratified, fine Sandy SILT, trace Subrounded f.-c. Gravel FILL							Surface Fr gravel	
1										
2										
3				SM-ML	1	HD	5-9-20 (29)	1.5/1.5	0818 2.5-4.0 Compact, Greenish Brown Olive Gray Non-Stratified, f. Sandy SILT, trace Subrounded f.-c. Gravel No Odor	
4										
5									Non-Stratified 0823 5-6.5 V. Dense, Pale Yellowish	
6		V. Dense, Pale Yellowish Brown, Olive Gray Non-Stratified SILT, little fine Sand, trace Subrounded f.-c. Gravel, TILL		ML-SM	2	HD	17-25-30 (55)	1.5/1.5	Brown, SILT, little f. Sand, trace, Subrounded f.-c. Gravel, trace Organic matter No Odor	
7										
8				ML-SM	3	HD	50/6	.5/.5	0830 7.5-8 V. Dense, Olive Gray, Non-Stratified, SILT, little f. Sand, little Subrounded f.-c. Gravel TILL No Odor	
9										
10									0835 10-10.2 V. Dense, Olive Gray,	
11				ML-SM	4	HD	17-50/5 (750)	.4/.5	Non-Stratified, SILT, little f. Sand trace Subrounded f. Gravel TILL No Odor	1
12										
13										
14										
15									0840-15-15.1 V. Dense, Olive Gray	
16				ML-SM	5	HD	27-50/3 (750)	.5/.1	Non-Stratified, SILT, little f. Sand, trace Subrounded, f. Gravel TILL No Odor	
17										
18										
19										
20										

DEPTH SCALE 1" = 2.5'
DRILLING CONTRACTOR Cascade
DRILLER Cody

Golder Associates

LOGGED BY GLZ
CHECKED
DATE

RECORD OF BOREHOLE # MW-4

STA. MW-4 OFFSET L R
PROJECT NO. 003-1321
INCLINATION 90° AZIMUTH
ELEVATION
DRILLING DATE 11-14-00
SHEET 2 OF 3
DATUM
DRILL RIG

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES — PIEZOMETER — STANDPIPE INSTALLATION
20		increase in amount of fine sands		ML SM	6	HO	17-50/5 75Ø	.8/.9	0850 20-20.9 V. Dense, Olive Gray NOW-Stratified, Silty f SAND trace Subrounded Gravel TILL f-C. No Odor	
21										
22										
23										
24										
25				SM	7	HO	20-50/4 >50	.8/.8	0855 25-25.8 V. Dense, Olive Gray NOW-Stratified, f. Sandy SILT. trace f Gravel TILL Slight increase in moisture sample is damp, but does not appear to be saturated No Odor	
26										
27										
28										
29										
30		V. Dense, Olive Gray NOW-Stratified, Silty F-C. SAND, trace to little F.-C. Subrounded Gravel damp ADVANCED OUTWASH		SW SM	8	HO	50/6	.5/.5	0902 30-30.5 V. Dense, Olive Gray NOW-Stratified Silty f-C. SAND trace to little f-C. Gravel, damp Advanced OUTWASH No Odor	
31										
32										
33										
34										
35				SW-SM	9	HO	22-50/6	1.0/1.0	0915 35-36 V. Dense Olive Gray NOW-Stratified Silty f-C. SAND trace Subrounded f.-C. Gravel damp ADVANCED OUTWASH No Odor	
36										
37										
38										
39										
40										

DEPTH SCALE 1" = 2.5'
DRILLING CONTRACTOR Cascade
DRILLER

Golder Associates

LOGGED BY GLZ
CHECKED
DATE

RECORD OF BOREHOLE # MW-4

SHEET 3 OF 3

STA. MW-4 OFFSET L R
PROJECT NO. 003-1321
INCLINATION 90° AZIMUTH
ELEVATION
DRILLING DATE 11-14-00
DATUM
DRILL RIG

DEPTH SCALE (FEET)	BORING METHOD	SOIL PROFILE / SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES — PIEZOMETER — STANDPIPE INSTALLATION
40		reduction in Coarse sands		SW	10	HO	22 50/6	10/10	0930 40-41 V. Dense, Olive Gray Well Stratified, f-M SAND trace f-C Gravel ADVANCED OUTWASH No Odor	
41										
42										
43										
44										
45									0945 45-45.5 As above	
		45 EOH			11		90/6	1.5/6		
46									Allow hole to sit open for 15 minutes. No water or checks in hole. Chip the hole closed	
47										
48										

DEPTH SCALE 1" = 2.5'
DRILLING CONTRACTOR Cascade
DRILLER

Golder Associates

LOGGED BY GLZ
CHECKED
DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW5

SHEET 1 OF 3

LOCATION: Sea-Tac Parking

ELEVATION

DRILLING DATE 1/2/01

DATUM

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
0										0930 Start Post hole
5				SW	1		100-6	0% P/S	~~Very~~ Dense, dark yellowish brown (10YR 4/2) unstratified SAND, some silt, little gravel damp	940 HS-PID 0.0ppm No odor
10	HSA			SW	2		50-5	0% P/S	Same as above - Dense	942 HS PID 0.0 ppm No odor
15				SW	3		100-6		V Dense, dark yellowish Brown (10YR 4/2) unstratified, SAND Some silt Some to little gravel damp	945 HS PID 0.0 ppm No odor
20										950

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321-900

RECORD OF BOREHOLE # MW 5

SHEET 2 OF 3

LOCATION: Sea Tac Parking

ELEVATION

DRILLING DATE 1/2/01

DATUM

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE / SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / 6 IN.	SAMPLES: RECOVERY	SAMPLE DESCRIPTION	NOTES: PIEZOMETER / STANDPIPE INSTALLATION
-20				SW	4		80-6	0%/5	V. Dense, Dark yellowish Brown (10 YR 4/2) Unstratified, Silty SAND to SAndy SILT, some to little gravel dmp	PSH HS PID 0.0 PPM
-25				SP	5		100-6	0%/6	Dense Dark Yellowish Brown (10 YR 4/2) Unstratified, SAND dmp	HS PID 0.0 PPM 854
									30 ID"	
-30	ASR			ML	6		40, 50-6	1%/1	Dense Dark Yellowish Brown (10 YR 4/2) Unstratified to Slightly bedded SILT dmp to moist	858 HS PID 0.0 PPM
									30'4" - 31'0"	
				SW					Dense Dark Yellowish Brown (10 YR 4/2) Unstratified F. to C SAND and F gravel dmp	
-35					7		32 50-6	1%/0	Compact to Dense Dark yellowish Brown (10 YR 4/2) Unstratified F to C Sand little to some gravel dmp	902 HS PID 0.0 PPM
				SW						
-40					8					

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Gies

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW5

SHEET 3 OF 3

LOCATION: SeaTac Parking

ELEVATION

DRILLING DATE 1/02/01

DATUM

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	NUMBER	TYPE	BLOWS / 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
40				SP	8		65-6	0.7/0.5	V. Dense, dark yellowish Brown (10YR 4/2) unstratified SAND (M to C) little gravel dry	chem Sample 912 HSPID 0.0 ppm
45				SP	9		70-6	0.7/0.5	V. Dense dark yellowish brown (10YR 4/2) unstratified M SAND dry HS PID 0.0 ppm	916 chem sample
50				SP	10		50-6	0.7/0.5	Same as above HS PID 0.0 ppm	920 chem sample
55	HSA			SP	11		25,50-6		Same as above HS PID 0.0 ppm	chem Sample
									TD 58 ft bgs ? ~ 50.5 ft bgs	
60										

Installation notes: Bentonite Chips; Blank; Sand; Screen; SAND; 10 slot screen

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

1200 K

RECORD OF BOREHOLE # MW6

PROJECT NO. 003-1321-900
LOCATION: Sea-Tac Parking

ELEVATION
DRILLING DATE 1/02/01

SHEET 1 OF 3
DATUM
DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
0									0-0.3 Asphalt	1210 Start Hand auger
5				SP	1	HD	13, 33, 25	1.5/1.5	Loose to compact Moderate Brown (5YR 4/4) stratified m SAND little gravel little silt trace charcoal FILL	1222 HS PID 0.0 ppm
10				SP	2	HD	15 15 17	1.5/1.5	Loose Dark Yellowish Brown (10YR 4/2) unstratified f-m SAND damp	1226
15				SP	3	HD	50-6	0.7/0.5	Compact to dense Dark Yellowish Brown (10YR 4/2) unstratified f-m SAND damp	1230 chem sample
										17 ft → wet? JMC at side of sample muddy @ 4?
20					4					1232

DEPTH SCALE 7.5 inches = 2 feet
DRILLING CONTRACTOR Cascade
DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton
CHECKED
DATE

PROJECT NO. 003-1321-900

RECORD OF BOREHOLE # MW6

SHEET 2 OF 3

LOCATION: Sea Tac Parking

ELEVATION

DRILLING DATE 1/02/01

DATUM

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
-20				ML	4	HA	23 50-6	10/10	Dense, Dark Yellowish Brown (10YR 4/2) unstratified SILT little m-c SAND little fine Gravel damp	Chem Sample PID HS 0.0 ppm
-25				SP	5	HA	50-6	07/05	Dense, Dark Yellowish Brown (10YR 4/2) unstratified f SAND trace gravel damp	1235 PID HS 0.0 ppm
-30				SW	6	HA	50-6	05/05	Dense, Dark Yellowish Brown (10YR 4/2) unstratified f-c SAND little to some gravel dmp	1239 PID HS 0.0 ppm
-35				SP	7	HA	50-6	07/05	Dense, Dark Yellowish Brown (10YR 4/2) unstratified f-m SAND damp	1245 HS PID 0.0 ppm
-40					8					1248

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW 6

SHEET 3 OF 3

LOCATION: SeaTac Parking

ELEVATION

DATUM

DRILLING DATE 11/02/01

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
40				SW to SP	8	HD	50-6	01/05	Dense, Dark Yellowish Brown (10YR 4/2) unstratified, f-c SAND Trace Silt Trace gravel dup	1248 HS PID 0.0 ppm chem sample
45				SP	9	HD	50-6	07/05	Dense, Dark Yellowish Brown (10YR 4/2) unstratified f-m SAND dup	1252 HS PID 0.0 ppm chem sample
50				SP	10	HD	50-6	07/05	Same as above	1256 HS PID 0.0 ppm chem sample
										water?
55				SP	11	HD	51-5	06/05	Same as above "wet"	1300 HS PID 0.0 ppm
60									TD 60 ft bgs	

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Gores

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW 7

SHEET 1 OF 3

LOCATION: SeaTac Parking

ELEVATION

DRILLING DATE 1/3/01

DATUM

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE / SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER / STANDPIPE INSTALLATION
0		ASPHALT 0-0.5 Crushed Gravel								1055 start
										1110 dug by hand to 2.5
					1	HD	50-6	05/05	Dense, Dark Yellowish Brown (10YR 4/2) Slightly Stratified f-m SAND little silt dry	1112 HS PID 0.0 ppm
5										gravel in cuttings
					2	HD	50-6	05/05	Dense, Dark Yellowish Brown (10YR 4/2) Unstratified Sandy SILT some gravel clasts (TILL)	1120 HS PID 0.0 ppm
10										
					3	HD	100-6	07/05	V Dense Dark Yellowish Brown (10YR 4/2) Unstratified Silty SAND to Sandy SILT some gravel clasts (TILL)	HS PID 0.0 ppm 1125
15										
					4	HD	100-6	07/05	V Dense, Dark Yellowish Brown (10YR 4/2) f-m SAND some silt some gravel clasts (TILL)	HS PID 0.0 ppm 1130
20										

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Coes

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW7

SHEET 2 OF 3

LOCATION: SeaTac Parking

ELEVATION

DRILLING DATE 1/3/01

DATUM

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE / SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES / PIEZOMETER / STANDPIPE INSTALLATION
-20										
					5	HA	100-6	0.5/0.5	V. Dense, Dark Yellowish Brown (10YR4/2) unstratified f-m SAND some to little Silt, some gravel damp (TILL)	HS PID 0.1 ppm 1230
-25										
					6	HA	100-6	0.5/0.5	V. Dense, Dark Yellowish Brown (10YR4/2) unstratified f-c SAND some Gravel little Silt moist damp (TILL)	Chem Sample HS PID 0.0 ppm 1245 1255
-30										
					7	HA	100-6	0.5/0.5	V. Dense Dark Yellowish Brown (10YR4/2) unstratified med SAND trace silt trace gravel damp to moist (outwash SAND)	Chem Sample faint TPH odor PID 13 ppm NS 1150
-35										
					8	HA	50-6	0.5/0.5	V Dense, Dark Yellowish Brown (10YR4/2) unstratified f-m SAND moist to damp (outwash SAND) TPH odor	48 ppm Chem Sample 1453
-40										

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW7

SHEET 3 OF 3

LOCATION: Sea-Tac Parking

ELEVATION

DATUM

DRILLING DATE 1/3/00

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE / SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / 6 IN.	SAMPLES: RECOVERY	SAMPLE DESCRIPTION	NOTES: PIEZOMETER / STANDPIPE INSTALLATION
-40										
									Very Dense, Dark yellowish Brown (10YR 4/2) weathered	HS PID 225 ppm wet
					9	HD	50-6	05/05	in SAND moist to wet	TPH odor
-45										1205
									Very Same as above wet	
-50					10	HD	50-6	05/05		1208
-5										
-0										

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321-900

RECORD OF BOREHOLE # MW 8

SHEET 1 OF 2

LOCATION: SeaTac Parking

ELEVATION

DRILLING DATE 1/4/00

DATUM

DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
0		crushed gravel / Asphalt 0"								935
									4.5' - Compact, olive gray ( )	
5					1	HB	23, 20, 20	15/15	Sandy SILT some gravel damp (Ablation TILL)	940 HS PID 0.0 ppm
	9.5' TD									
10	HSA				2	HB	14, 12, 14	14/15	same as above	945 HS PID 0.0 ppm
									Dense, Dark Yellowish Brown (10YR 4/2) and Med gray unstratified	950
15					3	HB	50-6	0.7/0.5	slightly mottled (with FE O.) Sandy SILT some gravel damp	chem sample HS 0.0 PID ppm
									Dense (olive gray ( ) unstratified F-med SAND some SILT little gravel moist to wet	collected GW sample through augers D wet
20					4		55-6	6/6		955 PID HS 0.0 ppm

DEPTH SCALE 1.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW 8

SHEET 2 OF 2

LOCATION: SeaTac Parking

ELEVATION

DATUM

DRILLING DATE 1/4/00

DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER / STANDPIPE INSTALLATION
20										
25					5	HA	10-6	06/06	Same as above	1010 HS PID 0.0 ppm
30										
35										
40										

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER A. Goes

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321-900

RECORD OF BOREHOLE # MW 8a

SHEET 1 OF 3

LOCATION: Sea-Tac Parking

ELEVATION

DATUM

DRILLING DATE 1/6/01

DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	TYPE	BLOWS / 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
0	HSA - 10"	Asphalt								845 Auger to
		Compact, Dark yellowish Brown, unstratified, fine SAND, Some Gravel little Silt damp (FILL								
		Compact Olive Gray, unstratified, slightly weathered fine-med SAND, Some to little Silt, Some gravel (TILL FILL)								
		[illegible]								4.5 ft large cobble in hole move, over 2 ft
5										
		Brownish Black, Sandy SILT with little organics wood & roots (cuttings)								
10										
		(cuttings) Dark Yellowish Brown (10 YR 4/2) med Sand Some SILT Some Gravel (TILL)								12 feet check No Water 930
15										15 feet check for water cutting moist No Water
										wet at 17.5 940
20										945 water in hole at 15

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER C.

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

RECORD OF BOREHOLE # MW 8a

PROJECT NO. 003-1321-900
LOCATION: Sea Tac Parking
ELEVATION
DRILLING DATE 1/6/01
SHEET 2 OF 3
DATUM
DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	NUMBER	TYPE	BLOWS / 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
20										
25										24.5 check hole then reaching [illegible]
					1	HD	50-6	0.5/0.5	Dense, Dark Yellowish Brown (10YR 4/4) unsaturated SAND some gravel some to little silt damp (T. Elc) Beckwith on outside of Sample	1103 PID HS 0.0 ppm
30										
					2	HD	50-6	1/0.5	Same as Above	1109 PID HS 0.0 ppm
35										
					3	HD	100-6	NR		1114 PID 0.0 ppm
40										

DEPTH SCALE 7.5 inches = 2 feet
DRILLING CONTRACTOR Cascade
DRILLER C

Golder Associates

LOGGED BY T. Norton
CHECKED
DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW8a

SHEET 3 OF 3

LOCATION: SeaTac Parking

ELEVATION

DRILLING DATE 1/6/01

DATUM

DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE / SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES / PIEZOMETER / STANDPIPE INSTALLATION
40										
45					4	HD	100-6	0"/0"	V. Dense, Dark Yellowish Brown (10YR4/2) unstratified, med SAND	dark hole dry 1120 PID 0.0 ppm
									Dense, Olive gray ( ) to	
					5	HD	50-6	5/5	Dark yellowish Brown (10YR4/2) unstratified med SAND	1125
50									Outwash SAND	1128 ! 1165 1145 septic PID 0.0 ppm
									Same as above	1148
					6		100-6	0"/0"	TD	
55										PID 0.0 ppm
60										

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER C

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 013-1321-900

RECORD OF BOREHOLE # MW 9

SHEET 1 OF 3

LOCATION: Sea Tac Parking

ELEVATION

DRILLING DATE 1/4/02

DATUM

DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE / SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES / PIEZOMETER / STANDPIPE INSTALLATION
0		ASPHALT								1230 surface elev.
5					1	HA	50-6	0.6/0.5	Dense, Dark Yellowish Brown slightly stratified and mottled with fine Sandy SILT, some to little gravel clasts (TILL	1246 HS PID 0.0 ppm
10					2	HA	60-6	0.5/0.5	Very Dense Olive gray (5Y) unstratified Silty SAND some to little gravel clasts (TILL)	1251 PID HS 0.0 ppm
15					3	HA	70-6	0.5/0.5	Same as above	1255 PID HS 0.0 ppm
20					4					

DEPTH SCALE 1.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Goss

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW 9

SHEET 2 OF 3

LOCATION: Sea-Tac Parking

ELEVATION

DATUM

DRILLING DATE 1/4/01

DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
20					4	HA	100-6	05/05	Dense Dark Yellowish Brown (10YR 4/6) unstratified f-m SAND some to little Silt some to little gravel (Imp TILL)	1259 PID HS 0.0 ppm
25					5	HA	100-6	07/05	Same as above	1305 Chem Sample PID HS 0.0 ppm
									20°-30°	Silt
30					6	HS	100-6	07/05	Dense, Dark Yellowish Brown (10YR 4/6) Stratified SILT and fine Sand SILT, Imp to moist	Chem Sample Silt 1310 PID HS 0.0 ppm
									30°-30° Dense Olive gray ( ) unstratified coarse SAND little gravel moist.	
35					7	HS	50-6		Dense, Olive gray unstratified medium SAND trace gravel Imp (Outwash SAND)	1315 Chem Sample PID problems No HDor
40					8					

DEPTH SCALE 1.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Cocs

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

RECORD OF BOREHOLE # MW 9

PROJECT NO. 003-1321-900
LOCATION: Sea-Tac Parking

ELEVATION
DRILLING DATE 1/4/00

SHEET 3 OF 3
DATUM
DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	TYPE	BLOWS / 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
40					8	HA	50-6		Dense, Olive gray to Dark yellow Brown, ( ) unstratified f to m (SAND	1315 slight TPH odor
45					9	HA	50-4		Same as above	1320 mild TPH odor
50					10	HA	50-6		Dense, Olive gray ( ) unstratified m (SAND moist	Strong TPH odor 1325 ∇ ATD 51.58
55					11	HA			Same as above wet	1330 strong tpH odor
60										

DEPTH SCALE 7.5 inches = 2 feet
DRILLING CONTRACTOR Cascade
DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton
CHECKED
DATE

RECORD OF BOREHOLE # MW 10

PROJECT NO. 003-1321.900
LOCATION: Sea-Tac Parking
ELEVATION
DRILLING DATE 1/5/01
SHEET 1 OF
DATUM
DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	NUMBER	TYPE	BLOWS / 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
0										8:00 post hole
5					1	HD	50-6	0/.5	Dense, Dark Yellowish Brown (10YR 4/2) slightly stratified to mottled, SILT, some to little sand some to little gravel 70 or staining damp (FILL TILL)	810
10					2	HD	50-6	.4/.5	Dense Dark Yellowish Brown (10YR 4/2) unstratified f-med SAND. Some silt (0' silt bed at 10') Some to little gravel damp (TILL)	815
15					3	HD	60-6	.5/.5	Dense Dark Yellowish Brown (10YR 4/2) slightly stratified V. fine Silty SAND little gravel damp (TILL)	820
20										

DEPTH SCALE 7.5 inches = 2 feet
DRILLING CONTRACTOR Cascade
DRILLER B. Goes

Golder Associates

LOGGED BY T. Norton
CHECKED
DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW 10

SHEET 2 OF

LOCATION: Sea Tac Parking

ELEVATION

DRILLING DATE 1/5/01

DATUM

DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
-20					4	HA	65-6	5/6	V. Dense Dark yellowish Brown (10YR4/2) unstratified F-med SAND Some to little gravel Some to little silt trace (TILL)	825 HS PID 0.0 ppm
-25					5	HA	100-6	6/6	V. Dense Dark Yellowish Brown (10YR4/2) unstratified F-med SAND little silt, little Gravel trace (TILL)	830 HS PID 0.0 ppm
-30					6	HA	100-6		V. Dense Dark Yellowish Brown (10YR4/2) unstratified F-C SAND some to little gravel little silt trace (TILL)	835 clean Sample PID HS 0.0 ppm
-35					7	HA	75-6		V. Dense Olive gray ( ) unstratified M-F SAND trace F. gravel clays (Outwash sand)	840 clean Sample PID 0.8 - 1.2 ppm
-40					8					

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Gross

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW 10

SHEET 3 OF

LOCATION: Sea Tac Parking

ELEVATION

DRILLING DATE 1/5/01

DATUM

DRILL RIG CME 75

DEPTH FEET	BORING METHOD	SOIL PROFILE / SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER / STANDPIPE INSTALLATION
40					8	HD	58-6	0/6	Dense, Dark Yellowish Brown (10YR4/2) to Olive Gray ( ) slightly stratified oil fine to med sand fine to coarse SAND trace gravel damp (TPH odor) Out wash SAND	846 Chem Sample HS PID 45 ppm
									Dense, Olive Gray ( )	
45					9	HD	50-6	2/5	Instratified Medium SAND damp (TPH odor) (OUT WASH SAND)	853 TPH odor Chem Sample 75 ppm HS PID
50					10	HD	50-6	6/6	Same as above wet (TPH Odor)	858 Wet TPH odor Moderate 425 ppm HS PID
55					11	HD	60-6	6/6	Dense Olive Grey ( ) instrat. Pied fine to coarse SAND wet (TPH odor) Out wash SAND	906 tripping out / 7:40 am 275 ppm HS PID
60					12					911

DEPTH SCALE 1.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER B. Goss

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

RECORD OF BOREHOLE # MW10

PROJECT NO. 003-1321.900
LOCATION: SeaTac Parking
ELEVATION
DRILLING DATE 1/5/00
SHEET 4 OF
DATUM
DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	TYPE	BLOWS / 6 IN.	RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER STANDPIPE INSTALLATION
60					12	HD	50-6	0.5/0.5	Same as: MW10-11	PID HS 90ppm Pulled augers 1247 drilled 10 3/4 augers
65					13				Tried sample heave & grout	1342
70					14	HS	60-5	0/0.5	Dense, olive to med gray unstratified f-m SAND outwash sand / Heave?	Blows not accurate HS PID 104 ppm 1352
75					15	HP	50-6	0.5/0.5	Same as above	1405 Blows not accurate PID Switch sampler to 1" SPT
80					16	HD				

DEPTH SCALE 7.5 inches = 2 feet
DRILLING CONTRACTOR Cascade
DRILLER B. Coes

Golder Associates

LOGGED BY T. Norton
CHECKED
DATE

PROJECT NO. 003-1321.900

RECORD OF BOREHOLE # MW10

SHEET 5 OF 5

LOCATION: SeaTac Parking

ELEVATION

DRILLING DATE 1/5/00

DATUM

DRILL RIG CME

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	USCS	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / 6 IN.	SAMPLES RECOVERY	SAMPLE DESCRIPTION	NOTES PIEZOMETER / STANDPIPE INSTALLATION
80					16	SPT		15/15	SAME AS 14 Above	1415
									0.15 in shoe 86.4-86.5	
									Dense Olive gray ( )	
85					17	SPT		15/15	unsorted, fine to coarse sand,	1437
									some fine Gravel, trace silt	
									(OUTWASH SAND?)	
90					18	SPT		15/10	Same as #16	1445
										1448 TD
										T2
5										
0										

DEPTH SCALE 7.5 inches = 2 feet

DRILLING CONTRACTOR Cascade

DRILLER

Golder Associates

LOGGED BY T. Norton

CHECKED

DATE

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. R 71930

Construction/Decommission

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[x] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: **Master Park Lot A**

Site Address: **18220 International Blvd**

Consulting Firm: **ATC Associates**

City: **Seattle** County: **King**

Unique Ecology Well ID Tag No. BAT 048

Location 1/4 SE 1/4 NE Sec 33 Twn 23N R 4E or WWM (EWM)

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x Long Deg x Long Min/Sec x

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Tax Parcel No.: **N/A**

[X] Driller [ ] Trainee Name (Print) Scott Krueger

Driller/Trainee Signature _____

Driller/Trainee License No. 2073

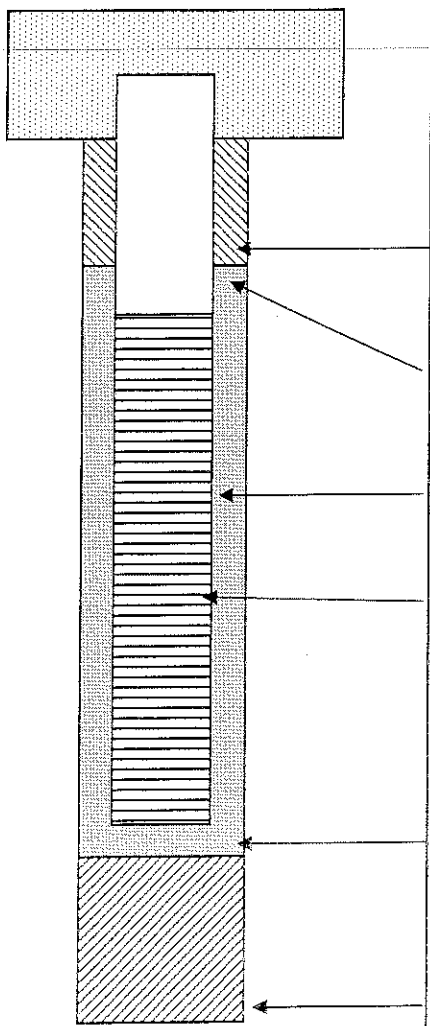
Cased or Uncased Diameter _____ Static Level 30

Work/Decommision Start Date: **8/17/2007**

If trainee, licensed driller's Signature and License No. _____

Work/Decommision End Date: 11 11

Construction/Design



Well Data W07-549

Concrete Surface Seal Depth	4	FT
Blank Casing (dia x dep)	2 25	
Material	~~PVC~~ pvc	
Backfill	19	FT
Type	Bent Chips	
Seal		
Material		
Gravel Pack	17	FT
Material	2/12	
Screen (dia x dep)	2 15	
Slot Size	1010	
Material	pvc	
Well Depth	40	FT
Backfill		
Material		
Total Hole Depth		FT

Formation Description

0 - 13		FT
brown med Sand		
013 - 40		FT
gray Silty Sand, Some gravel		
0 -		FT

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. R 71791

Construction/Decommission

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* MW-11

Type of Well

[x] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Master Park C

Site Address: 16025 International Blvd

Consulting Firm: ATC Associates

City: Seattle County: King

Unique Ecology Well ID Tag No. BAT 255

Location 1/4 NE 1/4 NE Sec 28 Twn 23N R 4E [EWM] or WWM

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x Long Deg x Long Min/Sec x

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Tax Parcel No. N/A

[X] Driller [ ] Trainee Name (Print) Scott Krueger

Driller/Trainee Signature

Cased or Uncased Diameter

Static Level 32' 4"

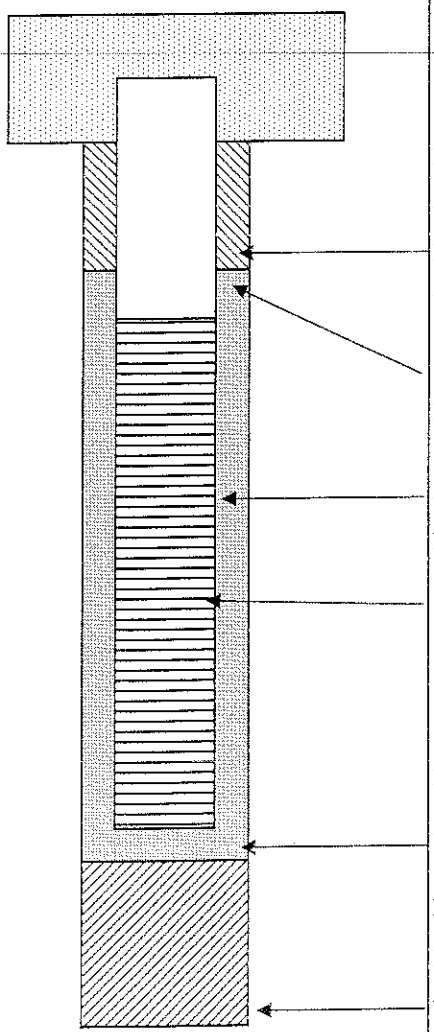
Driller/Trainee License No. 2073

Work/Decommision Start Date 8/9/2007

If trainee, licensed driller's Signature and License No.

Work/Decommision End Date / /

Construction/Design



Well Data **W07-549**

Concrete Surface Seal Depth	5	FT
Blank Casing (dia x dep)	2 42	
Material	pvc	
Backfill	35	FT
Type	Bent chips	
Seal		
Material		
Gravel Pack	17	FT
Material	2/12	
Screen (dia x dep)	2 15	
Slot Size	.010	
Material	pvc	
Well Depth	57	FT
Backfill		
Material		
Total Hole Depth		FT

Formation Description

0 - 45 FT brown silty sandy gravel

45 0 - 57 FT brown med Sand

0 - FT

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. R 71791

Construction/Decommission

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* MW-12

Type of Well

[x] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: **Master Park**

Site Address: **16025 International Blvd**

Consulting Firm: **ATC Associates**

City: **Seattle** County: **King**

Unique Ecology Well ID Tag No. BAT 256

EWM

Location 1/4 **NE** 1/4 **NE** Sec **28** Twn **23N** R **4E** or WWM

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x

Long Deg x Long Min/Sec x

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Tax Parcel No. **N/A**

[X] Driller [ ] Trainee Name (Print) Scott Kavega

Driller/Trainee Signature

Driller/Trainee License No. 2073

Cased or Uncased Diameter

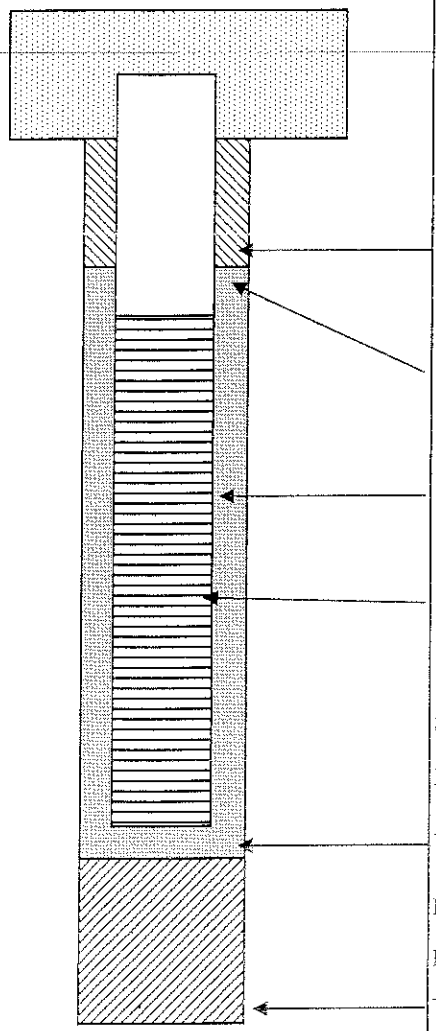
Static Level 55

Work/Decommision Start Date 8/9/2007

If trainee, licensed driller's Signature and License No.

