

**STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY**

In the Matter of Remedial Action by:

FOX AVENUE BUILDING, L.L.C.
6900 Fox Avenue South
Seattle, Washington 98108

AGREED ORDER

No. DE 8985

TO: FOX AVENUE BUILDING, L.L.C.
6900 Fox Avenue South
Seattle, Washington 98108

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I. INTRODUCTION

The mutual objective of the State of Washington, Department of Ecology (Ecology), and Fox Avenue Building, L.L.C. (Fox Avenue) under this Agreed Order (Order) is to provide for remedial action at a facility where there has been a release or threatened release of hazardous substances. This Order follows Agreed Order No. 6486, entered in 2009 by Ecology and Fox Avenue, which required Fox Avenue to implement an interim action, to conduct a supplemental evaluation of remediation alternatives, to prepare and submit a supplemental feasibility study, and to prepare and submit a draft Cleanup Action Plan (dCAP).

This Order requires Fox Avenue to implement a Cleanup Action Plan (CAP). Ecology believes the actions required by this Order are in the public interest.

II. JURISDICTION

This Agreed Order is issued pursuant to the Model Toxics Control Act (MTCA), RCW 70.105D.050(1).

III. PARTIES BOUND

This Agreed Order shall apply to and be binding upon the Parties to this Order, their successors and assigns. The undersigned representative of each party hereby certifies that he or she is fully authorized to enter into this Order and to execute and legally bind such party to comply with this Order. Fox Avenue agrees to undertake all actions required by the terms and conditions of this Order. No change in ownership or corporate status shall alter Fox Avenue's responsibility under this Order. Fox Avenue shall provide a copy of this Order to all agents, contractors, and subcontractors retained to perform work required by this Order, and shall ensure that all work undertaken by such agents, contractors, and subcontractors complies with this Order.

IV. DEFINITIONS

Unless otherwise specified herein, the definitions set forth in Chapter 70.105D RCW and Chapter 173-340 WAC shall control the meanings of the terms in this Order.

A. Site: The Site is referred to as Fox Avenue Building and is generally located at 6900 Fox Avenue South, Seattle, Washington, 98108 (Fox Avenue Property) and is defined by the extent of contamination caused by the release of hazardous substances at the Fox Avenue Property. The Fox Avenue Building Site is adjacent to the former Tyee Lumber dip tank and underground storage tank that were located on the neighboring property to the south of Fox Avenue Building at 710 South Myrtle Street, Seattle, Washington and affects parcel(s) of real property associated with the Fox Avenue Building Site. It is not currently believed that contamination from the aforementioned adjacent property and the Fox Avenue Building Site are commingled. Therefore, that property is not included in the scope of this Order. The Site Diagram (Exhibit A) more particularly describes the Site. The Site constitutes a Facility under RCW 70.105D.020(5).

B. Parties: Refers to State of Washington, Department of Ecology and Fox Avenue.

C. Potentially Liable Person (PLP): Refers to Fox Avenue.

D. Agreed Order or Order: Refers to this Order and each of the exhibits to this Order. All exhibits are integral and enforceable parts of this Order. The terms "Agreed Order" or "Order" shall include all exhibits to this Order.

V. FINDINGS OF FACT

Ecology makes the following findings of fact, without any express or implied admissions of such facts by Fox Avenue:

A. Fox Avenue owns the Fox Avenue Property, Parcel # 0001800087, located at 6900 Fox Avenue South, Seattle, Washington, 98108. The Fox Avenue Property is currently the location of an active chemical distribution warehouse (Cascade Columbia). The Fox Avenue Property consists of approximately two and a half acres in the Duwamish industrial corridor, located approximately 400 feet from the South Myrtle Street Embayment of the Duwamish River.

B. The Site generally includes the Fox Avenue Property and those properties located between the Fox Avenue Property and the Duwamish River. The Site is listed on Ecology's

Hazardous Sites List as "Fox Ave Bldg" with the Facility Site ID No. 2282. Its Site Hazard Assessment ranking is 1.

C. Since 1989, investigation activities at the Site have identified several contaminants in soil and groundwater at the Property and locations to its south and west. This contamination is attributed to the historical handling and storage of materials by the now defunct GWC, prior to Fox Avenue ownership. The primary contaminants identified in soil and groundwater are:

- Chlorinated solvents - tetrachloroethylene (PCE), trichloroethylene (TCE), and their associated degradation products (e.g., 1,2-dichloroethene and vinyl chloride);
- Pentachlorophenol (PCP); and
- Petroleum hydrocarbons.

D. Beginning in the mid-1950s, Great Western Chemical (GWC) engaged in the commercial repackaging and distribution of chemical and petroleum products at the Fox Avenue Property.

E. In 1991, Ecology and GWC signed Agreed Order No. DE TC91-N203 (1991 Agreed Order). Under the 1991 Agreed Order, GWC was required to perform a Remedial Investigation/Feasibility Study (RI/FS) at the Site. In 1993, Hart Crowser, on behalf of GWC, submitted a "Remedial Investigation/Preliminary Risk Assessment" to Ecology. In 2000, Terra Vac and Floyd Snider McCarthy, on behalf of GWC, submitted a "Supplemental Remedial Investigation and Feasibility Study" to Ecology. These documents provide information regarding activities conducted and chemicals handled by GWC at the Fox Avenue Building Site.

F. In 2001, GWC filed for bankruptcy protection.

G. In 2003, Fox Avenue purchased the Fox Avenue Property. Amendment No. 1 to Agreed Order No. DE TC91-N203 (Amendment 1) substituted Fox Avenue for GWC under the 1991 Agreed Order. Amendment 1 also directed Fox Avenue to perform remedial actions set forth in the "Work Scope Summary and Schedule," attached as Exhibit A to Amendment 1, including conducting supplemental investigation and a pilot study evaluating in situ chemical oxidation technologies, and preparing a feasibility addendum and a dCAP.

H. From 2003 to 2007, Environmental Resources Management (ERM), on behalf of Fox Avenue, conducted supplemental remedial investigation and feasibility study work at the Site, culminating in an expanded pilot study (EPS). In December 2007, ERM, on behalf of Fox Avenue, submitted to Ecology the "Draft Fox Avenue Expanded Pilot Study Phase III Memorandum" (ERM 2007). Ecology reviewed the ERM 2007 and accepted it as concluding the EPS in a letter dated January 30, 2008. In the letter, Ecology agreed that the three year long pilot test demonstrated that the in situ chemical oxidation technology was not likely to be effective in permanently reducing to the maximum extent practicable the solvent concentration and would not be selected as the permanent cleanup alternative for the site.

I. In March 2008, Ecology and Fox Avenue, with its environmental consultant Floyd|Snider, met and discussed how to proceed at the Site. Ecology agreed that Fox Avenue would proceed with a groundwater Enhanced Reductive Dechlorination (ERD) interim action and would conduct additional evaluation of source controls in a Supplemental Feasibility Study.

J. In 2009, Ecology and Fox Avenue signed Agreed Order No. DE 6486 (2009 Agreed Order), which supersedes the 1991 Agreed Order and Amendment 1. Under the terms of the 2009 Agreed order, Fox Avenue performed the ERD interim action and prepared a revised Remedial Investigation/Feasibility Study (RI/FS) and dCAP for the Site. The dCAP describes remediation activities for three primary areas of the Site: the Main Source Area, the Downgradient Groundwater Plume, and the Northwest Corner Plume. Fox Avenue completed all requirements for deliverables under the 2009 Agreed Order..

K. All requirements under the 1991 and 2009 Agreed Orders, as amended, have been completed to Ecology's satisfaction.

VI. ECOLOGY DETERMINATIONS

A. Fox Avenue is an "owner or operator" as defined in RCW 70.105D.020(17) of a "facility" as defined in RCW 70.105D.020(5).

B. Based upon all factors known to Ecology, a “release” or “threatened release” of “hazardous substance(s)” as defined in RCW 70.105D.020(25) and RCW 70.105D.020(10), respectively, has occurred at the Site.

C. Based upon credible evidence, Ecology issued a PLP status letter to Fox Avenue dated June 30, 2003, pursuant to RCW 70.105D.040, -.020(21), and WAC 173-340-500. By letter dated July 15, 2003, Fox Avenue voluntarily waived its rights to notice and comment and accepted Ecology’s determination that Fox Avenue is a PLP under RCW 70.105D.040. By letter dated July 16, 2003, Ecology issued a final determination of PLP status.

D. Pursuant to RCW 70.105D.030(1) and -.050(1), Ecology may require PLPs to investigate or conduct other remedial actions with respect to any release or threatened release of hazardous substances whenever it believes such action to be in the public interest. Based on the foregoing facts, Ecology believes the remedial actions required by this Order are in the public interest.

VII. WORK TO BE PERFORMED

Based on the Findings of Fact and Ecology Determinations, it is hereby ordered that Fox Avenue take the following remedial actions at the Site and that these actions be conducted in accordance with Chapter 173-340 WAC unless otherwise specifically provided for herein:

A. Fox Avenue shall perform a cleanup action at the Site by implementing the CAP (Exhibit B), which establishes the required remedial actions at the Site, in accordance with the Schedule (Exhibit C) and all other requirements of this Order. The CAP and Schedule are incorporated by reference and form an integral and enforceable part of this Order. These remedial actions include implementing:

1. Thermal treatment via Electrical Resistive Heating in the Main Source Area followed by Enhanced Reductive Dechlorination (ERD).
2. ERD in the Downgradient Groundwater Plume.
3. ERD and Soil Vapor Extraction in the Northwest Corner Plume.

4. Confirmation and performance monitoring as required under the CAP.

B. Fox Avenue shall perform the actions outlined above and set forth in the CAP (Exhibit B) in accordance with the Schedule set forth therein in Exhibit C. Should significant additional work be necessary based on information obtained during the supplemental investigation and/or new information that was not known at the time of the preparation of this Order, a supplemental work plan shall be submitted to Ecology for review and approval according to an agreed schedule. Schedule extensions are addressed in Section VIII.K. Any substantial changes to the work shall be described in an amendment to this Order as set forth in Section VIII.L.

C. Fox Avenue shall submit reports and other deliverables to Ecology for review in accordance with the Schedule.

D. Prior to commencing work on the actions identified in the CAP, Fox Avenue shall submit an Engineering Design Report (including Operation and Maintenance Plan and Compliance Monitoring Plan for active remedy elements) to Ecology for its review and approval. All sampling and analysis shall be conducted pursuant to an Ecology approved Compliance Monitoring Plan. After the active remedy elements have been completed and the Site transitions to Monitored Natural Attenuation, Fox Avenue shall submit a Long Term Monitoring Plan to Ecology for its review and approval. All work shall be conducted in accordance with a Health and Safety Plan (HASP). All environmental sampling shall be conducted pursuant to an Ecology Approved Quality Assurance Project Plan (QAPP). The Engineering Design Report, Long Term Monitoring Plan, SAP(s), and QAPP(s), upon review and approval by Ecology, and the HASP(s) upon review by Ecology, shall be incorporated by reference, and form an integral and enforceable part of this Order.

E. During performance of all remedial actions, Fox Avenue shall maintain detailed records including photographic documentation of substantive aspects of the work performed, including construction techniques and materials used, items installed, and tests and measurements performed. The Fox Avenue project coordinator or designee shall provide

progress reports to the Ecology project coordinator on a quarterly basis, unless an alternate schedule is requested by Fox Avenue and agreed to by Ecology in writing. Each progress report shall identify accomplishments for the prior quarter and expected accomplishments for the upcoming quarter.

F. If, at any time after the first exchange of comments on drafts, Ecology determines that insufficient progress is being made in the preparation of any of the deliverables required by this section, Ecology may complete and issue the final deliverable.

VIII. TERMS AND CONDITIONS OF ORDER

A. Public Notice

RCW 70.105D.030(2)(a) requires that, at a minimum, this Order be subject to concurrent public notice. Ecology shall be responsible for providing such public notice and reserves the right to modify or withdraw any provisions of this Order should public comment disclose facts or considerations which indicate to Ecology that this Order is inadequate or improper in any respect.

B. Remedial Action Costs

Fox Avenue shall pay to Ecology costs incurred by Ecology pursuant to this Order and consistent with WAC 173-340-550(2). These costs shall include work performed by Ecology or its contractors for, or on, the Site under Chapter 70.105D RCW, including remedial actions and Order preparation, negotiation, oversight, and administration. These costs shall include work performed both prior to and subsequent to the issuance of this Order, including work performed by Fox Avenue pursuant to the 2009 Agreed Order prior to the execution of this Order. Ecology's costs shall include costs of direct activities and support costs of direct activities as defined in WAC 173-340-550(2). For all costs incurred subsequent to the effective date of this Order, Fox Avenue shall pay the required amount within thirty (30) days of receiving from Ecology an itemized statement of costs that includes a summary of costs incurred, an identification of involved staff, and the amount of time spent by involved staff members on the project. A general statement of work performed will be provided upon request. Itemized

statements shall be prepared quarterly. Pursuant to WAC 173-340-550(4), failure to pay Ecology's costs within ninety (90) days of receipt of the itemized statement of costs will result in interest charges at the rate of twelve percent (12%) per annum, compounded monthly.

In addition to other available relief, pursuant to RCW 19.16.500, Ecology may utilize a collection agency and/or, pursuant to RCW 70.105D.055, file a lien against real property subject to the remedial actions to recover unreimbursed remedial action costs.

C. Implementation of Remedial Action

If Ecology determines that Fox Avenue has failed without good cause to implement the remedial action, in whole or in part, Ecology may, after notice to Fox Avenue, perform any or all portions of the remedial action that remain incomplete. If Ecology performs all or portions of the remedial action because of Fox Avenue's failure to comply with its obligations under this Order, Fox Avenue shall reimburse Ecology for the costs of doing such work in accordance with Section VIII.B (Remedial Action Costs), provided that Fox Avenue is not obligated under this Section to reimburse Ecology for costs incurred for work inconsistent with or beyond the scope of this Order.

Except where necessary to abate an emergency situation, Fox Avenue shall not perform any remedial actions at the Site outside those remedial actions required by this Order, unless Ecology concurs, in writing, with such additional remedial actions.

D. Designated Project Coordinators

The project coordinator for Ecology is:

Sunny Becker
Department of Ecology/Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008
(425) 649-7187

The project coordinator for Fox Avenue is:

Tom Colligan
Floyd|Snider
601 Union Street, Suite 600
Seattle, WA 98101
(206) 292-2078

Each project coordinator shall be responsible for overseeing the implementation of this Order. Ecology's project coordinator will be Ecology's designated representative for the Site. To the maximum extent possible, communications between Ecology and Fox Avenue, and all documents, including reports, approvals, and other correspondence concerning the activities performed pursuant to the terms and conditions of this Order shall be directed through the project coordinators. The project coordinators may designate, in writing, working level staff contacts for all or portions of the implementation of the work to be performed as required by this Order.

Any party may change its respective project coordinator. Written notification shall be given to the other party at least ten (10) calendar days prior to the change.

E. Performance

All geologic and hydrogeologic work performed pursuant to this Order shall be under the supervision and direction of a geologist licensed in the State of Washington or under the direct supervision of an engineer registered in the State of Washington, except as otherwise provided for by Chapters 18.220 and 18.43 RCW.

All engineering work performed pursuant to this Order shall be under the direct supervision of a professional engineer registered in the State of Washington, except as otherwise provided for by RCW 18.43.130.

All construction work performed pursuant to this Order shall be under the direct supervision of a professional engineer or a qualified technician under the direct supervision of a professional engineer. The professional engineer must be registered in the State of Washington, except as otherwise provided for by RCW 18.43.130.

Any documents submitted containing geologic, hydrologic, or engineering work shall be under the seal of an appropriately licensed professional as required by Chapters 18.220 and 18.43 RCW.

Fox Avenue shall notify Ecology in writing of the identity of any engineer(s) and geologist(s), contractor(s) and subcontractor(s), and others to be used in carrying out the terms of this Order, in advance of their involvement at the Site.