Work/Decommision End Date 8/10/07

Construction/Design



Well Data **W07-549**

Concrete Surface Seal Depth	3 FT
Blank Casing (dia x dep)	2 50
Material	
Backfill	45 FT
Type	Bent. chips
Seal	
Material	
Gravel Pack	17 FT
Material	2/12
Screen (dia x dep)	2 15
Slot Size	010
Material	pvc
Well Depth	65 FT
Backfill	2
Material	2/12
Total Hole Depth	67 FT

Formation Description

0 - 8 FT: Silty Sandy clay

8 - 32 FT: brown Silty Sandy gravel

32 - 65 FT: brown med Sand

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev=v 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. R 7179 I

Construction/Decommission

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* MW-13

Type of Well

[x] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: **Master Park**

Site Address: **16025 International Blvd**

Consulting Firm: **ATC Associates**

City: **Seattle** County: **King**

Unique Ecology Well ID Tag No. BAT 257

Location 1/4 **NE** 1/4 **NE** Sec **28** Twn **23N** R **4E** [EWM] or WWM

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x Long Deg x Long Min/Sec x

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Tax Parcel No. **N/A**

[X] Driller [ ] Trainee Name (Print) Scott Krueger

Driller/Trainee Signature

Driller/Trainee License No. 2073

Cased or Uncased Diameter

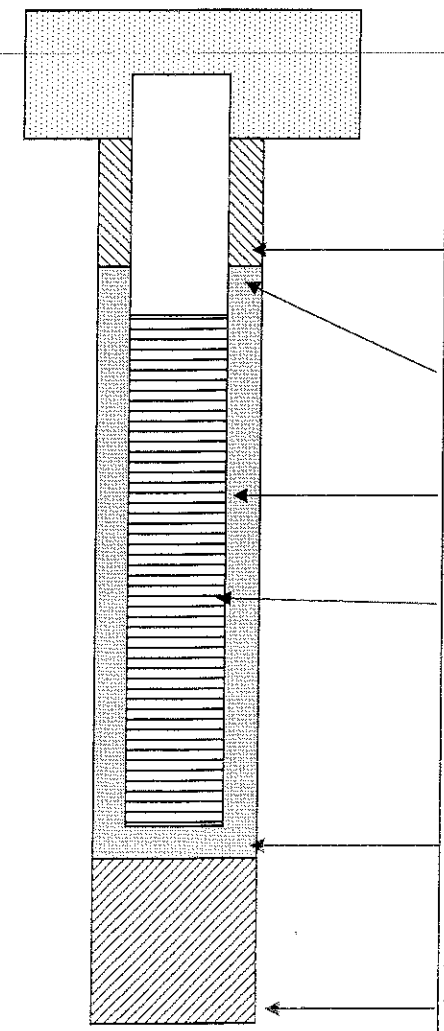
Static Level 6.6

Work/Decommision Start Date **8/9/2007**

If trainee, licensed driller's Signature and License No.

Work/Decommision End Date 8.13-07

Construction/Design



Well Data **W07-549**

Concrete Surface Seal Depth	5	FT
Blank Casing (dia x dep)	2 50	
Material	pvc	
Backfill	43	FT
Type	Bent chips	
Seal		
Material		
Gravel Pack	17	FT
Material	2/12	
Screen (dia x dep)	2 15	
Slot Size	.010	
Material	pvc	
Well Depth	65	FT
Backfill		
Material		
Total Hole Depth		FT

Formation Description

0 - 35	FT	brown silty sandy gravel
35 - 65	FT	brown med sand
0 -	FT	

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. R 71791

Construction/Decommission
[X] Construction
[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* MW - 14

Type of Well
[x] Resource Protection
[ ] Geotechnical Soil Boring

Property Owner: Master Park
Site Address: 16025 International Blvd
Consulting Firm: ATC Associates
City: Seattle County: King

Unique Ecology Well ID Tag No. BAT 258

Location 1/4 NE 1/4 NE Sec 28 Twn 23N R 4E [EWM] or WWM

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x Long Deg x Long Min/Sec x

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Tax Parcel No. N/A

[x] Driller [ ] Trainee Name (Print) Scott Krueger
Driller/Trainee Signature
Driller/Trainee License No. 2073

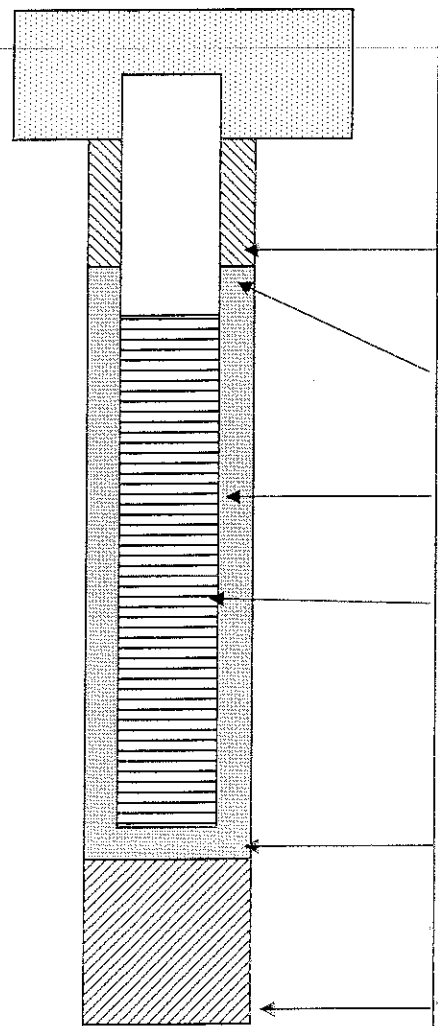
Cased or Uncased Diameter
Static Level 55

Work/Decommision Start Date 8/9/2007

If trainee, licensed driller's Signature and License No.

Work/Decommision End Date 8-14-07

Construction/Design



Well Data W07-549

Concrete Surface Seal Depth	5	FT
Blank Casing (dia x dep)	2 50	
Material	pvc	
Backfill	43	FT
Type	Bent Chips	
Seal		
Material		
Gravel Pack	17	FT
Material	2/12	
Screen (dia x dep)	2 15	
Slot Size	.010	
Material	pvc	
Well Depth	65	FT
Backfill		
Material		
Total Hole Depth		FT

Formation Description

0 - 35 FT
brown Silty Sand, gravel,

0 35 - 65 FT
brown med Sand

0 - FT

Scale 1" = _____

ECY 050-12 (Rev 2/01)

RECORD OF BOREHOLE MW-15

SHEET 1 of 2

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 60.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/29/07
DATE COMPLETED: 10/30/07
WEATHER:

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE:

INCLINATION: 90
DEPTH W.L.: 56.8 ft
ELEVATION W.L.:
DATE W.L.: 10/29/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
0		0.0 - 0.5 ASPHALT			0.5							MW-15 Manhole	**MW-15** Borehole Diameter: 8.0 IN **WELL CASING** Interval: 0-50 FT Material: PVC Diameter: 2.0 IN Joint Type: Threaded **WELL SCREEN** Interval: 50-65 FT Material: PVC Diameter: 2.0 IN Slot Size: 0.010 IN End Cap: **FILTER PACK** Interval: 48-65 FT Type: Sand Quantity: 17 FT **FILTER PACK SEAL** Interval: 3-48 FT Type: Bentonite Chips Quantity: 45 FT **ANNULUS SEAL** Interval: 0-3 Type: Cement Quantity: 3 FT
		0.5 - 1.0 SUBGRADE and FILL, concrete fragments and sand			1.0							Cement	
		1.0 - 5.0 Silty SAND with gravel (SP)	SP										
5		5.0 - 10.0 Light Red to Brown Silty fine SAND, medium dense, damp, no odor (SM)	SM		5.0								
							1	SS	5 -6 -5				
10		10.0 - 15.0 Medium Brown Silty fine SAND, some fine gravel, damp, no odor (SM)	SM		10.0								
							2	SS	19 -20 -22				
15		15.0 - 20.0 Light Brown medium SAND with fine to medium gravel, some silt, medium dense, no odor (SP)	SP		15.0								
							3	SS	27 -50/4"				
20		20.0 - 25.0 Brownish Gray Silty fine SANDwith fine to medium gravel, damp (SP-SM)	SP-SM		20.0								
							4	SS	50/6"				
25		25.0 - 30.0 Grayish Brown medium SAND with fine to medium gravel, some silt, no odor (SP)	SP		25.0							Bentonite	
							5	SS	50/6"				
30		30.0 - 35.0 Medium Brown Silty fine to medium SAND with fine to medium gravel, damp (SP-SM)	SP-SM		30.0								
							6	SS	6 -14 -26				
35		35.0 - 40.0 Medium Brown medium to coarse SAND, with some silt, samp, no odor or staining (SP)	SP		35.0								
							7	SS	14 -14 -15				
40		Log continued on next page											

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Andy

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-15

SHEET 2 of 2

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 60.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

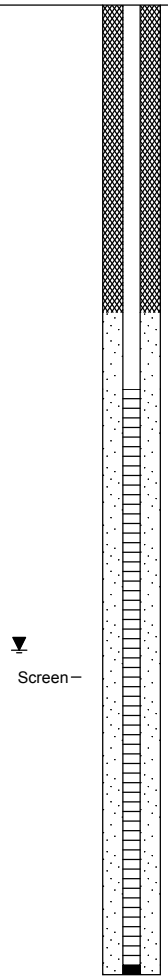
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/29/07
DATE COMPLETED: 10/30/07
WEATHER:

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE:

INCLINATION: 90
DEPTH W.L.: 56.8 ft
ELEVATION W.L.:
DATE W.L.: 10/29/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT
40		40.0 - 45.0 Medium Brown medium to coarse SAND with rare medium gravel, damp to moist, noodor or staining (SP)	SP		40.0						
							8	SS	18 -19 -20		
45		45.0 - 50.0 Medium Brown to Grayish Brown medium to coarse SAND interbedded with silt layers, some fine to medium gravel, damp to moist, no odor (SP)	SP		45.0						
							9	SS	8 -14 -15		
50		50.0 - 55.0 Medium to coarse SAND with fine gravel, wet, with slight petroleum odor (SP)	SP		50.0						
							10	SS	10 -13 -13		
55		55.0 - 60.0 Medium to coarse SAND, saturated (SW)	SW		55.0						
							11	SS	3 -16 -17		
60		Boring completed at 60.0 ft									
65											
70											
75											
80											

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-15
Borehole Diameter: 8.0 IN
WELL CASING
Interval: 0-50 FT
Material: PVC
Diameter: 2.0 IN
Joint Type: Threaded
WELL SCREEN
Interval: 50-65 FT
Material: PVC
Diameter: 2.0 IN
Slot Size: 0.010 IN
End Cap:
FILTER PACK
Interval: 48-65 FT
Type: Sand
Quantity: 17 FT
FILTER PACK SEAL
Interval: 3-48 FT
Type: Bentonite Chips
Quantity: 45 FT
ANNULUS SEAL
Interval: 0-3
Type: Cement
Quantity: 3 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Andy

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-16

SHEET 1 of 2

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 73.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

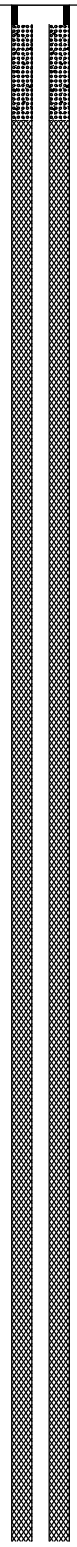
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/8/07
DATE COMPLETED: 11/8/07
WEATHER:

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE:

INCLINATION: 90
DEPTH W.L.: 66.1 ft
ELEVATION W.L.:
DATE W.L.: 11/8/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT
0		0.0 - 0.3 ASPHALT 0.3 - 0.7 SUBGRADE			0.7						
		0.7 - 5.0 Medium Brown Silty fine to medium SAND, some fine gravel, dry (SP-SM)	SP-SM								
5		5.0 - 13.0 Medium Brown Silty SAND, some fine gravel, dry (SP-SM)	SP-SM		5.0						
10		13.0 - 23.0 Grayish Brwon SILT with some fine sand, medium dense, damp (SM)	SM		13.0		1	SS	19 -21 -25		
15							2	SS	18 -23 -25		
20		23.0 - 27.0 Grayish Brown Silty medium SAND with fine to medium gravel, damp (SP-SM)	SP-SM		23.0		3	SS	19 -24 -26		
25		27.0 - 30.0 Brownish Gray Silty fine to medium SAND, no gravel, damp (SM)	SM		27.0		4	SS	17 -20 -23		
30		30.0 - 35.0 Grayish Brown fine to medium SAND with some silt, trace gravel, damp (SP)	SP		30.0		5	SS	14 -19 -20		
35		35.0 - 40.0 Grayish Brown fine to medium SAND with trace silt, no gravel, damp (SP)	SP		35.0		6	SS	11 -20 -20		
40		Log continued on next page									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-16
Borehole Diameter: 8.0 IN
WELL CASING
Interval: 0-60 FT
Material: PVC
Diameter: 2.0 IN
Joint Type: Threaded
WELL SCREEN
Interval: 63-73 FT
Material: PVC
Diameter: 2.0 IN
Slot Size: 0.010 IN
End Cap:
FILTER PACK
Interval: 60-73 FT
Type: Sand
Quantity: 13 FT
FILTER PACK SEAL
Interval: 3-60 FT
Type: Bentonite
Quantity: 57 FT
ANNULUS SEAL
Interval: 0-3 FT
Type: Cement
Quantity: 3 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Curtis

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-16

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 73.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

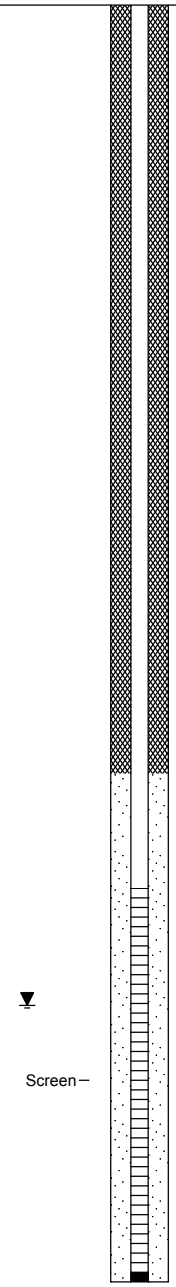
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/8/07
DATE COMPLETED: 11/8/07
WEATHER:

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE:

INCLINATION: 90
DEPTH W.L.: 66.1 ft
ELEVATION W.L.:
DATE W.L.: 11/8/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT
40		40.0 - 45.0 Grayish Brown fine to medium SAND with trace silt, no gravel, damp (SP)	SP		40.0		6	SS	11 -20 -20		
45		45.0 - 50.0 Brownish Gray medium to coarse SAND, trace silt, damp (SP)	SP		45.0		7	SS	17 -18 -18		
50		50.0 - 55.0 Grayish Brown fine to medium SAND with some silt, damp (SP); Gravelly SAND with a large cobble at 54 FT	SP		50.0		8	SS	19 -24 -25		
55		55.0 - 60.0 Grayish Brown medium to coarse SAND, trace silt, damp to moist, strong petroleum odor (SP)	SP		55.0		9	SS	14 -17 -18		
60		60.0 - 65.0 Brownish Gray SAND with some silt, saturated (SP)	SP		60.0		10	SS	7 -13 -13		
65		65.0 - 73.0 SAND with silt	SP		65.0		11	SS	11 -14 -15		
70		Boring completed at 73.0 ft									
75											
80											

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-16
Borehole Diameter: 8.0 IN
WELL CASING
Interval: 0-60 FT
Material: PVC
Diameter: 2.0 IN
Joint Type: Threaded
WELL SCREEN
Interval: 63-73 FT
Material: PVC
Diameter: 2.0 IN
Slot Size: 0.010 IN
End Cap:
FILTER PACK
Interval: 60-73 FT
Type: Sand
Quantity: 13 FT
FILTER PACK SEAL
Interval: 3-60 FT
Type: Bentonite
Quantity: 57 FT
ANNULUS SEAL
Interval: 0-3 FT
Type: Cement
Quantity: 3 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Curtis

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-17

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 83.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

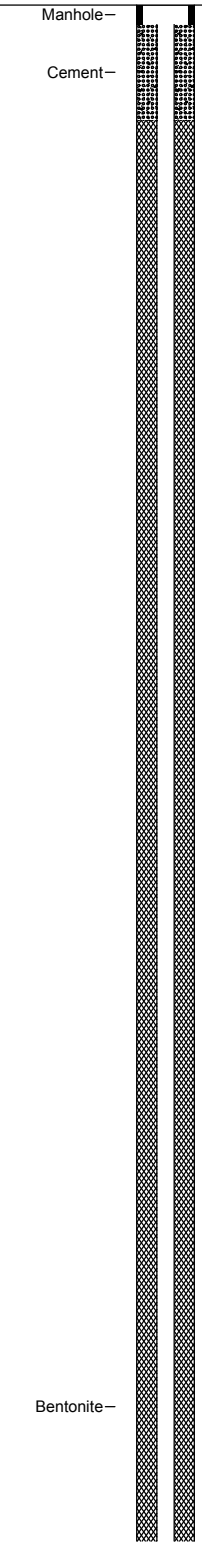
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/9/07
DATE COMPLETED: 11/9/07
WEATHER:

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE:

INCLINATION: 90
DEPTH W.L.: 76.0 ft
ELEVATION W.L.:
DATE W.L.: 11/9/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT
0		0.0 - 40.0 Medium Brown Silty fine to medium SAND, dry; grass at surface (SM)	SM								
							1	SS	50/5"		
40		Log continued on next page									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-17
Borehole Diameter: 8.0 IN
WELL CASING
Interval: 0-73
Material: PVC
Diameter: 2.0 IN
Joint Type: Threaded
WELL SCREEN
Interval: 73-83 FT
Material: PVC
Diameter: 2.0 IN
Slot Size: 0.010 IN
End Cap:
FILTER PACK
Interval: 70-83 FT
Type: SAND
Quantity: 13 FT
FILTER PACK SEAL
Interval: 3-70
Type: Bentonite
Quantity: 67 FT
ANNULUS SEAL
Interval: 0-3 FT
Type: Cement
Quantity: 3 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Curtis

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-17

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 83.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

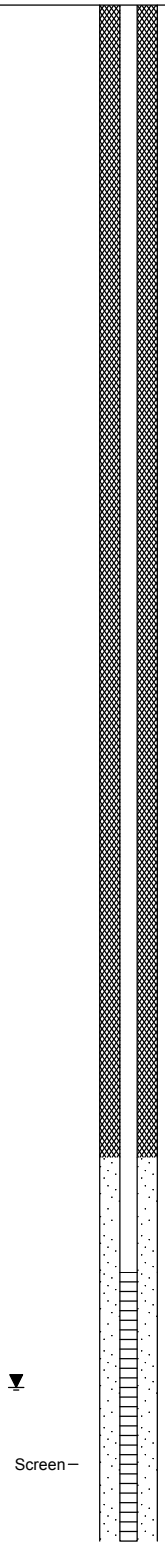
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/9/07
DATE COMPLETED: 11/9/07
WEATHER:

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE:

INCLINATION: 90
DEPTH W.L.: 76.0 ft
ELEVATION W.L.:
DATE W.L.: 11/9/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT
40		40.0 - 45.0 Brownish Gray fine to medium SAND with silt and fine gravel, damp, no odor (SP)	SP		40.0						
							2	SS	50/5"		
45		45.0 - 50.0 Grayish Brown fine to medium SAND with sand, trace fine gravel, damp, no odor (SP)	SP		45.0						
							3	SS	50/6"		
50		50.0 - 55.0 Grayish Brown Silty fine SAND, damp to moist, no odor (SM)	SM		50.0						
							4	SS	50/6"		
55		55.0 - 60.0 Grayish Brown medium to coarse SAND, some fine gravel, damp to moist (SP)	SP		55.0						
							5	SS	50/4"		
60		60.0 - 65.0 Brownish Gray coarse SAND with fine gravel, moist, no odor (SP)	SP		60.0						
							6	SS	50/6"		
65		65.0 - 70.0 Brownish Gray coarse SAND with fine gravel, moist, no odor (SP)	SP		65.0						
							7	SS	50/6"		
70		70.0 - 75.0 Brownish Gray coarse SAND with fine gravel, moist, no odor (SP)	SP		70.0						
							8	SS	50/6"		
75		75.0 - 80.0 Grayish Brown coarse SAND with fine to medium gravel, very moist, no odor (SP)	SP		75.0						
							9	SS	50/6"		
80		Log continued on next page									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-17
Borehole Diameter: 8.0 IN
WELL CASING
Interval: 0-73
Material: PVC
Diameter: 2.0 IN
Joint Type: Threaded
WELL SCREEN
Interval: 73-83 FT
Material: PVC
Diameter: 2.0 IN
Slot Size: 0.010 IN
End Cap:
FILTER PACK
Interval: 70-83 FT
Type: SAND
Quantity: 13 FT
FILTER PACK SEAL
Interval: 3-70
Type: Bentonite
Quantity: 67 FT
ANNULUS SEAL
Interval: 0-3 FT
Type: Cement
Quantity: 3 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Curtis

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-17

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 83.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/9/07
DATE COMPLETED: 11/9/07
WEATHER:

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE:

INCLINATION: 90
DEPTH W.L.: 76.0 ft
ELEVATION W.L.:
DATE W.L.: 11/9/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
80		80.0 - 83.0 Brownish Gray coarse SAND with some fine gravel, wet, slight petroleum odor	SP		80.0							MW-17	**MW-17** Borehole Diameter: 8.0 IN **WELL CASING** Interval: 0-73 Material: PVC Diameter: 2.0 IN Joint Type: Threaded **WELL SCREEN** Interval: 73-83 FT Material: PVC Diameter: 2.0 IN Slot Size: 0.010 IN End Cap: **FILTER PACK** Interval: 70-83 FT Type: SAND Quantity: 13 FT **FILTER PACK SEAL** Interval: 3-70 Type: Bentonite Quantity: 67 FT **ANNULUS SEAL** Interval: 0-3 FT Type: Cement Quantity: 3 FT
		Boring completed at 83.0 ft											
85													
90													
95													
100													
105													
110													
115													
120													

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Curtis

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-18

SHEET 1 of 2

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 62.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/26/07
DATE COMPLETED: 11/26/07
WEATHER: Clear

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE: 34

INCLINATION: 90
DEPTH W.L.: 52.5 ft
ELEVATION W.L.:
DATE W.L.: 11/26/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
0		0.0 - 0.5 ASPHALT			0.5							Manhole Cover Cement	**MW-18** Borehole Diameter: 8.0 IN **WELL CASING** Interval: 0 - 47 FT Material: PVC Diameter: 2.0 IN Joint Type: Threaded **WELL SCREEN** Interval: 47 - 62 FT Material: PVC Diameter: 2.0 IN Slot Size: 0.010 IN End Cap: **FILTER PACK** Interval: 45 - 62 FT Type: Sand Quantity: 17 FT **FILTER PACK SEAL** Interval: 4 - 45 FT Type: Bentonie Quantity: 41 FT **ANNULUS SEAL** Interval: 0 - 4 FT Type: Cement Quantity: 4 FT
		0.5 - 4.0 Brown Silty fine SAND with fine gravel, large concrete boulders at approximately 4.0-ft, gray silty clay lenses, soft, pliable (FILL)											
5		4.0 - 5.5 Light Gray Clayey SAND with fine to medium gravel, dry	SP		4.0	0.0	1	SS	5 -7 -20		1.5/1.5		
		5.5 - 6.0 Gray medium SAND, slight TPH odor, dry	SW		5.5 6.0								
		6.0 - 8.0 Auger											
		8.0 - 9.5 Gray Silty medium SAND with fine to medium gravel and rare cobbles, slight TPH odor, dry	SP-SM		8.0	832	2	SS	15 -17 -18		1.5/1.5		
10		9.5 - 14.5 Auger			9.5								
15		14.5 - 16.0 Gray Silty medium SAND with fine to medium gravel and rare cobbles, slight TPH odor, dry	SP-SM		14.5	1857	3	SS	28 -50/6"		1.0/1.5		
		16.0 - 18.5 Auger			16.0								
		18.5 - 20.0 4.0-in of Light Brown fine SAND and 2.0-in of a large cobble/boudler, dry	SP		18.5	2000	4	SS	50/6"		0.5/1.5		
20		20.0 - 23.5 Auger			20.0								
		23.5 - 25.0 Light Brown fine SAND with fine gravel and a large cobble/boulder, dry	SP		23.5	83	5	SS	50/6"		0.5/1.5	Bentonite seal	
25		25.0 - 28.5 Auger			25.0								
		28.5 - 30.0 Gray-brown Clayey fine SAND with rare fine gravel , moist	SP-SC		28.5	18	6	SS	50/6"		0.5/1.5		
30		30.0 - 33.5 Auger			30.0								
		33.5 - 35.0 Brown fine SAND with rare fine gravel, some large cobbles, dry, slight TPH odor	SP		33.5	90.9	7	SS	29 -50/6"		1.0/1.5		
35		35.0 - 38.5 Auger			35.0								
		38.5 - 40.0 Brown fine SAND, dry, slight TPH odor	SW		38.5	729	8	SS	50/6"		0.5/1.5		
40		Log continued on next page											

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: D. Gose

GA INSPECTOR: D.Gorman
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-18

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 62.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

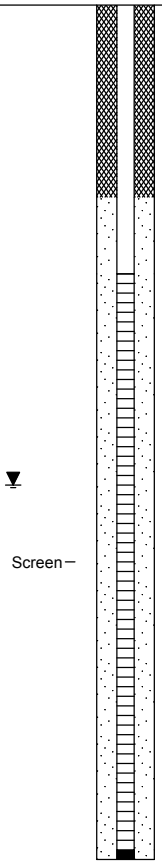
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/26/07
DATE COMPLETED: 11/26/07
WEATHER: Clear

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE: 34

INCLINATION: 90
DEPTH W.L.: 52.5 ft
ELEVATION W.L.:
DATE W.L.: 11/26/07
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT
40		40.0 - 43.5 Auger			40.0						
		43.5 - 45.0 Brown medium SAND with rare fine to medium gravel, few cobbles, moist, slight TPH odor	SP		43.5	1252	9	SS	50/6"		0.5 / 1.5
45		45.0 - 48.5 Auger			45.0						
		48.5 - 50.0 Gray fine SAND with rare fine gravel, moist, slight TPH odor	SP		48.5	198	10	SS	14 -27 -29		1.5 / 1.5
50		50.0 - 53.5 Auger			50.0						
		53.5 - 55.0 Gray fine to medium SAND, saturated, TPH odor	SW		53.5	71.8	11	SS	12 -23 -50/6"		1.5 / 1.5
55		55.0 - 58.5 Auger			55.0						
		58.5 - 60.0 Assumed SAND; heaved to approximately 57.0 FT, no sample	SW		58.5		12	SS	7 -26 -50/3"		1.5 / 1.5
60		60.0 - 62.0 Auger			60.0						
		Boring completed at 62.0 ft									
65											
70											
75											
80											

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-18
Borehole Diameter: 8.0 IN
WELL CASING
Interval: 0 - 47 FT
Material: PVC
Diameter: 2.0 IN
Joint Type: Threaded
WELL SCREEN
Interval: 47 - 62 FT
Material: PVC
Diameter: 2.0 IN
Slot Size: 0.010 IN
End Cap:
FILTER PACK
Interval: 45 - 62 FT
Type: Sand
Quantity: 17 FT
FILTER PACK SEAL
Interval: 4 - 45 FT
Type: Bentonie
Quantity: 41 FT
ANNULUS SEAL
Interval: 0 - 4 FT
Type: Cement
Quantity: 4 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: D. Gose

GA INSPECTOR: D.Gorman
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-19

SHEET 1 of 2

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 59.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

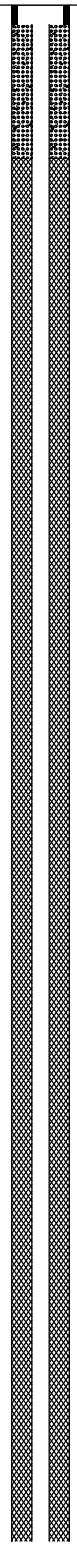
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 1/31/08
DATE COMPLETED: 1/31/08
WEATHER: Cloudy

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE: 32

INCLINATION: 90
DEPTH W.L.: 47.3 ft
ELEVATION W.L.:
DATE W.L.: 1/31/08
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT
0		0.0 - 0.5 ASPHALT			0.5						
		0.5 - 2.5 Brown Silty Sandy fine to medium GRAVEL (FILL)			2.5						
		2.5 - 5.5 Brown Gravelly Sandy SILT, damp, medium density	ML			0.0	1	SPT	3 -4 -4		1.5 / 1.5
5		5.5 - 9.0 Auger			5.5						
		9.0 - 10.5 Brownish grey fine to medium SAND with Silt and fine Gravel, dry	SP-SM		9.0	0.0	2	SPT	6 -18 -19		1.5 / 1.5
10		10.5 - 11.5 Auger			10.5						
		11.5 - 12.5 Brownish grey fine to medium SAND with Silt and fine Gravel, dry	SP-SM		11.5	0.0	3	SPT	60 -50/6"		1.0 / 1.5
		12.5 - 14.0 Auger			12.5						
		14.0 - 14.5 No recovery. Cobble in sampler.			14.0		4	SPT	60/6"		0.0 / 1.5
15		14.5 - 16.5 Auger			14.5						
		16.5 - 17.5 Brownish grey fine to medium Gravelly fine to medium SAND with Silt, dry, very compact	SP		16.5	0.0	5	SPT	26 -50/6"		1.0 / 1.5
		17.5 - 19.0 Auger			17.5						
		19.0 - 20.5 Brownish grey Silty fine to medium SAND and medium GRAVEL with some cobbles, dry, very compact	SP-SM		19.0	0.0	6	SPT	26 -50/3"		0.8 / 1.5
20		20.5 - 21.5 Auger	SP		20.5						
		21.5 - 22.0 Brownish grey Silty fine to medium SAND and medium GRAVEL with some cobbles, dry			21.5	0.0	7	SPT	50/6"		0.5 / 1.5
		22.0 - 24.0 Auger	SP-SM		22.0						
25		24.0 - 25.0 Light grey fine SAND with Silt and fine Gravel, some cobbles, moist			24.0	0.0	8	SPT	23 -50/6"		1.0 / 1.5
		25.0 - 29.0 Auger			25.0						
		29.0 - 29.5 Greyish brown Silty fine to medium SAND with fine Gravel, some cobbles, damp	SP-SM		29.0	0.0	9	SPT	50/6"		0.5 / 1.5
30		29.5 - 34.0 Auger			29.5						
		34.0 - 35.5 Greyish brown medium to course SAND with fine Gravel, moist	SP		34.0	0.0	10	SPT	12 -48 -50/3"		1.3 / 1.5
35		35.5 - 39.0 Auger			35.5						
			SP		39.0	7.2	11	SPT	24 -24 -47		
40		Log continued on next page									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-19
Borehole Diameter: 8.0 IN
WELL CASING
Interval: 0 - 43 FT
Material: PVC
Diameter: 2.0 IN
Joint Type: Threaded
WELL SCREEN
Interval: 43 - 58 FT
Material: PVC
Diameter: 2.0 IN
Slot Size: 0.010
End Cap:
FILTER PACK
Interval: 40 - 58 FT
Type: Sand
Quantity: 17 FT
FILTER PACK SEAL
Interval: 4 - 40 FT
Type: Bentonite
Quantity: 36 FT
ANNULUS SEAL
Interval: 0 - 4 FT
Type: Cement
Quantity: 4 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: A. Flagan

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-19

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-9336801
DRILLED DEPTH: 59.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

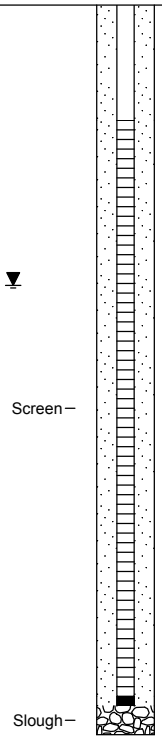
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 1/31/08
DATE COMPLETED: 1/31/08
WEATHER: Cloudy

DATUM: Geodetic
COORDS: not surveyed
GS ELEVATION:
TOC ELEVATION:
TEMPERATURE: 32

INCLINATION: 90
DEPTH W.L.: 47.3 ft
ELEVATION W.L.:
DATE W.L.: 1/31/08
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT
40		39.0 - 40.5 Greyish brown medium to course SAND with Silt, some fine gravel, moist *(Continued)*	SP		40.5	7.2	11	SPT	24 -24 -47		1.5 / 1.5
		40.5 - 44.0 Auger									
45		44.0 - 45.5 Greyish brown medium to course SAND, trace Silt, moist	SW		44.0	48.0	12	SPT	21 -24 -24		1.5 / 1.5
		45.5 - 49.0 Auger			45.5						
50		49.0 - 50.0 Greyish brown fine to medium SAND with Silt, trace fine Gravel, moist	SW		49.0	53.8	13	SPT	29 -50/2"		0.8 / 1.5
		50.0 - 54.0 Auger			50.0						
55		54.0 - 55.5 Grey fine to medium SAND with Silt, wet	SW		54.0		14	SPT	4 -8 -12		1.5 / 1.5
		Boring completed at 59.0 ft			55.5						
60											
65											
70											
75											
80											

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-19
Borehole Diameter: 8.0 IN
WELL CASING
Interval: 0 - 43 FT
Material: PVC
Diameter: 2.0 IN
Joint Type: Threaded
WELL SCREEN
Interval: 43 - 58 FT
Material: PVC
Diameter: 2.0 IN
Slot Size: 0.010
End Cap:
FILTER PACK
Interval: 40 - 58 FT
Type: Sand
Quantity: 17 FT
FILTER PACK SEAL
Interval: 4 - 40 FT
Type: Bentonite
Quantity: 36 FT
ANNULUS SEAL
Interval: 0 - 4 FT
Type: Cement
Quantity: 4 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: A. Flagan

GA INSPECTOR: I. Young
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MASTERPARK LOT C BORINGS 11.26.2007.GPJ GOLDER NJ-PA 05-24-06.GDT 3/13/08

RECORD OF BOREHOLE MW-20

SHEET 1 of 4

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 128.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: CME 75
DATE STARTED: 5/15/09
DATE COMPLETED: 5/15/09
WEATHER: Sunny

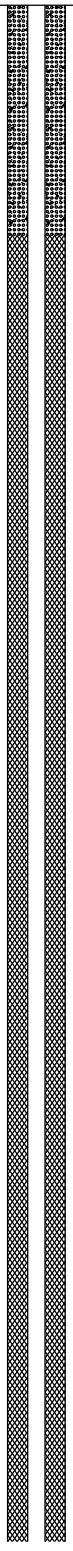
DATUM: Geodetic
COORDS: N: 170,757.8 E: 1,278,702.3
GS ELEVATION: 431.0 ft
TOC ELEVATION: 431.0 ft
TEMPERATURE: 60

INCLINATION: -90
DEPTH W.L.: 118.9 ft
ELEVATION W.L.: 312.1 ft
DATE W.L.: 5/15/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
0	430	0.0 - 1.0 Loose, dark brown, heterogeneous, silty fine to medium SAND, some organics, damp (SM) (FILL)	SM	430.0 1.0						
		1.0 - 8.0 Compact, brown-gray, heterogeneous, silty fine to coarse SAND, some fine to coarse gravel, damp (SM) (FILL)	SM		0.0	1	SPT	6 -9 -9		1.5 / 1.5
5	425									
		8.0 - 13.0 Very dense, light brown, non-stratified, silty fine to coarse SAND, trace fine to coarse gravel, trace iron-oxide staining, damp (SM) (GLACIAL TILL)	SM	423.0 8.0	0.0	2	SPT	32 -50/6"		0.8 / 1.0
10	420									
		13.0 - 18.0 Very dense, brown-gray, non-stratified, silty fine to coarse SAND, trace fine to coarse gravel, socketing, faceting, damp (SM) (GLACIAL TILL)	SM	418.0 13.0	0.0	3	SPT	50/4"		0.4 / 0.5
15	415									
		18.0 - 43.0 Very dense, olive gray, non-stratified, silty fine to coarse SAND, trace fine to coarse gravel, socketing, faceting, damp (SM) (GLACIAL TILL)		413.0 18.0	0.0	4	SPT	50/3"		0.3 / 0.5
20	410	21.0: -Observed 1-inch fine to medium sand seam .								
25	405	25.0: -Observed 1-inch fine to medium sand seam .			0.0	5	SPT	50/4"		0.4 / 0.5
			SM		0.0	6	SPT	50/5"		0.5 / 0.5
30	400									
35	395				0.0	7	SPT	50/4"		0.5 / 0.5
40										

Log continued on next page

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-20
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 117 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 117 - 127 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.010
End Cap: End Cap
FILTER PACK
Interval: 115 - 128 FT
Type: Sand
Quantity: 9 Bags
FILTER PACK SEAL
Interval: 6 - 115 FT
Type: Bentonite
Quantity: 68 Bags
ANNULUS SEAL
Interval: 0 - 6 FT
Type: Cement
Quantity: 6 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Steve L.