F. Access

Ecology or any Ecology authorized representative shall have the full authority to enter and freely move about all property at the Site that Fox Avenue either owns, controls, or has access rights to at all reasonable times for the purposes of, inter alia: inspecting records, operation logs, and contracts related to the work being performed pursuant to this Order; reviewing Fox Avenue's progress in carrying out the terms of this Order; conducting such tests or collecting such samples as Ecology may deem necessary; using a camera, sound recording, or other documentary type equipment to record work done pursuant to this Order; and verifying the data submitted to Ecology by Fox Avenue. Fox Avenue shall make all reasonable efforts to secure access rights for those properties within the Site not owned or controlled by Fox Avenue where remedial activities or investigations will be performed pursuant to this Order. Ecology or any Ecology authorized representative shall give reasonable notice before entering any Site property owned or controlled by Fox Avenue unless an emergency prevents such notice. All persons who access the Site pursuant to this Section shall comply with any applicable Health and Safety Plan(s). Ecology employees and their representatives shall not be required to sign any liability release or waiver as a condition of Site property access.

G. Sampling, Data Submittal, and Availability

With respect to the implementation of this Order, Fox Avenue shall make the results of all sampling, laboratory reports, and/or test results generated by it or on its behalf available to Ecology. Pursuant to WAC 173-340-840(5), all sampling data shall be submitted to Ecology in both printed and electronic formats in accordance with Section VII (Work to be Performed), Ecology's Toxics Cleanup Program Policy 840 (Data Submittal Requirements), and/or any subsequent procedures specified by Ecology for data submittal.

If requested by Ecology, Fox Avenue shall allow Ecology and/or its authorized representative to take split or duplicate samples of any samples collected by Fox Avenue pursuant to implementation of this Order. Fox Avenue shall notify Ecology seven (7) days in advance of any sample collection or work activity at the Site. Ecology shall, upon request, allow

Fox Avenue and/or its authorized representative to take split or duplicate samples of any samples collected by Ecology pursuant to the implementation of this Order, provided that doing so does not interfere with Ecology's sampling. Without limitation on Ecology's rights under Section VIII.F (Access), Ecology shall notify Fox Avenue prior to any sample collection activity unless an emergency prevents such notice.

In accordance with WAC 173-340-830(2)(a), all hazardous substance analyses shall be conducted by a laboratory accredited under Chapter 173-50 WAC for the specific analyses to be conducted, unless otherwise approved by Ecology.

H. Public Participation

A Public Participation Plan is required for this Site. Ecology shall review any existing Public Participation Plan to determine its continued appropriateness and whether it requires amendment, or if no plan exists, Ecology shall develop a Public Participation Plan alone or in conjunction with Fox Avenue.

Ecology shall maintain the responsibility for public participation at the Site. However, Fox Avenue shall cooperate with Ecology, and shall:

1. If agreed to by Ecology, develop appropriate mailing lists and prepare drafts of public notices and fact sheets at important stages of the remedial action, such as the submission of work plans, remedial investigation/feasibility study reports, cleanup action plans, and engineering design reports. As appropriate, Ecology will edit, finalize, and distribute such fact sheets and prepare and distribute public notices of Ecology's presentations and meetings.

2. Notify Ecology's project coordinator prior to the preparation of all press releases and fact sheets, and before major meetings with the interested public and local governments. Likewise, Ecology shall notify Fox Avenue prior to the issuance of all press releases and fact sheets, and before major meetings with the interested public and local governments. For all press releases, fact sheets, meetings, and other outreach efforts by Fox Avenue that do not receive prior Ecology approval, Fox Avenue shall clearly indicate to its audience that the press release, fact sheet, meeting, or other outreach effort was not sponsored or endorsed by Ecology.

3. When requested by Ecology, participate in public presentations on the progress of the remedial action at the Site. Participation may be through attendance at public meetings to assist in answering questions or as a presenter.

4. When requested by Ecology, arrange and/or continue information repositories to be located at the following locations:

- a. South Park Branch Public Library
8604 Eighth Avenue South
Seattle, WA 98108
(206) 615-1688
- b. Ecology's Northwest Regional Office
3190 160 Avenue NE
Bellevue, WA 98008
(425) 649-7190

At a minimum, copies of all public notices, fact sheets, press releases, and documents relating to public comment periods; all quality assured monitoring data; remedial action plans and reports; supplemental remedial planning documents; and all other similar documents relating to performance of the remedial action required by this Order shall be promptly placed in the repository at Ecology's Northwest Regional Office in Bellevue, Washington.

I. Retention of Records

During the pendency of this Order, and for ten (10) years from the date of completion of work performed pursuant to this Order, Fox Avenue shall preserve all records, reports, documents, and underlying data in its possession relevant to the implementation of this Order, the 2009 Agreed Order, the 1991 Agreed Order, and Amendment 1, and shall insert a similar record retention requirement into all contracts with project contractors and subcontractors. Upon request of Ecology, Fox Avenue shall make all records available to Ecology and allow access for review within a reasonable time. Nothing in this Order is intended by Fox Avenue to waive any right it may have under applicable law to limit disclosure of documents protected by the attorney work-product privilege and/or the attorney-client privilege. If Fox Avenue withholds any requested records based on an assertion of privilege, it shall provide Ecology with a privilege log

specifying the records withheld and the applicable privilege. No actual data collected on Site pursuant to this Order shall be considered privileged.

J. Resolution of Disputes

1. In the event a dispute arises as to an approval, disapproval, proposed change, or other decision or action by Ecology's project coordinator, or an itemized billing statement under Section VIII.B (Remedial Action Costs), the Parties shall utilize the dispute resolution procedure set forth below.

a. Upon receipt of Ecology's project coordinator's written decision or the itemized billing statement, Fox Avenue has fourteen (14) days within which to notify Ecology's project coordinator in writing of its objection to the decision or itemized statement.

b. The Parties' project coordinators shall then confer in an effort to resolve the dispute. If the project coordinators cannot resolve the dispute within fourteen (14) days, Ecology's project coordinator shall issue a written decision responding to Fox Avenue's objection.

c. Fox Avenue may then request regional management review of the decision. This request shall be submitted in writing to the Northwest Region Toxics Cleanup Section Manager within seven (7) days of receipt of Ecology's project coordinators written decision.

d. The Section Manager shall conduct a review of the dispute and shall endeavor to issue a written decision regarding the dispute within thirty (30) days of Fox Avenue's request for review. The Section Managers decision shall be Ecology's final decision on the disputed matter.

2. The Parties agree to only utilize the dispute resolution process in good faith and agree to expedite, to the extent possible, the dispute resolution process whenever it is used.

3. Implementation of these dispute resolution procedures shall not provide a basis for delay of any activities required in this Order, unless Ecology agrees in writing to a schedule extension.

K. Extension of Schedule

1. An extension of schedule shall be granted only when a request for an extension is submitted in a timely fashion, generally at least thirty (30) days prior to expiration of the deadline for which the extension is requested, and good cause exists for granting the extension. All extensions shall be requested in writing. The request shall specify:

- a. The deadline that is sought to be extended;
- b. The length of the extension sought;
- c. The reason(s) for the extension; and
- d. Any related deadline or schedule that would be affected if the extension were granted.

2. The burden shall be on Fox Avenue to demonstrate to the satisfaction of Ecology that the request for such extension has been submitted in a timely fashion and that good cause exists for granting the extension. Good cause may include, but may not be limited to:

- a. Circumstances beyond the reasonable control and despite the due diligence of Fox Avenue including delays caused by unrelated third parties or Ecology, such as (but not limited to) delays by Ecology in reviewing, approving, or modifying documents submitted by Fox Avenue;
- b. Acts of God, including fire, flood, blizzard, extreme temperatures, storm, or other unavoidable casualty; or
- c. Endangerment as described in Section VIII.M (Endangerment).

However, neither increased costs of performance of the terms of this Order nor changed economic circumstances shall be considered circumstances beyond the reasonable control of Fox Avenue.

3. Ecology shall act upon any written request for extension in a timely fashion. Ecology shall give Fox Avenue written notification of any extensions granted pursuant to this Order. A requested extension shall not be effective until approved by Ecology. Unless the extension is a substantial change, it shall not be necessary to amend this Order pursuant to Section VIII.L (Amendment of Order) when a schedule extension is granted.

4. An extension shall only be granted for such period of time as Ecology determines is reasonable under the circumstances. Ecology may grant schedule extensions exceeding ninety (90) days only as a result of:

- a. Delays in the issuance of a necessary permit which was applied for in a timely manner;
- b. Other circumstances deemed exceptional or extraordinary by Ecology; or
- c. Endangerment as described in Section VIII.M (Endangerment).

L. Amendment of Order

The project coordinators may verbally agree to minor changes to the work to be performed without formally amending this Order. Minor changes will be documented in writing by Ecology within seven (7) days of verbal agreement.

Except as provided in Section VIII.N (Reservation of Rights), substantial changes to the work to be performed shall require formal amendment of this Order. This Order may only be formally amended by the written consent of both Ecology and Fox Avenue. Fox Avenue shall submit a written request for amendment to Ecology for approval. Ecology shall indicate its approval or disapproval in writing and in a timely manner after the written request for amendment is received. If the amendment to this Order represents a substantial change, Ecology will provide public notice and opportunity to comment. Reasons for the disapproval of a proposed amendment to this Order shall be stated in writing. If Ecology does not agree to a proposed amendment, the disagreement may be addressed through the dispute resolution procedures described in Section VIII.J (Resolution of Disputes).

M. Endangerment

In the event Ecology determines that any activity being performed at the Site is creating or has the potential to create a danger to human health or the environment on or surrounding the Site, Ecology may direct Fox Avenue to cease such activities for such period of time as it deems necessary to abate the danger. Fox Avenue shall immediately comply with such direction.

In the event Fox Avenue determines that any activity being performed at the Site is creating or has the potential to create a danger to human health or the environment, Fox Avenue may cease such activities. Fox Avenue shall notify Ecology's project coordinator as soon as possible, but no later than twenty-four (24) hours after making such determination or ceasing such activities. Upon Ecology's direction Fox Avenue shall provide Ecology with documentation of the basis for the determination or cessation of such activities. If Ecology disagrees with Fox Avenue's cessation of activities, it may direct Fox Avenue to resume such activities.

If Ecology concurs with or orders a work stoppage pursuant to Section VIII.M (Endangerment), Fox Avenue's obligations with respect to the ceased activities shall be suspended until Ecology determines the danger is abated, and the time for performance of such activities, as well as the time for any other work dependent upon such activities, shall be extended in accordance with Section VIII.K (Extension of Schedule) for such period of time as Ecology determines is reasonable under the circumstances.

Nothing in this Order shall limit the authority of Ecology, its employees, agents, or contractors to take or require appropriate action in the event of an emergency.

N. Reservation of Rights

This Order is not a settlement under Chapter 70.105D RCW. Ecology's signature on this Order in no way constitutes a covenant not to sue or a compromise of any of Ecology's rights or authority. Ecology will not, however, bring an action against Fox Avenue to recover remedial action costs paid to and received by Ecology under this Order. In addition, Ecology will not take

additional enforcement actions against Fox Avenue regarding remedial actions required by this Order, provided Fox Avenue complies with this Order.

Ecology nevertheless reserves its rights under Chapter 70.105D RCW, including the right to require additional or different remedial actions at the Site should it deem such actions necessary to protect human health and the environment, and to issue orders requiring such remedial actions. Ecology also reserves all rights regarding the injury to, destruction of, or loss of natural resources resulting from the release or threatened release of hazardous substances at the Site.

O. Transfer of Interest in Property

No voluntary conveyance or relinquishment of title, easement, leasehold, or other interest in any portion of the Site shall be consummated by Fox Avenue without provision for continued implementation of all requirements of this Order and implementation of any remedial actions found to be necessary as a result of this Order.

Prior to Fox Avenue's transfer of any interest in all or any portion of the Site, and during the effective period of this Order, Fox Avenue shall provide a copy of this Order to any prospective purchaser, lessee, transferee, assignee, or other successor in said interest; and, at least thirty (30) days prior to any transfer, Fox Avenue shall notify Ecology of said transfer. Upon transfer of any interest, Fox Avenue shall restrict uses and activities to those consistent with this Order and notify all transferees of the restrictions on the use of the property.

P. Compliance with Applicable Laws

1. All actions carried out by Fox Avenue pursuant to this Order shall be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in RCW 70.105D.090. The permits or specific federal, state, or local requirements that the agency has determined are applicable and that are known at the time of entry of this Order have been identified in Exhibit D.

2. Pursuant to RCW 70.105D.090(1), Fox Avenue is exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW and of any laws

requiring or authorizing local government permits or approvals. However, Fox Avenue shall comply with the substantive requirements of such permits or approvals. At this time, no state or local permits or approvals have been identified as being applicable but procedurally exempt under this Section.

Fox Avenue has a continuing obligation to determine whether additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order. In the event either Ecology or Fox Avenue determines that additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order, it shall promptly notify the other party of its determination. Ecology shall determine whether Ecology or Fox Avenue shall be responsible to contact the appropriate state and/or local agencies. If Ecology so requires, Fox Avenue shall promptly consult with the appropriate state and/or local agencies and provide Ecology with written documentation from those agencies of the substantive requirements those agencies believe are applicable to the remedial action. Ecology shall make the final determination on the additional substantive requirements that must be met by Fox Avenue and on how Fox Avenue must meet those requirements. Ecology shall inform Fox Avenue in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Order. Fox Avenue shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination.

3. Pursuant to RCW 70.105D.090(2), in the event Ecology determines that the exemption from complying with the procedural requirements of the laws referenced in RCW 70.105D.090(1) would result in the loss of approval from a federal agency that is necessary for the State to administer any federal law, the exemption shall not apply and Fox Avenue shall comply with both the procedural and substantive requirements of the laws referenced in RCW 70.105D.090(1), including any requirements to obtain permits.

Q. Land Use Restrictions

Fox Avenue shall record an Environmental Covenant, as approved by Ecology, with the office of the King County Auditor within ten (10) days of the completion of the active remedial action as detailed in the CAP. The Environmental Covenant shall restrict future uses of the Site to industrial use. Fox Avenue shall provide Ecology with a copy of the recorded Environmental Covenant within thirty (30) days of the recording date.

R. Financial Assurances

Pursuant to WAC 173-340-440(11), Fox Avenue shall maintain sufficient and adequate financial assurance mechanisms to cover all costs associated with the operation and maintenance of the remedial action at the Site, including institutional controls, long-term compliance monitoring, and corrective measures. Fox Avenue's financial assurance is a Trust Agreement approved by Ecology and attached as Exhibit F.

Fox Avenue shall adjust the financial assurance coverage and provide Ecology's project coordinator with documentation of the updated financial assurance for:

1. Inflation, annually, within thirty (30) days of the end of the calendar year; or if applicable, the modified anniversary date established in accordance with this Section, or if applicable, ninety (90) days after the close of Fox Avenue fiscal year if the financial test or corporate guarantee is used, and

2. Changes in cost estimates, within thirty (30) days of issuance of Ecology's approval of a modification or revision to the cleanup action plan (CAP) that result in increases to the cost or expected duration of remedial actions. Any adjustments for inflation since the most recent preceding anniversary date shall be made concurrent with adjustments for changes in cost estimates. The issuance of Ecology's approval of a revised or modified CAP will revise the anniversary date established under this Section to become the date of issuance of such revised or modified CAP.

S. Indemnification

Fox Avenue agrees to indemnify and save and hold the State of Washington, its employees, and agents harmless from any and all claims or causes of action for death or injuries to persons or for loss or damage to property to the extent arising from or on account of acts or omissions of Fox Avenue, its officers, employees, agents, or contractors in entering into and implementing this Order. However, Fox Avenue shall not indemnify the State of Washington nor save nor hold its employees and agents harmless from any claims or causes of action to the extent arising out of the negligent acts or omissions of the State of Washington, or the employees or agents of the State, in entering into or implementing this Order.

IX. SATISFACTION OF ORDER

The provisions of this Order shall be deemed satisfied upon Fox Avenue's receipt of written notification from Ecology that Fox Avenue has completed the remedial activity required by this Order, as amended by any modifications, and that Fox Avenue has complied with all other provisions of this Order.