GA INSPECTOR: A. Dennison
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-20

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 128.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

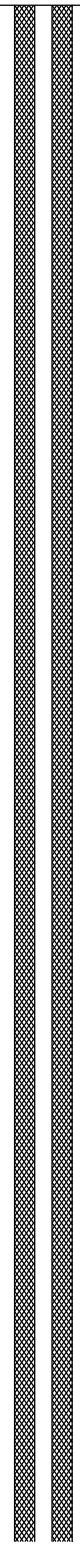
DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: CME 75
DATE STARTED: 5/15/09
DATE COMPLETED: 5/15/09
WEATHER: Sunny

DATUM: Geodetic
COORDS: N: 170,757.8 E: 1,278,702.3
GS ELEVATION: 431.0 ft
TOC ELEVATION: 431.0 ft
TEMPERATURE: 60

INCLINATION: -90
DEPTH W.L.: 118.9 ft
ELEVATION W.L.: 312.1 ft
DATE W.L.: 5/15/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
40	390	18.0 - 43.0 Very dense, olive gray, non-stratified, silty fine to coarse SAND, trace fine to coarse gravel, socketing, faceting, damp (SM) (GLACIAL TILL) *(Continued)*	SM		388.0 / 43.0	0.0	8	SPT	50/2"		0.2 / 0.5
45	385	43.0 - 68.0 Very dense, brown gray, non-stratified, fine to coarse SAND, trace silt, damp (SP) (ADVANCE OUTWASH)				0.0	9	SPT	50/4"		0.4 / 0.5
50	380					0.0	10	SPT	50/5"		0.5 / 0.5
55	375		SP			0.0	11	SPT	50/6"		0.5 / 0.5
60	370					0.0	12	SPT	50/6"		0.5 / 0.5
65	365				363.0 / 68.0	0.0	13	SPT	50/4"		0.5 / 0.5
70	360	68.0 - 78.0 Very dense, brown gray, non-stratified, fine to coarse SAND, little to trace fine to coarse gravel, trace silt, damp (SP) (ADVANCE OUTWASH)	SP								
75	355					0.0	15	SPT	50/6"		0.5 / 0.5
80		78.0 - 93.0 Very dense, light brown, stratified, fine to medium SAND, trace silt, damp (SP) (ADVANCE OUTWASH)	SP		353.0 / 78.0						
		Log continued on next page									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-20
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 117 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 117 - 127 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.010
End Cap: End Cap
FILTER PACK
Interval: 115 - 128 FT
Type: Sand
Quantity: 9 Bags
FILTER PACK SEAL
Interval: 6 - 115 FT
Type: Bentonite
Quantity: 68 Bags
ANNULUS SEAL
Interval: 0 - 6 FT
Type: Cement
Quantity: 6 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Steve L.

GA INSPECTOR: A. Dennison
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-20

SHEET 3 of 4

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 128.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: CME 75
DATE STARTED: 5/15/09
DATE COMPLETED: 5/15/09
WEATHER: Sunny

DATUM: Geodetic
COORDS: N: 170,757.8 E: 1,278,702.3
GS ELEVATION: 431.0 ft
TOC ELEVATION: 431.0 ft
TEMPERATURE: 60

INCLINATION: -90
DEPTH W.L.: 118.9 ft
ELEVATION W.L.: 312.1 ft
DATE W.L.: 5/15/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
80	350	78.0 - 93.0 Very dense, light brown, stratified, fine to medium SAND, trace silt, damp (SP) (ADVANCE OUTWASH) *(Continued)*	SP			0.0	16	SPT	50/5"		0.5 / 0.5
85	345					0.0	17	SPT	50/5"		0.5 / 0.5
90	340					0.0	18	SPT	50/6"		0.5 / 0.5
					338.0 / 93.0						
95	335	93.0 - 98.0 Very dense, brown, non-stratified, fine to coarse SAND, trace silt, damp (SP) (ADVANCE OUTWASH)	SP			0.0	19	SPT	50/6"		0.5 / 0.5
					333.0 / 98.0						
100	330	98.0 - 128.0 Very dense, brown, non-stratified, fine to coarse SAND, little to trace fine to coarse gravel, trace silt, damp (SP) (ADVANCE OUTWASH)				0.0	20	SPT	50/6"		0.5 / 0.5
105	325		SP			0.0	21	SPT	50/6"		0.5 / 0.5
110	320					0.0	22	SPT	50/5"		0.5 / 0.5
115	315					0.0	23	SPT	50/6"		0.5 / 0.5
120											

Log continued on next page

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES

MW-20

WELL CONSTRUCTION DETAILS

MW-20
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 117 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 117 - 127 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.010
End Cap: End Cap
FILTER PACK
Interval: 115 - 128 FT
Type: Sand
Quantity: 9 Bags
FILTER PACK SEAL
Interval: 6 - 115 FT
Type: Bentonite
Quantity: 68 Bags
ANNULUS SEAL
Interval: 0 - 6 FT
Type: Cement
Quantity: 6 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Steve L.

GA INSPECTOR: A. Dennison
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-20

SHEET 4 of 4

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 128.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

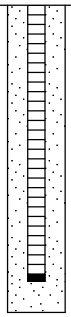
DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: CME 75
DATE STARTED: 5/15/09
DATE COMPLETED: 5/15/09
WEATHER: Sunny

DATUM: Geodetic
COORDS: N: 170,757.8 E: 1,278,702.3
GS ELEVATION: 431.0 ft
TOC ELEVATION: 431.0 ft
TEMPERATURE: 60

INCLINATION: -90
DEPTH W.L.: 118.9 ft
ELEVATION W.L.: 312.1 ft
DATE W.L.: 5/15/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
120	310	98.0 - 128.0 Very dense, brown, non-stratified, fine to coarse SAND, little to trace fine to coarse gravel, trace silt, damp (SP) (ADVANCE OUTWASH) *(Continued)*	SP			0.0	24	SPT	50/5"		0.5 / 0.5
125	305					0.0	25	SPT	50/5"		0.5 / 0.5
					303.0	0.0	26	SPT	50/5"		0.5 / 0.5
		Boring completed at 128.0 ft									
130	300										
135	295										
140	290										
145	285										
150	280										
155	275										
160											

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-20
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 117 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 117 - 127 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.010
End Cap: End Cap
FILTER PACK
Interval: 115 - 128 FT
Type: Sand
Quantity: 9 Bags
FILTER PACK SEAL
Interval: 6 - 115 FT
Type: Bentonite
Quantity: 68 Bags
ANNULUS SEAL
Interval: 0 - 6 FT
Type: Cement
Quantity: 6 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Cascade Drilling Inc
DRILLER: Steve L.

GA INSPECTOR: A. Dennison
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-21

SHEET 1 of 3

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 92.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: Mobile B-53
DATE STARTED: 11/30/09
DATE COMPLETED: 12/1/09
WEATHER: Overcast, snowing.

DATUM: Geodetic
COORDS: N: 170,455.2 E: 1,278,982.1
GS ELEVATION: 390.8 ft
TOC ELEVATION: 390.8 ft
TEMPERATURE: 30

INCLINATION: -90
DEPTH W.L.: 82.7 ft
ELEVATION W.L.: 308.1 ft
DATE W.L.: 12/3/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT	MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
0	390	0.0 - 15.0 Compact, brown, non-stratified, silty, fine to coarse SAND, some fine coarse gravel, damp to moist. (SM)	SM									Well Casing with 2-ft stick-up.	**MW-21** Borehole Diameter: 6 IN **WELL CASING** Interval: 0 - 60 FT Material: Schedule 40 PVC Diameter: 2.0 IN Joint Type: Threaded, O-ring **WELL SCREEN** Interval: 42.5 - 57.5 FT Material: Schedule 40 PVC Diameter: 2.0 IN Slot Size: .020 End Cap: End Cap **FILTER PACK** Interval: 39.9 - 60 FT Type: Sand Quantity: 10 Bags **FILTER PACK SEAL** Interval: 1.5- 39.9 FT Type: Bentonite Quantity: 35 Bags **ANNULUS SEAL** Interval: 0 - 1.5 FT Type: Concrete Quantity: 1.5 FT
5	385												
10	380												
15	375				375.8 15.0								
		15.0 - 92.0 Compact to dense, brownish-grey, non-stratified, fine SAND, little medium to coarse sand and fine gravel, trace silt, coarse gravel, and cobbles, damp to moist. (SP)* *pockets of increased coarse gravel and cobble content, especially at approximately 15 to 40ft bgs.	SP									Bentonite seal	
20	370												
25	365												
30	360												
35	355												
40		Log continued on next page											

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Boart Longyear
DRILLER: J. Bennet

GA INSPECTOR: B. Borer
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-21

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 92.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: Mobile B-53
DATE STARTED: 11/30/09
DATE COMPLETED: 12/1/09
WEATHER: Overcast, snowing.

DATUM: Geodetic
COORDS: N: 170,455.2 E: 1,278,982.1
GS ELEVATION: 390.8 ft
TOC ELEVATION: 390.8 ft
TEMPERATURE: 30

INCLINATION: -90
DEPTH W.L.: 82.7 ft
ELEVATION W.L.: 308.1 ft
DATE W.L.: 12/3/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT	MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
40	350	15.0 - 92.0 Compact to dense, brownish-grey, non-stratified, fine SAND, little medium to coarse sand and fine gravel, trace silt, coarse gravel, and cobbles, damp to moist. (SP)* *pockets of increased coarse gravel and cobble content, especially at approximately 15 to 40ft bgs. *(Continued)*	SP									MW-21	**MW-21** Borehole Diameter: 6 IN **WELL CASING** Interval: 0 - 60 FT Material: Schedule 40 PVC Diameter: 2.0 IN Joint Type: Threaded, O-ring **WELL SCREEN** Interval: 42.5 - 57.5 FT Material: Schedule 40 PVC Diameter: 2.0 IN Slot Size: .020 End Cap: End Cap **FILTER PACK** Interval: 39.9 - 60 FT Type: Sand Quantity: 10 Bags **FILTER PACK SEAL** Interval: 1.5- 39.9 FT Type: Bentonite Quantity: 35 Bags **ANNULUS SEAL** Interval: 0 - 1.5 FT Type: Concrete Quantity: 1.5 FT
45	345												
50	340												
55	335												
60	330												
65	325												
70	320												
75	315												
80													

Log continued on next page

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Boart Longyear
DRILLER: J. Bennet

GA INSPECTOR: B. Borer
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-21

SHEET 3 of 3

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 92.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

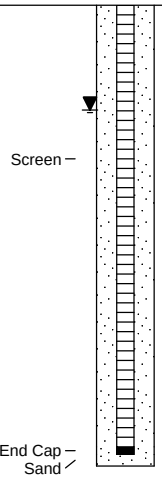
DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: Mobile B-53
DATE STARTED: 11/30/09
DATE COMPLETED: 12/1/09
WEATHER: Overcast, snowing.

DATUM: Geodetic
COORDS: N: 170,455.2 E: 1,278,982.1
GS ELEVATION: 390.8 ft
TOC ELEVATION: 390.8 ft
TEMPERATURE: 30

INCLINATION: -90
DEPTH W.L.: 82.7 ft
ELEVATION W.L.: 308.1 ft
DATE W.L.: 12/3/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
80	310	15.0 - 92.0 Compact to dense, brownish-grey, non-stratified, fine SAND, little medium to coarse sand and fine gravel, trace silt, coarse gravel, and cobbles, damp to moist. (SP)* *pockets of increased coarse gravel and cobble content, especially at approximately 15 to 40ft bgs. *(Continued)* 85.0: No odor, sheen, or other visible signs of contamination.	SP					SPT	20 -31 -32		1.5 / 1.5
85	305										
90	300	91.0: No odor, sheen, or other visible signs of contamination.			298.8			SPT	10 -18 -28		1.5 / 1.5
		Boring completed at 92.0 ft									
95	295										
100	290										
105	285										
110	280										
115	275										
120											

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-21
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 60 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 42.5 - 57.5 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: .020
End Cap: End Cap
FILTER PACK
Interval: 39.9 - 60 FT
Type: Sand
Quantity: 10 Bags
FILTER PACK SEAL
Interval: 1.5- 39.9 FT
Type: Bentonite
Quantity: 35 Bags
ANNULUS SEAL
Interval: 0 - 1.5 FT
Type: Concrete
Quantity: 1.5 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Boart Longyear
DRILLER: J. Bennet

GA INSPECTOR: B. Borer
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-22

SHEET 1 of 3

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 97.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: Mobile B-53
DATE STARTED: 12/1/09
DATE COMPLETED: 12/1/09
WEATHER: Overcast.

DATUM: Geodetic
COORDS: N: 171,097.8 E: 1,279,059.6
GS ELEVATION: 393.3 ft
TOC ELEVATION: 393.3 ft
TEMPERATURE: 25

INCLINATION: -90
DEPTH W.L.: 84.5 ft
ELEVATION W.L.: 308.8 ft
DATE W.L.: 12/3/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
0	390	0.0 - 8.0 Compact, brown, non-stratified, silty, fine to coarse GRAVEL, some fine coarse sand, damp to moist. (GM)	GM		385.3 / 8.0						
5											
10	385	8.0 - 28.0 Compact, grey, non-stratified, silty, fine SAND, little fine to coarse gravel and medium to coarse sand, dry to damp. (SM)	SM								
15	380	15.0: Faint, diesel-like odor. No sheen or other visible signs of contamination.						GRAB			
20	375	20.0: Faint, diesel-like odor. No sheen or other visible signs of contamination.						GRAB			
25	370				365.3 / 28.0						
30	365	28.0 - 94.0 Compact to dense, brownish-grey, non-stratified, silty, fine SAND, little medium to coarse sand and fine gravel, trace coarse gravel, moist. (SM)	SM								
35	360										
40	355	Log continued on next page									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES

MW-22

Well Casing

Bentonite seal

WELL CONSTRUCTION DETAILS

MW-22
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 97 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 80 - 95 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.020
End Cap: End Cap
FILTER PACK
Interval: 78 - 95 FT
Type: Sand
Quantity: 11 Bags
FILTER PACK SEAL
Interval: 1 - 78 FT
Type: Bentonite
Quantity: 39 Bags
ANNULUS SEAL
Interval: 0 - 1 FT
Type: Concrete
Quantity: 1 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Boart Longyear
DRILLER: J. Bennet

GA INSPECTOR: B. Borer
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-22

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 97.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

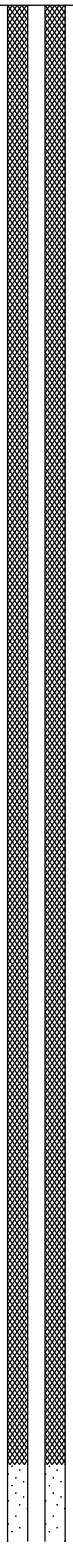
DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: Mobile B-53
DATE STARTED: 12/1/09
DATE COMPLETED: 12/1/09
WEATHER: Overcast.

DATUM: Geodetic
COORDS: N: 171,097.8 E: 1,279,059.6
GS ELEVATION: 393.3 ft
TOC ELEVATION: 393.3 ft
TEMPERATURE: 25

INCLINATION: -90
DEPTH W.L.: 84.5 ft
ELEVATION W.L.: 308.8 ft
DATE W.L.: 12/3/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
40	350	28.0 - 94.0 Compact to dense, brownish-grey, non-stratified, silty, fine SAND, little medium to coarse sand and fine gravel, trace coarse gravel, moist. (SM) *(Continued)* 40.0: Faint, diesel-like odor. No sheen or other visible signs of contamination.						GRAB			
45	345										
50	340										
55	335										
60	330	60.0: Faint, diesel-like odor. No sheen or other visible signs of contamination.	SM					GRAB			
65	325										
70	320										
75	315	75.0: Diesel-like odor. No sheen or other visible signs of contamination.						GRAB			
80		Log continued on next page									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-22
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 97 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 80 - 95 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.020
End Cap: End Cap
FILTER PACK
Interval: 78 - 95 FT
Type: Sand
Quantity: 11 Bags
FILTER PACK SEAL
Interval: 1 - 78 FT
Type: Bentonite
Quantity: 39 Bags
ANNULUS SEAL
Interval: 0 - 1 FT
Type: Concrete
Quantity: 1 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Boart Longyear
DRILLER: J. Bennet

GA INSPECTOR: B. Borer
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-22

SHEET 3 of 3

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 97.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

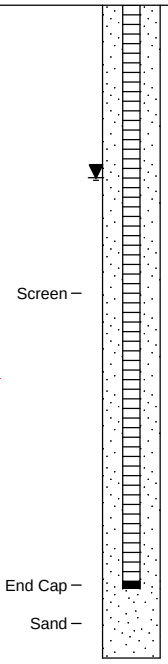
DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: Mobile B-53
DATE STARTED: 12/1/09
DATE COMPLETED: 12/1/09
WEATHER: Overcast.

DATUM: Geodetic
COORDS: N: 171,097.8 E: 1,279,059.6
GS ELEVATION: 393.3 ft
TOC ELEVATION: 393.3 ft
TEMPERATURE: 25

INCLINATION: -90
DEPTH W.L.: 84.5 ft
ELEVATION W.L.: 308.8 ft
DATE W.L.: 12/3/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
80		28.0 - 94.0 Compact to dense, brownish-grey, non-stratified, silty, fine SAND, little medium to coarse sand and fine gravel, trace coarse gravel, moist. (SM) *(Continued)*	SM								
	310										
85											
	305										
90		90.0: Diesel-like odor. No sheen or other visible signs of contamination.						SPT	22 -50=1"		0.6 1.5
	300				299.3						
		94.0 - 97.0 Dense, grey, non-stratified, fine SAND, some coarse gravel, little medium to coarse sand and fine gravel, wet. (SP)	SP		94.0						
95					296.3						
		Boring completed at 97.0 ft									
	295										
100											
	290										
105											
	285										
110											
	280										
115											
	275										
120											

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-22
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 97 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 80 - 95 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.020
End Cap: End Cap
FILTER PACK
Interval: 78 - 95 FT
Type: Sand
Quantity: 11 Bags
FILTER PACK SEAL
Interval: 1 - 78 FT
Type: Bentonite
Quantity: 39 Bags
ANNULUS SEAL
Interval: 0 - 1 FT
Type: Concrete
Quantity: 1 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Boart Longyear
DRILLER: J. Bennet

GA INSPECTOR: B. Borer
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-23

SHEET 1 of 2

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 65.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: Mobile B-53
DATE STARTED: 12/2/09
DATE COMPLETED: 12/2/09
WEATHER: Overcast.

DATUM: Geodetic
COORDS: N: 171,093.0 E: 1,279,494.1
GS ELEVATION: 354.9 ft
TOC ELEVATION: 354.9 ft
TEMPERATURE: 25

INCLINATION: -90
DEPTH W.L.: 46.6 ft
ELEVATION W.L.: 308.3 ft
DATE W.L.: 12/3/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
0	350	0.0 - 7.5 Compact, brown, non-stratified, silty, fine to coarse GRAVEL, some fine coarse sand, damp to moist. (GM)	GM		347.4 7.5						
10	345	7.5 - 18.0 Compact, brown, non-stratified, silty, fine SAND, some fine coarse gravel, little medium to coarse sand, cobbles, and boulders, damp to moist. (SM)	SM								
15	340	15.0 - 45.0 Compact to dense, brownish-grey, non-stratified, silty, fine to coarse SAND, little fine to coarse gravel, trace clay, moist. (SM)			336.9						
25	330		SM								
35	320	37.5: No odor, sheen, or other visible signs of contamination.						SPT	10 -50=5"		0.5/1.5
40	315	Log continued on next page									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES

MW-23

Well Casing

Bentonite seal

WELL CONSTRUCTION DETAILS

MW-23
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 57.5 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 42.5 - 57.5 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.020
End Cap: End Cap
FILTER PACK
Interval: 39.9 - 60 FT
Type: Sand
Quantity: 10 Bags
FILTER PACK SEAL
Interval: 1 - 39.9 FT
Type: Bentonite
Quantity: 14 Bags
ANNULUS SEAL
Interval: 0 - 1 FT
Type: Concrete
Quantity: 1 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Boart Longyear
DRILLER: J. Bennet

GA INSPECTOR: B. Borer
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

RECORD OF BOREHOLE MW-23

SHEET 2 of 2

PROJECT: MasterPark Lot C
PROJECT NUMBER: 073-93368-05
DRILLED DEPTH: 65.0 ft
AZIMUTH: N/A
LOCATION: SeaTac, WA

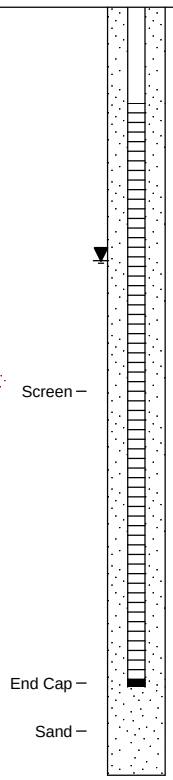
DRILL METHOD: 4-in ID Hollow Stem Auger
DRILL RIG: Mobile B-53
DATE STARTED: 12/2/09
DATE COMPLETED: 12/2/09
WEATHER: Overcast.

DATUM: Geodetic
COORDS: N: 171,093.0 E: 1,279,494.1
GS ELEVATION: 354.9 ft
TOC ELEVATION: 354.9 ft
TEMPERATURE: 25

INCLINATION: -90
DEPTH W.L.: 46.6 ft
ELEVATION W.L.: 308.3 ft
DATE W.L.: 12/3/09
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	PID (ppm)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT
40		15.0 - 45.0 Compact to dense, brownish-grey, non-stratified, silty, fine to coarse SAND, little fine to coarse gravel, trace clay, moist. (SM) *(Continued)* 40.0: No odor, sheen, or other visible signs of contamination.	SM					SPT	18 -23 -27		1.5 / 1.5
45	310	45.0 - 60.0 Dense, grey, non-stratified, fine to medium SAND, little fine gravel, wet. (SP) No odor, sheen, or other visible signs of contamination.			309.9 45.0			SPT	13 -20 -29		1.5 / 1.5
50	305	50.0: No odor, sheen, or other visible signs of contamination.	SP					SPT	18 -22 -34		1.3 / 1.5
55	300										
60	295				294.9 60.0						
65	290	Boring completed at 65.0 ft									
70	285										
75	280										
80	275										

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

MW-23
Borehole Diameter: 6 IN
WELL CASING
Interval: 0 - 57.5 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Joint Type: Threaded, O-ring
WELL SCREEN
Interval: 42.5 - 57.5 FT
Material: Schedule 40 PVC
Diameter: 2.0 IN
Slot Size: 0.020
End Cap: End Cap
FILTER PACK
Interval: 39.9 - 60 FT
Type: Sand
Quantity: 10 Bags
FILTER PACK SEAL
Interval: 1 - 39.9 FT
Type: Bentonite
Quantity: 14 Bags
ANNULUS SEAL
Interval: 0 - 1 FT
Type: Concrete
Quantity: 1 FT

LOG SCALE: 1 in = 5 ft
DRILLING COMPANY: Boart Longyear
DRILLER: J. Bennet

GA INSPECTOR: B. Borer
CHECKED BY:
DATE:

Golder Associates

AA BOREHOLE RECORD MPLOT-MW-20-23-BB.GPJ GOLDER NJ-PA 05-24-06.GDT 1/20/10

APPENDIX C
QUALITY ASSURANCE PROJECT PLAN

REPORT

Appendix C

Quality Assurance Project Plan for Compliance Monitoring at The Sea-Tac Development Site

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

Submitted On Behalf Of: The Sea-Tac Development Site PLP Group

November 2, 2011

Project No. 073-93368-05.04

A world of capabilities delivered locally

Golder Associates

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ATL	Air Toxics, Ltd.
ARAR	applicable or relevant and appropriate requirement
ARI	Analytical Resources, Inc
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAO	cleanup action objectives
COC	contaminants of concern
CMP	Compliance Monitoring Plan
CQA	construction quality assurance
DMP	Data Management Plan
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EDB	1,2-dibromoethane (ethylene dibromide)
EPA	United States Environmental Protection Agency
ESA	Environmental Site Assessment
FCAP	Final Cleanup Action Plan
FS	feasibility study
GC/MS	gas chromatography/mass spectronomy
HASP	Health and Safely Plan
HDPE	high density polyethylene
IAS	In-situ Air Sparging
IDW	Investigation derived waste
IRA	independent remedial action
MTCA	Model Toxics Control Act
O&M	operation and maintenance
PAC	Procedure Alteration Checklist
PLP	Potentially Liable Party
PQL	practical quantitation limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QP	quality procedures
RI	remedial investigation
SAP	Sampling and Analysis Plan
SEPA	State Environmental Policy Act
SIM	selected ion method
SMCL	Secondary Maximum Contaminant Level
SOP	standard operating procedures
SPCC	spill prevention, control and countermeasure
SVE	soil vapor extraction
TP	technical procedures
USEPA	US Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WAC	Washington Administrative Code
WDOH	Washington State Department of Health

1.0 PROJECT DESCRIPTION

1.1 Project Objective and Historical Background

This Quality Assurance Project Plan (QAPP) was prepared for the Sea-Tac Development Site PLP Group (the PLP Group) by Golder Associates Inc. (Golder) as Appendix C to the Compliance Monitoring Plan (CMP) for the Sea-Tac Development Site (the Site). The QAPP was written in general accordance with EPA QA/G-5, "EPA Guidance for Quality Assurance Project Plans" (EPA 1998). The overall objective of the CMP is to describe monitoring to be conducted at the site under the Compliance Monitoring Plan. This QAPP provides procedures for making accurate measurements and obtaining representative, accurate, and precise analytical data.

1.2 Site Description

The Site is located in SeaTac, Washington. A thorough discussion of the Site location is provided in the first two sections of the CMP. A Site location map, monitoring location map, and remediation layout map are included as figures in the CMP.

1.3 Sampling Program Design

The sampling locations and frequency, sampling procedures and analyses to be performed are presented in Sections 3 and 4 of the CMP.

2.0 PROJECT ORGANIZATION

2.1 Organizational Structure

The organizational structure for compliance monitoring for the Site is shown graphically in Figure QAPP-1. All key project personnel can be reached with the following contact information:

	Client	Project Manager	Project Director
Contact:	Mr. Harry Edward Grant	Dr. Douglas Morell	[TBD]_____
Company:	Riddell Williams P.S.	Golder Associates Inc.	Golder Associates Inc.
Address:	1001 Fourth Avenue, Suite 4500 Seattle, Washington 98154	18300 NE Union Hill Road, #200 Redmond, Washington 98052-3333	18300 NE Union Hill Road, #200 Redmond, Washington 98052-3333
Phone:	(206) 389-1574	(425) 883-0777 Work	(425) 883-0777 Work
Facsimile:	(206) 389-1708	(425) 882-5498	(425) 882-5498

Project Director

As Project Director, [TBD] will ensure that the appropriate resources are brought to the project, and that the work meets the standards set by Riddell Williams P.S. and Golder. The Project Director also acts as the Quality Assurance Coordinator. This role entails review of work plan tasks, referenced method quantitation limits, regulatory compliance levels, and other pertinent documents, to confirm that data quality objectives are being met.

Project Manager

The Project Manager reports to the Project Director and is responsible for planning and executing all environmental sampling and analysis for compliance monitoring and for preparation of analytical data reports, including submittals to Ecology. The Project Manager prepares the specifications for, and administers the subcontracts for laboratory analysis.

Chemist/Validator

The Chemist/Validator reports to the Project Manager. He/she is responsible for coordinating with the offsite laboratories to obtain required analyses, and for sample tracking, chain of custody, and other sampling and analysis documentation. The Chemist/Validator maintains the data center files, including tabulating, compiling and archiving data. The Chemist/Validator is responsible for the review and validation of laboratory analysis reports.

Database Coordinator

The Database Coordinator reports to the Project Manager. The Database Coordinator is responsible for setting up the project database, designing and formatting data tables, preparing customized data reports, entering essential information, troubleshooting and maintenance of the database.

Field Sampling Personnel

The Field Sampling Personnel report to the Project Manager. The Field Sampling Personnel are responsible for collecting all field samples in accordance with the CMP. In addition, the Field Sampling Personnel are responsible for assembly, organization and maintenance of all information collected during field activities (including sampling logbook, daily activity logbook, geologic boring logs, chain-of-custody forms, well construction details, and water-level measurements).

2.2 Use of Subcontractors

Analytical Resoucres, Inc. (ARI) of Seattle, Washington has been selected to perform the groundwater analytical testing. Appropriate and established methods will be used, and samples will be handled properly, and promptly transported to meet holding times. ARI is accredited by the Washington State Department of Ecology and Department of Health for inorganic and organic analytical testing. ARI conforms to U.S. EPA's "Guidance on Preparation of Laboratory Quality Assurance Plans" (EPA 910/9-92-032, October, 1992, USEPA Region 10) and holds the following qualifications:

- Current certification from the Washington State Department of Ecology for Drinking Water Quality Standards analysis
- Accreditation for analytical methods listed in QAPP Tables, by the Washington State Department of Ecology

Air Toxics Ltd. (ATL) of Folsom, California will provide analyses for air samples to track the presence of benzene, toluene, ethylbenzene, and total xylenes or other volatile petroleum hydrocarbon compounds in the SVE system at the Site. ATL utilizes USEPA Compendium Methods for Determination of Toxic Organic Compounds in Ambient Air – Second Edition (USEPA 1999) to provide guidance and analytical criteria for a range of collection methods and detection limits. ATL has maintained validation of their methods and procedures through National Environmental Laboratory Accreditation Program and currently participates in EPA's Water Pollution Performance Evaluation Study program and certification through California State Department of Health Services among others. Upon selection, the laboratory QA plan will be incorporated as Attachment QAPP-A of this QAPP.

2.3 Planning Structure

Compliance monitoring at the Site is supported by several planning documents, which are briefly described as follows:

- **Quality Assurance Project Plan:** This Quality Assurance Project Plan (QAPP) is designed to support compliance monitoring activities involving field and/or laboratory investigations, and is prepared in compliance with the requirements of Guidelines and Specifications for Preparing Quality Assurance Project Plans (Ecology 1991).
- **Data Management Plan**: the Data Management Plan (DMP) describes the procedural controls that will be used to manage and protect original field records, other project quality records, and the management, protection, and reporting of validated analytical data from all sampling investigations.
- **Remediation Health and Safety Plan**: the Health and Safety Plan (HASP) describes all necessary personal protective gear, site controls, and monitoring requirements applicable to onsite activities conducted during Long-Term Monitoring that are required pursuant to 20 CFR 1910.120.

3.0 DATA QUALITY OBJECTIVES

An objective of the CMP activities is to provide analytical data that is of known and defensible quality. Table QAPP-1 summarizes referenced methods for analysis of media by sampling event. Table QAPP-2 lists all parameters of interest defined for water and air sampling during compliance monitoring, which are comprised the following:

- gasoline and benzene, toluene, ethylbenzene, and xylenes (BTEX), and naphthalene compounds by the NWTPH-Gx method.
- 1,2-dibromoethane (EDB) by the EPA Method 8011.

3.1 Water Samples

Collection of groundwater samples will be to evaluate performance of the air sparging and soil vapor extraction systems. Groundwater samples will be obtained from selected wells into standard samples containers and specified in this document. Standard field parameters, including temperature, pH, conductivity, dissolved oxygen (DO) and turbidity will also be measured for all monitoring well water samples.

3.2 Air Samples

Collection of air samples will be provided to evaluate the performance of the SVE system. Samples will be collected in specially passivated and evacuated (Summa) canisters and sent for gas chromatography/ mass spectroscopy (GC/MS) analysis to ATL of Folsom, California. The canisters will be tested using the TO-15 selected ion method (SIM) method of analysis (USEPA 1999) for gasoline, BTEX, and naphthalene, and EPA Method 8011 for EDB analysis in order to achieve a selected detection limit that will allow Golder to compare results to MTCA Method B risk based cleanup levels.

The objectives for analytical data quality are defined in terms of the quantitation limits achievable using the referenced analytical methods, and in terms of the resulting goals for precision, accuracy, representativeness, completeness, and comparability of analytical data. Quantitation limits are provided for each analytical parameter in Table QAPP-2, and are cross-referenced to applicable standard EPA reference methods. The quality objectives established for long-term monitoring are described as follows:

- Precision: analytical precision shall be reported as required by the governing EPA reference method cited in Table QAPP-2.
- Accuracy (Bias): accuracy shall be reported as required by the governing EPA reference method cited in Table QAPP-2.
- Representativeness: Goals for sample representativeness are addressed qualitatively by the sampling locations and intervals defined in Section 3 of the CMP. The rationale behind the sampling schedule and the selection of sampling locations is also discussed in Section 3 of the CMP. In addition, the use of standard procedures for sample acquisition (as described in Section 4 of this QAPP) will facilitate the collection of representative data.

- Completeness: Completeness is defined as the percentage of valid analytical determinations with respect to the total number of requested determinations in a given sample delivery group; completeness goals are established at 90 percent. Failure to meet this criterion shall be documented and evaluated in the data validation process described in Section 8 of this QAPP, and corrective action taken as warranted on a case-by-case basis.
- Comparability: Approved analytical procedures shall require the consistent use of the reporting techniques and units specified by the EPA reference methods cited in Table QAPP-2 in order to facilitate the comparability of data sets from sequential sampling rounds in terms of their precision and accuracy.

4.0 SAMPLING AND OTHER FIELD PROCEDURES

4.1 Selected Procedures, by Task

Table QAPP-3 lists the technical procedures that have been developed to support sampling activities, data validation, and other technical activities required during long-term monitoring. Technical procedures applicable to individual activities are available in the Golder Associates Inc. Redmond, Washington office for review.

4.2 Document Distribution, Variation Request, and Change Control Considerations

The technical procedures cited in this QAPP, the CMP, the HASP, and the DMP, and all other procedures cited in this QAPP are subject to the distribution control requirements of QP-5.0-1, "Document Preparation, Distribution, and Change Control." Quality procedures (QP) applicable to individual activities are available in the Golder Associates Inc. Redmond, Washington office for review.

Variations from established field procedure requirements may be necessary in response to unique circumstances encountered during sampling activities. All such variations must be documented on a Procedure Alteration Checklist (PAC) and submitted to the Project Manager and QA Officer for review and approval. The Project Manager or his assigned Field Sampling Personnel is authorized to implement non-substantive variations based on immediate need, provided that the Project Manager and QA Officer are notified within 24 hours of the variation, and the PAC is forwarded to the Project Manager and QA Officer for review within 2 working days. Substantive variations require notification of the Project Manager, QA Officer and PLP Technical Leader prior to implementation and a PAC is forwarded for review within 2 working days. If the variation is unacceptable to either reviewer, the activity shall be re-performed or other corrective action taken as indicated in the "Comments" section of the PAC. Changes to the requirements of this QAPP, the CMP, the HASP, or the DMP shall be controlled through the Long-Term Change Notice procedures.

4.3 Sample Quantities, Types, Locations, and Intervals

Sample quantities, types, locations, and intervals for the groundwater and air sampling shall be as specified in Sections 3 and 4 of the CMP. Field quality control samples shall be included in the minimum quantities specified in Section 7 of this QAPP. Reference samples (AKA: performance audit samples) shall not be identified as such to the laboratory, but shall be identified as equipment or field blanks. Appropriate documentation of the purpose of the sample shall be maintained in the field log, identified by the assigned sample number; copies shall be separately provided to the data validator. See Sections 6 and 8 of this QAPP.

4.4 Sample Container Type, Volume, Preservation, and Handling Requirements

All sample containers, container preparation services, preservatives, trip blank, and sample coolers shall be provided by the analytical laboratory as part of their agreement for services. Sample container type, volume requirements, preservation requirements, and special handling requirements are listed by sample matrix and analytical category in Table QAPP-4.

All samples shall be sealed, labeled, properly identified, and submitted to the analytical laboratory under formal chain of custody requirements as described in Section 4.6 of this QAPP.

4.5 Sample Identification and Labeling Requirements

Each sample shall be uniquely identified by “MPLOTC” followed by the well number or location, and sample date. The sample container shall be labeled and sealed. The sample ID is a unique identifier that will appear identically on all sample bottles or containers collected for each sample. The number system will ensure field QC samples will remain indistinguishable from the field locations. Sample labels will also be marked with the sampler’s initials, and the appropriate collection date and time. The sample number will be used to identify the location, depth, and monitoring well or geological data in the field notes. Identification numbers shall be recorded on the field report forms shown in the applicable sampling procedures, and on the chain of custody/sample analysis request form supplied by the analytical laboratory.

4.6 Chain of Custody Considerations

All samples obtained during the course of this investigation shall be controlled as required by procedure, TG-1.2-23 "Chain of Custody." Chain of custody forms (see Exhibit C in TG-1.2-23) shall be completed for each shipment of samples as described in the procedure. Sample analysis request forms supplied by the analytical laboratory or chain of custody forms shall be completed instead of Sample Integrity Data Sheets; such forms shall specifically identify the applicable reference methods specified in Table QAPP-2 as appropriate for each individual sample. Chain-of-custody forms shall be initiated for return of residual samples as required by the laboratories' own chain of custody procedures. All laboratory chain of custody and sample tracking procedures shall ensure traceability of analytical results to the original samples through unique internal identification codes that are traceable to unique sample identification numbers as specified in Section 4.5 above. Approved laboratory chain of custody and sample tracking procedures will be addressed in laboratory QA plan, to be included (upon laboratory selection and plan approval) for information as Attachment QAPP-1 to this QAPP.

4.7 Sampling Equipment Decontamination

All non-dedicated sampling equipment (in contact with sample) shall be thoroughly cleaned prior to each sampling location to prevent cross-contamination between samples and to ensure accurate

representation of analytes of interest in each sample interval. Personnel performing decontamination shall wear rubber gloves, face shields, and such other safety equipment as directed by the project-specific HASP. Samplers and sampling tools shall be disassembled as necessary and placed in clean, dedicated drums or troughs fitted with gravity drains. Non-dedicated equipment shall be cleaned with a portable hand-held sprayer or brushed with water and non-phosphate detergent, and then rinsed with organic-free distilled/deionized water. Samplers shall be reassembled using clean rubber gloves; all decontaminated samplers and sampling tools shall be sealed in clean plastic bags pending their next use. All wash and rinse fluids shall be transferred to storage drums pending characterization and final disposal at the direction of the Project Manager.

4.8 Investigative Derived Wastes (IDW)

Purge water from each well location will be identified as investigative derived liquid waste that must be containerized. Solid and liquid IDW will be separated and segregated to the extent possible. In most cases, the IDW will be stored in steel 55-gallon drums (Type 17H) at the Facility (MasterPark Lot C property). Each drum shall be labeled by the field scientist, secured with a bolted lid, and placed in a location where the potential for tampering is minimized. The label will include identification of the contents, the matrix, the date of generation, and a phone number for the Golder Project Site manager.

Water samples submitted for analysis will become the responsibility of the laboratory. As such, the laboratory is responsible for disposal of samples upon completion of testing. See the CMP for further details on IDW procedures.

4.9 Calibration Requirements

Calibration of all measuring and test equipment, whether in existing inventory or purchased for this investigation, shall be controlled as required by procedure QP-11.1, "Calibration and Maintenance of Measuring and Test Equipment." Leased equipment shall require certifications or other documentation demonstrating acceptable calibration status for the entire period of use for this project. Field calibration requirements shall be in compliance with the technical procedure describing the instrument's use and/or with the manufacturer's instructions issued with the equipment. Method- and analytical equipment-specific calibration requirements applicable within the individual analytical laboratories identified in Section 2.2 of this QAPP are addressed within the laboratory QA plans to be included (upon laboratory selection and plan approval) as Attachment QAPP-1 to this QAPP.

5.0 ANALYTICAL PROCEDURES

Table QAPP-2 cross-references the analytes of interest of this investigation to the standard reference methods and method detection limits that shall be established as contractual requirements between the PLP Group and the subcontracted analytical laboratory. These requirements will be reflected in the laboratory QA plan; which will be included for information as Attachment QAPP-1 of this QAPP after approval. The subcontracted laboratory is responsible for implementation of the analytical methods, documentation of modifications (if any) to the methods through Standard Operating Procedures (SOP), and providing this documentation for review upon request. The project manager must be notified in writing of any changes to the method number identified in Table QAPP-1 before analysis can commence.

The contractual requirements for PQLs and analytical methods are based upon potential ARARs established for the Site work. PQLs in most cases are below the “Most protective cleanup level for soil and groundwater” (See QAPP-1). However, for certain analytes (shaded in the QAPP Tables); the laboratory PQL exceeds the most stringent ARARs considered for the site. According to WAC 173-340-720 (7) (c), “no MTCA cleanup levels shall be set at levels below the practical quantitation limit or natural background concentrations, whichever is higher”. Therefore, PQLs for established analytical methods, as presented in the QAPP tables, shall be considered adequate for this investigation. Instances of PQLs found above the most protective cleanup level will be brought to the attention of the Project Manager and analytical results will be assessed by matrix and location at the conclusion of the site remediation and compliance monitoring events.

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 Minimum Requirements for Laboratory Analytical Data Packages

All analytical data packages submitted by the analytical laboratory shall include the following:

- Sample receipt, chain-of-custody and shipping documentation, including identification of field sampling personnel, shipping personnel (or organization); copies of completed chain of custody documentation noting dates of sample receipt.
- Analytical results for each sample containing the reduced results for all analytes/constituents requested in the chain of custody, request for analysis or purchase order.
- Analytical quality control results for laboratory method blanks, spikes, duplicates, laboratory control samples, matrix spike/matrix spike duplicates, surrogates and internal standards.
- Sample extraction and preparation data including dates of sample extraction and analysis.

All data packages for all analytical parameters shall be reviewed and approved by the analytical laboratory's QA Officer prior to submittal for validation.

6.2 General Validation Requirements

All analytical data packages from each sample delivery group shall be validated by the detailed review and calculation over check processes described in National Functional Guidelines documents from the EPA Contract Laboratory Program (EPA 2008). The analytical data packages will undergo a Tier II level validation. The guidelines help to ensure that the laboratory has met all contractual requirements, all applicable reference method requirements, and has met the data quality objectives discussed previously in Section 3 and Table QAPP-2. A sample delivery group may be interpreted as the group of samples delivered to the laboratory in a single week.

The data validator shall document all contacts made with the laboratory to resolve questions related to the data package, and shall prepare a technical review documenting the evaluation of laboratory blanks, field blanks, equipment blanks, duplicates, matrix spikes/matrix spike duplicates, laboratory control samples, calibration data (as applicable for the specified method), and any requalification of analytical results that may be required as a result of the validation exercise. The validation report, laboratory contact documentation, copies of the laboratory sample concentration reports, and the as-reviewed laboratory data package shall be routed to the Project Manager for data assessment purposes and to the permanent project records, as required by the Data Management Plan (DMP).

7.0 QUALITY CONTROL PROCEDURES

All analytical samples shall be subject to quality control measures in both the field and laboratory. The following minimum field quality control requirements apply to all analyses. These requirements are adapted from "Test Methods for Evaluating Solid Waste" (SW-846) (EPA 1986b), as modified by the proposed rule changes included in the "Federal Register," Volume 54, No. 13 (EPA 1989b).

- **Field duplicate samples.** Depending on the availability of sufficient sample quantities, field duplicate water samples shall be collected at a minimum of one duplicate for each period of sampling activity. Duplicate samples shall be retrieved from the same sampling location using the same equipment and sampling technique, and shall be placed into identically prepared and preserved containers. All field duplicates shall be analyzed independently as an indication of gross errors in sampling techniques.
- **Blind (reference) samples**. At the Project Manager's direction, blind reference samples may be introduced into any sampling round for performance audit purposes. Blind samples shall be represented as field or equipment blanks to the laboratory.
- **Spiked samples.** At the Project Manager's direction, spiked samples for performance audit purposes may be prepared for volatile aromatic, semivolatile base/neutral, and metallic analytes. Spiked samples shall be prepared by adding an aliquot of an EPA reference compound to the reagent water, and shall be represented as field or equipment blanks to the analytical laboratory.
- **Field blanks.** Field blanks shall consist of pure deionized distilled water, transferred into a sample container at the site and preserved with the reagent specified for the analytes of interest. Field blanks are used as a check on reagent and environmental contamination, and shall be collected at the same frequency as field duplicate samples.
- **Equipment blanks.** Equipment blanks shall consist of pure deionized distilled water washed through decontaminated non-dedicated sampling equipment and placed in containers identical to those used for actual field samples. Equipment blanks are used to verify the adequacy of non-dedicated sampling equipment decontamination procedures, and shall be collected at the same frequency as field duplicate samples, if non-dedicated sampling equipment is used.
- **Trip blanks.** Trip blanks consist of pure deionized distilled water added to one clean volatile organic sample vial, accompanying a batch of samples shipped during a sampling activity or period. Trip blanks shall be returned unopened to the laboratory, and are prepared as a check on possible contamination originating from container preparation methods, shipment, handling, storage, or site conditions. The analyses of the trip blank will be at the Project Manager's direction.

The internal quality control checks performed by the analytical laboratory shall meet the following minimum requirements:

- Temperature monitoring of the transport coolers upon receipt to the laboratory. The monitoring temperature may be recorded from infra-red sensor instruments or by record of the temperature blank vial (if used), by the receiving personnel at the receiving laboratory. Temperature receipt data must be recorded on a receipt form or chain of custody record, to be included in the laboratory deliverable report as agreed to under the contract with the testing laboratory.

- Matrix spike and matrix spike duplicate samples. Matrix spike and matrix spike duplicate samples require the addition of a known quantity of a representative analyte of interest to the sample as a measure of recovery percentage. The spike shall be made in a replicate of a field duplicate sample. Replicate samples are separate aliquots removed from the same sample container in the laboratory. Spike compound selection, quantities, and concentrations shall be described in the laboratories analytical procedures. One sample shall be spiked per analytical batch, or once every 20 samples, whichever is greater.
- Quality control reference samples. A quality control reference sample shall be prepared from an independent standard at a concentration other than that used for calibration, but within the calibration range. Reference samples are required as an independent check on analytical technique and methodology, and shall be run with every analytical batch, or every 20 samples, whichever is greater.

8.0 PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits shall be performed at the request of the PLP Group to systematically verify the quality of critical elements of the total measurement system. The two types of audits are defined as follows:

- Performance Audits: In a performance audit, quantitative data are independently obtained for comparison with data routinely obtained by the measurement system.
- Systems Audits: Systems audits involve a qualitative on-site evaluation of field operations, laboratories, or other organizational elements of the measurement system for compliance with established quality assurance program and procedure requirements.

For this investigation, performance audit requirements shall be met by the analysis of a minimum of one spiked performance audit sample per each Target Analyte List/Target Compound List method. The performance audit samples shall not be identified as such to the laboratory, but shall be represented as a standard field sample using the sample numbering system as established for the project . They may be made from traceable standards or from routine samples spiked with a known concentration of a known compound. System audit requirements shall be implemented through the use of Procedure QP-10.1, "Surveillance Inspection."

Additional performance and system audits may be scheduled as a consequence of corrective action requirements, or may be performed upon request by the authorized representative of the PLP Group or Ecology. Any discrepancies observed during the evaluation of performance audit results or during system audit surveillance activities that cannot be immediately corrected to the satisfaction of the investigator shall be documented on a nonconformance report and resolved in compliance with procedure QP-14.1, "Control of Nonconformances, Incidents, and Corrective Action."

9.0 PREVENTIVE MAINTENANCE

All measurement and testing equipment used in the field and laboratory that directly affects the quality of the analytical data shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime. The subcontracted analytical laboratories shall be responsible for performing or managing the maintenance of their analytical equipment; maintenance requirements, spare parts lists, and instructions shall be incorporated in the laboratory QA plan, which will be included in Attachment QAPP-1 after approval.

10.0 DATA ASSESSMENT PROCEDURES

As previously discussed in Section 6, analytical data shall first be compiled and reduced by the laboratory and validated by project personnel in compliance with National Functional Guideline documents (USEPA 2007 and 2008), and then reported to Ecology using an Ecology-specified application program. Data assessment will be performed on the distributions and statistical characteristics of the validated data, and will consist primarily of comparisons of the data to applicable regulatory levels and background concentrations to determine if a potential release of chemicals from the mine site has occurred, as discussed in the CMP.

11.0 REFERENCES

Environmental Protection Agency. 1986. *Test Methods for Evaluating Solid Waste* (SW-846). As modified by the proposed rule changes included in the EPA 1989 Federal Register, Volume 54, No. 13.

Environmental Protection Agency. 1992. *Guidance on Preparation of Laboratory Quality Assurance Plans*. USEPA Region 10. EPA 910/9-92-032. October, 1992.

Environmental Protection Agency. *1998 EPA Guidance for Quality Assurance Project Plans*. EPA QA/G-5.

Environmental Protection Agency. 1999. *USEPA Compendium Methods for Determination of Toxic Organic Compounds in Ambient Air*. Second Edition.

Environmental Protection Agency. 2007-2008. National Functional Guidelines. http://www.epa.gov/superfund/programs/clp/guidance.htm.

TABLES

TABLE QAPP-1
INORGANIC WATER QUALITY CRITERIA

Field Test	Point of Compliance	Method[a]	Target Water PQL	Typical Instrument Applied[c]
Temperature	Purge water source	SM2550	0.1 deg. C	Golder Calibrated Thermometer
pH	Purge water source	EPA 150.1	0.05 units	Orion Model 250Aplus with Combination Glass Electrode.
Specific Conductance	Purge water source	EPA 120.1	5 :mhos	Orion Model 115Aplus with Epoxy 2 Electrode Conductivity Cell.
Turbidity	Purge water source	EPA 180.1	1 NTU	Hach 2100P with dual optical compensation.
Dissolved Oxygen	Purge water source	SM4500-O	0.1 mg/L	Orion Model 810Aplus with Combination Glass Electrode.

Notes:

a - Methods from SW-846, Test Methods for Evaluating Soild Waste (EPA, 1986); Methods for the Chemical Analysis of Water and Wastes (EPA-600/4-79-20; EPA1979); and Standard Methods for the Examination of Water & Wastes (1998, 20th Ed.)

b - PQL: Practical Quantitation Limits established by Manufacturers recommendation.

c - Orion and Hach are registered trademarks.

TABLE QAPP-2
PARAMETERS OF INTEREST AND ANALYTICAL METHODS

Analyte				Groundwater			Air/Soil Vapor		
				Laboratory Water PQL[c]	MTCA Method A for Groundwater (unrestricted landuse)	MTCA Method B for Groundwater (unrestricted landuse)	Laboratory PQL	Site Specifc for Commercial Landuse	NIOSH Exposure Limits for workers
	CAS #	GW Method	Air Method	µg/L	µg/L	µg/L	µg/m^3	µg/m^3	µg/m^3
Benzene	71-43-2	NWTPH-Gx	TO-15 SIM	1	5[e]	5[g]	0.05	3.2	319
Toluene	108-88-3	NWTPH-Gx	TO-15 SIM	1	1000[e]	1600	0.02	183	375,000
Ethylbenzene	100-41-4	NWTPH-Gx	TO-15 SIM	1	700[e]	800	0.02	NSA	435,000
Xylenes	1330-20-7	NWTPH-Gx	TO-15 SIM	1	1000f	16000	0.040/0.020[d]	100	435,000
Gasoline Range Organics, Benzene present	---	NWTPH-Gx	TO-15 SIM	5	800	NSA			
Gasoline Range Organics, Benzene not present	---	NWTPH-Gx	TO-15 SIM	5	1000	NSA	2	NSA	NSA
EDB (Dibromoethane)	106-93-4	EPA 8011	EPA 8011	1	0.01[f]	0.0005	0.1	0.11	346
n-hexane[h]	110-54-3	NWTPH-Gx	TO-15 SIM	40	NSA	480	0.1	700	50,000
Lead[h]	7439-92-1	EPA 200.8/6020	NA	1	15[e]	NSA	NA	NA	NA
Naphthalenes	91-20-3	NWTPH-Gx	TO-15 SIM	0.05	160[f]	160	0.5	3	10,000

Notes:
NSA - No standard available.
NA – Not analyzed for that media.
a - Methods from SW-846, Test Methods for Evaluating Soild Waste (EPA, 1986).
b - Methods from Department of Ecology Toxics Cleanup Program, "Petroleum Analysis Methods",
c - PQL; Practical Quantitation Limit established by the laboratory.
d – m,p-xylene/o-xylene PQLs
e – Inclusive of 40 CFR 141.61 Federal Law for drinking water Maximum Contaminant Levels (MCLs).
f – Value is more protective than Federal MCLs.
g- MTCA 173-340-705(5) Adjustments to cleanup levels based on applicable laws.
h- compound is not a COC, but may be included as an analyte in future sampling events.
Shading indicates PQL is greater than the most stringent ARAR.

TABLE QAPP-3
Supporting Procedures List

TG-1.2-20, "Collection of Groundwater Quality Samples"

TG-1.2-23, "Chain of Custody"

TP-1.2-25, "Ambient Air/Soil Vapor Sampling for Chemical Analysis"

TP1.4-6, "Water Level Measurement"

TP-2.3-2, "Calibration, Operation, and Maintenance of Organic Vapor Analyzers"

QP-5.0-1, "Document Preparation, Distribution, and Change Control"

QP-10.1, "Surveillance Inspection"

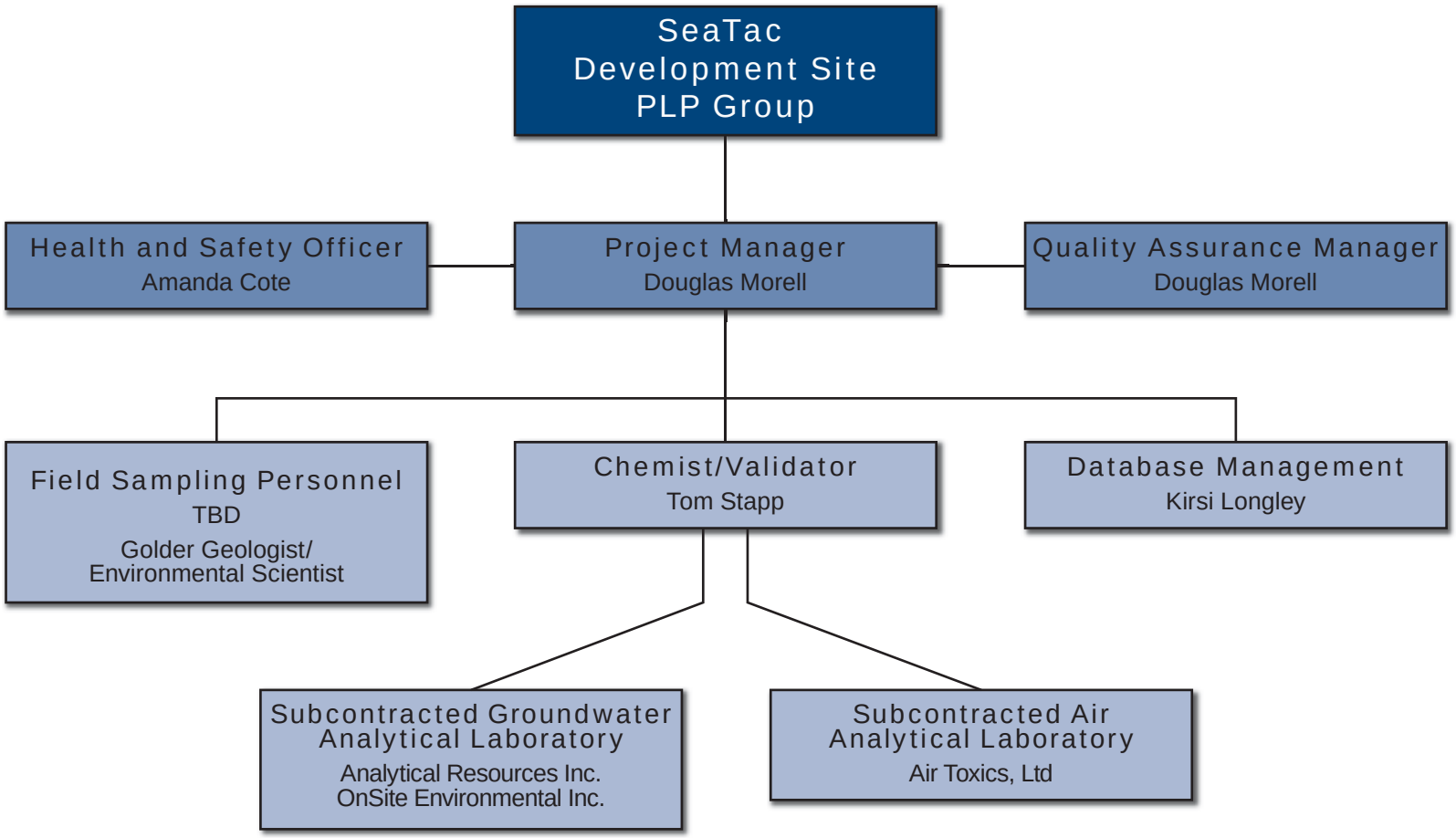
QP-11.1, "Calibration and Maintenance of Measuring and Test Equipment'

QP-14.0-1, "Control of Nonconformances, Incidents, and Corrective Action"

TABLE QAPP-4
Sample Container Types, Volumes, Preparation, Handling Preservation, and Holding Times

Analytes of Concern	Container Type	Special Handling	Preservation	Maximum Holding Time
pH, Sp. Conductance, Total Dissolved Solids, Turbidity	1, 500 mL narrow mouth polyethylene bottle	Fill to neck	None, store at 4°C if necessary.	pH, analyze on site Sp. Cond., 28 days TDS, 7 days Turbidity, 48 hours
Metals, Hardness	1, 500 mL narrow mouth polyethylene bottle	Fill to neck, 0.45 um filter if required when source is turbid (>5 NTU)	Preserve to pH < 2 with Nitric Acid.	6 months
Petroleum Hydrocarbons/BTEX/n-Hexane/naphthalene Compounds **(Gasoline Range Organics)**	3, 40 mL glass vial, teflon-lined silicon septum cap	Fill completely with no air bubbles	HCL, pH < 2, store in dark at 4°C.	14 days
EDB (Dibromoethane)	2, 40 mL VOA vial, amber glass, with Teflon lined screw cap	Fill completely with no air bubbles	HCL, pH <2, Store in dark at 4°C.	14 days
Petroleum Hydrocarbons/VOC **(Gasoline Range Organics)**	6 L Summa Canister	Fill using flow controller	None	30 days to analysis

FIGURES



QAPP-1
ORGANIZATION CHART
SEATAC DEVELOPMENT SITE/CAP/WA

APPENDIX QAPP-A
LABORATORY QA PLAN (TO BE INCLUDED UPON REQUEST)

APPENDIX D
DATA MANAGEMENT PLAN

REPORT

Appendix D

Data Management Plan for Compliance Monitoring Sea-Tac Development Site SeaTac, Washington

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

Submitted On Behalf Of: The Sea-Tac Development Site PLP Group

November 2, 2011

Project No. 073-93368-05.04

A world of capabilities delivered locally

Golder Associates

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

Table of Contents

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
CMP	Compliance Monitoring Plan
DNS	Determination of Non-significance
DMP	Data Management Plan
Ecology	Washington State Department of Ecology
EIM	Information Management System
FS	Feasibility Study
GIS	Geographic Information System
MCL	maximum contaminant level
MTCA	Model Toxics Control Act
PLP	Potentially Liable Party
QAPP	Quality Assurance Project Plan
RI	remedial investigation

1.0 DATA MANAGEMENT

This Data Management Plan was prepared for the Sea-Tac Development Site PLP Group by Golder Associates Inc. (Golder) as Appendix D of the Compliance Monitoring Plan (CMP) for remedial action at the Sea-Tac Development Site (the Site). The Compliance Monitoring Plan is one of the Project Plans for the Sea-Tac Development Site Cleanup Action Plan.

Data management involves the routing and storage of all incoming data and correspondences unique to the project activities for security, ease of access, and compliance with project goals. The data management plan (DMP) will incorporate up-to-date procedures for acquiring data, storing data, and providing for the efficient retrieval of data. Additionally, the DMP incorporates guidance from the Washington State Department of Ecology (Ecology) to allow for electronic data transfer from a project specific database. This DMP describes standards in place to complete the data management process.

1.1 Records Management

All records generated during the course of the remedial action and compliance monitoring activities at the Site, will be filed and maintained in the Redmond, Washington Golder office in access controlled project archives, as required by procedure Golder QP-16.1 “Quality Assurance Records Management,” the duplicate storage requirements of QP-16.1 Section 8.1.3 shall not apply. Records that provide evidence of a service or a communication relevant to the project are defined as completed and signed documents. Records produced during the course of the project may include, but not be limited to, the following:

- Incoming and outgoing correspondence and facsimile transmissions, and relevant E-mail communication
- Analytical data packages and analytical quotes
- Project contracts, agreements, and amendments
- Purchase orders and subcontractor agreements, quotes, and receipts
- Historical file copies of the data and communication provided by the SeaTac Development Site PLP Group, and the Washington State Department of Ecology
- A historical file of all versions of the RI/FS Work Plan, RI/FS, Quality Assurance Project Plan, Data Management Plan, Health and Safety Plan, Compliance Monitoring Plan, and supporting QA and technical procedures that are used during this project
- Technical field logs and field reports
- Interim change reports, procedure alteration checklists, surveillance inspection reports, and nonconformance/incidence reports
- Computer disk files, electronic copies of analytical data, and technical support parameters

1.2 Analytical Data Management

Laboratory data will be provided to Golder in both hard copy (paper) and electronic format from all analytical laboratories. The paper copy will be routed to the data validator for confirmation of analytical data receipt and subsequent validation activities. Electronic data, by diskette, or by electronic (e-mail) delivery will be reserved by the data management specialist. Validated analytical data packages and diskettes will be routed to the project records for controlled storage and the validated data shall be processed into the analytical database in accordance with guidance in Technical Procedure TP-2.2-12 "Analytical Data Management" (See Table QAPP-1).

1.3 Data Review and Reporting

Following receipt and final data validation of groundwater analytical results, concentrations of detected analytes will be compared to the cleanup levels established in the Cleanup Action Plan. The proposed action levels for the RI/FS and remedial action are provided in Table QAPP-2, Appendix C, of the Quality Assurance Project Plan (QAPP). The groundwater action levels are established as the most protective value as compared to Primary Drinking Water Regulation maximum contaminant level (MCL) Standards (USEPA 2003), Model Toxics Control Act (MTCA) Method A, or MTCA Method B calculated levels for groundwater (Ecology 2007a). Soil and soil gas/indoor air action levels are site specific and were derived from calculations specified in MTCA and Ecology's *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* (2009), respectively.

After data has been received, validated, and reviewed, it will be included in a compliance monitoring report to Ecology. The report will include the date of the sampling event, a discussion of groundwater findings, a tabular presentation of groundwater and soil analytical results, and a comparison to established action levels for the site. At this time, the data will also be uploaded to an appropriate site specific database such as EQuIS (maintained by Golder) as well as the electronic Environmental Information Management System for acceptance by Ecology.

2.0 DATABASE

Database files will be created for each compliance-monitoring round. The laboratory data will be compiled in an appropriate site specific database such as EQuIS Environmental Data Management Software. Database files will be created and data processed in accordance with the procedures outlined in Technical Procedure TP-2.2-12 “Analytical Data Management.” Information fields which will be entered into the project database will include the following:

- Monitoring well information – location (x,y), elevation, screened interval, borehole diameter, casing diameter
- Groundwater elevation data – date and time of measurement, measuring device, measured depth to groundwater from measuring point, elevation of measuring point, elevation of groundwater
- Sample designation information – sample ID, QA/QC identification, date and time of sample collection
- Analytical data containing laboratory data qualifiers and revised data qualifiers assigned during the data validation process
- Table of cleanup levels to be used as screening concentrations
- Table of data quality qualifier abbreviations and descriptions

Validated data will also be uploaded to Ecology’s Environmental Information Management System for review by Ecology as discussed in the next section.