X. ENFORCEMENT

Pursuant to RCW 70.105D.050, this Order may be enforced as follows:

A. The Attorney General may bring an action to enforce this Order in a state or federal court.

B. The Attorney General may seek, by filing an action, if necessary, to recover amounts spent by Ecology for investigative and remedial actions and orders related to the Site.

C. In the event Fox Avenue refuses, without sufficient cause, to comply with any term of this Order, Fox Avenue will be liable for:

1. Up to three (3) times the amount of any costs incurred by the State of Washington as a result of its refusal to comply; and

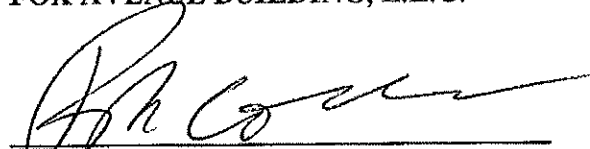
2. Civil penalties of up to Twenty-Five Thousand Dollars (\$25,000) per day for each day it refuses to comply.

D. This Order is not appealable to the Washington Pollution Control Hearings Board.

This Order may be reviewed only as provided under RCW 70.105D.060.

Effective date of this Order: JUNE 18, 2012

FOX AVENUE BUILDING, L.L.C.

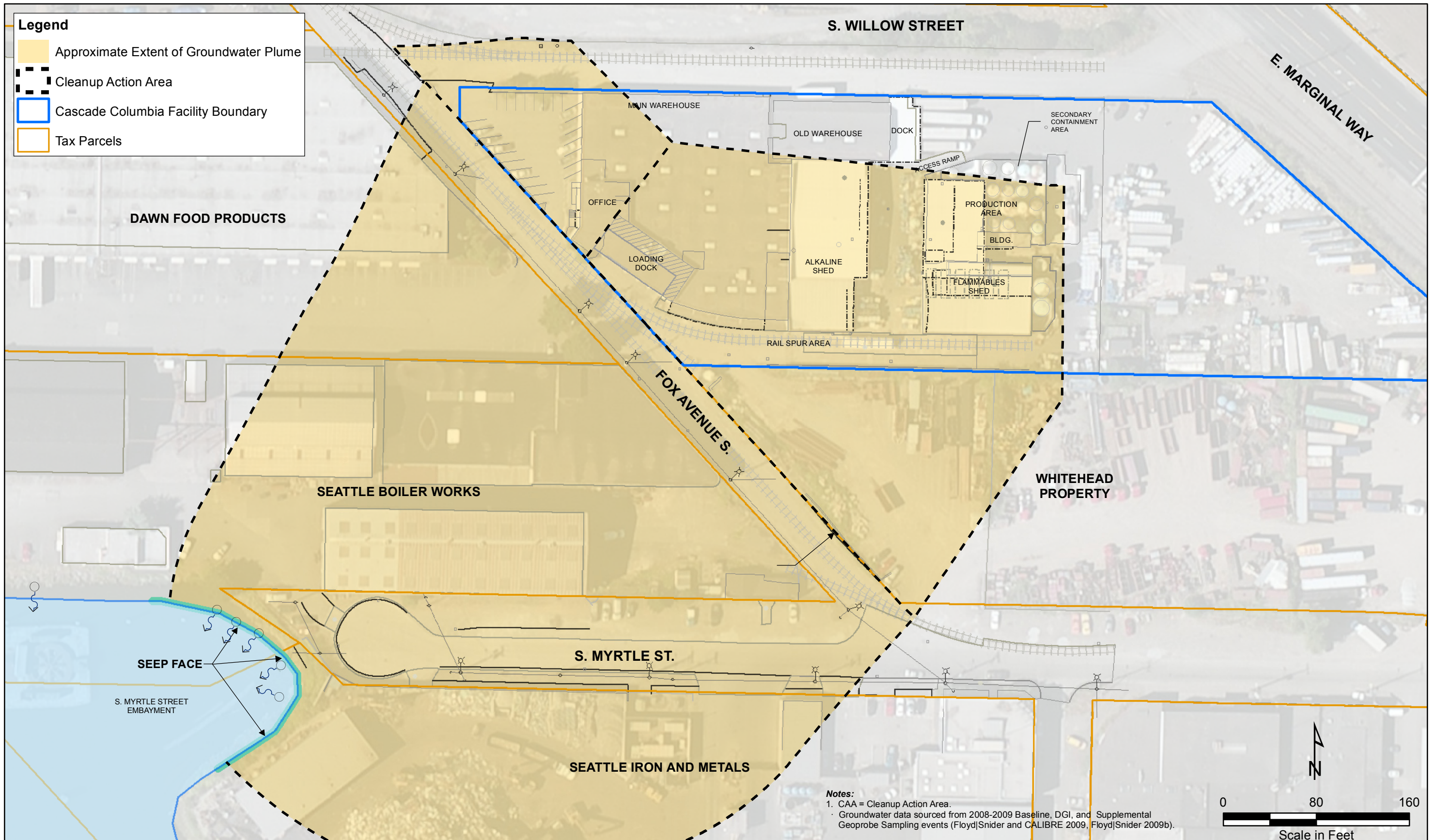


Robert Code
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**STATE OF WASHINGTON,
DEPARTMENT OF ECOLOGY**



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FINAL CLEANUP ACTION PLAN

FOX AVENUE SITE SEATTLE, WASHINGTON

Issued by:

Washington State Department of Ecology
Toxics Cleanup Program
Northwest Regional Office
Bellevue, Washington

June 2012

**Fox Avenue Site
Seattle, Washington**

Cleanup Action Plan

FINAL

June 2012

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List of Abbreviations and Acronyms

Abbreviation/ Acronym	Definition
1 st SH	First Silt Horizon
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Aboveground storage tank
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and xylene
CAA	Cleanup Action Area
CAP	Cleanup Action Plan
Cascade Columbia	Cascade Columbia Distribution
cis-1,2-DCE	cis-1,2-Dichloroethene
COC	Chemical of concern

Abbreviation/ Acronym	Definition
CPOC	Conditional point of compliance
CVOC	Chlorinated volatile organic compound
DCE	Dichloroethene
DNAPL	Dense non-aqueous phase liquid
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
Eh	Reduction-oxidation (redox) potential
EOS	Edible oil substrate
ERD	Enhanced reductive dechlorination
ERH	Electrical Resistance Heating
Fox LLC	Fox Avenue Building, LLC
FS	Feasibility Study
GWCC	Great Western International Chemical Company
LDW	Lower Duwamish Waterway
LGZ	Lower Groundwater Zone
LNAPL	Light non-aqueous phase liquid
LTM	Long-term monitoring
MNA	Monitored natural attenuation
MTCA	Model Toxics Control Act
NAPL	Non-aqueous phase liquid
NAVD88	North American Vertical Datum
PCE	Tetrachloroethene
Penta	Pentachlorophenol
PID	Photoionization detector
POC	Point of compliance
PRB	Permeable Reactive Barrier
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RI/PRA	Remedial Investigation/Preliminary Risk Assessment
RL	Remediation level
Seattle Chain	Seattle Chain and Manufacturing Company
SH	Silt Horizon
Site	Fox Avenue Site
SVE	Soil vapor extraction
TCE	Trichloroethene
TPH	Total petroleum hydrocarbon
UCL	Upper confidence limit
UGZ	Upper Groundwater Zone
URS	URS Corporation
UST	Underground storage tank
VC	Vinyl chloride
VOC	Volatile organic compound

Abbreviation/ Acronym	Definition
WAC	Washington Administrative Code
WBZ	Water Bearing Zone
ZVI	Zero-valent iron

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 requirements 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.

Sunny Becker
Site Manager
Toxics Cleanup Program
Northwest Regional Office

Date

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

Date

1.0 Introduction

This Cleanup Action Plan (CAP) describes the cleanup action selected by the Washington State Department of Ecology (Ecology) for the Fox Avenue Site (the Site). The Site is the former location of Great Western International Chemical Company (GWCC) and is currently in operation as the Cascade Columbia Facility located at 6900 Fox Avenue S. in Seattle, Washington (Figure 1.1). The selected cleanup action described in this document fulfills the requirements of the Model Toxics Control Act (MTCA), Chapter 70.105D of the Revised Code of Washington (RCW), administered by Ecology under the MTCA Cleanup Regulation Chapter 173-340 of the Washington Administrative Code (WAC).

This CAP was developed using information presented in the Remedial Investigation/Feasibility Study (RI/FS) for the Site, which was prepared by Floyd|Snider, Inc. in 2011 on behalf of Fox Avenue, LLC, and reviewed and approved by Ecology. Fox Avenue, LLC and Ecology entered into an Agreed Order (No. DE 6486) on May 6, 2009. The Agreed Order required Fox Avenue, LLC to initiate an interim action for groundwater, update the existing RI/FS for the Site, and submit a draft CAP to Ecology.

The objective of this document is to satisfy the MTCA requirements for cleanup action plans set forth in WAC 173--340--380(1). Consistent with the requirement of that chapter, this CAP provides the following information:

- Site description, background, and characterization
- Cleanup standards and remediation levels for each hazardous substance in each media of concern
- Description of the selected remedial action, including justification for the selection
- Brief summary of the remedial action alternatives considered in the RI/FS
- Implementation schedule and restoration time frame
- Institutional controls
- Applicable state and federal laws

This final CAP incorporates public comment received on the draft CAP.

2.0 Site Description, Background, and Characterization

The Site currently includes the Cascade Columbia Facility located at 6900 Fox Avenue S. and certain downgradient properties under which a groundwater contaminant plume travels and eventually discharges to the Lower Duwamish Waterway (LDW). The Site is located in the Duwamish industrial corridor of Seattle as shown on Figure 1.1.

The Cascade Columbia Facility occupies approximately 2.5 acres of flat land located approximately 400 feet from the S. Myrtle Street Embayment of the LDW. The property is bordered to the north by South Willow Street, to the south by the Whitehead property, to the east by East Marginal Way S, and to the west by Fox Avenue S. Active rail lines also cross the site area. The area is zoned for heavy industry and a large number of commercial and industrial operations are located nearby, including: Seattle Iron and Metals Corporation, a metals recycler; Seattle Boiler Works, a fabricator of steel pressure vessels; Schultz Fuel Distributing, a distributor of petroleum products; and Dawn Foods Distribution, a warehouse distributor of food products. Figure 2.1 shows the Site and surrounding properties.

2.1 CURRENT FACILITY USE

Cascade Columbia warehouses, packages, and distributes mainly liquid and solid bulk chemicals for the aerospace, electronics, food manufacturing, personal care, water treatment, and metal plating industries. Product is received either by rail tanker via a rail spur on the south side of the facility or truck via a main loading dock on the northeast side of the warehouse and a smaller loading dock along Fox Avenue. Product is offloaded and stored in bermed aboveground storage tanks (ASTs) or in a variety of sacks, bags, drums, and containers. Currently there are no active underground storage tanks (USTs) at the facility and Cascade Columbia does not distribute or repackage chlorinated solvents. Approximately 20 personnel work full time at the Cascade Columbia Facility. Figure 2.2 shows the current primary operational areas of the Cascade Columbia Facility.

2.2 HISTORICAL OWNERSHIP AND HISTORY

The Fox Avenue Building, LLC (Fox LLC) property was first developed in the early 20th century by the Seattle Chain and Manufacturing Company (Seattle Chain). Seattle Chain and successor companies operated coke- and oil-fired furnaces and built warehouses on the property. For the next 20 years, ownership of the property changed hands several times until 1956 when Marian Properties, LLC Enterprises bought the property and leased a portion of it to GWCC, which started its operations in the former Seattle Chain warehouse building that is still in use today by Cascade Columbia as a warehouse and loading dock. Other lessees of the Site during the 1950s and 1960s included Campbell Chain Company, which leased the warehouse in the northern part of the property, and Tyee Lumber Company, which leased parts of the warehouse building for storage and product assembly until 1969 when the Tyee Lumber Company shut down. From the 1960s through the 1980s, GWCC replaced and upgraded much of the earlier structures and built the current warehouse and exterior operational areas.

GWCC operated a chemical and petroleum repackaging and distribution facility on the property. GWCC received bulk chemical products and repackaged, transferred, and distributed both liquid and dry chemical products, including solvents (e.g., mineral spirits, toluene, tetrachloroethene

[PCE¹, etc.). Until the late 1980s, GWCC supplied chemicals and supplies to the laundry and dry cleaning industry. This aspect of GWCC business, as well as most of its petroleum product handling, was phased out by 1990. GWCC pumped bulk product received via tanker truck or rail through buried pipes at the rail siding area along the southern edge of the warehouse or by hoses that ran along the ground surface. Additionally, GWCC began handling pentachlorophenol (Penta) on the property sometime in 1966. Penta was stored in one of the 12,000-gallon tank compartments and, for a period of one to two years only, Penta was blended with Stoddard solvents or mineral spirits in a small AST north and west of the drum shed. From 1969 until the late 1970s or early 1980s, GWCC purchased mixed Penta in drums from outside vendors.

The GWCC facility had a number of ASTs and USTs that stored chemical and petroleum products, including solvents, acids, Penta, and lube oils. A series of six USTs were originally installed in 1956 under the current Flammables Shed and a set of 10 double-compartment USTs were later installed in 1976 under the current Production Area. Both sets of tanks were decommissioned in 1989 by GWCC. The ten newer USTs were physically removed along with a limited amount of associated contaminated soil; however, the six older USTs were abandoned in place by cleaning the contents and then filling the USTs with pea gravel. These tanks were not able to be safely removed due to their location under warehouse structural elements. Portable, vertical ASTs called "tote bins," used for product storage, were stored on pallets in the vicinity of the older UST tank farm.

A 1,000-gallon UST located near the Loading Dock Area historically was used for storage of gasoline. It was decommissioned in place in 1989. Two 1,000-gallon, aboveground "wing tanks" were also used historically on the loading dock. One of the wing tanks contained PCE and the other tank stored methanol.

Soil contamination was first discovered in 1990 at the Site in the main tank farm area following removal of the main tank farm USTs. Subsequent to that discovery, GWCC entered into an Agreed Order with Ecology in September 1991. The Agreed Order required that GWCC perform a Remedial Investigation (RI) to address the nature and extent of contamination discovered during the UST removal, an environmental and health risk assessment and a Feasibility Study (FS) to study and evaluate remedial options at the Site. Results of the RI were presented in a Remedial Investigation/Preliminary Risk Assessment (RI/PRA), which was submitted to Ecology in December 1993 by Hart Crowser, Inc.

Since that time, the Site has been the subject of numerous additional investigative activities and interim remedial actions. The RI/FS prepared by Floyd|Snider in 2011 presented a detailed summary of all prior investigations at the Site.

2.3 REGIONAL AND SITE GEOLOGY

In general, the Lower Duwamish Valley deposits consist of 50 to 100 feet of older alluvium, representing sand and silt estuarine deposits. Locally, these older sediments contain discontinuous gravel lenses, shells, and some wood. The younger alluvial deposits atop the older alluvium have a relatively uniform thickness and depth, with a base that almost everywhere is within 5 to 10 feet of the modern sea level. These deposits, which consist of silt,

¹ The abbreviation "PCE" is derived from perchloroethene, a synonym to the International Union of Pure and Applied Chemistry name of tetrachloroethene. Other synonyms for tetrachloroethene include Perc, tetrachloroethylene, and perchloroethylene.

sand, and sandy silt with abundant wood and organics, represent channel and floodplain deposits laid down by the modern Duwamish River. Overlying the younger alluvium are varying amounts of fill that range in thickness from 3 to 10 feet. The fill material is composed of a mixture of sand, gravel, silt, and miscellaneous construction debris.

At the Site, near-surface soil predominately consists of fill material. Fill ranges in depth from 5 to 10 feet below ground surface (bgs). Typically, the fill is thickest near the center of the Site and thinner near the edges. Some of the thickest fill deposits occur beneath the raised outdoor storage and Production Area. Fill material is predominately composed of poorly graded silty fine sand to gravelly sand, or sandy silt to gravelly sandy silt. Locally, fill includes some organic matter, wood, and debris, including pieces of masonry, cinders, and slag.