3.0 THE ENVIRONMENTAL INFORMATION MANAGEMENT SYSTEM

The Environmental Information Management System (EIM) (Ecology 2007b) is Ecology's main database for environmental monitoring data. The EIM was developed to aid in the transfer of data for project sites in Washington State that are being monitored by Ecology, or will eventually be reviewed by Ecology through various state programs. The EIM will facilitate, for both the Potentially Liable Parties (PLPs) and Ecology, efficient data transfer and review of data for the key components of the Site, including the following:

- Project Study - an organized set of monitoring actions for collecting data about an area that will include site setting information, project status, and agency or public involvement
- Location Information - locations are where the data are collected and could include Geographic Information System (GIS) data, and sample reference information
- Data Results - physical observations, field measurements, or laboratory analyses of samples will include the bulk of a database collected for the duration of the project

The transfer of data will be facilitated by an online import tool (the EIM System) for sites that are required to submit data electronically to Ecology. Golder will utilize the EIM, as well as maintaining their own secure site specific database such as EQuIS, to record physical and chemical measurements and provide for retrieval of the data into reporting formats.

3.1 Records Turnover

Records turnover will be conducted at times specified by the client or by the Ecology project manager, utilizing the EIM and /or traditional reporting formats. The scope of the interim record distribution shall be as specified by the client or the Ecology project manager, or both. Records turnovers shall be in accordance with the Quality Procedure QP-16.1 and shall be inspected before transmittal by the Golder project manager or his designee.

4.0 REFERENCES

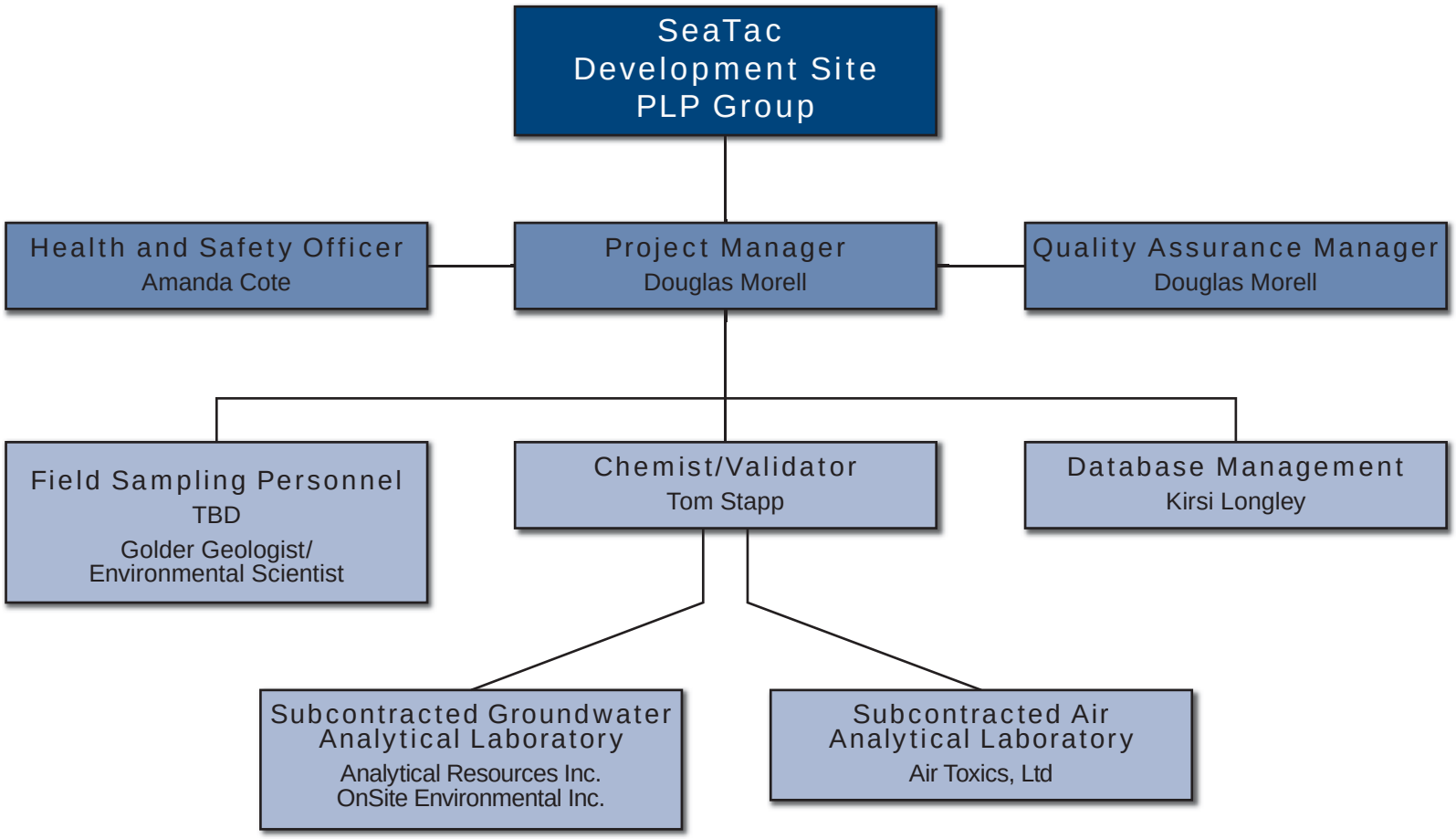
USEPA. 2003. National Primary Drinking Water Regulations, List of Contaminants & their MCLs, http://www.epa.gov/safewater/contaminants/index.html, Office of Water (4606M), EPA 816-F-03-016, June 2003.

Washington State Department of Ecology (Ecology). 2007b. *EIM Submittal Guidelines* www.ecy.wa.gov/eim Version 2006.01.

Washington State Department of Ecology (Ecology). 2007a. *Model Toxics Control Act Statute and Regulation, Compiled by Washington State Department of Ecology, Toxics Cleanup Program*, Publication No. 94-06, Rev. November 2007.

Washington State Department of Ecology (Ecology). 2009. *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action. Toxics Cleanup Program*. Review Draft. Publication no. 09-09-047. October 2009.

FIGURE
ORGANIZATION OF DATA MANAGEMENT TEAM



DMP-1
ORGANIZATION CHART
SEATAC DEVELOPMENT SITE/CAP/WA

APPENDIX E
HEALTH AND SAFETY PLAN

1. **Items 1-9 to be completed by Project Manager.**

Project Name Sea-Tac Development Site

Task Remediation & Compliance Monitoring Field Work

Requested by Doug Morell

Proposed Start-Up Date: January 2011 Project/Task No. 073-93368-05.04

Prepared by/Reviewed by Health and Safety Officer

Printed Name: Kirsi Longley

Signature K Longley Date 11/2/11 2011

Reviewed by Project Health and Safety Coordinator

Printed Name: Jane Mills

Signature Jane B Mills Date 11/2/11 2011

Approved by Project Manager

Printed Name: Doug Morell

Signature D Morell Date November 2 2011

Title Principal - Project Manager

Note to Project Managers:

A signed and completed copy of the Health and Safety Plan and a signed and completed copy of the safety briefing (p. 15) must be included in the project file.

2. **Introduction and Project Description:**

This HASP is Appendix E of the Attachment E - Compliance Monitoring Plan. This HASP provides the guidance and procedures to conducted field activities in support of the SeaTac Development Site Remediation and Compliance Monitoring, which includes the MasterPark Lot C Facility and surrounding properties included as the SeaTac Development Site, in a manner protective of workers health and safety. Based on previous environmental investigations, soil has been impacted with gasoline range petroleum hydrocarbons and volatile petroleum compounds (benzene, toluene, ethylbenzene, and xylenes – "BTEX"). The historical data also indicate groundwater in the regional Qva aquifer, underlying the northeast portion of the MasterPark Lot C property and the adjacent properties have been impacted by gasoline and diesel range petroleum hydrocarbons and volatile petroleum compounds (BTEX). Golder implemented a series of investigations during the latter half of 2007 through early 2010 with the intent of identifying potential on-site sources that may have contributed impacts to the Qva aquifer and delineating their extent in the vadose zone including the gasoline UST. The remedial investigations confirmed impacts to groundwater were connected (at least in part) to a former on-facility gasoline underground storage tank (UST), which had been removed during the 1970s. No heavier petroleum hydrocarbons have been detected in the Qva aquifer. The impacted area is delineated on figures contained in the Cleanup Action Plan (CAP) and Compliance Monitoring Plan (CMP) which are supporting documents of the SeaTac Development Site Agreed Order.

This HASP is a modified version of the RI HASP and includes pertinent environmental data that was gathered during the RI and has been modified to be protective of the activities that will be involved in the remediation and compliance monitoring at the Site.

The remediation and compliance monitoring field activities include worker protection air monitoring during remediation activities; construction observation and quality assurance during remediation activities, including working around construction machinery; groundwater sampling new and existing monitoring wells, including wells located within roadway right-of-ways; monitoring well drilling, installation (using hollow-stem auger technology) and development; and collecting SVE system air samples.

3. **Location:**

Facility (MasterPark Lot C) Location: 16025 International Blvd, SeaTac, Washington, 98188

4. **Facility/Work Site Description:**

Most of the work will take place at the Facility on a relatively flat parking lot. Some work will also be conducted elsewhere on the Site, including the Washington Memorial Park Cemetery, the Louden property, City of SeaTac roadway (South 160th and potentially International Boulevard), and Port of Seattle property north of South 160th.

Bathrooms are available at the MasterPark Lot C Facility.

5. **Proposed Personnel and Tasks:**

Project Manager: Doug Morell

Field Team Leader: Kirsi Longley

Proposed Field Team	Job Function/Tasks
(TBD)_____ - Remediation construction oversight	Oversee remediation field work, including construction quality assurance. May include limited soil sampling for disposal characterization purposes.
(TBD)_____ - Groundwater sampling	Oversee field work, including installation of monitoring wells, groundwater sampling.
(TBD)_____ – Air sampling	Collect SVE air samples into Summa canisters, for eventual shipment to Air Toxics Laboratory. Also conduct other performance monitoring activities at the SVE system.

6. Confined Space Entry

A confined space is defined as any space not currently used or intended for human occupancy, having a limited means of egress, which is subject to the accumulation of toxic contaminants, a flammable or oxygen deficient atmosphere, or other hazards, such as engulfment, or electrical or mechanical hazards should equipment be inadvertently activated while an employee is in the space. Confined spaces include but are not limited to storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, air pollution control devices, smoke stacks, underground utility vaults, sewers, septic tanks, and open top spaces more than four feet in depth such as test pits, waste disposal trenches, sumps and vats.

Will this task require entry into any confined or partially confined space? ☐ YES - Describe below ☒ No

7. Cutting and Welding

Will this task involve use of a cutting torch or welding? ☐ YES - Describe below ☒ No

8. Other Potential Hazards

☒ Chemical	☒ Trips, Slips, Falls
☐ Radiological	☒ Trenching/Shoring
☐ Fire/Explosion	☒ Heavy Equipment/Vehicular Traffic
☒ Heat Stress	☒ Overhead Hazards
☒ Electrical	☐ Unstable/Uneven Terrain
☒ Machinery/Mechanical Equipment	☒ Other - Describe below

6,7,8 Description/Other

The job will involve working in proximity to drill rigs, construction heavy machinery, and vehicular traffic within a major roadway. Soil and groundwater contaminated with gasoline, diesel, and BTEX compounds are to be encountered. Trips, slips and falls are also a possibility, due to the presence of heavy machinery, and working outdoors. The Facility is a long term parking lot with constant traffic;

therefore all personnel are to be aware of their surroundings and at all times where traffic safety vests. Work may also entail installation and/or monitoring of wells in the City of SeaTac right of way. A Right of Way Use Permit and associated Traffic Safety Plan is appended to this document for use when work is required within a roadway. The soil vapor sample collection effort will involve potential exposure to vapors during the sample collection process at the SVE system. Personnel should remain upwind of each air sample location. Potential subsurface obstructions including electrical lines are on-site. Commercial and private locating services will be employed to locate and mark such items for avoidance. See the attached Golder Standard Work Procedures for the above identified potential hazards.

9. I, Douglas Morell *(project manager)*, attest that this information is accurate to the best of my knowledge and hereby request a Health and Safety Plan for the task(s) designated above.

Signature _____ Date _____2010_____

Title _____

10. Chemical/Radiological Hazard Evaluation

Waste Media	Hazardous Characteristics
☒ Airborne Contamination	☐ Ignitible
☐ Surface Contamination	☐ Corrosive
☒ Contaminated Soil	☐ Reactive
☒ Contaminated Groundwater	☐ Explosive
☐ Contaminated Surface Water	☒ Toxic (non-radiological)
☐ Solid Waste	☐ Radioactive
☐ Liquid Waste	
☐ Sludge	

Substance

This task will involve the reasonable possibility of exposure to the substances listed below at concentrations or in quantities which may be hazardous to the health of the site personnel.

PRIMARY HAZARD (Rate: Low, Med, High, Ext)								
Substance	Inhalation of Gases / Vapors	Inhalation of Dusts / Mists	Ingestion	Dermal Absorption of Solids / Liquids and/or Skin Contam.	Dermal Absorption of Gases / Vapors	Corrosive / Irritant	Ignitability	Reactivity / Explosion
Gasoline-range petroleum hydrocarbons	Low	Low	Low	Low	Low	Low	Low	Low
Diesel-range petroleum hydrocarbons	Low	Low	Low	Low	Low	Low	Low	Low
BTEX Compounds	Low	Low	Low	Low	Low	Low	Low	Low
EDB	Low	Low	Low	Low	Low	Low	Low	Low
Naphthalene	Low	Low	Low	Low	Low	Low	Low	Low

Substance	Exposure Limit	IDLH Level	Health Effects
Gasoline Range Hydrocarbons	300 ppm (TWA) 500 ppm (short-term)	None	Acute Effects - Headache dizziness, nausea, confusion, slowed unsteady speech, at extremely high concentrations. Chronic Effects – central nervous system, peripheral nervous system damage, liver, kidney damage.
Benzene	1 ppm (TWA) 5 ppm (short-term)	500 ppm	Acute Effects – Irritated eyes, skin, nose, respiratory system; giddiness; headache; nausea, staggered gait; fatigue; anorexia; lassitude; dermatitis, bone marrow depression. Chronic Effects – Damage to eyes, skin, respiratory system, blood, central nervous system, bone marrow (leukemia).
Ethylbenzene	100 ppm (TWA)	800 ppm	Acute Effects – Irritated eyes, skin, mucous membrane; headache; dermatitis; narcosis; coma. Chronic Effects – Damage to eyes, skin, respiratory system, central nervous system.
Toluene	200 ppm (TWA) 300 ppm (Ceiling Limit) 500 ppm (10-min max peak)	500 ppm	Acute Effects – Irritated eyes, nose; fatigue; weakness; confusion; euphoria; dizziness; headache; dilated pupils; lacrimation (discharge of tears); nervousness; muscular fatigue; insomnia; paresthesia; dermatitis; damage to liver and kidney. Chronic Effects – Damage to eyes, skin, respiratory system, central nervous system, kidneys.
Xylenes	100 ppm	900 ppm	Acute Effects – Irritated eyes, skin, nose, throat; dizziness; excitement, drowsiness, incoordination; staggering gait; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis. Chronic Effects – Damage to eyes, skin, respiratory system, central nervous system, gastrointenstinal tract, blood, liver, kidneys.
Naphthalene	100 ppm 150 ppm (Ceiling limit)	900 ppm	Acute Effects – Irritated eyes, skin, repiratory system, central nervous system. Chronic Effects – Damage to eyes, skin, respiratory system, central nervous system, GI tract, blood, liver, and kidneys.
EDB	20 ppm (TWA) 30 pm (ceiling limit) 50 ppm (5-minute max)	100 ppm	Eyes, skin, respiratory system, liver, kidneys, reproductive system

11. Ambient Air/Site Monitoring Procedures

The following instruments shall be used to monitor the work environment and workers' breathing zones during remedial construction at the Facility within the zone of highest soil and groundwater impact.

Instrument	Monitoring Frequency
_☒_ PID (HNU, OVM) w/8.12-9.24 eV lamp	**Cont.** 15min. 30min. hourly other
___ OVA	Cont. 15min. 30min. hourly other
___ Combustible Gas Indicator	Cont. 15min. 30min. hourly other
___ H2S Detector	Cont. 15min. 30min. hourly other
___ Colorimetric Detector Tubes	Cont. 15min. 30min. hourly other

A "Worst Case" vapor exposure calculation was done using the highest concentrations of volatile compounds detected in groundwater at the Site to determine what the worst case vapor exposure might be encountered during monitoring activities on-Site. The calculation indicated that the vapor exposure is insignificant. As such, PID monitoring and the use of respirators during groundwater sampling activities is not necessary for protection of worker health. The results of the calculation are attached to this HASP.

12. Action Levels

Task personnel shall observe the following Action Levels:

Instrument	Action Level	Specific Action
PID -calibrated with isobutylene	Continuous readings >10 ppm in breathing zone or interim readings or continuous readings >50 ppm in breathing zone other than a momentary spike.	Stop work and move upwind for >15 minutes until levels subside. Call project manager to assess conditions and develop procedures for continuing work.
PID -calibrated with isobutylene	Interim readings >75 ppm in breathing zone or any peak readings above 100 ppm.	Leave area and contact project manager and Health and Safety Officer. Implement engineering controls.

13. Personal Monitoring

☐ Passive Dosimeter ☒ Personal Air Sampling ☐ Other

Description/Other: PID worker breathing zone monitoring during remedial construction activities within the zone of greatest soil and groundwater impact on the Facility. This is only required during activities that present potential exposure of workers to impacted media. Most likely this is only going to be necessary when the asphalt cap has been removed during remedial construction.

14. Onsite Control

Control boundaries have been established, and the Exclusion Zone (the contaminated area), Hotline, Decontamination Line, Contamination Control Zone and Support Zone (clean area) have been designated and are identified as follows:

The area within 15 feet of the drill rig while drilling or installing monitoring wells or within 15 feet of construction machinery during activities that present the potential for exposure to impacted media, shall be considered the exclusion zone. Additionally, during groundwater sampling, the area within 15 feet of the well will be considered the exclusion zone. Only authorized people shall be permitted within the exclusion zone. Decontamination shall be conducted at the boundary of the exclusion zone.

The field engineer/scientist (TBD) conducting construction CQA, soil, air, and groundwater sampling will been designated to coordinate access control on the work site during this task. No unauthorized person shall be allowed beyond the Contamination Control line. Only HAZWOPER trained staff shall be identified as authorized personnel.

16. Personal Protective Equipment

Location	Job Function/Task	Initial Level of Protection
Controlled Zone	Direct construction activities air/soil/groundwater sampling	__ B C **D** 1 2 3 other
Decontamination Zone		__ B C D 1 2 3 other

List the specific protective equipment and material (where applicable) for each of the Levels of Protection identified above

Level B ☐

- ☐ Pressure demand airline
- ☐ Pressure demand airline with escape provisions
- ☐ Pressure demand SCBA
- ☐ Standard work clothes
- ☐ Hard hat, steel toed boots, safety glasses
- ☐ Ear protection during drill rig operation
- ☐ Inner latex gloves
- ☐ Outer NBR (Nitrile Butyl Rubber) gloves

Level C ☐

- ☐ Half face Air Purifying Respirator
- ☐ Full face Air Purifying Respirator
- ☐ Full face canister Air Purifying Respirator

Level D ☒	Level ___ ☐
☒ Standard work clothes	☐
☒ Hard hat, steel toed boots, safety glasses	☐
☒ Ear protection during machinery operation	☐
☒ Inner latex gloves when sampling	☐
☒ Reflective traffic safety vest at all times	☐

Hart hat is only required while working within a roadway and when working around heavy machinery. Typical groundwater sampling does not require a hardhat.

NO CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL BE MADE WITHOUT THE KNOWLEDGE AND APPROVAL OF THE HEALTH AND SAFETY OFFICER AND THE PROJECT MANAGER.

17. Decontamination

Personnel and equipment leaving the Controlled Zone shall proceed through the following decontamination stations and procedures from the decontamination zone:

PERSONNEL DECONTAMINATION

Station	Procedure
Remove Tyvek and prior to leaving site or eating	Wash hands with soap
End of day	Shower (off site)

EQUIPMENT DECONTAMINATION

Station	Equipment
Sampling areas	Clean all sampling equipment with alconox water solution scrub, followed by a tap water rinse and final DI water rinse

The following decontamination equipment is required for drilling and soil sampling: Alconox, scrub brushes, potable water, deionized or distilled water. All sample collection equipment for soil vapor and groundwater collection will be dedicated to each location.

Emergency decontamination procedures: See Emergency Procedures Below ☒ Not Applicable

18. Confined Entry Procedures ☒ **Not Applicable**

Yes	N/A		Yes	N/A	
☐	☐	Provide Forced Ventilation	☐	☐	Refer to Personal Protective Equip. (#16)
☐	☐	Test Atmosphere For	☐	☐	Refer to Emergency Procedures (#29)
☐	☐	(a) $\%O_2$	☐	☐	Other Special Procedures
☐	☐	(b) %LEL			
☐	☐	(c) Other			

Descriptions/Other: N/A

19. Cutting/Welding Procedures ☒ Not Applicable

Yes	N/A	
☐	☐	Relocate or Protect Combustibles
☐	☐	Wet Down or Cover Combustible Floor
☐	☐	Check Flammable Gas Concentrations (%LEL) in air
☐	☐	Cover Wall, Floor, Duct and Tank Openings
☐	☐	Provide Fire Extinguisher

Other Special Instructions: N/A

20. Onsite Organization and Coordination

Project Manager: Doug Morell
Office Safety Officer: Amanda Cote
Field Team Leader: Kirsi Longley
Site Safety Officer: (TBD) Field Engineer/Engineer

Off-site Contact: Doug Morell

FIELD TEAM

Name	Job Function
(TBD)_____ - Remediation construction oversight	Oversee remediation field work, including construction quality assurance. May include limited soil sampling for disposal characterization purposes.
(TBD)_____ - Groundwater sampling	Oversee field work, including installation of monitoring wells, groundwater sampling.
(TBD)_____ – Air sampling	Collect SVE air samples into Summa canisters, for eventual shipment to Air Toxics Laboratory. Also conduct other performance monitoring activities at the SVE system.

21. Special Instructions

None

22. Sanitation Requirements

Potable water supply available on work site? ☒ Yes

Portable toilets required on work site? ☐ Yes, how many?
☒ No

Temporary washing/shower facilities required at work site? ☐ Yes, describe below.
☒ No, state location of existing facilities.

Description: Closest toilet and washing facilities available inside MasterPark Lot C building facility.

23. Field Procedures Change Authorization

Instruction Number ___ Duration of Authorization Requested ___ Date:

to be changed ☐ Today only

☐ Duration of Task

Description of Procedures Modification:

Justification:

Person Requesting Change:	**Verbal Authorization Received From:**
Name	Name Time
Title	Title
Signature	Approved By (Signature of person named above to be obtained within 48 hours of verbal authorization)

24. Emergency Procedures **(**This page is to be posted at prominent location on site)

Yes	No	
☐	☒	On-site Communications Required? Emergency Channel:

Nearest Telephone:

Cell phone with TBD Field Engineer ( ) -

MasterPark Lot C facility (206) 444-9200

Other Pertinent Phone Numbers:

Doug Morell, Golder Project Manager (425)351-7451

Jed Goniu, MasterPark Lot C contact (206)261-4400

Harry Grant, Client Attorney (206) 389-1574

Scott Douglas, City of SeaTac (206)730-0403

Traffic Control Services (1-800-766-5272

Fire and Explosion

In the event of a fire or explosion, if the situation can be readily controlled with available resources without jeopardizing the health and safety of yourself, the public, or other site personnel, take immediate action to do so, otherwise:

1. Notify emergency personnel by calling 911.
2. If possible, isolate the fire to prevent spreading.
3. Evacuate the area.

Chemical Exposure

Site workers must notify the site health and safety officer immediately in the event of any injury or any of the signs or symptoms of overexposure to hazardous substances identified below:

Substances Present	Symptoms of Acute Exposure	First Aid
Gasoline Range Hydrocarbons	Acute Effects - Headache dizziness, nausea, confusion, slowed unsteady speech, at extremely high concentrations.	**Eye:** Wash eyes with water immediately **Skin:** Soap flush immediately **Breath:** Respiratory support **Swallow**: Immediate medical attention
Benzene	Acute Effects – Irritated eyes, skin, nose, respiratory system; giddiness; headache; nausea, staggered gait; fatigue; anorexia; lassitude; dermatitis, bone marrow depression.	**Eye:** Wash eyes with water immediately **Skin:** Soap flush immediately **Breath:** Respiratory support **Swallow**: Immediate medical attention
Ethylbenzene	Acute Effects – Irritated eyes, skin, mucous membrane; headache; dermatitis; narcosis; coma.	**Eye:** Wash eyes with water immediately **Skin:** Water flush immediately **Breath:** Respiratory support **Swallow**: Immediate medical attention
Toluene	Acute Effects – Irritated eyes, nose; fatigue; weakness; confusion; euphoria; dizziness; headache; dilated pupils; lacrimation (discharge of tears); nervousness; muscular fatigue; insomnia; paresthesia; dermatitis; damage to liver and kidney.	**Eye:** Wash eyes with water immediately **Skin:** Soap wash promptly **Breath:** Respiratory support **Swallow**: Immediate medical attention
Xylenes	Acute Effects – Irritated eyes, skin, nose, throat; dizziness; excitement, drowsiness, incoordination; staggering gait; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis.	**Eye:** Wash eyes with water immediately **Skin:** Soap wash promptly **Breath:** Respiratory support **Swallow**: Immediate medical attention
EDB	Acute Effects - Irritation eyes, skin, respiratory system; dermatitis with vesiculation; liver, heart, spleen, kidney damage, reproductive effects; [potential occupational carcinogen]	**Eye**: Irrigate immediately; **Skin**: Soap wash immediately; **Breath**: Respiratory support; **Swallow**: Medical attention immediately
Naphthalene	Acute Effects - Irritation eyes; headache, confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	**Eye**: Irrigate immediately; **Skin**: Molten flush immediately/solid-liquid soap wash promptly; **Breath**: Respiratory support; **Swallow**: Medical attention immediately

On Site Injury Or Illness

In the event of an injury requiring more than minor first aid, or any employee reporting any sign or symptom of exposure to hazardous substances, immediately take the victim to Highline Medical Center located at 16251 Sylvester Rd SW, Burien, WA, phone (206) 244-9970. In the event of life-threatening or traumatic injury, implement appropriate first-aid and immediately call for emergency medical assistance at 911. The nearest designated trauma center is Highline Medical Center located at the above address.

Designated Personnel Current in First Aid/CPR (Names)

(TBD) Field Engineer/Scientist

Designated Back-Up Personnel (Names)	**Function**

Required Emergency Back-Up Equipment

Emergency Response Authority

The TBD Field Engineer/Scientist is the designated site emergency coordinators and have final authority for first response to on-site emergency situations.

Upon arrival of the appropriate emergency response personnel, the site emergency coordinator shall defer all authority but shall remain on the scene if necessary to provide any and all possible assistance. At the earliest opportunity, the site safety officer or the site emergency coordinator shall contact the project coordinator or health and safety officer.

Project Coordinator Doug Morell	Phone (w) 425-883-0777	(c) 425-351-7451
Health and Safety Officer Amanda Cote	Phone (w) 425-883-0777	(c) 425-417-2218

25. Safety Briefing

The following personnel were present at pre-job safety briefing conducted at ___ (time) on ___ (date) at ___ (location), and have read the above plan and are familiar with its provisions:

Name	Signature

Fully charged ABC Class fire extinguisher available on site? ☐ YES

Fully stocked First Aid Kit available on site? ☐ YES

All project personnel advised of location of nearest phone? ☐ YES

All project personnel advised of location of designated medical facility or facilities? ☐ YES

Printed Name of Field Team Leader or Site Safety Officer

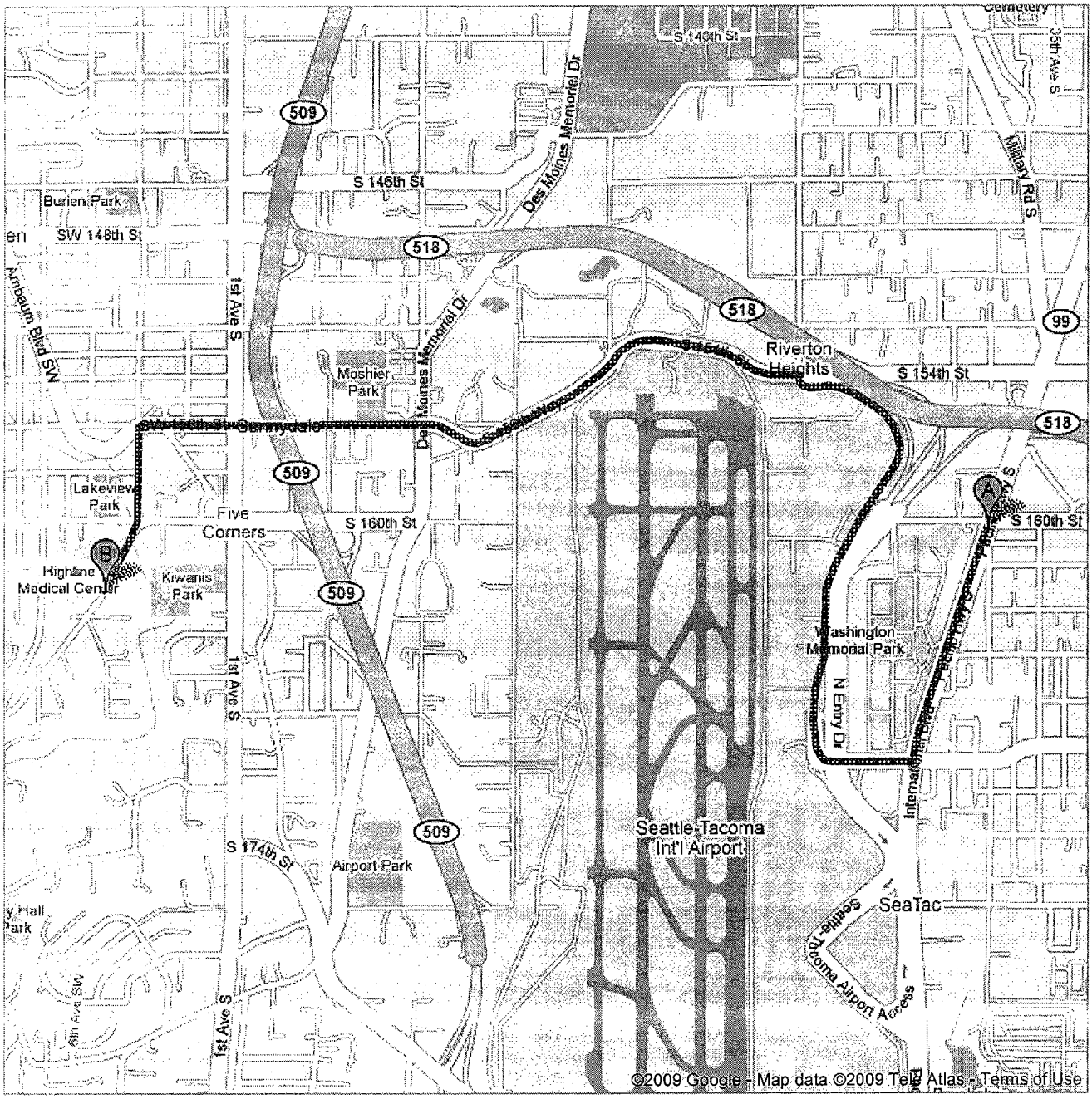
Signature Date

Google Maps

Directions to 16251 Sylvester Rd SW, Seattle, WA 98166

4.4 mi -- about **12 mins**

SeaTac Development Site to Highline Medical Center



A 16025 International Blvd, Seattle, WA 98188

99	1. Head **south** on **International Blvd/WA-99** toward **Washington Memorial Park Rd** About 1 min	go 0.6 mi total 0.6 mi
↱	2. Turn **right** at **S 170th St**	go 0.2 mi total 0.8 mi
↱	3. Turn **right** at **Air Cargo Rd/Perimeter Rd** About 3 mins	go 1.3 mi total 2.1 mi
↰	4. Turn **left** at **S 154th St/Southcenter Blvd** About 2 mins	go 0.5 mi total 2.6 mi
	5. Continue on **S 156th Way** About 4 mins	go 1.3 mi total 3.9 mi
↰	6. Turn **left** at **4th Ave SW** About 1 min	go 0.2 mi total 4.2 mi
	7. Continue on **Sylvester Rd SW** Destination will be on the right	go 0.2 mi total 4.4 mi

B 16251 Sylvester Rd SW, Seattle, WA 98166

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2009 , Tele Atlas

VaporLevel "WORST CASE" VAPOR EXPOSURE CALCULATION SeaTac Development

Prepared by: Kirsi Longley for volatile compounds in water

CONTAMINANT	CONCENTR'N (site water) (ug/l)	Solubility mg/l	Pressure When Pure (torr)	Limit (OSHA) (ppm)	Concentr'n in Air (ppm)	Total vapor in Air (% by ppm)	Concentr'n in Air Frax'n of PEL
Acetone	1.E-9	3,000,000.	180	500	0.00	0.00%	0.00
Benzene	3,000.	1,800.	75	0.5	164.44	0.32%	328.88
Bromochloromethane	1.E-9	10,000.	300	200	0.00	0.00%	0.00
Carbon Disulfide	1.E-9	2,000.	300	4	0.00	0.00%	0.00
Carbon Tetrachloride	1.E-9	800.	91	2	0.00	0.00%	0.00
Chlorobenzene	1.E-9	500.	11.8	10	0.00	0.00%	0.00
Chloroform	1.E-9	7,950.	246	2	0.00	0.00%	0.00
Dichlorobenzenes	1.E-9	156.	1.47	10	0.00	0.00%	0.00
1,1-Dichloroethane	1.E-9	5,060.	227	100	0.00	0.00%	0.00
1,2-Dichloroethane	1.E-9	8,524.	90	1	0.00	0.00%	0.00
1,1-Dichloroethene	1.E-9	2,500.	591	1	0.00	0.00%	0.00
1,2-Dichloroethene	1.E-9	800.	200	200	0.00	0.00%	0.00
1,4-Dioxane	1.E-9	2,000,000.	30	25	0.00	0.00%	0.00
Ethylbenzene	2,600.	150.	7.1	100	161.89	0.32%	1.62
Ethyl Chloride	1.E-9	5,740.	900	100	0.00	0.00%	0.00
Gasoline	100,000.	1.	38	300	49989.00	98.17%	166.63
Methyl Butyl Ketone	1.E-9	5,000,000.	3.8	5	0.00	0.00%	0.00
Methyl Chloride	1.E-9	4,800.	3756	50	0.00	0.00%	0.00
Methyl Ethyl Ketone	1.E-9	3,560,000.	100	200	0.00	0.00%	0.00
Methylene Chloride	1.E-9	13,000.	435	25	0.00	0.00%	0.00
Naphthalene	1.E-9	31.7	0.082	10	0.00	0.00%	0.00
Propylene Dichloride	1.E-9	2,600.	40	75	0.00	0.00%	0.00
Tetrachloroethane	1.E-9	2,900.	7	1	0.00	0.00%	0.00
Tetrachloroethylene	1.E-9	150.3	18.49	25	0.00	0.00%	0.00
Toluene	7,600.	500.	25	50	499.89	0.98%	10.00
1,1,1-Trichloroethane	1.E-9	4,400.	124	350	0.00	0.00%	0.00
1,1,2-Trichloroethane	1.E-9	4,500.	25	10	0.00	0.00%	0.00
Trichloroethylene	1.E-9	1,100.	75	50	0.00	0.00%	0.00
Trimethylbenzene	1.E-9	57.	2.02	25	0.00	0.00%	0.00
Vinyl Chloride	1.E-9	1,100.	760	1	0.00	0.00%	0.00
Xylene	1,600.	130.	6.6	100	106.86	0.21%	1.07
Total Vapors	Combined Volatiles Level (ppm)				50,922.08	100.00%	507.12
			[1]Fraction Combined Exposure Limit				508.19

[1]For confined spaces, if this ratio is greater than 100, significant exposure could occur. For unconfined field conditions, if the ratio is between 100 and 5,000, exposure is anticipated to be insignificant. If the ratio exceeds 5,000, significant field exposure could occur.

023-93368 x05.14

Right of Way Use Permit

City of SeaTac
Public Works Department
4800 South 188th Street
SeaTac, WA 98188-8605
Phone: 206.973.4730
Fax: 206.973.4809

Permit Number ROW09-00308
Bond:
Bond Type:
Parcel Number: 940940-0135
Issue date: 11/19/2009
Expiration date: 5/19/2010

Owner \ Applicant:
GOLDER ASSOCIATES INC
18300 NE UNION HILL RD, SUITE
REDMOND, WA 98052

Phone 1: 206-755-4970 TED NORTON
Phone 2:
Fax:

Contractor:
BOART LONGYEAR CO
PO BOX 1890
MILTON, WA 98354-

Phone 1: 253-883-5200
Phone 2:
Fax:

SITE COPY

Contractors L & I Registration # : BOARTLC941RA Exp:
City of SeaTac Business License # : 000858 Exp: 05 /31 /2010

Type	Amount	Date	Receipt #
APPC	$174.00	11 /19 /2009	0000018280
PROC	$174.00	11 /19 /2009	0000018280
MANT	$88.40	11 /19 /2009	0000018280
BOND	$2,000.00	11 /19 /2009	0000018280
Total:	$2,436.40		

Description of Work: DRILLING AND INSTALLING TWO (2) MONITORING WELLS IN THE EAST BOUND (INNER - NEAR CENER) LANE OF S 160TH STREET JUST WEST OF THE INTERSECTION OF INTERNATIONAL BLVD. 24 HOUR CONTACT: DOUGLAS MORELL 425-351-7451
NOTE PAY SPECIAL ATTENTION TO ROW USE PERMIT CONDITIONS #1, #3, #28 AND #30.

Location of Work: 16025 INT'L BLVD

See Standard and Additional Conditions Attached

I certify that I am the ( ) utility, (X) Owner, (X) Contractor for the project for which this permit is being issued.

Signature: _____ Date: Nov. 19, 2009

Please Print Name: Douglas J. Morell

Public Works Represenative: Vicky Hutchens Date: 11/19/09

FOR JOB STARTS AND INSPECTIONS CALL 206.973.4730 OR PWJOBSTART@CI.SEATAC.WA.US
24 HOUR ADVANCE NOTICE REQUIRED FINAL INSPECTIONS ARE REQUIRED

Issuance of this permit shall not be construed as approval of any violation of the Codes, Laws or Ordinances as adopted by the City of SeaTac or the State of Washington.

CALL BEFORE YOU DIG - 48 HOUR LOCATORS (800) 424-5555

Right of Way Use Permit

Conditions:

INDEMNITY AND HOLD HARMLESS: THE PERMITTEE AGREES TO INDEMNIFY AND HOLD HARMLESS THE CITY OF SEATAC AS PROVIDED HEREIN TO THE MAXIMUM EXTENT POSSIBLE UNDER LAW. ACCORDINGLY, THE PERMITTEE AGREES FOR ITSELF, ITS SUCCESSORS AND ASSIGNS TO DEFEND ALL CLAIMS, DEMANDS, SUITS AND JUDGEMENTS, INCLUDING COST OF DEFENSE THEREOF, FOR INJURY TO PERSONS, DEATH OR PROPERTY DAMAGE WHICH IS CAUSED BY , ARISES OUT OF, OR IS INCIDENTAL TO PERMITTEES EXERCISE OF RIGHTS AND PRIVILEGES GRANTED BY THIS PERMIT. THE PERMITTEES OBLIGATIONS UNDER THIS PERMIT SHALL INCLUDE: A) INDEMNIFICATION FOR SUCH CLAIMS WHETHER OR NOT THEY ARISE FROM THE SOLE NEGLIGENCE OF EITHER THE CITY OF SEATAC OR THE PERMITTEE, THE CONCURRENT NEGLIGENCE OF BOTH PARTIES, OR THE NEGLIGENCE OF ONE OR MORE THIRD PARTIES; B) THE DUTY TO PROMPTLY ACCEPT TENDER OF DEFENSE AND PROVIDE DEFENSE TO THE CITY OF SEATAC AT THE PERMITTEES OWN EXPENSE; C) INDEMNIFICATION OF CLAIMS MADE BY THE PERMITTEES OWN EMPLOYEES OR AGENTS; AND D) WAIVER OF THE PERMITTEES IMMUNITY UNDER THE INDUSTRIAL INSURANCE PROVISIONS OF TITLE 51 RCW, WHICH WAIVER HAS BEEN MUTUALLY NEGOTIATED BY THE PARTIES. IN THE EVENT IT IS NECESSARY FOR THE CITY OF SEATAC TO INCUR ATTORNEY'S FEES, LEGAL EXPENSES OR OTHER COSTS TO ENFORCE THE PROVISIONS OF THIS SECTION, ALL SUCH FEES, EXPENSES AND COSTS SHALL BE RECOVERABLE FROM THE PERMITTEE. IN THE EVENT IT IS DETERMINED THAT RCW 4.24.115 APPLIES TO THIS PERMIT, THE PERMITTEE AGREES TO DEFEND, HOLD HARMLESS AND INDEMNIFY THE CITY OF SEATAC TO THE MAXIMUM EXTENT PERMITTED THEREUNDER, AND SPECIFICALLY FOR ITS NEGLIGENCE CONCURRENT WITH THAT OF THE CITY OF SEATAC TO THE FULL EXTENT OF PERMITTEES NEGLIGENCE.

THE PERMITTEE, ITS SUCCESSORS AND ASSIGNS, IS GIVEN AND GRANTED THE RIGHT AND AUTHORITY TO ENTER UPON THE RIGHT-OF-WAY FOR THE PURPOSE OF PERFORMING THE WORK DESCRIBED IN THIS PERMIT SUBJECT TO THE REQUIREMENTS AND CONDITIONS LISTED BELOW.

1. A CITY INSPECTOR WILL BE ASSIGNED TO THE PROJECT. PERMITTEE IS REQUIRED TO NOTIFY THE CITY OF SEATAC PUBLIC WORKS DEPT. AT 973-4730, ***24 HOURS PRIOR TO STARTING WORK***. FAILURE TO GIVE REQUIRED NOTICE WILL RESULT IN ASSESSMENT OF A ONE HOUR INSPECTION FEE CHARGED AGAINST PERMITTEE. THIS ASSESSMENT IS IN ADDITION TO ANY OTHER REMEDY AVAILABLE UNDER LAW OR EQUITY WHICH THE CITY MAY WISH TO PURSUE AND SHALL NOT BE CONSTRUED AS AN ELECTION OF REMEDIES BY THE CITY OF SEATAC.

2. ALL HARD SURFACED ROADS TO BE JACKED OR BORED. EXCEPTIONS WILL BE ON A CASE-BY-CASE BASIS WITH THE EXPRESS PERMISSION OF THE CITY OF SEATAC CITY ENGINEER.

3. ONE-WAY TRAFFIC AND LOCAL ACCESS SHALL BE MAINTAINED AT ALL TIMES. SIGN AND TRAFFIC CONTROLS WILL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) FOR STREETS AND HIGHWAYS (LATEST EDITION). DETOURS AND ROAD CLOSURES SHALL BE ONLY BY THE EXPRESSED WRITTEN APPROVAL OF THE SEATAC CITY ENGINEER.

4. IT IS THE RESPONSIBILITY OF THE PERMITTEE TO NOTIFY ALL UTILITY DISTRICTS AND PRIVATE PROPERTY OWNERS WHEN SUCH PROPERTY IS SUBJECT TO INJURY OR DAMAGE THROUGH THE PERFORMANCE OF THE WORK UNDER THIS PERMIT.

5. AFTER THE INSTALLATION, OPERATION, MAINTENANCE OR REMOVAL OF A UTILITY OR FACILITY, THE PERMITTEE SHALL RESTORE ALL RIGHTS OF WAY AND PUBLIC PLACES TO THE CONDITION WHICH IS EQUIVALENT IN ALL RESPECTS TO THE CONDITION THEY WERE IN BEFORE STARTING WORK. ALL WORK TO MEET THE APPROVAL OF THE CITY ENGINEER. IN THE EVENT THAT DAMAGE OF ANY KIND IS CAUSED BY THE PERMITTEE IN THE COURSE OF PERFORMING WORK AUTHORIZED BY THIS PERMIT, THE PERMITTEE WILL REPAIR SAID DAMAGE AT ITS SOLE COST AND EXPENSE. REPAIR WORK SHALL BEGIN WITHOUT DELAY AND CONTINUE WITHOUT INTERRUPTION UNTIL COMPLETED. IF DAMAGE IS EXTENSIVE, THE TIME ALLOWED FOR REPAIR WILL BE PRESCRIBED BY THE CITY.

6. THE CITY MAY, AT ANY TIME, DO, ORDER OR HAVE DONE ANY AND ALL WORK CONSIDERED NECESSARY TO RESTORE TO A SAFE CONDITION ANY AREA LEFT BY THE PERMITTEE IN A CONDITION DANGEROUS TO LIFE OR PROPERTY AND UPON DEMAND THE PERMITTEE SHALL PAY TO THE CITY ALL COSTS OF SUCH WORK, MATERIALS, ETC.

7. THIS GRANT OR PRIVILEGE SHALL NOT BE DEEMED OR CONSTRUED TO BE AN EXCLUSIVE FRANCHISE. IT DOES NOT PROHIBIT THE CITY FROM GRANTING OTHER PERMITS OR FRANCHISE RIGHTS OF LIKE NATURE TO OTHER PUBLIC OR PRIVATE UTILITIES, NOR SHALL IT PREVENT THE CITY FROM USING ANY OF ITS ROADS OR PUBLIC PLACES FOR ANY AND ALL PUBLIC USE, OR AFFECT ITS JURISDICTION OVER ALL OR ANY PART OF THEM.

8. THE CITY MAY UNILATERALLY REVOKE, ANNUL, OR TERMINATE, REVISE OR AMEND THIS PERMIT WITHOUT CAUSE AND FOR ANY REASON INCLUDING, BUT NOT LIMITED TO:

A) PERMITTEES FAILURE TO COMPLY WITH ANY PROVISION, REQUIREMENT, OR REGULATION HEREIN SET FORTH;

B) PERMITTEES WILLFUL NEGLECT OF, OR FAILURE TO HEED OR COMPLY WITH, NOTICES GIVEN IT;

C) PERMITTEES FACILITIES ARE NOT INSTALLED, OPERATED, OR MAINTAINED IN CONFORMITY WITH CONDITIONS HEREIN SET FORTH;

D) PERMITTEES FAILURE TO CONFORM TO ANY APPLICABLE LAW OR REGULATION AS CURRENTLY EXISTS OR MAY HEREAFTER BE ENACTED, ADOPTED, OR AMENDED.

9. THIS PERMIT AND ANY UNDERLYING FRANCHISE DOES NOT AUTHORIZE THE CUTTING OF TREES WITH A TRUNK DIAMETER GREATER THAN FOUR (4) INCHES UNLESS AUTHORIZATION IS SPECIFICALLY GRANTED IN WRITING BY THE DIRECTOR OF PUBLIC WORKS.

Right of Way Use Permit

10) A COPY OF THIS PERMIT AND ALL ATTACHMENTS SHALL BE MAINTAINED AT THE WORK SITE AT ALL TIMES. NOT HAVING A COPY OF THE PERMIT ONSITE MAY RESULT IN WORKERS BEING SENT OFF THE RIGHT-OF-WAY.

11) THE CITY HAS ADOPTED AS ITS STANDARD SPECIFICATIONS (SMC 11.05.040) THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION PUBLISHED BY WSDOT. THE CITY HAS ADOPTED (SMC 11.50.050) AS ITS ROAD STANDARDS THE LATEST EDITION OF THE KING COUNTY ROAD STANDARDS. IF THERE ARE CONFLICTS BETWEEN PROJECT SPECIFICATIONS AND THE CITY'S STANDARDS AND SPECIFICATIONS THE LATTER SHALL PREVAIL FOR ANY PROJECT PERMITTED BY THE PUBLIC WORKS DEPARTMENT.

12) ALL CONTRACTOR'S AND SUB-CONTRACTORS ARE TO HAVE A CURRENT WASHINGTON STATE L&I CONTRACTOR'S REGISTRATION NUMBER AND HAVE A CURRENT CITY OF SEATAC BUSINESS LICENSE.

13) THE PERMITTEE IS TO NOTIFY (CALL 206-973-4730 OR YOU MAY EMAIL TO PWJOBSTART@CI.SEATAC.WA.US) THE CITY OF SEATAC ENGINEERING DIVISION 24 HOURS PRIOR TO THE START OF WORK (JOB START) AND 24 HOURS PRIOR TO A REQUIRED OR REQUESTED INSPECTION. FAILURE TO CALL IN A JOB START OR A REQUEST FOR A FINAL INSPECTION WILL RESULT IN ADDITIONAL PERMIT FEES.

14) THE PERMITTEE IS RESPONSIBLE FOR ALL ACTIONS OF THEIR CONTRACTOR.

15) ALL SPOILS AND OR OTHER EXCESS MATERIALS TO BE REMOVED FROM THE RIGHT-OF-WAY ARE TO BE TAKEN TO AN APPROVED SITE. ALL SITES WITHIN THE CITY LIMITS OF SEATAC ARE TO BE APPROVED IN WRITING BY THE ENGINEERING DIVISION PRIOR TO THEIR USE. ANY MATERIAL DISPOSED OF AT AN UNAPPROVED SITE WITHIN THE CITY LIMITS OF THE CITY OF SEATAC SHALL BE REMOVED AND THE SITE RESTORED TO THE SITE'S ORIGINAL OR BETTER CONDITION AT THE EXPENSE OF THE PERMITTEE.

16) A PRE-CONSTRUCTION MEETING IS TO BE HELD 72 HOURS PRIOR TO START OF CONSTRUCTION BETWEEN THE PERMITTEE, THE PERMITTEE'S CONTRACTOR AND SUB-CONTRACTORS, AND THE CITY OF SEATAC ENGINEERING DIVISION.

17) A TRAFFIC CONTROL PLAN PER THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) IS TO BE SUBMITTED TO AND APPROVED BY THE CITY OF SEATAC ENGINEERING DIVISION A MINIMUM OF 48 HOURS PRIOR TO START OF CONSTRUCTION.

18) WORKING HOURS ON RESIDENTIAL STREETS ARE FROM 7:00 A.M. TO 5:00 P.M. MONDAY THROUGH FRIDAY, HOWEVER, ADDITIONAL RESTRICTIONS MAY APPLY BASED ON THE STREET BEING WORKED WITHIN. WORK OUTSIDE THESE HOURS OF WORK AND ON SATURDAYS, SUNDAYS, AND HOLIDAYS WILL REQUIRE PRIOR WRITTEN APPROVAL FROM THE ENGINEERING DIVISION. REQUESTS FOR SUCH AFTER HOURS WORK ON SATURDAY, SUNDAY, OR HOLIDAYS ARE TO BE SUBMITTED TO THE ENGINEERING DIVISION 72 HOURS IN ADVANCE OF SUCH WORK AND MUST BE APPROVED IN WRITING. CITY STAFF TIME FOR AFTER HOURS, SATURDAY, SUNDAY, AND HOLIDAY WORK WILL BE BILLED AT THE RATE OF ONE AND ONE HALF TIMES THE STANDARD HOURLY RATE.

19) A REIMBURSEMENT AUTHORIZATION FORM FOR WORK AFTER HOURS (4:00 P.M. MTWTF), WEEKENDS, AND HOLIDAYS IS TO TO BE FILLED OUT BY THE PERMITTEE AND SUBMITTED TO AND APPROVED BY THE PUBLIC WORKS DIRECTOR, OR DESIGNEE A MINIMUM OF 72 HOURS PRIOR TO THE START OF AFTER HOURS, WEEKEND, OR HOLIDAY WORK.

20) TRENCH BACKFILL IS TO BE 100% CRUSHED, EXCEPT THOSE TRENCHES PARALLEL TO THE RIGHT-OF-WAY CENTERLINE THAT ARE GREATER THAN 100 FT. IN LENGTH AND THOSE TRENCHES THAT ARE OUTSIDE PAVED OR IMPROVED AREAS. THE CITY WILL CONSIDER TRENCHES GREATER THAN 100 FT. IN LENGTH AND AREAS UNDER PAVEMENT AND OTHER RIGHT-OF-WAY IMPROVEMENTS ON A CASE BY CASE BASIS. FACTORS TO CONSIDER INCLUDE GEOTECH REPORTS AND COMPACTION TESTING UNDER PAVED AND IMPROVED AREAS AND POTENTIAL FUTURE IMPROVEMENTS OUTSIDE EXISTING IMPROVED AREAS.

21) TRENCH COMPACTION IS TO BE ACCOMPLISHED IN EITHER 1 FOOT LIFTS USING A MECHANICAL HAND TAMPER OR IN 2 FOOT LIFTS USING A HOE TAMPER (PAC).

22) AFTER BACKFILL AND COMPACTION, AN IMMEDIATE HOT MIX PATCH IS TO BE PLACED AND MAINTAINED IN A MANNER ACCEPTABLE TO THE INSPECTOR. ON ASPHALT PAVEMENT, A PERMANENT HOT MIX PATCH THE SAME THICKNESS AS THE ORIGINAL ASPHALT OR A MINIMUM OF 3 INCHES, WHICHEVER IS THE GREATER, IS TO BE PLACED AND SEALED WITH A PAVING GRADE ASPHALT WITHIN 30 CALENDER DAYS. CEMENT CONCRETE PAVEMENT IS TO BE RESTORED WITH AN 8-SACK MIX, USING EITHER TYPE II OR TYPE III CEMENT, WITHIN 30 CALENDER DAYS.

Right of Way Use Permit

23) ROADS, SHOULDERS, CURBS & GUTTERS, DRIVEWAYS, SIDEWALKS, AND/OR OTHER IMPROVEMENTS IN THE PUBLIC RIGHT-OF-WAY WHICH ARE DAMAGED DURING CONSTRUCTION ARE TO BE REPLACED OR RESTORED TO CURRENT CITY STANDARDS. ALL RESTORATION AND CLEAN-UP WORK ARE TO MEET THE APPROVAL OF THE PUBLIC WORKS INSPECTOR.

24) RESTORATION OF ROADWAY, SHOULDER, DITCH, AND ASSOCIATED APPURTENANCES ARE TO BE COMPLETED WITHIN 30 DAYS IN ACCORDANCE WITH CITY OF SEATAC DETAIL NO. SR-2 "INTERNATIONAL BOULEVARD ROADWAY RESTORATION" (ATTACHED).

25) ANY SIDEWALK DAMAGED OR REMOVED IS TO BE REMOVED TO THE NEXT NEAREST EXPANSION JOINT AND REPLACED PER CURRENT CITY OF SEATAC AND AMERICANS WITH DISABILITIES ACT STANDARDS.

26) NO MATERIAL IS TO BE STOCKPILED OR TEMPORARILY PLACED ON THE PAVEMENT SECTION OF ANY RIGHT-OF-WAY UNLESS SPECIFICALLY APPROVED IN WRITING BY A REPRESENTATIVE OF THE ENGINEERING DIVISION. NO MATERIAL OR EQUIPMENT IS TO BE PLACED, PARKED, STORED, STOCKPILED, ETC. WITHIN THE RIGHT-OF-WAY UNLESS PREVIOUSLY APPROVED IN WRITING BY THE CITY OF SEATAC.

27) THE PUBLIC RIGHT-OF-WAY IS TO BE KEPT CLEAN AND FREE OF DEBRIS, CONSTRUCTION MATERIAL, AND EQUIPMENT AT ALL TIMES PER THE DIRECTION OF THE PUBLIC WORKS INSPECTOR.

28) ALL PRECAUTIONS ARE TO BE TAKEN DURING CONSTRUCTION TO PREVENT SILT AND DEBRIS FROM ENTERING INTO OR COLLECTING IN THE CITY STORM DRAINAGE SYSTEM, WETLAND AREAS, OR FLOWING ONTO ADJOINING PROPERTY. INSTALL AND MAINTAIN TEMPORARY EROSION AND SEDIMENTATION CONTROL BEST MANAGEMENT PRACTICES AS DESCRIBED IN APPENDIX "D" OF THE 2005 KING COUNTY SURFACE WATER DESIGN MANUAL; AS SHOWN ON THE TESC PLANS; AND AS MAY BE DIRECTED BY THE PUBLIC WORKS INSPECTOR. SPECIFICALLY, THE CONTRACTOR SHALL INSTALL CB INSERTS IN ALL EXISTING AND NEW CATCHBASINS. MULCH ALL DISTURBED AREAS NOT CURRENTLY BEING WORKED. HYDROSEED DISTURBED AREAS ONCE WORK IS COMPLETED TO REESTABLISH GROUND COVER. AFTER COMPLETION OF CONSTRUCTION STORM DRAINS ARE TO BE CLEANED AS DIRECTED BY THE CITY PUBLIC WORKS INSPECTOR.

29) THE CONTRACTOR SHALL DESIGNATE A PERSON TO BE TESC SUPERVISOR PER APPENDIX "D" OF THE 2005 KING COUNTY SURFACE WATER DESIGN MANUAL THE TESC SUPERVISOR SHALL BE RESPONSIBLE FOR MAINTENANCE AND REVIEW OF TESC MEASURES AND FOR COMPLIANCE WITH ALL PERMIT CONDITIONS RELATING TO TESC. THE TESC SUPERVISOR MUST BE AVAILABLE FOR RAPID RESPONSE TO TESC PROBLEMS. THE CONTRACTOR WILL PROVIDE THE PUBLIC WORKS INSPECTOR THE NAME AND PHONE NUMBER(S) TO REACH THE TESC SUPERVISOR AT ALL TIMES.

30) THE DRILLING CONTRACTOR IS RESPONSIBLE FOR THE COLLECTION AND DISPOSAL OF CONTAMINATED SOILS THAT ARE UNCOVERED OR GENERATED BY THE DRILLING OPERATION. CLEAN UP AND DISPOSAL OF CONTAMINATED MATERIALS IS AT THE SOLE COST AND EXPENSE OF THE DRILLING CONTRACTOR OR PERMIT APPLICANT.

I AGREE TO ADDRESS THE ABOVE CONDITIONS TO THE SATISFACTION OF THE CITY OF SEATAC.

DATE: Nov. 19, 2009 SIGNATURE: Douglas J. Morell

NAME (PRINT) : Douglas J. Morell

GOLDER ASSOCIATES

SEA TAC
MONITORING WELL DRILLING

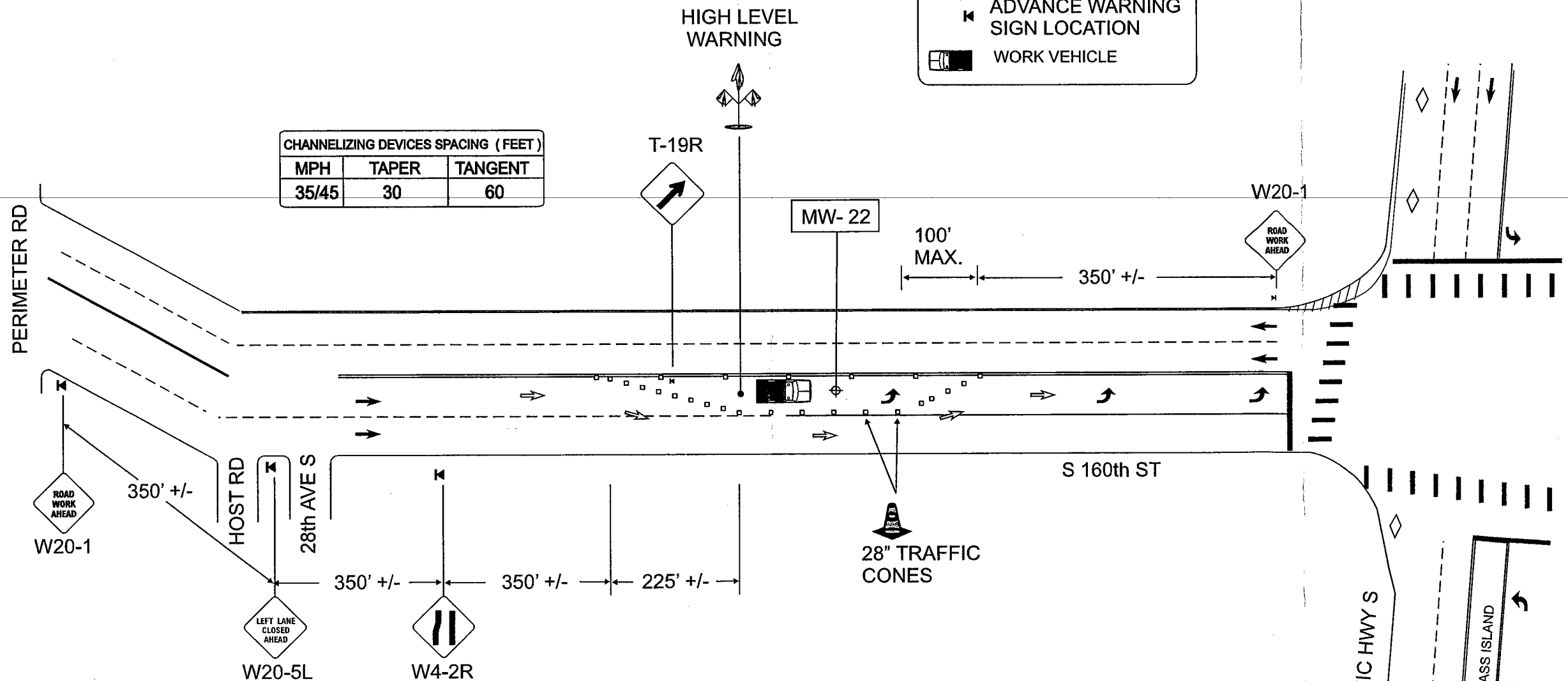
NOT TO SCALE

TRAFFIC CONTROL
PLAN #1 OF 2

LEGENDS

- TRAFFIC DIRECTION
- TEM .TRAFFIC DIRECTION
- CHANNELIZING DEVICE
- ADVANCE WARNING SIGN LOCATION
- WORK VEHICLE

CHANNELIZING DEVICES SPACING (FEET)		
MPH	TAPER	TANGENT
35/45	30	60



TRAFFIC CONTROL SERVICES
FELIPE J. MACIAS, TCS #002689
TELEPHONE: (425) 746-1060
E-MAIL: jack@trafficcontrolservices.net

REVISED NOVEMBER 13, 2009

SITE COPY

Rev09-00308

GOLDER ASSOCIATES
SEA TAC
MONITORING WELL DRILLING

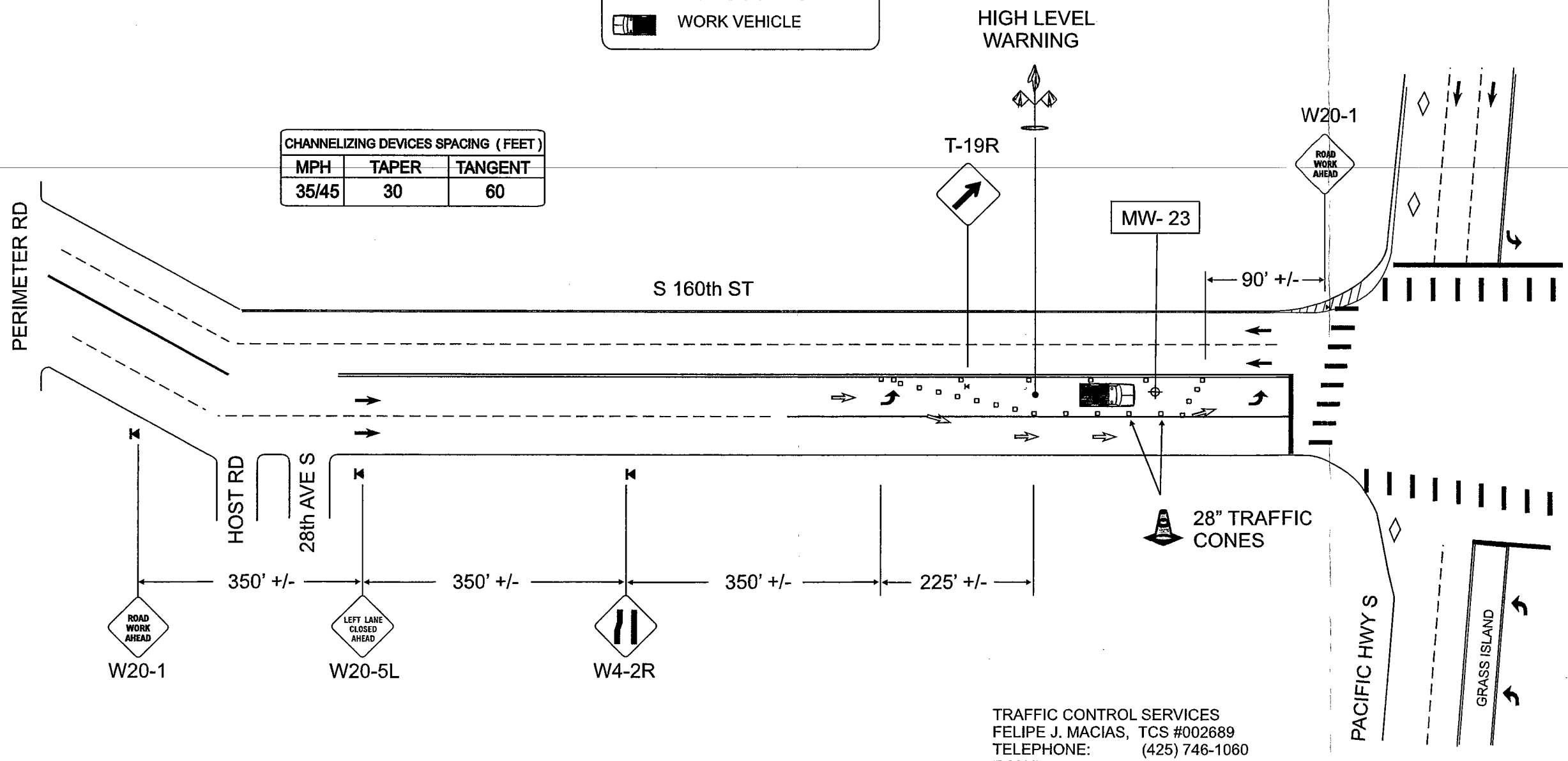
LEGENDS

- TRAFFIC DIRECTION
- TEM .TRAFFIC DIRECTION
- CHANNELIZING DEVICE
- ADVANCE WARNING SIGN LOCATION
- WORK VEHICLE

NOT TO SCALE

TRAFFIC CONTROL
PLAN #2 OF 2

CHANNELIZING DEVICES SPACING (FEET)		
MPH	TAPER	TANGENT
35/45	30	60



TRAFFIC CONTROL SERVICES
FELIPE J. MACIAS, TCS #002689
TELEPHONE: (425) 746-1060
E-MAIL: jack@trafficcontrolservices.net
REVISED NOVEMBER 13, 2009