The first native soils encountered beneath the fill are interpreted to represent recent (i.e., pre-development) alluvial deposits of the Lower Duwamish Valley. These deposits range in composition from fine to medium sand to slightly silty to very silty fine to medium sand. Locally, within these deposits, fine sandy silt lenses are intercepted. Where fill is lacking, these deposits range in depth from near-surface to approximately 10 to 15 feet bgs. These deposits have been interpreted to represent channel and floodplain deposits laid down by the modern Duwamish River (Booth and Herman 1998). These younger alluvial deposits host the first occurrence of groundwater at the Site, as described in further detail in the following section.

One primary low permeability horizon of significance to site conditions has been identified. This unit is termed the First Silt Horizon (1st SH) and occurs at the base of the recent alluvial deposits. The 1st SH is too discontinuous to act as an aquitard, but it can influence chemical migration. When it is present and relatively clean, it acts to limit diffusion and dispersion of groundwater contaminants with depth; however, when it is contaminated, it acts as a substantial reservoir of contamination. The 1st SH is located beneath most of the Cascade Columbia Facility, except for a small area northwest of the former main UST farm. The 1st SH is absent south of the Cascade Columbia Facility along Fox Avenue, but tends to exist, with discontinuities, further downgradient. By Seattle Boiler Works, the 1st SH is no longer contaminated, and, where present, acts to limit chemical dispersal with depth.

2.4 REGIONAL AND SITE GROUNDWATER

Groundwater occurs throughout the Lower Duwamish Valley in both the older and younger alluvial deposits. Shallow groundwater can also occur locally within fill material. In general, the valley alluvium is believed to comprise a single, large aquifer system (Booth and Herman 1998). Where this aquifer is thickest, upper and lower groundwater zones are often differentiated on a site-specific basis, based on the occurrence of locally-continuous silt layers, upward gradients at depth, and/or saline groundwater pockets (Booth and Herman 1998).

Locally, the valley aquifer is differentiated based on continuous silt aquitards that separate the major water bearing zones (WBZs) and the occurrence of upward gradients and/or the occurrence of saline groundwater pockets. Of most importance to site conditions is the Upper Groundwater Zone (UGZ). The UGZ is hosted by both younger and older alluvial deposits and typically occurs down to depths of 60 to 80 feet bgs. The net groundwater flow within the UGZ is generally toward the LDW; however, locally, daily tidal effects have been shown to cause apparent groundwater flow reversal near the waterway. Of lesser importance to site conditions is the Lower Groundwater Zone (LGZ), which is hosted in deeper estuarine/deltaic deposits. The LGZ is typically differentiated from the UGZ by a higher percentage of fines, an abundance

of shell fragments, and brackish groundwater conditions caused by contact with seawater. In the central part of the Duwamish Valley, where the Site is located, the LGZ is estimated to occur at depths greater than 80 feet bgs (Booth and Herman 1998).

Two groundwater bearing zones (i.e., 1st WBZ and 2nd WBZ) have been distinguished within the UGZ at the Site. This distinction is based on water chemistry, tidal effects, and the presence or absence of a low permeability deposit (the 1st SH) separating the zones. The 1st WBZ is the uppermost groundwater bearing unit. This zone is primarily composed of native alluvial deposits of fine to medium sand to slightly silty to very silty fine to medium sand. The 1st WBZ is unconfined, with depth to the water table ranging from approximately 7 to 13 feet bgs. Where present, the 1st SH serves as the base for the 1st WBZ throughout most of the Site. Where absent, the 1st WBZ grades into the underlying 2nd WBZ with no identifiable marker. The 1st WBZ is 3 to 8 feet thick in sections where the 1st SH is present. The 2nd WBZ is contained within a semi-confined (i.e., locally unconfined) estuarine/deltaic aquifer that consists of fine to medium silty sands with interbeds, stringers, and lenses of dense to very dense silty fine sand to soft to medium stiff sandy silt. In general, estuarine/deltaic deposits become fine-grained with depth, but often show repeated sequences of silt to silty sand to sand. The 2nd WBZ ranges in depth from approximately 15 to at least 80 feet bgs.

The general direction of groundwater flow at the Site is to the southwest, towards the LDW, regardless of the tidal cycle. At low tide, west of Fox Avenue, groundwater flows toward the S. Myrtle Street Embayment; however, at high tide, groundwater flows northeast towards the Site. This reversal in groundwater flow direction during the tidal cycle is typical of aquifers in contact with marine water bodies.

2.5 CHEMICALS OF CONCERN AND CLEANUP AREAS

The primary chemicals of concern (COCs) identified at the Site are PCE in soil, groundwater, and air; trichloroethene (TCE) in groundwater and air; benzene in soil and ground water; and 1,1-dichloroethene (1,1- DCE), Penta, total petroleum hydrocarbons (TPH; Mineral spirits to heavy oil range), and vinyl chloride (VC) in groundwater only.

The majority of contamination at the Site originates from well-defined source areas. Volatile and other mobile chemicals have migrated in groundwater and reached the S. Myrtle Street Embayment, but non-mobile contaminants, such as Penta, remain localized in their source areas.

The Site has been divided into the following cleanup areas as shown in Figure 2.3.

- **Main Source Area:** The Main Source Area represents those areas of the Site where past releases have occurred and the underlying soil is now the source of the plume found in downgradient groundwater. Contaminants in soil and groundwater include PCE, TCE, the dichloroethene (DCE) isomers, VC, aromatic volatile organic compounds (VOCs; benzene, toluene, ethylbenzene, and xylene [BTEX] for example), TPH (as mineral spirits) and Penta. The Main Source Area extends from under the Flammables Shed and Production Area to the southern part of the Site beneath the railroad tracks on Frontenac Street. Current and historical soil contamination in this area gives rise to groundwater plumes in the 1st WBZ and deeper 2nd WBZ that extends across the corner of the Whitehead Property that lies between the Fox Avenue right-of-way.

The Loading Dock Source Area is a subarea of the Main Source Area. Contamination in this area is limited to the vadose zone and 1st WBZ, and does not extend to the 2nd WBZ.

- **Northwest Corner Source Area:** The Northwest Corner Source Area is a smaller separate plume that is not commingled with the Main Source Area, and is located in the northwest corner of the Site in the parking lot. A distinct soil source has never been identified for the Northwest Corner Plume and its origin is thought to be related to several minor spills that occurred from tanker cars stored along the S. Willow Street rail line. The Northwest Corner Plume is composed primarily of PCE and TCE and is confined to 1st WBZ groundwater. Soil impacts greater than the selected cleanup levels have not been identified in this area.
- **Downgradient Groundwater Plume:** The Downgradient Groundwater Plume extends from the source areas southwest toward the S. Myrtle Street Embayment until it is discharged to the S. Myrtle Street Embayment via several prominent seeps along a tidal bank as well as direct discharge through the sediments of the embayment. There is no associated soil contamination in the Downgradient Groundwater Plume. The plume is comprised primarily of PCE and TCE in the 1st WBZ groundwater, and DCE and VC in the 2nd WBZ groundwater. There are also occurrences of 1,1-DCE, benzene, Penta, and TPH in this plume. The Penta is primarily found in 1st WBZ groundwater upgradient from Fox Avenue. Since 2009, this plume has been the subject of an interim action using enhanced reductive dechlorination (ERD) to stimulate the natural biological destruction of the chlorinated solvents. The ERD interim action is still ongoing and data to date indicate significant acceleration in the conversion of parent PCE to the daughter products TCE, DCE, and VC, as well as the increased production of the end product of dechlorination, ethene gas.

A conceptual site model for the release, which depicts contaminant migration at the Site, is shown on Figure 2.4.

2.6 CONTAMINANT DISTRIBUTION BY MEDIA

Soil on the Site has been impacted by the following COCs:

- **PCE and TCE.** PCE is the most abundant and prevalent Site contaminant in soil. It sometimes occurs as droplets of dense non-aqueous phase liquid (DNAPL). TCE is also present in site soil but at much lower relative concentrations and is limited in occurrence to those areas of significant PCE accumulations. The distribution of PCE and TCE (PCE+TCE) in soil with depth is shown on Figure 2.5.
- **TPH and BTEX.** Site soil in the Main Source Area may also contain limited areas of TPH and BTEX. The TPH is mainly comprised of mineral spirits and the BTEX represents a soluble fraction of the mineral spirits. In places, the mineral spirits contains commingled PCE.
- **Penta.** Penta contamination remains in shallow site soil in a limited area under the railroad spur.

Groundwater on the Site has been impacted by the following COCs:

- **PCE, TCE, DCE, and VC.** Groundwater in the 1st and 2nd WBZ from the Main Source Area is contaminated with Chlorinated volatile organic compounds (CVOCs). Seeps in the S. Myrtle Street Embayment where this contamination discharges contain PCE and its degradation products, especially VC. The distribution of PCE+TCE, cis-1,2-DCE, and VC in groundwater (1st WBZ and 2nd WBZ) is shown on Figure 2.6.
- **TPH and BTEX.** The TPH footprint is similar to the solvent footprint with the highest concentrations located near the railroad spur in the Production Area and in the Loading Dock Area. TPH concentrations are either non-detectable or in compliance with groundwater cleanup levels by Fox Avenue. Groundwater in the 1st and 2nd WBZ from the Main Source Area is contaminated with benzene, which appears to have commingled and migrated with the CVOC plume discharging along with the CVOCs in the 2nd WBZ seeps.
- **Penta.** Penta occurs primarily in groundwater within the 1st WBZ. Concentrations are either non-detectable or in compliance with groundwater cleanup levels by Fox Avenue.

Indoor Air on the Site has been impacted by the following COCs:

- **PCE and TCE.** Concentrations of PCE and TCE levels in indoor air are greater than the MTCA Method C cleanup levels in the downstairs office and restroom at Cascade Columbia. Indoor air samples collected by URS at the Seattle Boiler Works facility in December 2010 indicate that PCE and TCE are present in indoor and outside ambient air (background) at concentrations greater than the MTCA Method B cleanup levels but lower than MTCA Method C cleanup levels. A summary of soil gas and indoor air sampling results at Seattle Boiler Works and at Cascade Columbia is included in Table 2.1.

Sediments and surface water in the S. Myrtle Street Embayment are not contaminated by COCs associated with the Site and are not considered contaminated media.

The stormwater from the operational areas of the Site is combined with process water, treated, and sent to the sanitary sewer under permit. Stormwater is not considered a contaminated media at this Site.

3.0 Cleanup Standards

Cleanup standards have been established for this Site. Establishment of cleanup standards requires specification of the cleanup levels (chemical concentrations that are protective of human health and the environment) for each COC in each impacted media and the location on the Site where the cleanup levels must be attained, the point of compliance (POC).

3.1 SOIL CLEANUP LEVELS

The following pathways were considered for the establishment of soil cleanup levels at the Site:

- Protection of human health via direct exposure using MTCA Method C for industrial workers.
- Protection of ecological receptors. Since the Cascade Columbia Facility is paved with active industrial operations, and will remain paved for the foreseeable future, an ecological evaluation is not required under MTCA. Institutional controls will ensure the industrial future use of the Cascade Columbia property.
- Protection of groundwater resources from chemicals leaching from soil.
- Protection of indoor air from vapor intrusion from contaminated soil and/or groundwater.

In developing cleanup levels, the following site-specific information is relevant:

- The Fox LLC property and the adjacent properties that make up the Site are currently zoned industrial. This area has been an industrial area since the 1920s. Furthermore, the City of Seattle has identified this area for future industrial land use and redevelopment. For these reasons, industrial land use exposure assumptions have been applied to the Site.
- Soil contamination at the Site is limited to the Cascade Columbia facility because exceedances of applicable cleanup levels have not been detected in off-property areas.
- The Fox LLC property is presently covered with buildings or pavement. Although the direct exposure pathway will be considered in setting cleanup levels, it should be understood that direct exposure to contaminated soil is currently a “blocked” pathway in that there is no ongoing exposure.

The upper 15 feet of the Site is the standard POC for soil under MTCA, assuming direct contact. Only PCE has a maximum soil concentration that exceeds the Method C value and only occurs within the Fox LLC property boundary. The Method C PCE cleanup level for soil based on direct contact is, however, not sufficiently protective of groundwater or indoor air so it was not selected as the cleanup level. The soil cleanup level protective of both groundwater and indoor air will not be a numerical value but an empirical demonstration that confirms that soil concentrations remaining after active remediation will be protective of groundwater and indoor air, as allowed under MTCA (WAC 173-340-747(3)(f)). Final cleanup levels for soil are provided in Section 3.4.

3.2 GROUNDWATER CLEANUP LEVELS

The following pathways were considered for the establishment of groundwater cleanup levels at the Site:

- Protection of surface water resources, based on the discharge of groundwater into the Duwamish River at the S. Myrtle Street Embayment. The surface water resources will be protected for both human health (via the consumption of VOC-contaminated aquatic organisms) and ecological receptors.
- Protection of indoor air at the Cascade Columbia Facility and downgradient properties from vapor intrusion from contaminated groundwater in the 1st WBZ.
- Protection of sediment in the LDW was *not* considered a pathway because VOCs are not regulated under the Sediment Management Standards due to the chemical properties that prevent them from partitioning to sediments.

In developing groundwater cleanup levels for the Site, the following site-specific information is relevant:

- Groundwater at the Site is within a tidally-influenced section of the Lower Duwamish Valley. The section of the aquifer in which the Site is located is non-potable, and its maximum beneficial use is protection of adjacent surface water resources in the LDW.
- The water in the LDW is saline and qualifies as a marine water body.

Consistent with the regulation, MTCA equations for the calculation of cleanup levels based on fish consumption were only used when there were no promulgated standards for that pathway. The applicable cleanup levels for groundwater discharging to marine waters are listed in Tables 3.1 and 3.2. Where multiple criteria were available for a chemical, the lowest value was selected, consistent with MTCA (WAC 173-340-730(3)(b)(i)). Only a few compounds were detected in the seeps at concentrations greater than the cleanup levels. These compounds include PCE, TCE, 1,1-DCE, and VC. Final cleanup levels for COCs in groundwater, as well as groundwater seeps, are provided in Section 3.4. A groundwater cleanup level protective of indoor air was not calculated; instead, an empirical demonstration will be used to confirm that groundwater concentrations during and after active remediation are protective of indoor air as described in Section 6.6.

3.3 INDOOR AIR CLEANUP LEVELS

In developing cleanup levels for indoor air, the following site-specific information is relevant:

- The Fox Avenue Building and the adjacent properties that make up the Site are zoned industrial. This area has been an industrial area since the 1920s. Furthermore, the City of Seattle has identified this area for future industrial land use and redevelopment. For these reasons, industrial land use (MTCA Method C) exposure assumptions have been applied to the Fox Avenue facility.
- The Seattle Boiler Works property is also currently zoned industrial; however, the property owner will not currently accept a covenant that restricts future property use to industrial; therefore, Ecology determined that MTCA Method B cleanup levels be applied to the Seattle Boiler Works property.

Standard MTCA Method B and C cleanup levels to protect indoor air quality exist for the individual COCs as derived using the equations in WAC 173-340-750. Final cleanup levels for COCs in indoor air are provided in Section 3.4.

3.4 FINAL CLEANUP LEVELS

The final site-wide cleanup levels are:

Chemical of Concern	Soil Cleanup Level— Protection of Groundwater/ Indoor Air	Groundwater Cleanup Level— Protection of Surface Water (µg/L)	MTCA Method B ¹ Indoor Air Cleanup Level (µg/m ³)	MTCA Method C ² Indoor Air Cleanup Level (µg/m ³)
Benzene	Empirical ³	51	NA	NA
1,1-DCE	Empirical ³	3.2	NA	NA
Penta	Empirical ³	3.0	NA	NA
PCE	Empirical ³	3.3	0.42	4.2
TCE	Empirical ³	30	0.10	1.0
TPH (Mineral Spirits to Heavy Oil Range)	Empirical ³	500	NA	NA
Vinyl Chloride	Empirical ³	2.4	NA	NA

Notes:

- 1 MTCA Method B Air CULs are applied to the Seattle Boiler Works property
- 2 MTCA Method C Air CULs are applied to the Cascade Columbia building.
- 3 CUL has no numeric value. Instead, soil, indoor air, and groundwater will be empirically demonstrated to be in compliance when indoor air and groundwater (at the conditional point of compliance) meet their respective cleanup levels within the estimated restoration time frame.