Row09 - 00308

SITE COPY

GOLDER ASSOCIATES

PROJECT LOCATED
IN THE CITY OF:
SEATAC,WAV

CHANNELIZING DEVICES SPACING (FEET)		
MPH	TAPER	TANGENT
35/45	30	40

LEGENDS

- SEQUENTIAL ARROW BOARD
- TRAFFIC DIRECTION
- CHANNELIZING DEVICE
- ADVANCE WARNING SIGN LOCATION
- WORK VEHICLE

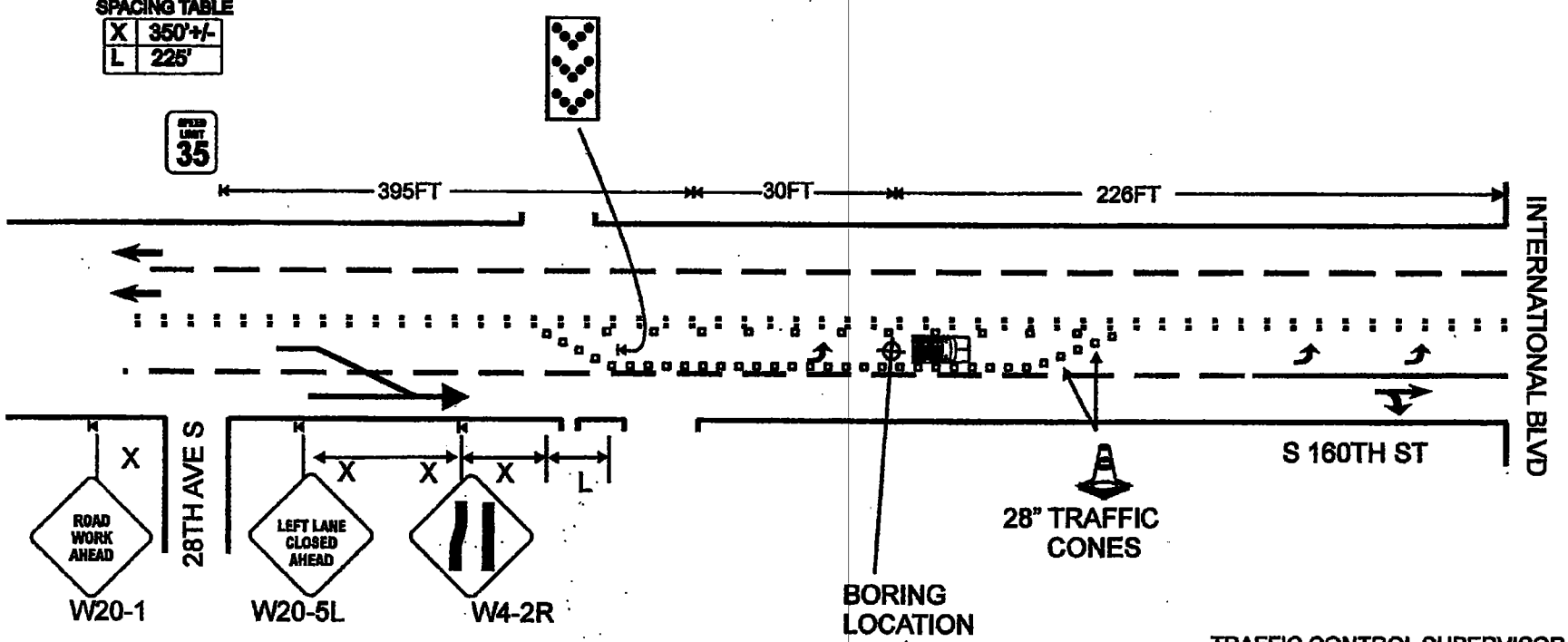
N
W E
S

NOT TO SCALE

TRAFFIC CONTROL PLAN #1 OF 1

SPACING TABLE

X	350'+/-
L	225'



TRAFFIC CONTROL SUPERVISOR

NAME: FELIPE J. MACIAS
CO. TRAFFIC CONTROL SERVICES
TELEPHONE: (425) 746-1060
TCS#02689, EXPIRATION 11/30/2009

* Schedule at least one week w/ Traffic Ctrl Svcs 800-766-5272

** call city 24hrs before sampling
Scott Douglas 206-730-0403
No permit if work less than 15minutes

CHEMICAL SUBSTANCE

The following safety protocol is intended for personnel who, during the course of their work, may be exposed to or encounter chemical or biological substances not usually encountered under normal working conditions. Anyone who continually encounters chemical or biological substances will have the appropriate OSHA training. Any individual who does not usually deal with but comes across chemical or biological substances should locate someone with the appropriate OSHA training immediately and inform them of the hazard. These chemical or biological substances may include the residues from industrial processes or commercial activities, compounds used in manufacturing, and/or materials present in specialized work environments. These substances, if present in sufficient concentrations, could potentially affect worker health and safety. Therefore, it is important to be aware that such hazards could exist and take appropriate measures to reduce and/or eliminate potential exposure.

Note

This protocol does not include exposure to ionizing radiation. Specialized safety measures, monitoring and testing is required for such environments, and is beyond the scope of this protocol.

As a matter of company policy, Golder personnel will not work in chemical and/or biological environments considered immediately dangerous to life or health (IDLH), or requiring personal protective measures to US Environmental Protection Agency (USEPA) Level A (i.e., self-contained breathing apparatus (SCBA) and fully-encapsulating, chemically resistant clothing), unless specific and specialized training for working in such environments is provided to personnel, all required equipment is provided, and all required monitoring (air, exposure, medical, etc.) is undertaken.

Chemicals have the potential to cause irritating localized effects, acute toxic effects or longer term carcinogenic effects. The hazards posed by each chemical will depend on the type of chemical, the form in which it is available for exposure, the frequency of exposure and the duration of each exposure.

Chemicals that employees can come into contact with could be in a solid, liquid or gas form. Each form of each chemical will pose its own hazards.

Pathways leading to possible health effects relate to the inhalation, ingestion or dermal contact with the chemical.

Using lead as an example it can be ingested as solid, cause burns to the skin as a liquid and inhaled as a gas following heating, or when sprayed as a component of a product such as paint. Each of these three forms will cause differing potential acute or toxic health effects either immediately or over time.

For each exposure scenario, the specific physical and chemical properties of chemicals will strongly influence the hazard posed by the chemical. Factors such as boiling point, vapor pressure, flammable limits, melting point, freezing point, corrosiveness, auto ignition temperatures, and vapor density will all affect the risk of injury/illness to an exposed worker.

HAZARDS

- Inhalation of chemical and/or biological substances;
- Ingestion of chemical and/or biological substances; and
- Contact with or absorption of chemical and/or biological substances.

POSSIBLE CONSEQUENCES

- Short term health effects such as eye irritations, breathing difficulties, burns and poisoning
- Long term health effects such as organ damage, possible carcinogenic related disease

PRECAUTIONS

Prior to undertaking site work:

- Review the historical activities at and/or previous use of the site or environment in question to identify potential chemicals and/or biological substances that may be present. If possible, ask the Client and/or former site workers for information.
- If chemicals are known to be in use at a site, obtain and review Material Safety Data Sheet (MSDS) documentation.
- Once potential chemical and/or biological hazards have been identified, consult reference materials concerning health effects, allowable exposure limits and appropriate personal protective equipment to be used when encountering such substances. Standard references, available at Golder, include:
    - OSHA Permissible Exposure Limit (PEL) for General Industry: 29 CFR 1910.1000 Z-1 Table.
    - OSHA Permissible Exposure Limit (PEL) for Construction Industry: 29 CFR 1926.55 Appendix A.
    - OSHA Permissible Exposure Limit (PEL) for Maritime: 29 CFR 1915.1000 Table Z-Shipyards.
    - National Institute for Occupational Safety and Health (NIOSH) "Pocket Guide to Chemical Hazards" (latest edition).
    - American Conference of Governmental Industrial Hygienists (ACGIH) "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" (latest edition).
- Air monitoring requirements (i.e., the selection of specific, air monitoring devices such as photo and flame ionization detectors, combustible gas meters, chemical specific meters, etc.), the calibration and maintenance requirements of such equipment, the selection and use of appropriate

respiratory protection equipment, project-specific medical monitoring requirements, and other procedures deemed appropriate for the protection of human health will be detailed in the HASP or a separate SWP.

- It is important to note that the actual conditions encountered at a site may be different from those anticipated. Therefore, should levels of contamination (i.e., concentrations of chemical and/or biological substances) or physical working conditions (i.e., unstable ground, etc.) be encountered at a site that are substantially different from those originally anticipated, or should any situation arise which is obviously beyond the scope of the monitoring, respiratory protection and/or decontamination procedures specified in the plan, work activities will be halted, pending review by the Project Manager and/or Project Health and Safety Officer.

Revised procedures and protective measures, compatible with the site conditions encountered, will then be identified and implemented.

MINIMUM PERSONAL PROTECTION EQUIPMENT REQUIRED

- Steel-toed safety boots
- Coveralls
- Hard hat
- Respirator (if required)
- High visibility reflective vest (around moving equipment)
- Hearing Protection (as conditions dictate)
- Eye Protection (as conditions dictate)

Additional Equipment (Chemical and/or Biological Substances)

- Chemically-resistant safety boots
- Chemically-resistant gloves (latex, nitrile, butyl rubber, etc.)
- Chemically-resistant clothing (tyvek, samex suits, etc.)
- Air purifying respirators or supplied air equipment
- Air monitoring equipment

TRAINING

- OSHA 10 hour Construction Safety course
- First Aid and CPR courses
- 40 Hour HAZWOPER Class or specific Hazard Communication Training

APPLICABLE OSHA REGULATION PARTS

Further information can be found on chemical and/or biological exposure measures in 29 CFR Sections 1910, 1915, & 1926 as noted on page 2 and:

29 CFR 1910.1200 Hazard Communication

29 CFR 1910.120 HAZWOPER

DRILLING

Drilling techniques include auger, rotary, percussion, and sonic which all have high-speed rotating and moving components which require caution to avoid injury when working.

Drilling can be safely undertaken in all types of terrain and in all types of conditions, if proper precautions are taken. Because of the variety of situations staff may experience, it is important to recognize and be aware of potential hazards associated with this operation.

KEY HAZARDS

- Impact by moving equipment;
- Encountering subsurface utilities;
- Mast contact with overhead wires;
- Traversing uneven ground to drill, document and sample:
- Clothing, fingers or other body parts caught in high speed and high torque rotating equipment.
- Noise generated by the equipment or surroundings
- Dust generated by equipment

PRECAUTIONS

Before Drilling:

- Inform staff of the emergency shut-off switch on the rig and have the driller test it daily.
- Get as much site-specific information as possible concerning ground conditions and surface obstructions. Ask the Project Manager and, if possible, the Client or Client Contact.
- Use available soils information (i.e., previous reports, US Geological Survey Surficial Geology Maps, colleagues who have had experience in the area) to ascertain potential subsurface conditions.
- Each drilling location should be inspected by the GAI field leader and subcontractor supervisor and approved as safe for drilling. Consider access requirements, and look for evidence of underground services (i.e., buried utility lines, wire, conduits, tanks, service boxes, plugs, exposed pipe, trenches, etc.), and locate the boreholes accordingly (see Test Pit).
- Always utilize state, local, or 811 utility location services to get clearance to proceed at each drilling location. Plan at least 48 hours in advance prior to scheduled work.
- Look for surface and overhead features that may represent a hazard. Overhead power lines are a major concern and must be avoided or de-energized. Even without direct contact, electricity can arc from the power lines to another object (see Test Pit)
- Do not pile drill spoil such that it could endanger workers (see Test Pit)
- Drill rigs should not be operated within 12 feet of lines less than 132 KV; within 20 feet of lines 132 to 330 KV; or within 26 feet of lines greater than 330 KV.
- Drill rig should not be moved from one location to the next with the mast raised.
- Drill rig equipment should be safety inspected by the subcontractor on a daily basis dependent on specific use, field conditions, and manufacturer's recommendations.

During Drilling

- Identify a safe viewing area where you can observe the drilling operations, but not so close that you are either in danger of being struck by the equipment swinging from wirelines or winch cables.
- Always make sure you have a route of escape, should things go wrong. Be aware of wind direction and consider escaping upwind if subsurface contaminants are involved
- Make sure the drill crew knows where you are **at all times**.
- Approach the drill rig during times when it is safest to do so. If necessary, signal the operator first and make sure the equipment is stopped before you approach.
- Avoid the temptation to act as the driller's helper. Do not handle heavy rods or equipment. Remember that the drilling contractor is responsible for providing the necessary drilling equipment and personnel who are trained in its safe use. This also includes traffic control needs, unless otherwise specifically indicated by GAI project manager (i.e. for road drilling where GAI provided the necessary traffic control.)
- Know where everyone is at all times;
- Never use gasoline or any other combustible solvent as a cleaning agent. It is a fire and explosion hazard;
- Use a personal fall arrest system while working at any height above 5 feet on the mast or on top of the rig;
- Do not perform maintenance while the rig is running;
- Do not remove any blocking or jacks from under rig while the rig is drilling;
- Stand clear of cables as much as possible while pulling pipe or while the rig is under a heavy strain;
- When racking drill rods for rotary drilling/sampling, the total length of rods racked shall not be more than 1.5 times the height of the mast;
- Do not wear loose clothing or jewelry around moving machinery;
- Be on guard for pinch and shear hazards for fingers and toes--especially around the drill string;
- Practice good housekeeping--keep excess spoil material and unnecessary equipment well out of the way;
- When jumping batteries during cold weather starting, be sure of terminal connections. Connect the positive terminal first, then the negative terminal. Batteries can explode, spraying acid to eyes and skin; wear protective goggles and clothing;
- Communicate effectively; if using hand signals, make sure everyone knows what they are;
- Know where fire extinguisher(s) are and how to use them. Check the charge condition before the start of project activities, and periodically thereafter;
- All hoses carrying high pressure air or fluids should have safety chains or cables at connectors;
- Lighting on the site or rig shall be properly installed and sufficient in quantity to provide adequate illumination for night work. All receptacles shall be protected with a ground fault circuit interrupter (GFCI);
- Weight indicators should be standard equipment;
- All hooks shall have safety latches and be checked between borings;
- Do not ride on hook ropes or other traveling lines on rig;
- Keep walkways clear;

- Using a properly calibrated real-time air quality instrumentation,, monitor for suspected airborne gas hazards (combustible and/or toxic as applicable);
- Ear protection must be worn by employees working in close proximity to equipment that generates noise (85 dB(A) or greater);
- Wear required respiratory protective equipment when hazards from toxic chemicals are suspected (See Respiratory Protection);
- Observe proper lifting techniques;
- Fuel tanks should be properly installed according to local fire codes with appropriate secondary contaminant;
- Wastewater and drilling fluids must be properly diverted or contained;
- Containerize drilling spoils and fluids suspected to be contaminated as required by environmental regulatory requirements;
- Protect the public by use of proper barricades, ramps over pipes, warning signs and guard rails;
- Use caution during welding activities, remain at a safe distance and do not look directly at the welding arc. The drillers will need to wear welding goggles and gloves; properly ground arc-welding equipment; properly vent PVC solvent glue vapors from installed well casings before cutting or welding the casings; and
- Have a first-aid safety kit handy.

After Drilling

- Properly decontaminate all drilling equipment, as required, before leaving. This includes drilling tools, pipe, pumping equipment, and mud-pits, in addition to the drill rig and drill string;
- Never leave a borehole open for an extended period. Always backfill and compact the near surface soil after you have completed sampling, any instrumentation installation(s) and documentation activities. Open drill holes represent a potential hazard to yourself and others.
- Clean up waste materials from drilling operations, such as discarded containers, hoses, damaged tools or blocking, and wasted pipe and casing, etc. Dispose of properly.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard Hat
- Steel Toe Safety Boots
- High Visibility Vest
- Hearing Protection
- Safety Glasses
- Close fitting clothing
- Dust Mask (Respirator if required)
- Gloves

TRAINING

- OSHA 10 hour Construction Safety course
- First Aid and CPR courses

APPLICABLE OSHA REGULATION PARTS

The following are the major OSHA standards impacted by this work: 29 CFR 1926

- .21 Safety Training
- .23 First Aid
- .52 Noise Exposure
- .59 Hazard Communication
- .96 Foot Protection
- .100 Head Protection
- .101 Hearing Protection
- .102 Eye and Face Protection
- .103 Respiratory Protection
- .351 Arc Welding
- .403 General Electrical
- .404 Wiring
- .500-503 Fall Protection
- .601 Motor Vehicles
- Subpart Z – Toxic and Hazardous Substances

SAMPLING CONTAMINATED GROUNDWATER

Photo ionizing air monitoring instrument – A direct reading air monitoring instrument equipped with an ultraviolet light source that ionizes organic vapours with ionization potentials less than that of the lamp.
Flame ionizing air monitoring instrument – A direct reading air monitoring instrument equipped with a hydrogen flame that ionizes (through combustion) all combustible organic vapours.

KEY HAZARDS

- Chemical exposure via inhalation, skin contact or ingestion (See Chemical SWP);
- Heat or cold stress (See Extreme Weather SWP);
- Lightning and high winds;
- Drilling (See Drilling SWP)
- Motor vehicles;
- Slip, Trip and Fall and
- Electrical (See Electrical SWP)
- Insect bites/stings
- Heavy lifting

Chemical Hazards

Groundwater sampling often involves the use of line operated pumps to extract water from the subsurface. Ensure that the generator utilized is equipped with ground fault interrupter (GFI) circuitry to prevent possible shock hazards. Collect development or purge water in containers as required for proper disposal. Protect the public and client staff from investigation derived waste (IDW) by utilizing secure areas for storage. If internal combustion engines are used (generators), they must be in an area with adequate ventilation, and in an area free of combustible materials (i.e. dry grass, gasoline, etc.).

Keep your face as far as possible from the opening of the well to avoid inhalation of volatile contaminants. Avoid any direct contact with a skin surface or eyes from ground water. Air monitoring should be performed utilizing a photo ionizing or flame ionizing instrument that can measure a minimum of 0.5 PPM organic vapour. Calibrate the air monitoring instrument daily as described in the literature provided. In general, total organic vapour readings of less than 1 PPM are safe. Steady breathing zone measurements at 1 PPM or above warrant engineering controls (ventilation) or personal protective equipment (respiratory protection) to reduce exposure. Concentrations in the well opening that exceed 500 PPM could indicate a large quantity of organic vapour, not only a toxicity risk but also a

flammability risk. Wells with high organic vapour concentrations should be sampled carefully with a minimum of ferrous tools or other sources of ignition.

Maintain material safety data sheets (MSDS) or equivalent for all chemicals of concern at the site including any chemicals required as part of the sampling program (i.e. calibration gas, sample preservatives, etc.). Detailed chemical safety information can be found at www.osha.gov and www.cdc.gov/NIOSH

PRECAUTIONS

Sampling for contaminated groundwater often occurs at sites that are known hazardous wastes or adjacent to those sites. Follow all local regulations in regards to working at such properties.

This project presents construction related hazards such as trips, falls, and slips, and resulting injuries which are typical of undeveloped or industrial sites.

- Wear proper footwear including steel toes for earthwork
- Clean boots and testing equipment, since slips may result from mud on a hard surface.
- Avoid jumping across obstacles (ie: anchor trenches).
- Exercise caution while walking on improvised plank bridges across ditches or anchor trenches.

Observe site traffic rules and right-of-way practices at all times. Heavy equipment and trucks should be assumed to have the right-of-way. Generally, the following rules apply to determining the right-of-way:

- The heavier piece of equipment has the right-of-way.
- Loaded trucks and equipment have precedence over unloaded ones.
- Equipment moving down slope has precedence over one going upslope.

Other general site vehicle operation rules are as follows:

- Observe speed limits within the site which usually do not exceed 15 miles per hour;
- Do not follow another vehicle closely; material may fall off the vehicle or be thrown by the tires when in motion;
- Large equipment may have a significant “blind spot” on the right side of the vehicle. Avoid passing heavy equipment unless specifically instructed to do so by the operator of that equipment. Assume the equipment operator does not know you are present in an area and maneuver accordingly;
- Listen for and heed back-up alarms from heavy equipment;
- When possible, make eye contact with equipment operators;
- Park the company vehicle near the work location to mark your presence in the area. Wear high visibility clothing (reflective vests) to aid the operator in noticing your presence. Use extreme caution when operating in dusty conditions. Drive with your headlights on to increase your visibility. If conditions become dusty and significantly reduce visibility across the site, leave the area and wait for conditions to improve and contact the Golder Project Manager.

- Do not ride on the contractor's equipment, and do not attempt to operate any such equipment.
- Do not ride on anything that does not have a seat designed for human occupancy.
- Wear your seatbelt at all times.

Because monitoring wells may provide habitat for insects such as bees, spiders and wasps, caution should be take when initially opening the well. When opening the well protective cover, open the cover and stand back for a few minutes to allow any flying insects an opportunity to leave. Prior to removing the well cap, inspect the inside of the protective casing to make sure no inhabitants of the well are present.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard hat as required
- Safety glasses
- Respirator with appropriate cartridges as required.
- High visibility clothing (reflective vest)
- Steel-toed and shank safety boots
- Nitrile (or equivalent) gloves

TRAINING

- 40 hour HAZWOPER or equivalent local requirement (8 hour annual refresher required)
- Golder and site specific induction
- Emergency and First Aid Course

HEARING PROTECTION

INTRODUCTION

Although noise-induced hearing loss is one of the most common occupational illnesses, it is often ignored because there are no visible effects, it usually develops over a long period of time, and, except in very rare cases, there is no pain. What does occur is a progressive loss of communication, socialization, and responsiveness to the environment.

Work-related hearing loss continues to be a critical workplace safety and health issue. The National Institute for Occupational Safety and Health (NIOSH) and the occupational safety and health community named hearing loss one of the 21 priority areas for research in the next century. Noise-induced hearing loss is 100 percent preventable but once acquired, hearing loss is permanent and irreversible. Therefore, prevention measures must be taken by employers and workers to ensure the protection of workers' hearing.

HAZARDS AND POSSIBLE CONSEQUENCES

Golder Associates provides earplugs and/or earmuffs to all employees who work where peak noise levels may exceed 85 dB (A). Unless specific noise readings are available to demonstrate otherwise, noise levels near heavy equipment, drill rigs, pile drivers, concrete coring devices etc. should be assumed to potentially exceed 85 dB(A) or in areas where signs are posted requiring hearing protection. Employees shall use the issued hearing protection devices when in any of the following situations:

- When work area safety requirements include hearing protection,
- When working in an area of steady state (continuous) noise which interferes with normal speech when individuals are standing at a distance of three feet
- When working in an area of any impact noise (such as driving casing or piles) which is loud enough to cause discomfort
- When noise levels measured with a properly calibrated sound level meter exceed 85 dB(A)

CONTROL MEASURES AND PPE

Employees shall comply with all ear plugs/muffs manufacturer’s guidelines. All hearing protection utilizes a NRR (Noise Reduction Rating) System which is measured in dB’s.

TRAINING

Employees shall be trained in the use, limitations, and how to properly don any type of hearing protection before usage. From the training, employees will learn about proper maintenance of hearing protection that is not designed for a single use.

REGULATORY CITATION

Federal OSHA Regulations are found in 29 CFR 1910.95 Occupational Noise Exposure. Some States have adopted different standards applicable to this topic or may have different enforcement policies. This regulation requires that the employer shall administer a continuing, effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted

average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent.

SLIPS, TRIPS AND FALLS

Over half of all office injuries are the result of falls. The majority of falls occur on slippery, uneven, defective, cluttered or obstructed walking surfaces. A significant number of debilitating falls are the result of a person falling out of his or her own chair, typically while in the process of sitting down, or leaning back. Falls from elevations while reaching for an overhead object are also common, and frequently cause severe injuries.

PRECAUTIONS WHEN IN THE OFFICE - HOUSEKEEPING

- Watch your step! Wipe up spilled liquids immediately. Tripping hazards such as defective floors, missing floor tiles, loose or matted carpeting, bunched-up floor mats, extension cords, phone cords, etc., should be corrected or reported and repaired immediately. Don't carry loads that are so large or bulky that the line of vision is impaired.
- Be careful when sitting down. Sitting on the edge of a seat, sitting too far back, or kicking the chair out from under one's self can result in a fall and fractured vertebrae. Occasionally check the mechanical condition of chairs commonly used.
- Be especially careful going up and down stairs. Avoid using stairs if both arms are loaded. Watch your step and if possible always have one hand free to use a railing. Maintain 3 points of contact when ascending/descending.

PRECAUTIONS WHEN OUT IN THE FIELD

In the field, falls are the second leading cause of work-related deaths.

TYPES OF FALLS

Falls are of two basic types: elevated falls and same-level falls. Same-level falls are most frequent, but elevated falls are more severe.

- Same-Level Falls: high frequency--low severity
- Elevated Falls: lower frequency--high severity

Same-level falls are generally slips or trips. Injury results when the individual hits a walking or working surface or strikes some other object during the fall. Over 60 percent of elevated falls are from less than 10 feet.

SAME-LEVEL FALLS

Examples of same-level falls are described below.

SLIP AND FALL

Slips are primarily caused by a slippery surface and compounded by wearing the wrong footwear. In normal walking, two types of slips occur. The first of these occurs as the heel of the forward foot contacts the walking surface. Then, the front foot slips forward, and the person falls backward.

The second type of fall occurs when the rear foot slips backward. The force to move forward is on the sole of the rear foot. As the rear heal is lifted and the force moves forward to the front of the sole, the foot slips back and the person falls.

The force that allows you to walk without slipping is commonly referred to as "traction." Common experience shows that dry concrete sidewalks have good traction, while icy surfaces or freshly waxed floors can have low traction. Technically, traction is measured as the "coefficient of friction." A higher coefficient of friction means more friction, and therefore more traction. The coefficient of friction depends on two things: the quality of both the walking surface and the soles of your shoes.

To prevent slips and falls, a high coefficient of friction (COF) between the shoe and walking surface is needed. On icy, wet, and oily surfaces, the COF can be as low as 0.10 with shoes that are not slip resistant. A COF of 0.40 to 0.50 or more is needed for excellent traction. To put these figures in perspective, a brushed concrete surface and a rubber heel will often show a COF greater than 1.0. Leather soles on a wet smooth surface, such as ceramic tile or ice, may have a COF as low as 0.10.

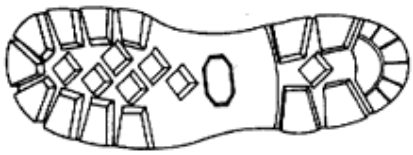


Figure 1. Shoes with soft rubber soles and heels with rubber cleats provide a high coefficient of friction (COF).

Providing dry walking and working surfaces and slip-resistant footwear are the answer to slips and their resultant falls and injuries. Obviously, high heels, with minimal heel-to-surface contact, taps on heels, and shoes with leather or other hard, smooth-surfaced soles lead to slips, falls, and injuries. Shoes with rubber-cleated, soft soles and heels provide a high COF and are recommended for most agricultural work.

In work areas where the walking and working surface is likely to be slippery, non-skid strips or floor coatings should be used. Since a COF of 0.40 to 0.50 is preferred for walking and working surfaces, we should strive for a surface which provides a minimum of 50 percent of this friction. If the working surface is very slippery, no footwear will provide a safe COF.

Trip and Fall Trips occur when the front foot strikes an object and is suddenly stopped. The upper body is then thrown forward, and a fall occurs.

As little as a 3/8" rise in a walkway can cause a person to "stub" his toe resulting in a trip and fall. The same thing can happen going up a flight of stairs: only a slight difference in the height of subsequent steps and a person can trip and fall.

CONTRIBUTING FACTORS

Proper housekeeping in work and walking areas can contribute to safety and the prevention of falls. Not only is it important to maintain a safe working environment and walking surface, these areas must also be kept free of obstacles which can cause slips and trips. One method which promotes good housekeeping in work environments is the painting of yellow lines to identify working and walking areas. These areas should never be obstructed by objects of any kind.

Adequate lighting to ensure proper vision is also important in the prevention of slips and falls. Moving from light to dark areas, or vice versa, can cause temporary vision problems that might be just enough to cause a person to slip on an oil spill or trip over a misplaced object.

Carrying an oversized object can also obstruct one's vision and result in a slip or a trip. This is a particularly serious problem on stairs.

BEHAVIORS THAT LEAD TO FALLS

In addition to wearing the wrong footwear, there are specific behaviors which can lead to slips, trips, and falls. Walking too fast or running can cause major problems. In normal walking, the most force is exerted when the heel strikes the ground, but in fast walking or running, one lands harder on the heel of the front foot and pushes harder off the sole of the rear foot; thus, a greater COF is required to prevent slips and falls. Rapid changes in direction create a similar problem.

Other problems that can lead to slips, trips and falls are: distractions; not watching where one is going; carrying materials which obstruct view; wearing sunglasses in low-light areas; and failure to use handrails. These and other behaviors, caused by lack of knowledge, impatience, or bad habits developed from past experiences, can lead to falls, injuries, or even death.

SAMPLING CONTAMINATED SOIL/WASTE PILES

DEFINITIONS

Photo ionizing air monitoring instrument (PID): A direct reading air monitoring instrument equipped with an ultraviolet light source that ionizes organic vapors with ionization potentials less than that of the lamp.
Flame ionizing air monitoring instrument (FID): A direct reading air monitoring instrument equipped with a hydrogen flame that ionizes (through combustion) all combustible organic vapors.

KEY HAZARDS

- Chemical exposure via inhalation, skin contact or ingestion (See Chemical SWP).
- Heat or cold stress (See Inclement Weather SWP).
- Lightning and high winds.
- Drilling (See Drilling SWP).
- Motor vehicles.
- Slip, Trip and Fall.
- Electrical (See Electrical SWP).
- Excavations (See Excavation SWP).
- Working near or over water (See Working over water SWP).

Chemical Hazards

Sampling of contaminated soils involves obtaining representative samples from waste piles, beneath bodies of water, on level or sloped grounds and in excavations. Avoid any direct contact from contaminated soil with a skin surface or eyes. Air monitoring should be performed utilizing an intrinsically safe photo ionizing or flame ionizing instrument that can measure a minimum of 0.5 PPM organic vapor. Calibrate the air monitoring instrument daily as described in the literature provided. In general, total organic vapor readings of less than 1 PPM are safe. Steady breathing zone measurements at 1 PPM or above warrant engineering controls (ventilation) or personal protective equipment (respiratory protection) to reduce exposure; however, review of the site specific health and safety plan will aid in understanding the site-specific hazards. Concentrations in excavations that exceed 500 PPM could indicate a large quantity of organic vapor; not only toxicity risks but also a flammability risk. Soils with high organic vapor concentrations should be sampled carefully with attention paid to the types of tools used, since some tools may be or aid sources of ignition.
Maintain material safety data sheets (MSDS) or equivalent for all chemicals of concern at the site. Detailed chemical safety information can be found at www.osha.gov and www.cdc.gov/NIOSH.

Sampling in excavations and over water entail additional risks requiring the use of additional SWPs.

PRECAUTIONS

Sampling for contaminated soils or sludges often occurs at sites that are known hazardous waste sites or adjacent to those sites. Follow all local regulations in regards to working at such properties.

This project task commonly presents construction-related hazards such as trips, falls, and slips, and resulting injuries which are typical of undeveloped or industrial sites. In order to aid in preventing these types of hazards:

- Wear proper footwear including steel toes for earthwork.
- Wear long pants and long sleeve shirts.
- Clean boots and testing equipment as needed, since slips may result from mud on a hard surface.
- Avoid jumping across obstacles (i.e.: anchor trenches).
- Exercise caution while walking on improvised plank bridges across ditches or anchor trenches.
- Wear high visibility clothing (reflective vests) to aid motor vehicle operators in noticing your presence.

When traversing a site by foot or when operating a motor vehicle observe site traffic rules and right-of-way practices at all times. Heavy equipment and trucks should be assumed to have the right-of-way. Generally, the following rules apply to determining the right-of-way:

- The heavier piece of equipment has the right-of-way.
- Loaded trucks and equipment have precedence over unloaded ones.
- Equipment moving down slope has precedence over one going upslope.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard hat as required.
- Safety glasses.
- Respirator with appropriate cartridges as required.
- High visibility clothing (reflective vest).
- Steel-toed and shank safety boots.
- Nitrile (or equivalent) gloves.