Abbreviations:

- CUL Cleanup level
- DCE Dichloroethene
- µg/L Micrograms per liter
- µg/m³ Micrograms per cubic meter
- MTCA Model Toxics Control Act
- NA: Not applicable, the chemical is not a contaminant of concern for air
- PCE Tetrachloroethene
- Penta Pentachlorophenol
- TCE Trichloroethene
- TPH Total petroleum hydrocarbon

3.5 POINTS OF COMPLIANCE

POCs (locations where the cleanup levels shall be achieved) are established for each impacted media at the Site. These impacted media include groundwater, air, and soil. The POCs for each medium are discussed separately below.

3.5.1 Soil Points of Compliance

The points of compliance for soil are based on three pathways of exposure:

1. **Soil direct contact.** The MTCA standard POC for soil for direct contact is from the ground surface to a depth of 15 feet bgs. Compliance will be determined by direct sampling of soil following source area remediation.
2. **Soil leaching contaminants to groundwater.** This is a cross-media pathway that concerns all site soil that is a potential source of chemicals to groundwater. Compliance will be demonstrated empirically by directly comparing groundwater concentrations at the Fox Avenue conditional point of compliance (CPOC) following source area remediation to the groundwater remediation and cleanup levels. If groundwater at the CPOC meets the groundwater cleanup levels, this pathway will be empirically demonstrated to be in compliance.
3. **Soil in the vadose zone causing vapor intrusion.** For protection of this cross-media pathway, the POC is from the surface to the uppermost groundwater table (approximately 10 feet bgs at the Site). Compliance will be demonstrated empirically by direct sampling of indoor air following source area remediation. If indoor air is in compliance with the indoor air cleanup levels, then this pathway will be empirically demonstrated to be in compliance.

3.5.2 Groundwater Conditional Point of Compliance

The standard POC for groundwater under MTCA is “throughout the site from the uppermost level of the saturated zone extending vertically to the lowest depth which could potentially be affected by the site” (WAC 173-340-720(8)(b)); however, per MTCA (WAC 173-340-720(8)(c)), where it can be demonstrated that it is not practicable to meet the cleanup levels throughout the Site in a reasonable restoration time frame, a CPOC may be approved by Ecology. Currently, there is not a practicable technology that exists to clean up the source areas at DNAPL sites in a reasonable restoration time frame to meet current regulatory levels. This is especially true at this Site due to the continued presence of DNAPL and the large mass of solvent released at this Site. Therefore, a CPOC is warranted. At the Cascade Columbia facility, source areas such as at the loading dock and rail spur lie at the property boundary making the property boundary along Fox Avenue a justifiable CPOC.

Therefore, the CPOC for groundwater is Fox Avenue, along the downgradient property boundary of both the Fox LLC property and the Whitehead Property under which the groundwater plume travels (refer to Figure 2.3). These two properties encompass the full width of the plume. The owner of the Whitehead property has provided written agreement to the use of a conditional POC.

The current owner of the downgradient Seattle Boiler Works property has indicated that he will not concur with a CPOC that extends across Fox Avenue and onto his property (i.e., at the S. Myrtle Street Embayment). In the future, should he or a subsequent owner consent to the use of an off-property CPOC for groundwater, Ecology will consider moving the CPOC off-property from Fox Avenue to the S. Myrtle Street Embayment per MTCA (WAC 173-340-720(8)(d)(ii)). The POC for the groundwater seeps discharging to surface water will be the seeps along the S. Myrtle Street Embayment. The seeps will be sampled and the concentrations directly compared to the groundwater cleanup standards that are protective of surface water.

3.5.3 Indoor Air Point of Compliance

The POC for ambient and indoor air is site-wide; however, vapor intrusion from subsurface contaminants occurs only in enclosed spaces and structures such as the Cascade Columbia office, or buildings overlying the downgradient plume. The active remedial actions proposed for the source areas are intended to reduce soil concentrations by approximately 98 percent on average. The resultant residual soil and groundwater concentrations following active remediation are anticipated to be protective of indoor air site-wide. Compliance will be documented by measuring indoor air in the Cascade Columbia office, the downgradient Seattle Boiler Works buildings, and other potentially impacted structures before, during, and after active remediation of soil and groundwater. Details of the plan and schedule for compliance sampling of indoor air are described in Section 6.6. Additional details will be set forth in the EDR.

3.6 REMEDIATION LEVELS

In accordance with WAC 173-340-200, a remediation level “means a concentration of a hazardous substance in soil, air, water, or sediment above which a particular cleanup action component will be required as part of a cleanup action at a site.” Remediation levels are, by definition, concentrations that exceed cleanup standards and are used when a combination of cleanup action components are necessary to achieve cleanup levels at the POC. Cleanup actions that use remediation levels to meet the cleanup standards at a CPOC are also considered to comply with the cleanup standards.

Remediation levels are applicable to this Site because implementation of multiple aggressive treatment technologies will likely be necessary to achieve cleanup levels for groundwater at the CPOC, located along Fox Avenue and throughout the Downgradient Groundwater Plume. As explained in the RI, COC concentrations in soil and groundwater are elevated and occur deep within the aquifer. Attaining the groundwater cleanup levels would require at least four orders of magnitude reduction (99.99 percent) in the current concentrations in groundwater; a challenge that is beyond the ability of any single existing technology to achieve in a reasonable restoration time frame. Compounding the situation is the location of the source areas with respect to the CPOC for groundwater. The Main Source and Loading Dock Areas lie very close to or abut Fox Avenue, leaving no room for attenuation between the soil source and the CPOC.

Given the above situation, a combination of cleanup technologies must be used at this Site in order to reduce concentrations of COCs to the lowest concentrations technologically achievable and practicable. Remediation levels, therefore, were established that allow one cleanup technology to transition to another, as described in more detail in Section 4.0.

The selected remediation levels for soil and groundwater are summarized in the table below.

Groundwater Remediation Level	Basis	Soil Remediation Level	Basis
<p>250 µg/L Total CVOCs (as measured in the designated monitoring well network)</p>	<ol style="list-style-type: none"> 1. Expected residual average concentration in source area groundwater following source area remedy implementation. 2. Use of thermal treatment and ERD to achieve 250 µg/L total CVOCs, which is predicted to result in achieving cleanup levels at the seeps in reasonable restoration time frame. 3. Concentration will not present a vapor intrusion risk in downgradient properties. 4. Cleanup levels will be attained at the CPOC over an extended restoration time frame via natural attenuation. 	<p>10 mg/kg (average soil concentration following source area treatment)</p>	<ol style="list-style-type: none"> 1. Technologically achievable; represents 98 percent reduction from source area average concentration. 2. Achieves MTCA Method C direct contact levels. 3. Expected to eliminate source of current vapor intrusion into Cascade Columbia office. 4. Expected to result in 98 percent reduction in source area groundwater concentrations in 1st and 2nd WBZs.

Abbreviations:

- CPOC Conditional point of compliance
- CVOC Chlorinated volatile organic compound
- ERD Enhanced reductive dechlorination
- µg/L Micrograms per liter
- mg/kg Milligrams per kilogram
- MTCA Model Toxics Control Act
- WBZ Water Bearing Zone

4.0 Description of Cleanup Action

A preliminary screening of remedial technologies was conducted as part of the RI/FS for each of the cleanup action areas (CAAs) to reduce the number of alternatives included in the detailed evaluation. The screening, which is summarized in Table 4.1, presented information regarding technology benefits and constraints. As a result, certain technologies were rejected from further evaluation. The technologies retained for detailed evaluation included monitored natural attenuation, permeable reactive barriers, capping, thermal treatment, soil vapor extraction, enhanced reductive dechlorination, and air sparging. Table 4.2 lists the technologies considered for each cleanup action area. The detailed evaluation of these technologies is contained in the RI/FS.

The selected cleanup action is comprised of the highest ranking and most permanent of the remedial alternatives evaluated for each cleanup action area. It is a comprehensive final remedy for the Site that is compliant with all of the applicable remedy selection requirements under MTCA. The cleanup action is described below and summarized in the table that follows. Figure 4.1 displays the locations and major elements of the selected remedy.

4.1 MAIN SOURCE AREA CLEANUP ACTION AREA

- **Soil:** To treat CVOCs in soil in the Main Source Area CAA, thermal treatment by Electrical Resistance Heating (ERH) will occur until the mean soil concentration in the treatment area meets the 10 mg/kg total PCE+TCE remediation level (refer to Section 6.1.3). This will be followed by post-thermal application of ERD as a polish to further destroy contaminant mass in the source areas. The predicted time frame for soil to achieve compliance with remediation level is expected to be 1 year.
- **Groundwater:** Subsequent to source area removal using ERH, CVOCs in groundwater in the Main Source Area CAA will be treated by post-thermal applications of ERD as a polish to further destroy contaminant mass in the source areas. ERD will occur until groundwater concentrations at the CPOC meet the remediation level of 250 µg/L total CVOCs. The predicted time frame for groundwater to achieve compliance with remediation level is expected to be 5 years following thermal remediation.

4.2 DOWNGRAIDENT GROUNDWATER PLUME CLEANUP ACTION AREA

- **Groundwater:** The selected technology for groundwater treatment is ERD, which will occur until the groundwater remediation level of 250 µg/L total CVOCs is achieved throughout the downgradient plume and the groundwater seeps at the S. Myrtle Street Embayment are in compliance with the cleanup levels. It is anticipated that ERD will continue throughout the majority of the Downgradient Groundwater Plume for approximately 10 years, and then will be phased out as areas come into compliance with the remediation level over the following 5 years. Following attainment of the remediation levels, monitored natural attenuation (MNA) of groundwater will occur until the cleanup levels are achieved throughout the Downgradient Groundwater Plume CAA, which may take an additional 50 years due to low regulatory levels and the high starting concentrations.

- **Soil:** There are no technologies proposed for soil treatment in the Downgradient Groundwater Plume CAA, as there are no soil cleanup level exceedances in the downgradient area of the Site.

4.3 NORTHWEST CORNER PLUME CLEANUP ACTION AREA

- **Groundwater:** The selected technology for groundwater treatment is ERD, which has shown to be effective at the Site based on results of the ERD Interim Action. ERD will be used to treat groundwater where concentrations of total CVOCs are greater than the remediation level of 250 µg/L, which is limited to the 1st WBZ. The predicted time frame for groundwater to achieve compliance with the 250 µg/L total CVOc remediation level at the CPOC is expected to be approximately 5 years.
- **Soil:** The selected technology for vadose zone soil treatment is soil vapor extraction (SVE), which is expected to operate for approximately 1 year or until asymptotic levels of extracted PCE are achieved. SVE is expected to remove several hundred pounds of PCE from the subsurface, thereby reducing the contamination mass in soils leaching to groundwater, and reducing the restoration time frame for groundwater compliance.

Summary of Selected Remedy Elements

Cleanup Action Area	Applied To	Technology	Implemented until Compliance with RL or CUL Achieved	Approximate Time Frame Required
Main Source Area	Vadose, 1 st WBZ, 1 st SH, 2 nd WBZ (to 65 feet bgs)	Electrical Resistance Heating (Primary)	RL: 10 mg/kg total PCE + TCE in soil	1 year of active heating
	1 st and 2 nd WBZ soil > 10 mg/kg or groundwater > 1,000 µg/L	ERD (Polish)	RL: 250 µg/L total CVOCs in groundwater (measured at CPOC)	5 years (post-thermal)
Downgradient Groundwater Plume	1 st and 2 nd WBZ groundwater (to 70 feet bgs) with total CVOCs > 100 µg/L at Fox Avenue	ERD	RL: 250 µg/L total CVOCs in groundwater (as measured in the designated monitoring well network)	10–15 years (post-thermal)
		MNA	CUL: Refer to table in Section 3.4 (cleanup levels measured in all downgradient wells)	50 years (post-ERD)

Cleanup Action Area	Applied To	Technology	Implemented until Compliance with RL or CUL Achieved	Approximate Time Frame Required
Northwest Corner Plume	1 st WBZ groundwater with total CVOC concentrations > 250 µg/L	ERD/SVE	RL: 250 µg/L total CVOCs in groundwater (measured at CPOC)	5 years (post-SVE)
	1 st WBZ groundwater with total CVOC concentrations < 250 µg/L	MNA	CUL: Refer to table in Section 3.4 (measured at CPOC)	50 years (post-ERD)

Abbreviations:

<	Less than	MNA	Monitored natural attenuation
>	Greater than	PCE	Tetrachloroethene
bgs	Below ground surface	RL	Remediation level
CVOC	Chlorinated volatile organic carbon	SH	Silt Horizon
CPOC	Conditional point of compliance	SVE	Soil vapor extraction
CUL	Cleanup level	TCE	Trichloroethene
ERD	Enhanced reductive dechlorination	WBZ	Water Bearing Zone

4.4 JUSTIFICATION FOR CLEANUP ACTION SELECTION

The selection of the cleanup action is justified as it meets the following minimum requirements for selection of a cleanup action under MTCA WAC 173-340-360(2)(a):

- (i) **Protect Human Health and the Environment.** The selected remedy will protect human health and the environment in both the short- and long-term. The remedy will permanently reduce the identified risks presently posed to human health (worker exposure to soil and indoor air) and the environment (discharge of the seeps to surface water) through a combination of source area treatment via thermal treatment followed by ERD polish, downgradient ERD treatment of groundwater, and natural attenuation of groundwater.
- (ii) **Comply with Cleanup Standards.** The selected remedy is expected to comply with the cleanup and remediation levels for groundwater, soil, and indoor air. While standard POCs are appropriate for soil and indoor air, a CPOC at Fox Avenue is appropriate for groundwater.
- (iii) **Comply with Applicable State and Federal Laws.** The selected remedy is expected to comply with all state and federal laws and regulations.
- (iv) **Provide Compliance Monitoring.** The selected remedy will include rigorous compliance monitoring for soil, indoor air, groundwater, and seeps to assess the effectiveness and permanence of each remedy element in each CAA. The monitoring is expected to be more intensive for the initial years of remedy implementation, with less frequent monitoring in the future.

The selected remedy also meets the other requirements for selection under MTCA WAC 173-340-360(2)(b), which includes the following:

- (i) **Using Permanent Solutions to the Maximum Extent Practicable.** The selected remedy utilizes permanent solutions to the degree practical. Thermal treatment will

remove a large portion of the existing contaminant mass from subsurface soil and will destroy it in a thermal oxidizer. SVE will extract PCE mass in the Northwest Corner Plume CAA and will capture it in activated carbon that will be regenerated or by using the thermal oxidizer. ERD destroys contaminant mass in groundwater in-situ by biological transformation of COCs into harmless by-products.

- (ii) **Providing for Reasonable Restoration Time Frame.** The thermal element of the selected remedy will require approximately 1 year to construct and complete the heating phase. Remediation levels in soil are expected to be attained following thermal shutdown. This will achieve restoration of soil for protection of workers (via direct contact to soil and also indoor air exposure from soil). The time frame for post-thermal treatment via ERD to achieve groundwater remediation levels at the CPOC is anticipated to be approximately 5 years, and compliance with cleanup levels at the point of discharge to surface water at the S. Myrtle Street Embayment is expected within approximately 10 to 15 years through a combination of ERD and MNA, assuming no access limitations. Once accomplished, this will eliminate all existing ecological risk from the migration of site contaminants. Attainment of the cleanup levels in the entire groundwater plume will take considerably longer, likely 50 years; however, assuming that indoor air levels are in compliance, no risk to human health and the environment has been identified by the Downgradient Groundwater Plume (except at the seeps) because this section of the aquifer is considered non-potable.
- (iii) **Considering Public Concerns.** This document was presented to the public and stakeholders through a public comment process. Ecology prepared a responsiveness summary that documents how each of the public comments were considered and addressed. This final CAP incorporated modifications based on public comment.

Finally, because this remedy relies on a CPOC due to the impracticality of attaining cleanup levels throughout the source area, this cleanup action is not considered permanent under WAC 173-340-360(2). The selected alternative complies with the following requirements for non-permanent groundwater cleanup actions under MTCA WAC 173-340-360(2)(c)(ii):

- A. **Treatment or Removal of the Source Including Light Non-aqueous Phase Liquid (LNAPL) and DNAPL.** This will be done to the extent practical by using thermal treatment in the source areas, followed by ERD to address any residually-contaminated areas.
- B. **Groundwater Containment, Including Barriers, to Avoid Spreading of the Groundwater Plume.** This will be done by the use of ERD that will, in effect, create a "biological barrier" that will prevent spreading of the plume and treat CVOCs within the plume.

5.0 Selected Cleanup Action Implementation

The general details of the selected remedy are presented below. Additional details will be provided in the Engineering Design Report (EDR), which will be prepared prior to cleanup action implementation.

5.1 MAIN SOURCE AREA CLEANUP ACTION AREA

This remedy consists of two components, thermal treatment and post-thermal ERD. The major elements of each are described below.

5.1.1 Thermal Treatment Area

The soil and groundwater in the Main Source Area CAA will be treated using thermal heating via ERH, which is ideally suited to site conditions. The area to be thermally treated is defined by the 1 mg/kg total PCE + TCE contour in soil that occurs within the Fox Avenue Building footprint, as shown on Figure 2.5. It is the large mass of solvent within this contour that is contributing to the longevity and magnitude of the plumes found primarily in 1st WBZ groundwater downgradient from the Loading Dock Area, Rail Spur Area, Flammables Shed, and in 2nd WBZ groundwater downgradient from primarily the Flammables Shed.

5.1.2 Penta and Mineral Spirits

The mass of mineral spirits at the Site, which includes a large BTEX fraction, also resides within this zone. Given that the most toxic light-end component of the mineral spirits present is benzene, which volatilizes at 80 degrees C, it is expected that the benzene fraction will also be treated by the thermal process that will reach temperatures close to the boiling point of water; however, the heavier end of mineral spirits, such as xylene and heavy organics such as Penta, which are found primarily in 1st WBZ groundwater, volatilize at temperatures greater than the boiling point of water and so will not be as effectively treated by the thermal process as the lighter, more volatile chlorinated solvents. Penta will not be effectively remediated by the thermal or ERD treatment processes; however, the current data do not indicate significant migration of TPH or Penta. TPH and Penta will be monitored in groundwater following remedial actions to confirm that concentrations of these COCs are stable in groundwater, or are reducing over time.

Concentrations of PCE and TCE in soil that are less than 1 mg/kg occur across a much larger portion of the Site but represent a very minor amount of solvent mass, rendering thermal treatment impractical. Additionally, these concentrations are found primarily in 1st WBZ soil downgradient from the Main Source Area CAA and are suspected to be the result of solvent migration from upgradient source areas and subsequent adsorption of the PCE and TCE in soil organic matter. These areas of low PCE and TCE concentrations in soil will be addressed by the remedy for the Downgradient Groundwater Plume CAA.

5.1.3 Thermal Treatment Zones

The area with combined concentrations of PCE and TCE in soil greater than 1 mg/kg will be thermally treated within the footprint shown on Figure 5.1. This footprint has been divided into

five zones, each with a unique treatment depth that captures the depth range of soil contamination greater than 1 mg/kg PCE and TCE as follows:

1. Loading Dock Area: 2,300 square feet, treat to 15 feet bgs
2. West Rail Area: 4,500 square feet, treat to 17 feet bgs
3. East Rail Area/East Flammables Shed Area: 4,600 square feet, treat to 22 feet bgs
4. Former Pump House and West Flammables Shed Area: 7,500 square feet, treat 1 to 65 feet bgs
5. Alkaline Shed and Production Area: 4,460 square feet, treat 15 to 65 feet bgs

Together, these areas represent a soil volume of approximately 33,000 cubic yards that will be treated; however, a significant fraction of this soil volume is actually free of contamination or exhibits very low concentrations. This is primarily a consequence of having two depth zones to treat, one shallow and widespread, and one much deeper and confined, with a relatively non-impacted zone in between. These two areas are separated by approximately 20 to 30 feet of relatively clean soil. This cleaner intermediate zone must be heated to boiling in order for the solvent mass liberated from the deep zone to rise and be captured by the vapor recovery wells located in the vadose zone. If heating is not equal throughout the treatment zone, liberated solvent mass may recondense prior to recovery, causing significant risk of solvent mass loss to downgradient groundwater. The benefit of this approach is to provide a high level of assurance that solvent mass (whether in soil or groundwater) within each zone will be treated. Because all soil within the treatment zone will be treated, it will result in significant reductions in those areas of soil with chemical concentrations now close to or less than the remediation level (i.e., the 1 to 10 mg/kg contour) resulting in significantly less residual source mass following thermal treatment.

5.1.4 System Layout and Vapor Treatment

The expected layout of the thermal system is shown on Figure 5.2, and includes the electrode locations and temperature monitoring points that are used to verify that the subsurface soil has achieved its boiling point. Figure 5.2 also shows the halo of soil lying outside of the immediate treatment zone that will also be heated to the boiling point and subject to cleanup. This additional 5- to 7-foot buffer provides added confidence that the limits of source area contamination are within the treatment area.

The electrodes (steel pipe surrounded by graphite) will be designed to function as steam/condensate extraction wells and will include the ability to remove free product mineral spirits should any be captured by the system. Electrodes are, in effect, remediation wells with the added capacity to direct electrical current to the proper depth for subsurface heating. Electrodes can serve as vapor and steam recovery points or can operate as multiphase extraction wells for the recovery of vapor, steam, water, and NAPL from the subsurface. The steam and vapors will be removed via a large blower using standard polyvinyl chloride (PVC) piping that will be manifolded at the ground surface and will run to the treatment compound. The extracted steam and vapor stream will pass through a condenser. The steam will condense back to water that will be relatively clean and either be treated with liquid phase carbon and disposed via sanitary sewer or dripped back into the vadose zone to prevent the soil from drying out, which would stop the flow of electrical current and hence the subsurface heating.

The vapor stream flowing out of the condenser will be chemical-rich and will be directed to a thermal oxidizer with an acid gas scrubber for destruction of the chlorinated and aromatic compounds extracted. The aboveground equipment will be located in a treatment compound located on the east side of the warehouse, as shown in Figure 5.2.

5.1.5 Electrical Service

A new electrical service supplying 13.8 kilovolts of power will be required to operate the remediation system. This large amount of power will require a temporary high voltage electrical service be brought into the Site by Seattle City Light. Specialized power control units will transform that voltage and feed it into the ground via copper cabling that services each electrode.

5.1.6 Post-thermal ERD

Following shutdown of the thermal treatment system, the steam within the treatment area will re-condense to groundwater, but will still be quite warm for several months. During this cool-down period, an assessment will be made of post-thermal groundwater quality within the treatment area. This will be done using a Geoprobe to collect samples at multiple depth intervals from 10 to 12 locations. Also, during the cool-down phase, the microbial community will be reestablished, and the subsurface environment will be amenable to accelerated biodegradation. The injection of ERD substrate into the thermal zone (using the existing steel electrodes that will be slotted to allow injection of substrate) will assist in promoting the correct conditions for anaerobic biodegradation of the residual chlorinated solvent that remains in the treatment area. As explained above, it is expected that the zone of residually-contaminated soils will be much smaller than the current footprint.

Following receipt of post-thermal groundwater data, a targeted ERD treatment plan will be designed based on the site-specific conditions at that time. If any areas are found to be residual “hot spots,” they will likely be targeted for injection of edible oil substrate (EOS). EOS has a very limited zone of influence since it does not readily dissolve into groundwater, so it is long lasting and ideal for source area treatments in areas with residual source that is expected to “bleed” solvent for an extended time period. In addition to the EOS, depending on site conditions, a more soluble substrate may be used—possibly combined with nano-scale zero-valent iron (ZVI), or other substrates that would increase the rate or effectiveness of the ERD injections. This post-thermal ERD will initially be applied to the majority of the residual treatment area, but subsequent treatments will be focused on any remaining smaller sub-areas that are found to be continuing sources of downgradient groundwater exceedances.

5.2 DOWNGRADIANT GROUNDWATER PLUME CLEANUP ACTION AREA

The remedy for the Downgradient Groundwater Plume CAA consists of two components—ERD as it currently is being implemented per the ongoing interim action, followed by MNA. The ERD component of the Downgradient Groundwater Plume remedy is intended to clean up the plume to the remediation level of 250 µg/L total CVOCs and the seeps to the cleanup levels in a relatively short time frame (anticipated in approximately 10 to 15 years). The MNA component will be used to reach the cleanup levels in groundwater upgradient from the seeps up to the CPOC in a longer time frame (approximately 50 years).

5.2.1 Enhanced Reductive Dechlorination

The full implementation of ERD will commence in parallel with the construction of the thermal remediation system. The goal of full implementation is to have a complete ERD network installed and functioning by the time the thermal treatment zone is undergoing heating. This will add protectiveness to the remedy because the full ERD network can act in its full capacity to destroy any unanticipated loss of solvent from the Main Source Area CAA during thermal remediation. A portion of the ERD network directly downgradient from the thermal heating zones will also benefit from the increased microbial activity that will occur because groundwater leaving the thermal treatment zone will be heated to levels greater than ambient temperature for up to an estimated 200 feet downgradient.

The full implementation of the ERD remedy will require installing an estimated 10 additional "Row 1" ERD wells along Fox Avenue to complement the existing 7 wells. The addition of these new wells will result in an ERD network along Fox Avenue that will treat the full width and depth of the current plume that lies within the 100 µg/L total CVOC contour. Locations for these additional "Row 1" wells are shown on Figure 4.1. Up to seven "Row 2" ERD wells may also be installed further downgradient, on Seattle Boiler Works and Dawn Foods Distribution Warehouse properties to extend the existing Row 2 well network across the full width of the plume prior to its discharge to the S. Myrtle Street Embayment. These two rows of ERD injection wells will aggressively remediate the downgradient plume, which will be without a significant source following thermal remediation. Access for installation and injection of the ERD wells located on private property is discussed below. Once the groundwater remediation level is achieved in wells downgradient from Fox Avenue, ERD injections will decrease in frequency, or cease. Further details will be provided in the EDR. Contingent actions that address the inability of ERD to achieve the remediation levels in groundwater and the cleanup levels in the seeps or indoor air within the specified time frames are discussed in Section 6.0.

5.2.2 Monitored Natural Attenuation

The ERD injections are expected to decrease in frequency and stop after 10 to 15 years. Following ERD injections, the aquifer is expected to remain adequately reducing for a significant time frame into the future. This condition will promote the continued natural attenuation of the residual concentrations of chlorinated solvents in the downgradient plume. Measurements will be collected regularly to determine if natural attenuation is occurring; however, given the very low cleanup levels, and the tendency for PCE and TCE in groundwater to adsorb to soil organic matter and then slowly release back to groundwater, it is expected that the full restoration of the downgradient plume to the cleanup levels for all COCs will be a long process, estimated to be 50 years or longer. Regardless, all risk to human health and the environment will have been addressed following achievement of cleanup levels at the seeps and elimination of the downgradient vapor intrusion pathway

5.2.3 Long-term Monitoring

Long-term monitoring (LTM) activities will commence following the termination of ERD injections, which are expected to last for 10 to 15 years following thermal remediation. LTM will be conducted under a plan that will be submitted to Ecology for review and approval following cessation of ERD injections. This plan will identify the wells and seeps that will form the designated monitoring network. The wells will be located along Fox Avenue, as well as downgradient of Fox Avenue. This network is expected to consist of 8 to 10 wells and 2 to

3 seeps. The frequency of sampling is expected to be semi-annual for an initial 5-year period, then decline to annual until cleanup levels are achieved. When cleanup levels are met site wide in the designated well network, quarterly monitoring will commence for a 1-year period. Compliance with the cleanup levels will be evaluated using the quarterly data and the procedures specified in WAC 173-340-720 (9). If compliance is demonstrated, then monitoring shall cease site-wide.

5.3 NORTHWEST CORNER PLUME CLEANUP ACTION AREA

The remedy for the Northwest Corner Plume CAA consists of two components: SVE and ERD. Each is described separately below.

5.3.1 Soil Vapor Extraction

The SVE remedy element will remove PCE from the vadose zone that otherwise would act as a long-term source of groundwater contamination. The SVE system is expected to consist of four vertical SVE wells placed in the parking lot located in the Northwest Corner Plume CAA and along S. Willow Street. The wells will be tied together via subsurface piping, which will extend above the surface at a central manifold location where they will be connected to a blower. The exhaust will be vented through granular activated carbon vessels or through the thermal system oxidizer prior to discharge to the atmosphere under a Puget Sound Clean Air Agency permit. It is expected that the footprint of the aboveground components of the SVE system will be limited and will be able to fit within a portable trailer or small shed located adjacent to the Cascade Columbia warehouse. An electrical power line will be extended from the warehouse to service the blower and control panel. The proposed layout of the SVE system is shown on Figure 4.1.

The SVE system will be run until asymptotic concentrations are achieved. Because previous investigations have determined that there is not substantial source mass in this area, achieving asymptotic concentrations is expected to occur within 1 year of operation. The effectiveness of the SVE system will primarily be determined by the total mass of PCE removed, and its impact upon groundwater concentrations in this area.

5.3.2 Enhanced Reductive Dechlorination

Groundwater impacts are limited to the 1st WBZ in the Northwest Corner Plume CAA. ERD injections upgradient from Fox Avenue will occur in a series of three shallow wells recently installed in the parking lot area. These three wells plus the Row 1 ERD wells along Fox Avenue further downgradient are expected to adequately treat the plume within the 100 µg/L total CVOC contour. A conceptual layout is presented in Figure 4.1. The substrate injections will be more frequent at first due to the need to convert the currently aerobic or slightly anaerobic groundwater to strongly anaerobic conditions, a process that will require approximately 1 to 2 years of injections on a regular basis (two to three times per year). The addition of nano-scale ZVI particles to the fermentable substrate may be considered to accelerate the promotion of strongly-reducing conditions. It is expected that once sufficient biogeochemical conditions are achieved in the treatment area, the frequency of injections will diminish to one to two times per year.

ERD will continue until the remediation level for groundwater of 250 µg/L total CVOCs is reached at the CPOC at Fox Avenue. The percent reduction in current concentrations necessary to achieve the remediation level is approximately 75 percent, which is well within the

range of the ERD technology. Therefore, the expected period of performance for ERD injections is 5 years. Current groundwater and ERD monitoring practices will continue as part of the ERD Interim Action and results will be provided regularly to Ecology.

Following 5 years of active treatment, if ERD has not achieved compliance with the 250 µg/L total CVOCs remediation level (as measured within the treatment area), then contingent actions will be evaluated as discussed in Section 6.0.

5.4 PERMISSION, ACCESS, AND INSTITUTIONAL CONTROLS

The use of a CPOC for properties near, but not abutting, surface water requires the written consent of affected property owners. The CPOC along Fox Avenue requires written permission from the owners of the Whitehead Property (executed copy included in Appendix A). Access was also obtained for groundwater sampling at the Whitehead Property, and will be required for other downgradient properties with monitoring and/or ERD injection wells (e.g., Seattle Iron and Metals). Access will also be required from Seattle Boiler Works and possibly other downgradient properties to allow for injection of ERD substrate into existing and new ERD wells, as well as access to sample indoor air and groundwater and install additional ERD wells necessary to optimize the Downgradient Groundwater Plume remediation following completion of source area thermal treatment. Should access to downgradient properties be withheld, the remedy for the Downgradient Groundwater Plume CAA cannot be fully implemented, making it impractical to meet the remediation and cleanup levels within the expected restoration time frame.