TRAINING

- 10 hour OSHA Construction Training
- Golder and site specific induction
- Emergency and First Aid Course

WORKING AROUND HEAVY EQUIPMENT

The following safety protocol is intended for persons visiting sites that employ the use of heavy equipment. Such sites include surface and underground mines, remediation areas and construction sites. Heavy equipment activity may change daily or hourly, with differing potential hazards to be identified and addressed.

KEY HAZARDS

- Haulage trucks and dump trucks
- Shovels and Draglines
- Excavators
- Bulldozers
- Mobile Drill rigs
- Cranes
- Other mobile equipment, such as water trucks, graders, and pick-up trucks

One of the most important points to remember about working around any piece of heavy equipment is that the operator has a limited field of vision. Always make eye contact with the operator of the equipment prior to moving into swing/operating radius.

PRECAUTIONS

- Make arrangements / discuss protocols with operator during daily tailgate or at shift change or when operators and/or operations change.
- Never approach an operational piece of heavy equipment until the operator is aware of your presence, your desire to approach and signals the OK – where possible use radio contact.
- Stand in a safe location well outside the maximum extended reach of the shovel, dragline or excavator arm, and out of the way of other mobile equipment. With an excavator, the optimum location is within the quadrant of the operator's visual coverage.
- When contact is made, either radio or visual, advise the operator of your wish to approach the equipment. The operator may want to complete a task prior to shutting down. If so, remain at the same location until the operator signals the OK to advance. Usually this will involve the bucket being lowered to the floor, however practices may vary between sites. It is advisable to check with the site superintendent/foreman before entering areas where heavy equipment is operating.
- Advise the operator of your task and requirements. Complete your task, advise the operator that you have completed your work, and depart the work area.

SAFE DRIVING PRACTICES

- All pieces of haulage equipment and large mobile equipment will have the right of way on all roadways. All other equipment will give way and will keep a safe distance until the roadway is

cleared.

- In areas of traffic congestion and narrow travel-ways, the smallest vehicle shall always yield to larger vehicles.
- When following heavy equipment, a safe travelling distance should be maintained at all times. The driver's side mirror should always be visible to you, and hence you to the operator.
- On the majority of operating surface mines, all traffic travels on the left-hand side of the road. However practices may vary between sites. Check with the site superintendent/foreman before travelling on site roadways.
- Overtaking haulage trucks and dump trucks should be done only when told to by the operator of the truck. Visual and/or radio contact must be made with the operator.

RESPONSIBILITIES

It is your responsibility to understand the traffic and equipment operating rules of the site. Ask the site superintendent/foreman for this information upon entering the site for the first time. This information should be reviewed during daily tailgate meetings.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard Hat
- Safety Boots
- High Visibility Vest
- Hearing Protection
- Safety Glasses

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working on projects with active uncontrolled traffic conditions (e.g., in street/highway right-of-ways).

2.0 TRAFFIC SAFETY

Traffic control is required whenever the uncontrolled movement of vehicle traffic could be hazardous to workers. Working on projects with active uncontrolled traffic conditions (e.g., in street/highway right-of-ways) can be very dangerous or even life threatening without the proper safety controls, awareness, and signage. Golder's project manager and site safety officer should develop a traffic control plan that will meet local, state, and federal regulations to ensure the safety of Golder personnel.

3.0 TRAFFIC CONTROLS

3.1 Non-Lane Closure

These traffic controls or actions are intended to protect Golder personnel without using lane closures or restricting traffic flow. Examples of non-lane closure activities include working at commercial properties (e.g., retail petroleum stations) or observing rock slopes in a right-of-way. Best management traffic control procedures include one or more of the following practices:

- Performing work within traffic areas at off-peak hours, if possible;
- Placing orange reflective cones and caution tape around the designated work area;
- Placing high-visibility signs to warn drivers of designated work areas;
- Placing your vehicle between you and oncoming traffic;
- Wearing high-visibility safety apparel, including high visibility vest intended to provide visibility during both daytime and nighttime (Note: must meet the Performance Class 2 or 3 requirements of the ANSI/ ISEA 107–2004)
- Wearing safety glasses to prevent dust or other debris from entering your eyes;
- Parking your vehicle behind the Jersey barrier or guardrail and exiting your vehicle on the opposite side of traffic;
- Turning on your vehicle's flasher lights and/or a roof-mounted flashing amber light;
- Always face traffic if possible;
- Be prepared for inclement weather and know how this may impact your work area (e.g., rain may create slippery driving conditions);
- When not engaged in the work (e.g., taking notes, talking on your cell phone, breaks) stand in a safe area behind the guard rails or Jersey barriers; and
- Reducing and/or eliminating the number of times you cross the road.

3.2 Lane Closure

The *Manual on Uniform Traffic Control Devices (***MUTCD)** defines the standards used by road managers nationwide to install and maintain traffic control devices on streets and highways. This resource should only be used as a reference.

Federal Highway Administration (FHWA) publishes MUTCD under 23 Code of Federal Regulations (CFR), Part 655, Subpart F. This resource should only be used as a reference.

Golder personnel should implement the following guidelines on projects where the fieldwork must be performed within traffic closures or lane restrictions. (The guidelines described herein have been prepared under the assumption that the set-up and control of the traffic closure is provided by an appropriately trained person or traffic control subcontractor. Traffic control procedures must meet the requirements of the local Department of Transportation (DOT) and/or local Police Department.). Golder personnel should also follow the best management traffic control procedures listed above during lane closures and/or lane restrictions.

- Make sure a Golder representative has in their possession a copy of all local, state, and federal permits to perform the lane closure and/or lane restriction;
- Field staff participating in the project must attend an orientation meeting with the person or representative of the traffic control company in charge of the lane closure or restriction (e.g., altering the traffic pattern) to discuss the particulars of each traffic closure/restriction set-up and safety requirements. Traffic closure or restrictions should only be set up by suitably trained and qualified individuals. Traffic controls must meet the requirements of the local DOT and/or Police Department requirements;
- Any work vehicle within the traffic closure or entering the work zone shall have its four-way flashers on or be equipped with a roof-mounted flashing amber light;
- Until all traffic control safety measures are in place, only the members of the field staff involved in the lane closure set–up will be allowed on-site. In the case where an outside firm is providing the lane closure, no staff shall be allowed within the closure until the closure is complete;
- Workers within the closure area must be within communicating range of each other. Two-way radios should be used when the workers are not within talking range of each other;
- In cases where equipment, noise and/or obstructions limit a worker's audible or visual cues to danger from traffic, a lookout person shall be stationed in these work areas to monitor traffic and signal the workers if a potential dangerous conditions arises;
- Be aware of construction equipment operating within the lane closure area;
- If working at night, understand that the bright lights from the construction area may decrease, confuse, or blind the oncoming drivers;

- Use extreme caution when exiting and entering a lane closure (i.e., getting within the "safe" zone of the traffic closure). Allow enough time to safely accelerate your vehicle to match traffic speeds and provide enough warning and distance to drivers behind you to safely decelerate your vehicle to enter the lane closure area; and
- The worker should face the on-coming traffic and position themselves away from traffic to the extent possible.

4.0 MINE TRAFFIC SAFETY

Golder personnel working at active mines must follow the Site-specific Health and Safety Plan prepared in accordance with Mine Safety & Health Association (MSHA) regulations.

5.0 REFERENCES

- American National Standard for High-Visibility Safety Apparel and Headwear", ANSI/ISEA 107-2004.
- Manual on Uniform Traffic Control Devices (MUTCD), Federal highway Administration (FHWA), 23 CFR Part 655, Subpart F.

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) Company Drivers who operate Company Vehicles or who operate their personal vehicles on Company-Related Business.

2.0 MOTOR VEHICLES AND DRIVING ON COMPANY-RELATED BUSINESS

Unlike other workplaces, the roadway is not a closed environment. Preventing work-related roadway crashes requires strategies that combine traffic safety principles and sound safety management practices. Although employers cannot control roadway conditions, they can provide safety information to workers and set and enforce driver safety policies to promote safe driving behavior. Vehicle crashes are not an unavoidable part of doing business.

All employees must comply with the Golder Motor Vehicle Policy effective October 16, 2009. The terms in this SWP are defined in that Policy.

3.0 GENERAL GUIDELINES

- Enforce mandatory seat belt use. Seat belts shall be worn by all drivers and passengers in vehicles on company business.
- Must carry appropriate insurance if using private vehicles for work purposes.
- Consider the risks driving while fatigued presents on all projects. Do not require workers to drive irregular hours or far beyond their normal working hours.
- Develop work schedules that allow employees to obey speed limits and to follow applicable hours-of-service regulations.
- Observe all the rules and regulations pertaining to the use of public land. Always ask permission before crossing pastoral land. Leave gates as you find them. Keep to constructed vehicle tracks. Avoid areas that are easily damaged, such as swamps, alpine snow plains and vegetated sand dunes.
- Observe all fire restrictions.
- Refer to the Cell Phone Safe Work Procedure for more information.

4.0 VEHICLE MAINTENANCE AND FLEET MANAGEMENT

- Adopt and enforce a structured vehicle maintenance program for Golder-owned vehicles.
- Maintain Vehicle Condition Check-out/Check-in list for Golder-owned vehicles.
- Test the brakes, wipers, tires, lights, and turn signals, and verify that the vehicle has an inflated spare tire and jack prior to use (in company, private, or rented vehicles). Address any notes or oral warnings concerning vehicle deficiencies, which must be remedied at the earliest possible opportunity. If any safety concerns are identified, the vehicle must not be used.
- Report vehicle deficiencies to the Office Manager as soon as they are noticed. The Office Manager, or his/her delegate, will arrange for maintenance of the vehicle.

- Equip Golder-owned, rented, or private vehicles used for on-site work with fire extinguishers and first aid kits, if required.
- Ensure rented or client-provided vehicles are in a roadworthy condition.

5.0 SAFETY PROGRAMS

- Teach workers strategies for recognizing and managing driver fatigue and in-vehicle distractions.
- Provide appropriate training to workers operating specialized motor vehicles or equipment.
- Emphasize the need to follow safe driving practices on and off the job.
- Consider fire safety when parking vehicles in areas with dried grasses, leaves, or other plant material. Hot engine fluids, catalytic converters or other vehicle equipment could ignite dry plant material, and cause a fire.

6.0 DRIVER PERFORMANCE

- Make sure each driver of a vehicle being used on company business (company owned, private, or hired) possesses a valid driver's license that is appropriate for the type of vehicle to be driven.
- Check driving records of prospective employees, and perform periodic rechecks after hiring.
- Maintain complete and accurate records of workers' driving performance.

7.0 SECURING LOADS

Unsecured and poorly secured items inside or outside of a vehicle can be extremely dangerous if they are loose or become airborne. They can harm the vehicle driver and passenger, and/or occupants in vehicles behind you. The following recommendations should be followed:

- Use tie-down straps that are in good condition and rated for the load you will carry. Ratcheting tie downs are better than bungee cords or tie downs that just pull tight
- Install mounts to secure loads that you haul frequently in the same vehicle or trailer.
- Secure tarps covering loads so they are snug and do not flap.
- Check your load after you have driven a short distance to make sure it has not shifted.
- Do not pile items higher than the side walls of the truck bed or trailer.

8.0 VEHICLE SAFETY EQUIPMENT

You may not know when a highway emergency will happen, but you can be prepared by ensuring that your vehicle is equipped to deal with roadside emergencies. Consider carrying items such as the following, and know how to use them properly:

- Flashlight
- Reflective safety vest

- Light sticks
- Fire extinguisher
- Tire inflator or sealant
- Reflective triangles or flares

9.0 DRIVING TECHNIQUES FOR 4-WHEEL DRIVING

9.1 Driving In Heavy Vegetation

- Get out and check road conditions before proceeding if you are unsure of the ground ahead, especially if there is mud or water.
- Position your hands on the steering wheel so that your thumbs are on the outside the steering wheel.
- Do not change transmission gears in the middle of a hazardous area, if in doubt always choose the lower gear.
- Tire pressures play an important part in off-road driving. Lowering tire pressures helps in getting through. 140-180 kPa (20-26 psi) is a good tire pressure for soft tracks. If you choose to use a lower tire pressure, the vehicle must be operated at a lower speed. Remember to re-inflate your tires as soon as you're back on hard ground.
- Cross small ridges 'square on' and cross ditches at a slight angle.
- Turn the steering wheel from side to side to maintain traction and move forward if you begin to lose traction going uphill, along a rutted track, or in mud.

9.2 Driving On Steep Hills

- Use low second or third gear for going uphill and low first gear for going downhill.
- Use the footbrake sparingly and with caution.
- Avoid turning the vehicle sideways on a hill. If the vehicle begins to slide sideways, very slightly accelerating and steering into the slide will normally straighten your descent.
- Allow any vehicle in front of your vehicle plenty of room
- Do not touch the clutch or accelerator if you stall going uphill.

9.3 Sand Driving

- Speed and flotation are the keys to success. High transmission gear ratio is best, if possible.
- Lower the tire pressure to 20 psi. If you choose to use a lower tire pressure, the vehicle must be operated at a lower speed. Remember to re-inflate your tires as soon as you are back on hard ground.
- Drive in existing wheel tracks if they are present.
- Avoid sudden changes in direction or acceleration. Coast to a stop if possible.
- Approach dunes head on.
- Avoid braking when descending a dune. Point the front of the vehicle downhill. Do not go fast, but also do not go so slow that the wheels stop rolling, or the vehicle begins to slide sideways. A touch on the throttle will keep the wheels moving and the vehicle pointing in the right direction.

- Try to rock the vehicle backwards or forwards, building up a small stretch of hardpack sand that you can accelerate from if the vehicle gets stuck. Do not spin the wheels!
- Be sure that recovery gear is always in the vehicle in these driving conditions.
- Wash the vehicle after use.

9.4 Snow, Rain, and Ice Driving

- Carry chains and install them on the tires when required.
- Prepare your vehicle and carry safety gear.
- Travel only on roads and tracks that are open to traffic.
- Drive with low beam lights on. Do not travel when visibility is poor.
- Vehicles travelling uphill in snow and ice conditions have right of way.
- Park only where directed and as close to the bank as possible. When parking, leave the vehicle in gear. Do not use the handbrake - it could freeze in the "on" position.
- Lift the wiper blades off the wind shield when leaving the vehicle parked.
- Watch for other travelers and animals and drive slowly in areas where they may be present. In the event that an animal is encountered on a road where driving conditions are poor due to the presence of snow, ice, or rain, do not over steer to avoid hitting the animal. The act of over steering may cause the vehicle to slide or roll. Most of the time the animal will move out of the road before the vehicle reaches it.
- Consider increasing the load or weight on the rear axle of front-wheel drive vehicles to improve traction when driving in snow, ice, or rain.

9.5 Driving in Mud

- Good tires with deep tread are helpful when driving in muddy conditions.
- Low second or third are probably the best gears for vehicle operation.
- Move the steering wheel rapidly from side to side to improve traction.
- Keep a steady pace.
- Stay out of ruts if possible.
- Rock the vehicle backwards or forwards by alternating between first and reverse if you do become stuck.

9.6 Driving in Fog/Limited Visibility

- Drive with low beam lights on. Do not travel when visibility is poor.
- Drive slowly and carefully.
- Pull over to a safe location if you can not see vehicles in front or behind you until weather improves.

10.0 REGULATORY CITATION

There are no Federal OSHA regulations relating to driving safety. The Department of Transportation (DOT) Title 49 (Transportation) Subtitle VI (Motor Vehicle and Driver Programs) provides information about commercial motor vehicle operations.

DRILLING

Drilling techniques include auger, rotary, percussion, and sonic which all have high-speed rotating and moving components which require caution to avoid injury when working.

Drilling can be safely undertaken in all types of terrain and in all types of conditions, if proper precautions are taken. Because of the variety of situations staff may experience, it is important to recognize and be aware of potential hazards associated with this operation.

KEY HAZARDS

- Impact by moving equipment;
- Encountering subsurface utilities;
- Mast contact with overhead wires;
- Traversing uneven ground to drill, document and sample:
- Clothing, fingers or other body parts caught in high speed and high torque rotating equipment.
- Noise generated by the equipment or surroundings
- Dust generated by equipment

PRECAUTIONS

Before Drilling:

- Inform staff of the emergency shut-off switch on the rig and have the driller test it daily.
- Get as much site-specific information as possible concerning ground conditions and surface obstructions. Ask the Project Manager and, if possible, the Client or Client Contact.
- Use available soils information (i.e., previous reports, US Geological Survey Surficial Geology Maps, colleagues who have had experience in the area) to ascertain potential subsurface conditions.
- Each drilling location should be inspected by the GAI field leader and subcontractor supervisor and approved as safe for drilling. Consider access requirements, and look for evidence of underground services (i.e., buried utility lines, wire, conduits, tanks, service boxes, plugs, exposed pipe, trenches, etc.), and locate the boreholes accordingly (see Test Pit).
- Always utilize state, local, or 811 utility location services to get clearance to proceed at each drilling location. Plan at least 48 hours in advance prior to scheduled work.
- Look for surface and overhead features that may represent a hazard. Overhead power lines are a major concern and must be avoided or de-energized. Even without direct contact, electricity can arc from the power lines to another object (see Test Pit)
- Do not pile drill spoil such that it could endanger workers (see Test Pit)
- Drill rigs should not be operated within 12 feet of lines less than 132 KV; within 20 feet of lines 132 to 330 KV; or within 26 feet of lines greater than 330 KV.
- Drill rig should not be moved from one location to the next with the mast raised.
- Drill rig equipment should be safety inspected by the subcontractor on a daily basis dependent on specific use, field conditions, and manufacturer's recommendations.

During Drilling

- Identify a safe viewing area where you can observe the drilling operations, but not so close that you are either in danger of being struck by the equipment swinging from wirelines or winch cables.
- Always make sure you have a route of escape, should things go wrong. Be aware of wind direction and consider escaping upwind if subsurface contaminants are involved
- Make sure the drill crew knows where you are **at all times**.
- Approach the drill rig during times when it is safest to do so. If necessary, signal the operator first and make sure the equipment is stopped before you approach.
- Avoid the temptation to act as the driller's helper. Do not handle heavy rods or equipment. Remember that the drilling contractor is responsible for providing the necessary drilling equipment and personnel who are trained in its safe use. This also includes traffic control needs, unless otherwise specifically indicated by GAI project manager (i.e. for road drilling where GAI provided the necessary traffic control.)
- Know where everyone is at all times;
- Never use gasoline or any other combustible solvent as a cleaning agent. It is a fire and explosion hazard;
- Use a personal fall arrest system while working at any height above 5 feet on the mast or on top of the rig;
- Do not perform maintenance while the rig is running;
- Do not remove any blocking or jacks from under rig while the rig is drilling;
- Stand clear of cables as much as possible while pulling pipe or while the rig is under a heavy strain;
- When racking drill rods for rotary drilling/sampling, the total length of rods racked shall not be more than 1.5 times the height of the mast;
- Do not wear loose clothing or jewelry around moving machinery;
- Be on guard for pinch and shear hazards for fingers and toes--especially around the drill string;
- Practice good housekeeping--keep excess spoil material and unnecessary equipment well out of the way;
- When jumping batteries during cold weather starting, be sure of terminal connections. Connect the positive terminal first, then the negative terminal. Batteries can explode, spraying acid to eyes and skin; wear protective goggles and clothing;
- Communicate effectively; if using hand signals, make sure everyone knows what they are;
- Know where fire extinguisher(s) are and how to use them. Check the charge condition before the start of project activities, and periodically thereafter;
- All hoses carrying high pressure air or fluids should have safety chains or cables at connectors;
- Lighting on the site or rig shall be properly installed and sufficient in quantity to provide adequate illumination for night work. All receptacles shall be protected with a ground fault circuit interrupter (GFCI);
- Weight indicators should be standard equipment;
- All hooks shall have safety latches and be checked between borings;
- Do not ride on hook ropes or other traveling lines on rig;
- Keep walkways clear;

- Using a properly calibrated real-time air quality instrumentation,, monitor for suspected airborne gas hazards (combustible and/or toxic as applicable);
- Ear protection must be worn by employees working in close proximity to equipment that generates noise (85 dB(A) or greater);
- Wear required respiratory protective equipment when hazards from toxic chemicals are suspected (See Respiratory Protection);
- Observe proper lifting techniques;
- Fuel tanks should be properly installed according to local fire codes with appropriate secondary contaminant;
- Wastewater and drilling fluids must be properly diverted or contained;
- Containerize drilling spoils and fluids suspected to be contaminated as required by environmental regulatory requirements;
- Protect the public by use of proper barricades, ramps over pipes, warning signs and guard rails;
- Use caution during welding activities, remain at a safe distance and do not look directly at the welding arc. The drillers will need to wear welding goggles and gloves; properly ground arc-welding equipment; properly vent PVC solvent glue vapors from installed well casings before cutting or welding the casings; and
- Have a first-aid safety kit handy.

After Drilling

- Properly decontaminate all drilling equipment, as required, before leaving. This includes drilling tools, pipe, pumping equipment, and mud-pits, in addition to the drill rig and drill string;
- Never leave a borehole open for an extended period. Always backfill and compact the near surface soil after you have completed sampling, any instrumentation installation(s) and documentation activities. Open drill holes represent a potential hazard to yourself and others.
- Clean up waste materials from drilling operations, such as discarded containers, hoses, damaged tools or blocking, and wasted pipe and casing, etc. Dispose of properly.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard Hat
- Steel Toe Safety Boots
- High Visibility Vest
- Hearing Protection
- Safety Glasses
- Close fitting clothing
- Dust Mask (Respirator if required)
- Gloves

TRAINING

- OSHA 10 hour Construction Safety course
- First Aid and CPR courses

APPLICABLE OSHA REGULATION PARTS

The following are the major OSHA standards impacted by this work: 29 CFR 1926

- .21 Safety Training
- .23 First Aid
- .52 Noise Exposure
- .59 Hazard Communication
- .96 Foot Protection
- .100 Head Protection
- .101 Hearing Protection
- .102 Eye and Face Protection
- .103 Respiratory Protection
- .351 Arc Welding
- .403 General Electrical
- .404 Wiring
- .500-503 Fall Protection
- .601 Motor Vehicles
- Subpart Z – Toxic and Hazardous Substances

ATTACHMENT F
RESTRICTIVE COVENANT

CONFORMED COPY

Harry E. Grant
Riddell Williams P.S.
1001 Fourth Avenue, Suite 4500
Seattle, WA 98154-1065

200305160010 95
25.00
DPC
RIDDELL
PAGE 001 OF 007
05/16/2003 11:21
KING COUNTY, WA

Document title(s): **Declaration of Restrictive Covenant**

Reference number(s) of document(s) assigned or released (if applicable): **N/A**

Grantor(s): **Scarsella Limited Partnership**, a Washington limited partnership, with Ida LLC, a Washington limited liability company, as General Manager

Grantee(s): **State of Washington, Department of Ecology**
The Public

Legal description (abbreviated):

Ptn NE 1/4, NE 1/4, S28-T23N-R4E, W.M. (aka Lots 26, 28-37, & 61-72, and unplatted 60-foot strip adjoining NWly of Lots 57-72, Wildon, unrecorded)

(Full legal description appears on Attachment A [pages 6-7])

Assessor's Tax Parcel Number(s):

940940-0135-08, 940940-0145-06, 940940-0150-08, 940940-0155-03, 940940-0160-06, 940940-0170-04, 940940-0175-09, 940940-0185-07, 940940-0320-03, 940940-0330-01, 940940-0360-04, 940940-0936-09

DECLARATION OF RESTRICTIVE COVENANT

Scarsella Limited Partnership and MasterPark Lot C

This Declaration of Restrictive Covenant is made this 6th day of May, 2003, pursuant to RCW 70.105D.030 (1) (f) and (g) and WAC 173-340-440 by Scarsella Limited Partnership, a Washington limited partnership ("Scarsella LP"), its successors and assigns, and the State of Washington Department of Ecology, its successors and assigns (hereafter "Ecology").

An independent remedial action (hereafter "Remedial Action") occurred at the property that is the subject of this Restrictive Covenant. The Remedial Action conducted at the property is described in the following documents:

1. Phase I Environmental Site Assessment, SunReal Inc., SeaTac Airport Site, SeaTac, WA, Golder Associates Inc., 10/12/00.

2. Final Phase II Environmental Site Assessment, Report, SeaTac Parking Garage Development Site, SeaTac, WA, Golder Associates Inc., 4/5/01.

3. Final Report for Extended Phase II Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, WA, Golder Associates, Inc., 4/5/01.

4. Final Report for the Phase III Environmental Site Assessment, SeaTac Parking Garage Development Site, SeaTac, WA, Golder Associates, Inc., 4/5/01.

5. Collection and Analytical Results of Groundwater Sample from Washington Memorial Park Cemetery Private Well, Golder Associates Inc., 9/7/01.

6. Closure of a 1000 Gallon Gasoline Underground Storage Tank and Associated Independent Remedial Action, Master Park Lot C, 16000 Block International Boulevard, SeaTac, WA, Golder Associates Inc., 10/4/01.

7. Site Assessment Conducted for the Closure of a 3,000 and 10,000 Gallon Underground Storage Tanks, Master Park Lot C, 16000 Block International Boulevard, SeaTac, WA, Golder Associates, Inc., 10/4/01.

8. Site Assessment Conducted for the Closure of a 1,000 Gallon Heating Oil Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, WA, Golder Associates Inc., 10/4/01.

9. Site Assessment for the Closure of a 300 Gallon Underground Storage Tank, Master Park Lot C, 16000 Block International Boulevard, SeaTac, WA, Golder Associates Inc., 10/24/01.

10. Final Independent Remedial Action Report, SeaTac Parking Garage Development Site, SeaTac, WA (Master Park Lot C), Golder Associates, Inc., 1/24/02.

These documents are on file at Ecology's Northwest Regional Office.

This Restrictive Covenant is required because residual concentrations of diesel and oil range petroleum hydrocarbons in soil, and gasoline range petroleum hydrocarbons remain in groundwater which exceed the Model Toxics Control Act Method A Residential Cleanup Levels for soil and groundwater established under WAC 173-340-704, notwithstanding the Remedial Action.

Scarsella LP owns the fee simple interest in real property (hereafter "Property"), which is located in the County of King, State of Washington that is subject to this Restrictive Covenant. The Property is legally described in Attachment A of this Restrictive Covenant and made a part hereof by reference. Sea-Tac Investments LLC, a Washington limited liability company ("Lessee"), leases the Property from Scarsella LP pursuant to that certain Amended and Restated Ground Lease Agreement between Scarsella LP and Lessee, which is effective as of February 1, 2001, as amended:

Gerald Scarsella, as the representative of the general partner of Scarsella LP and on behalf of Scarsella LP as such general partner, makes the following declaration as to limitations, restrictions, and uses to which the Property may be put and specifies that such declarations shall constitute covenants to run with the land, as provided by law and shall be binding on all parties and all persons claiming under them, including all current and future owners of any portion of or interest in the Property (hereafter "Owner").

Section 1. (1) No groundwater may be taken for any use from the property excepting for purposes required by possible remedial actions. (2) Any activity on the Property that may result in the release or exposure to the environment of the contaminated soil that was contained beneath the asphalt cap as part of the Remedial Action, or create a new exposure pathway, is prohibited.

Section 2. Any activity on the Property that may interfere with the integrity of the Remedial Action and continued protection of human health and the environment is prohibited.

Section 3. Any activity on the Property that may result in the release or exposure to the environment of a hazardous substance that remains on the Property as part of the Remedial Action, or create a new exposure pathway, is prohibited without prior written approval from Ecology.

Section 4. The Owner of the property must give thirty (30) day advance written notice to Ecology of the Owner's intent to convey any interest in the Property. No future conveyance of title, easement, lease, or other interest in the Property shall be consummated by the Owner without adequate and complete provision for continued monitoring, operation, and maintenance of the Remedial Action.

Section 5. The Owner must restrict leases to uses and activities consistent with the Restrictive Covenant and notify all lessees of the restrictions on the use of the Property.

Section 6. The Owner must notify and obtain approval from Ecology prior to any use of the Property that is inconsistent with the terms of this Restrictive Covenant. Ecology may approve any inconsistent use only after public notice and comment.

Section 7. The Owner shall allow authorized representatives of Ecology the right to enter the Property at reasonable times for the purpose of evaluating the Remedial Action; to take samples, to inspect remedial actions conducted at the property, and to

Section 8. The Owner of the Property reserves the right under WAC 173-340-440 to record an instrument that provides that this Restrictive Covenant shall no longer limit use of the Property or be of any further force or effect. However, such an instrument may be recorded only if Ecology, after public notice and opportunity for comment, concurs.

SCARSELLA LIMITED PARTNERSHIP, a
Washington limited partnership
By Ida LLC, a Washington limited liability company, General Partner

By: _____

Its: Manager

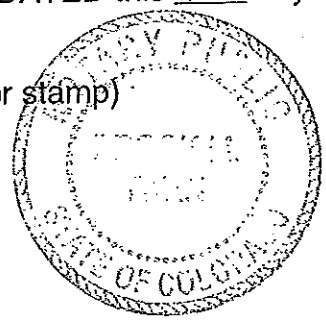
Date: 4/16/03

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

I certify that I know or have satisfactory evidence that Gerard Scarsella is/are the person(s) who appeared before me, and said person(s) acknowledged that he/she/they signed this instrument, on oath stated that he/she/they was/were authorized to execute the instrument and acknowledged it as the Manager of Id. LLC, GP of Scarsella Limited Partnership, to be the free and voluntary act of such party(ies) for the uses and purposes mentioned in the instrument.

DATED this 14 day of ~~February~~ April, 2003.

(Seal or stamp)



My Commission Expires 1-27-2005

Brook M. Ryan
Notary Signature

BROOK M RYAN
Print/Type Name
Notary Public in and for the State of ~~Washington~~, Colorado
residing at 8401 E Belleview Ave. Denver Co
My appointment expires 1-27-2005

291/344295.01
020403/1013/60210.00001

ATTACHMENT "A"

(Legal Description)

That portion of the northeast quarter of the northeast quarter of Section 28, Township 23 North, Range 4 East, W.M., in King County, Washington, described as follows:

Beginning at the intersection of the northwesterly line of State Highway No. 1, as established by Deed recorded under King County Recording No. 1994317, with the south line of the north 30 feet of said northeast quarter;

thence south 18°49'10" west along said northwesterly line 200 feet to the true point of beginning;

thence north 71°10'50" west 310 feet;

thence south 18°49'10" west 800 feet;

thence south 71°10'50" east 60 feet;

thence north 18°49'10" east 200 feet;

thence south 71°10'50" east 250 feet to said northwesterly line;

thence north 18°49'10" east along said northwesterly line 500 feet;

thence north 71°10'50" west 125 feet;

thence north 18°49'10" east 50 feet;

thence south 71°10'50" east 125 feet;

thence north 18°49'10" east 50 feet to the true point of beginning;

EXCEPT that portion conveyed to the State of Washington for road by Deeds recorded under King County Recording Nos. 3695689, 3695688 and 3706373;

TOGETHER WITH an easement for road and utilities purposes over a strip of land described as follows:

Beginning at the most northerly corner of the above described property;

thence south 71°10'50" east along the northeasterly line thereof 60 feet;

thence north 18°49'10" east to the southerly line of the north 30 feet of the northeast quarter of the northeast quarter of said section;

thence westerly along said southerly line to the point from which the point of beginning bears south 18°49'10" west;

thence south 18°49'10" west to the point of beginning;

TOGETHER WITH an easement for ingress, egress and driveway purposes as established by Superior Court Cause No. 90-2-02038-0;

(BEING KNOWN AS Lots 26, 28 through 37, inclusive, and 61 through 72, inclusive, and the unplatted 60 foot strip adjoining northwesterly of Lots 57 through 72, all in Wildon, according to the unrecorded plat thereof;

EXCEPT that portion conveyed for Primary State Highway No. 1).

COPY

RIDDELL WILLIAMS P.S.

ATTORNEYS AT LAW

ADDRESS
1001 FOURTH
AVENUE PLAZA
SUITE 4500
SEATTLE, WA
98154-1065

TELEPHONE
(206) 624-3600

FACSIMILE
(206) 389-1708

E-MAIL
hgrant
@riddellwilliams.com

DIRECT LINE
(206) 389 1574

February 18, 2003

VIA FIRST CLASS MAIL

Mr. Mike Scarey
Senior Planner
City of Seattle
4800 S. 188th St.
Seatac, WA 98188

Re: Notice and Opportunity to Comment on Real Property Subject to a Restrictive Covenant/Deed Restriction

Dear Mr. Scarey:

The Department of Ecology ("Ecology") requires me to notify your organization that a restrictive covenant is being proposed as part of the cleanup action at property located within your planning area. Ecology is required by law (RCW 70.105D.030), to seek your comments. It is Ecology's expectation that this notice be used by you to identify zoning conditions that could affect the protectiveness of a remedy decision. Please submit your written response to the enclosed restrictive covenant within 14 calendar day's receipt of this letter. Ecology will consider any comments you submit prior to imposing the covenant.

This covenant is necessary because the cleanup action results in residual contamination being left on site. The covenant is intended to restrict any site use that could result in exposure to the contaminant and interfere with the integrity of the cleanup action. The property in question is situated at the location indicated by the legal description and Assessor's Tax Parcel Numbers in the enclosed draft Declaration of Restrictive Covenant.

Sincerely,

Harry E. Grant

Harry Edward Grant
of
RIDDELL WILLIAMS P.S.
Our File: 60210.01
Enclosures
cc: Roger Nye

RECEIVED
FEB 19 2003
DEPT OF ECOLOGY

291/348712.001
021803/0404