Following achievement of remediation levels for groundwater, implementation of institutional controls will be required on those portions of affected properties where chemical concentrations in groundwater or indoor air exceed applicable cleanup levels and are expected to remain greater than cleanup levels for an extended time frame. Institutional controls (in the form of an environmental covenant) will likely include the following:

- Restriction in withdrawal of groundwater from the affected property for drinking purposes
- Consent to long-term access for environmental monitoring and maintenance

Additionally, Fox LLC and Whitehead properties will be required to be maintained for industrial use only, (as they are located upgradient of the groundwater CPOC at Fox Avenue) in a manner consistent with applicable zoning requirements. The owner for the Seattle Boiler Works property has indicated that a restrictive covenant on the Seattle Boiler Works property will not be allowed restricting future uses to industrial, resulting in MTCA Method B cleanup levels being applied for indoor air at the Seattle Boiler Works property. Figure 5.3 shows the tax lots where institutional controls will be implemented.

5.5 APPLICABLE STATE AND FEDERAL LAWS

5.5.1 Chemical-specific Applicable or Relevant and Appropriate Requirements

The selected alternative is predicted to attain concentration-based cleanup levels developed under MTCA for the COCs in applicable media at the Site. In addition, compliance with the Water Quality Standards for Washington Surface Waters (WAC 173-201A) and the National Toxics Rule, which were described in further detail in the RI/FS (Floyd|Snider 2011), will also be necessary.

5.5.2 Action-specific Applicable or Relevant and Appropriate Requirements

Action-specific applicable or relevant and appropriate requirements (ARARs) are requirements that define acceptable management practices and are usually specific to certain kinds of activities that occur or are specific to the technologies that are used during the implementation of cleanup actions. These selected alternatives will comply with the rules or regulations, which were described in further detail in the RI/FS (Floyd|Snider 2011), identified below.

- Washington Dangerous Waste Regulations (WAC 173-303)
- Water Quality Standards for Surface Waters of the State of Washington (RCW 90.48 and 90.54; WAC 173-201A)
- Federal, state, and local Air Quality Protection Programs
- Federal and State of Washington Worker Safety Regulations (Hazardous Waste Operations and Emergency Response (HAZWOPER), WAC 296-62; Health and Safety 29 CAR 1901.120)
- Occupational Safety and Health Act
- Washington Industrial Safety and Health Act, WAC 296-62, WAC 296-155, RCW 49.1
- Underground Injection Well Registration
- Sanitary Sewer Discharge

5.6 PROPOSED CLEANUP ACTION PLAN SCHEDULE

In general, the following reporting and remedial action implementation activities will occur in accordance with the following schedule. This schedule is subject to change based on Ecology's review schedule, permits, contractor availability, on- and off-site access, and weather.

A 30-day public comment period for the draft CAP was conducted in March of 2012. Ecology addressed public comments in a Responsiveness Summary and this final CAP has been modified to address public comments received on the draft CAP.

An EDR will be prepared and submitted within 30 days of Ecology's issuance of the Final CAP. Construction plans and specifications for the thermal, SVE, and expanded ERD remedy components will be included with the EDR as well as a construction schedule. A detailed plan for post-thermal ERD polish in the main source area will not be submitted until thermal remediation is completed, as the plan will be focused to treat specific areas with residual contamination.

An Operation and Maintenance Plan will be included in the EDR, as well as a compliance monitoring sampling and analysis plan for the active remedy elements.

After the active remedy elements have been completed and the Site transitions to Monitored Natural Attenuation, a LTM Plan will be submitted to Ecology for review and approval.

Field work for the construction of the thermal system, ERD well network, and the SVE system (including well installations and surface completions) will commence following the approval of the EDR. It is anticipated that construction activities will be completed within two to three

months and that the thermal and SVE system activation will occur immediately following construction completion, final engineering inspections, and permitting.

An As-Built Construction Report, which will include drawings and a report documenting construction and start-up and testing activities, will be submitted to Ecology within 90 days of completion of thermal, SVE, and ERD system installation activities. Monthly progress reports will be submitted to Ecology during the thermal remediation phase of the remedy. A final completion report including all confirmatory soil sampling results and final operational data will be submitted to Ecology 90 days following termination of the thermal remedy.

6.0 Remedial Action Monitoring and Contingency Actions

Performance and compliance monitoring for soil, groundwater, and indoor air will be conducted within each of the CAAs as described in general terms below. Contingency actions are also identified should the remediation and cleanup levels not be met in the predicted restoration time frames using the selected remedies. Additional details will be provided in a Compliance Monitoring Plan, which will be submitted as part of the EDR.

6.1 MAIN SOURCE AREA THERMAL REMEDIATION

The performance monitoring associated with the thermal remedy will include the collection of system operational data and soil compliance data.

6.1.1 Operational Data

One of the most important system operational data to collect is the soil temperature, which will be constantly monitored at over 100 individual temperature sensors (thermistors) installed in borings throughout the full width and depth of the subsurface treatment zone. Thermistors will also be placed in downgradient monitoring wells and/or ERD injection wells to monitor the off-site flow of heat from the treatment zone. The temperature data will document the rise of the subsurface temperature during the heating phase and identify areas of uneven heating, in which case additional current or other modifications will be directed to those areas. The temperature data will also confirm that the entire thermal treatment area has reached its design temperature (100 degrees C) and stays at this temperature for the predicted period of time necessary to treat the Main Source Area to achieve the soil remediation level.

Additional performance measures include the amount of electricity used (tracked daily) and VOC concentrations at the influent and effluent of the vapor stream being fed to the thermal oxidizer. It is expected that influent concentrations will rise slowly as the subsurface is heated, then rise to a maximum value as the subsurface is at the boiling point, and then drop off quickly as the contaminant source mass is depleted.

6.1.2 Soil Compliance Testing

Soil samples will be collected to assess remedy compliance with the remediation level of 10 mg/kg PCE + TCE. These soil samples will be collected at two stages. The Site, like many sites, is composed of a large volume of soil with relatively low chemical concentrations and a much smaller volume of "hot spot" soil with high chemical concentrations. The hot spot areas contain the bulk of the contaminant mass. Given that the energy needed to vaporize the contaminant mass in areas with low chemical concentrations is less than the energy needed in the higher concentration areas, the lower concentrated areas are expected to come into compliance well before the hot spot areas. Additional heating of these low concentration areas once they are in compliance does not provide any additional benefit, so evaluation of these areas will be conducted mid-way through the heating process to determine the need for continued heating. These intermediate compliance samples will be collected following temporary shutdown of the thermal system, so that steam is not being generated in the subsurface. Areas that are found to be in compliance after this intermediate testing will no longer be heated. The remaining energy will be directed to the higher concentration areas and any sampled areas found to be greater than the remediation level.

A second round of compliance samples will be collected in the remaining heating areas after 100 percent of the predicted total energy demand of 9.7 megawatts has been utilized and the chemical concentrations in the effluent vapor have decreased significantly.

Contingency Actions: If concentrations in soil remain greater than the 10 mg/kg remediation level (PCE + TCE) then an engineering assessment of various options to attain the compliance level will be undertaken. These options may include additional heating, chemical oxidation, installation of additional electrodes, or potential limited excavation. Compliance sampling of these areas will occur following any contingency actions until compliance has been demonstrated within the thermal footprint.

6.1.3 Compliance Testing Scheme

The compliance testing scheme is rigorous and expected to include the following elements:

1. Soil samples will be obtained in each of the five treatment areas by Geoprobe to collect continuous cores. Sample cores will be chilled, spilt open, screened with a photoionization detector (PID), and sampled for analysis from the interval with the highest observed PID reading.
2. Boring locations will be uniformly located within each of the five areas excluding areas within the 1 to 10 mg/kg PCE +TCE contour since these areas are already in compliance with the remediation level.
3. The approximate number of soil borings per zone, sample interval, and number of samples collected for analysis is defined in the table below. For the deep treatment areas, the intermediate zone of soil between elevations 0 to -20 feet will not be sampled because this elevation interval is currently in compliance site-wide.²
6. Each zone will be evaluated for compliance with the remediation level separately.

The 95 percent upper confidence level (UCL) of the mean concentration shall be compared to the remediation level to judge compliance.³

Treatment Area	Square Footage	Treatment Interval (feet bgs)	Number of Borings	Samples Per Boring	Total
Loading Dock	2,300	0 to 15 feet	5	1 per vadose zone 1 per 1 st WBZ 1 per 1 st SH, if present	15
West Rail Siding	4,500	0 to 17 feet	8	1 per vadose zone/1 st WBZ 1 per 1 st SH/ 2 nd WBZ	16

² In the event of an elevated PID reading in soil collected from this zone, a sample will be collected and added to the compliance dataset.

³ The determination of the 95 percent UCL shall be in accordance with current Ecology guidance.

Treatment Area	Square Footage	Treatment Interval (feet bgs)	Number of Borings	Samples Per Boring	Total
East Rail/ East Flammables	4,600	0 to 22 feet	8	1 per vadose zone/1 st WBZ 1 per 1 st SH/ 2 nd WBZ	16
Former Pump House/Flammables Shed	7,500	0 to 65 feet	10	1 per vadose zone/1 st WBZ 1 per 1 st SH/ top 2 nd WBZ 5 (every 5 feet starting at 45 feet bgs)	70
Production Area/Alkaline Shed	4,400	15 to 65 feet	7	5 (every 5 feet, starting at 45 feet bgs)	35
TOTAL			38		152

Note:

The numbers in the above table are approximate. Actual numbers to be determined based on field conditions.

Abbreviations:

- bgs Below ground surface
- SH Silt Horizon
- WBZ Water Bearing Zone

6.2 MAIN SOURCE AREA ENHANCED REDUCTIVE DECHLORINATION

Groundwater quality within the thermal treatment zone will be assessed following thermal shutdown. Based on groundwater data at that time, a plan for ERD substrate injections will be developed. Following the initial substrate injections, performance monitoring will occur to assess the effectiveness of post thermal ERD. The performance monitoring will be similar to that described for the Northwest Corner Plume CAA and ongoing Interim Action. This includes regular measurements (typically semi-annually) of water quality parameters (e.g., dissolved oxygen, reduction-oxidization potential (Eh), pH, and conductivity) from selected injection and monitoring wells and collection of water samples for total organic carbon (to judge substrate levels), VOCs (to judge concentration trends), and the dissolved gases ethane and ethene (the by-products of VC degradation).

The goal of the post-thermal ERD will be to achieve remediation levels for site groundwater in wells along Fox Avenue within 5 years following thermal treatment. If achieved in less than 5 years, then the frequency of injections may be reduced or discontinued. If monitoring indicates rebound of groundwater concentrations, then additional ERD injections will occur for no more than 2 additional years.

Contingency Actions: If following additional ERD injections, monitoring indicates that ground water concentrations continue to exceed the groundwater remediation level of 250 µg/L total CVOCs at the CPOC, contingency actions will be evaluated for implementation. This evaluation

is expected to first include an investigation to identify the source of the exceedance. Depending on the magnitude, concentration, and extent of any identified soil source mass, contingency actions such as excavation, Permeable Reactive Barrier (PRB) wall installation, or continued ERD will be considered. For example, if shallow soils are identified, excavation may be considered. If chemical source soils are found to be more extensive, a PRB may be installed downgradient from the area causing the exceedance subject to the location of existing utilities. Should the exceedances be confined to the 2nd WBZ soils, then additional ERD injection wells and/or injection of nano-scale ZVI and/or bacterial inoculation (by adding cultured dechlorinating bacteria) into existing wells may be considered depending on the site-specific conditions.

6.3 DOWNGRADIENT GROUNDWATER PLUME ENHANCED REDUCTIVE DECHLORINATION

The implementation of ERD in the Downgradient Groundwater Plume CAA will include performance monitoring consisting of regular measurements (typically semi-annually) of water quality parameters (e.g., dissolved oxygen, Eh, pH, conductivity) from selected injection and monitoring wells and collection of water samples for total organic carbon (to judge substrate levels), volatile organic compounds (to judge concentration trends), and the dissolved gases ethane and ethene (the by-products of VC degradation).

ERD will be terminated when the groundwater concentrations in the designated monitoring well network are less than or equal to the 250 µg/L total CVOC remediation level. It is expected that ERD injections will be phased out from individual wells and sub-areas over time as sub-areas of the Site come into compliance with the 250 µg/L remediation level for total CVOCs. In the event the seeps in the S. Myrtle Street Embayment are not in compliance with the surface water cleanup levels when the 250 µg/L total CVOC remediation level is achieved, the continued use of ERD to reduce concentrations from the seeps or other contingency actions will be evaluated as follows.

Contingency Actions: Contingency actions will be evaluated if groundwater concentrations in the monitoring well network remain greater than the 250 µg/L remediation level and the continued use of ERD is found to be ineffective. Factors to be considered include the location, magnitude, and scale of the exceedance. Possible contingency actions include the installation of additional ERD wells, use of different ERD substrates, injection of cultured dechlorinating bacteria, and/or injection of nano-scale ZVI.

Contingency actions to be considered if the seeps do not comply with surface water cleanup levels depending upon the magnitude and nature of the exceedance. The first step in evaluating potential contingency actions will be an assessment of the actual (not predicted) concentrations of COCs in shellfish near the seeps, the primary environmental exposure pathway. If actual concentrations are detected in shellfish posing a risk to human health and the environment, then a plan will be developed to identify a range of options for addressing the exposure. This plan may include the use of new science to reexamine current exposure assumptions and cleanup levels, the use of Shellfish Consumption Advisories expected to be in place in the LDW, further investigation to identify and address in-situ the source of the seep exceedance, and/or interception and treatment of the groundwater immediately prior to discharge to the seeps.

It is also possible that in the future the seeps will no longer be present as a result of future restoration projects in the S. Myrtle Street Embayment. Restoration actions may involve cutting back the current steep slope and removal of the concrete debris in the 1st WBZ that is thought to

be causing the channelization and seepage of groundwater flow. Should the seeps be permanently lost as part of a habitat restoration, or other redevelopment activity, compliance at the seeps will be measured at the closest upgradient groundwater monitoring well. If this occurs, per WAC 173-340-720(8)(e)(ii), an estimate of the natural attenuation occurring between the monitoring well and the point or points of discharge should be considered when evaluating whether compliance in surface water has been achieved.

6.4 DOWNGRAIENT GROUNDWATER PLUME CLEANUP ACTION AREA MONITORED NATURAL ATTENUATION

Following attainment of the groundwater remediation level in the Downgradient Groundwater Plume wells and attainment of the cleanup levels at the seeps, the Site will transition to monitored natural attenuation. The former ERD injection wells will become monitoring wells. ERD wells will be useful for monitoring as they are screened in deeper portions of the 2nd WBZ, unlike existing monitoring wells.

Performance monitoring will consist of measurements (typically semi-annually) of water quality parameters (e.g., dissolved oxygen, Eh, pH, conductivity) from selected injection and monitoring wells, VOCs (to judge concentration trends), and the dissolved gases ethane and ethene (the by-products of VC degradation).

Measurements of total organic carbon (to assess substrate levels), however, will no longer be necessary. Given the long time frame necessary for monitored natural attenuation to obtain cleanup levels site-wide in groundwater, monitoring will occur on an annual or biannual basis using a select subset of wells in the Downgradient Groundwater Plume CAA. Once all of these wells are in compliance with the cleanup levels, the restoration of the Site will be considered complete.

Contingency Actions: Contingency actions for this portion of the remedy include restarting the ERD process for any areas of the Downgradient Groundwater Plume that show rebound following termination of ERD or remain out of compliance.

6.5 NORTHWEST CORNER PLUME CLEANUP AREA SOIL VAPOR EXTRACTION AND ENHANCED REDUCTIVE DECHLORINATION

6.5.1 Soil Vapor Extraction

Performance monitoring of the SVE system will consist of monthly readings of influent and effluent vapor concentrations to demonstrate removal of solvent mass and compliance with the air discharge permit. Quarterly progress reports will be submitted to Ecology that track the mass of CVOCs extracted from the vadose zone. The SVE system is expected to operate until asymptotic discharge concentrations are reached and sustained for a 2-month period. The system will then be shut down for 1 month and then restarted to monitor rebound. If rebound does not occur, the system will be decommissioned. If rebound does occur, SVE system operation will continue, likely in cycles of on then off, with monitoring for rebound during the off cycles. The results of the SVE pilot test conducted in 2010 indicate that asymptotic conditions may be achieved within 1 year of operation as there is thought to be a limited amount of solvent mass in this area.

6.5.2 Enhanced Reductive Dechlorination

Performance monitoring of ERD will be initiated following the beginning of substrate injections. The monitoring will be similar to what is currently being done for the ERD interim action. This includes regular measurements (typically semi-annually) of water quality parameters (e.g., dissolved oxygen, Eh, pH, conductivity) from injection wells and selected monitoring wells. Samples will also be collected for analysis of total organic carbon (to evaluate substrate levels), VOCs (to evaluate concentration trends), and the dissolved gases ethane and ethene (the by-products of VC degradation).

The frequency of ERD injections will be based upon the rate at which substrate is fermented by the microbes. It is expected that injections will be more frequent in the first year and less frequent in the subsequent years as the aquifer becomes more anaerobic. The VOC concentration trends of the existing monitoring wells located in the parking lot area of the Northwest Corner Plume CAA and downgradient along Fox Avenue will be used to judge the effectiveness of this remedy element. Substrate injections will continue for an expected 5 years or until concentration of total CVOCs along the Fox Avenue wells in this area are in compliance with the groundwater remediation level of 250 µg/L (total CVOCs). Following that, the groundwater in this area will continue to be monitored semiannually until concentrations have stabilized at concentrations less than the remediation level, then the monitoring frequency shall decrease to annual or less frequent, depending on site conditions and Ecology approval.

Contingency Actions: Several contingency actions will be considered for implementation should the 250 µg/L (total CVOCs) remediation level not be reached within the expected 5 years. These include the following:

- Continue ERD injections. This contingency is appropriate if concentrations are on a downward trend and close to the remediation levels.
- Continue SVE system operation. This contingency is appropriate if the operation of the SVE system can be correlated with a decrease in groundwater concentrations, and mass removal is still occurring via SVE.
- Install a PRB wall along Fox Avenue downgradient from those areas of the plume not in compliance with the remediation level. The PRB wall would be similar to that evaluated in the analysis of remedial alternatives for this area. The PRB wall would be designed to treat the chemicals in the 1st WBZ groundwater (as contamination is not present in the 2nd WBZ) without the need for other cleanup actions.

6.6 INDOOR AIR

Monitoring of indoor air quality is a critical component of the remedial action to ensure protectiveness during active remediation, and to identify the need for contingency actions. Indoor air will be monitored at two properties, as described below.

6.6.1 Cascade Columbia Office

Current data indicate indoor air concentrations in the Cascade Columbia office exceed the MTCA Method C cleanup level for PCE and TCE. An interim mitigation measure, which included upgrading the ventilation fan in the men's bathroom with a more powerful motor that is wired to run continuously during the work day, was completed in May 2011. Sampling will be used to

evaluate the effectiveness of this interim measure. Additional mitigation measures will be evaluated if the implementation of the exhaust fan does not appear effective; however, the active soil and groundwater remediation will significantly reduce source area concentrations, which will mitigate soil gas and indoor air concentrations.

Compliance with the indoor air cleanup levels will be determined by direct measurement of indoor air inside the Cascade Columbia office during and following completion of thermal and Northwest Corner SVE remediation. In addition to direct sampling of indoor air, measurements of other parameters will be collected including monthly measurements of sub-slab vacuum and VOC concentrations. These data will be used to judge effectiveness of the SVE/thermal vapor collection system. The specific sampling scheme and schedule will be outlined in the EDR. Sampling methodologies are expected to be consistent with the methods implemented in 2009 to assess current conditions. Contaminant concentrations in indoor air will be corrected to account for ambient (background) concentrations of PCE and TCE in accordance with Section 3.2.3 of Ecology's *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Actions*, Draft October 2009 (Ecology 2009) and then directly compared to the MTCA Method C indoor air cleanup levels.

Contingency Action Trigger: Contingency actions to mitigate vapor intrusion for protection of workers at Cascade Columbia will be evaluated if indoor air concentrations exceed MTCA Method C cleanup levels.

6.6.2 Seattle Boiler Works

Current indoor air concentrations at the Seattle Boiler Works facility (Pipe Building) indicate that PCE and TCE exceed the MTCA Method B cleanup levels. In addition, PCE and TCE were also present in an ambient outside air (background) sample at concentrations greater than MTCA Method B cleanup levels. Prior to the beginning of thermal remediation, a comprehensive assessment of indoor air will be performed. This assessment will be used to identify which buildings on Seattle Boiler Works property are currently impacted at levels greater than cleanup levels and by what magnitude. During thermal remediation, measurements of sub-slab VOC concentrations will be collected monthly to monitor concentration trends and judge effectiveness of the remedial action. Groundwater temperature will also be continually monitored. Depending on sub-slab concentration and groundwater temperature trends, re-sampling of indoor air may be necessary followed by contingency actions as described below. At a minimum, indoor air will be tested at the mid-point of thermal heating and also during the cool down phase. The specific sampling scheme and schedule will be outlined in the EDR. Contaminant concentrations measured in indoor air will be corrected to account for ambient (background) concentrations of PCE and TCE in accordance with Section 3.2.3 of Ecology's draft soil vapor intrusion guidance (Ecology 2009). Access to the Seattle Boiler Works property is required for sample collection.

Contingency Action Trigger: Contingency actions to protect workers will be evaluated if air samples in any occupied Seattle Boiler Works buildings exceed the trigger level. Ecology has determined that modified MTCA Method B indoor air cleanup levels will be applied as the trigger level for contingency actions at Seattle Boiler Works. Modified MTCA Method B levels are allowable under WAC 173-340-705 (2) and in this situation are modified to take into account the current industrial use of the property. While meeting standard MTCA Method B air cleanup levels is necessary to free the property of any future development restrictions, modified MTCA Method B concentrations are protective concentrations for the current industrial site use. Modified MTCA Method B indoor air VOC concentrations, fully protective of the current

receptors inside a non-residential building can be calculated by changing the inputs to Equations 750-1 and/or 750-2, as applicable, to better reflect exposures to an adult worker. The resultant protective air levels will be utilized to decide if contingency measures are needed.

The acceptable adjustments to Equation 750-2 are to reduce the worker exposure from the standard 30 years to 15 years (given that the restoration time frame to achieve standard MTCA Method B cleanup levels in indoor at Seattle Boiler Works is 15 years) and to reduce the exposure frequency to reflect worker exposure (i.e., 8 hours per day, for 5 days per week, for 49 weeks per year). This results in the following contingency action trigger levels:

PCE: $3.7 \mu\text{g}/\text{m}^3$

TCE: $0.88 \mu\text{g}/\text{m}^3$

If, however, the site is converted to residential use, the contingency trigger will be revised downward to the standard MTCA Method B cleanup levels.

6.6.3 Contingency Action Description

At both facilities, the nature of the contingency action will depend on the magnitude of the exceedance, and may include physical modification to ventilation systems, sealing of floors and foundation cracks, or installation of a passive or active building or sub-slab ventilation system. Additionally, localized treatment of soil or groundwater to reduce the source of the vapor intrusion may also be considered. A work plan to implement contingency measures will be prepared and submitted to Ecology within 30 days following verification of any exceedance of the applicable contingency action trigger levels in indoor air as described above.

At the end of active remediation (estimated 10–15 years following thermal treatment), if the standard MTCA Method B indoor air cleanup level is exceeded at Seattle Boiler Works due to the release from the Site, similar contingency actions will be implemented.

6.7 SUMMARY OF REMEDIAL ACTIONS, COMPLIANCE TESTING, AND CONTINGENCIES

The above paragraphs describe details of the compliance testing and contingency actions for each of the CAAs. Table 6.1 presents the information presented in this section in a tabular format that is organized by impacted media (e.g., soil, indoor air, groundwater) and exposure pathways, and also includes summary information on the COCs, the cleanup levels, points of compliance, and restoration time frame.

7.0 References

- Booth, D. and L. Herman. 1998. *Duwamish Basin Groundwater Pathways Conceptual Model Report*. Duwamish Industrial Area Hydrogeologic Pathways Project. City of Seattle Office of Economic Development and King County Office of Budget and Strategic Planning. April.
- Floyd|Snider. 2011. *Draft Fox Avenue Site Remedial Investigation/Feasibility Study*. Prepared for Fox Avenue Building LLC. 25 February.
- Washington State Department of Ecology (Ecology). 2007. *Model Toxics Control Act Statute and Regulation*. Chapter 173-340 WAC. Publication No. 94-06. November.
- . 2009. *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*. Publication No. 09-09-047. October.

**Fox Avenue Site
Seattle, Washington**

Cleanup Action Plan

Tables

Table 2.1
Soil Gas and Indoor Air Sample Results
Seattle Boiler Works and Cascade Columbia

Sample ID	Sample Date	Tetrachloroethene ($\mu\text{g}/\text{m}^3$)	Trichloroethene ($\mu\text{g}/\text{m}^3$)	Sample Location
<i>Indoor Air—Cascade Columbia</i>				
IA-1	3/26/2009	75	1.1	Inside office, near sink
IA-2	3/26/2009	53	1	Inside office, men's restroom
IA-3	3/26/2009	6	0.52	Inside warehouse breakroom
IA-4	3/26/2009	2.7 ¹	0.2	Upstairs, at top of stairwell
<i>Ambient Air—Cascade Columbia</i>				
AA-1	3/26/2009	0.46	<0.18	Ambient outdoor, SW of facility
AA-2	3/26/2009	0.58	<0.17	Ambient outdoor, NE of facility
AA-3	3/26/2009	0.37	<0.18	Ambient outdoor, NW of facility
AA-4	3/26/2009	2	0.37	Ambient indoor, center of warehouse
<i>Soil Vapor—Cascade Columbia</i>				
SV-1	3/26/2009	47,000	1600	In office, near sink area, sub-slab
SV-2	3/26/2009	43,000	940	In office, men's restroom, sub-slab
SV-3	3/26/2009	43,000	2000	In warehouse breakroom, sub-slab
<i>Indoor Air—Seattle Boiler Works²</i>				
SBW-IA-SSVB	12/12/2010	2.9³	0.24²	SE corner inside Pipe Bldg
SBW-IA-Lunch	12/12/2010	3.0³	0.14²	Employee lunch room, inside Pipe Bldg
SBW-IA-Center	12/12/2010	2.5³	0.21²	Central area within Pipe Bldg
<i>Ambient Air—Seattle Boiler Works²</i>				
SBW-IA-AMB	12/12/2010	1.5	0.20	Outside, E of Pipe Bldg
<i>Soil Vapor—Seattle Boiler Works²</i>				
SVA-A	10/28/2010	1,600	<6.4	SE corner of Fabrication Shop, sub-slab
SVA-B	10/28/2010	5,100	220	SE corner of Pipe Bldg, sub-slab
SVA-C	10/28/2010	1,800	120	NE corner of Pipe Bldg, sub-slab
SVA-D	10/28/2010	2,800	96	SW corner of Pipe Bldg, sub-slab
<i>Applicable Regulatory Soil Gas Screening and Indoor Air Cleanup Levels</i>				
MTCA Method B		4.2	1	Soil Gas Screening Level
MTCA Method C		42	10	Soil Gas Screening Level
MTCA Method B ⁴		0.42	0.1	Unrestricted Use Indoor Air Cleanup Level
MTCA Method C ⁴		4.2	1	Industrial Indoor Air Cleanup level

Notes:

Bold indicates an exceedance of appropriate MTCA standard (refer to Note 1).

- The average ambient (outside) PCE air concentration was 0.47 $\mu\text{g}/\text{m}^3$. The sample results were adjusted to account for background in accordance with Section 3.2.3 of Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action,
- Seattle Boiler Works soil gas and indoor air sampling was performed by URS. Data was presented in a Vapor Intrusion Assessment letter prepared by URS and dated February 2, 2011.
- Ambient air samples collected at the Seattle Boiler Works facility in October 2010 indicated that ambient (background) PCE and TCE concentrations were above MTCA Method B CULs. Therefore, in accordance with Section 3.2.3 of Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action, Draft October 2009, concentrations were adjusted to account for background. Sample results will be adjusted to account for background during each sampling event.
- MTCA Method B CULs are applied to the Seattle Boiler Works property assuming unrestricted future land use and MTCA Method C CULs are applied to industrial use.

Abbreviations:

- $\mu\text{g}/\text{m}^3$ Micrograms per cubic meter
- CUL Cleanup level
- E East
- ID Identifier
- MTCA Model Toxics Control Act
- NE Northeast

Table 3.1
Groundwater Cleanup Levels for Organic Compounds¹

Chemical	CAS Number	Unit	Protection of Aquatic Species						Protection of Human Health				Screening Criterion (Lowest Standard)	Maximum Detected in Groundwater Since Measurements Began			Maximum Detected Since 2007 (Post ChemOx Interim Measures)			Maximum Post-IM Exceeds Concentration Criterion? ⁵
			Federal Standards			Washington			Federal Standards		Washington			Value	Location	Date	Value	Location	Date	
			National Recommended Water Quality ² Criteria CWA §304		National Toxics Rule ² 40 CFR 131	Surface Water Quality Standards ² WAC 173-201A		National Recommended Water Quality Criteria CWA §304	National Toxics Rule 40 CFR 131	MTCA Method B Surface Water WAC 173-340-730										
			Marine Chronic	Fresh Chronic	Marine Chronic	Fresh Chronic	Marine Chronic	Fresh Chronic	(Organism Only)	(Organism Only)	Fish Consumption									
Volatile Organic Compounds																				
Chlorinated Ethenes & Ethanes																				
Tetrachloroethene	127-18-4	µg/L	-	-	-	-	-	-	-	3.3	8.9	Use Standard	3.3	1,900,000	B-12	10/15/1990	64,000	B-46	1/28/2009	YES
Trichloroethene	79-01-6	µg/L	-	-	-	-	-	-	-	30	81	Use Standard	30	94,000	B-43	6/29/1993	44,000	GP-42	12/11/2008	YES
1,1-Dichloroethene	75-35-4	µg/L	-	-	-	-	-	-	-	7,100	3.2	Use Standard	3.2	810	B-43	6/29/1993	110	R1-IW2	7/23/2009	YES
cis-1,2-Dichloroethene	156-59-2	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	75,000	B-47	7/9/1993	50,000	GP-42	12/11/2008	no
trans-1,2-Dichloroethene	156-60-5	µg/L	-	-	-	-	-	-	-	10,000	No data	Use Standard	10,000	680	B-58	10/14/1999	240	GP-38	12/8/2008	no
Vinyl chloride	75-01-4	µg/L	-	-	-	-	-	-	-	2.4	530	Use Standard	2.4	25,000	B-33A	10/13/1999	15,600	PTM-2U	8/9/2007	YES
1,1,1-Trichloroethane	71-55-6	µg/L	-	-	-	-	-	-	-	-	-	930,000	930,000	18,000	B-31	9/15/1992	1,400	B-30	1/27/2009	no
1,1-Dichloroethane	75-34-3	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	2,500	B-08	9/28/1990	130	GP-38	12/8/2008	no
1,2-Dichloroethane	107-06-2	µg/L	-	-	-	-	-	-	-	37	99	Use Standard	37	300	B-10/10A	10/15/1990	29	GP-102	10/26/2010	no
Other Volatile Organic Compounds																				
1,2-Dichlorobenzene	95-50-1	µg/L	-	-	-	-	-	-	-	1,300	17,000	Use Standard	1,300	1,000	B-42	11/3/1998	400	B-47	1/29/2009	no
1,3-Dichlorobenzene	541-73-1	µg/L	-	-	-	-	-	-	-	960	2,600	Use Standard	960	91	B-29	5/6/1992	14	B-39	10/20/2010	no
1,4-Dichlorobenzene	106-46-7	µg/L	-	-	-	-	-	-	-	190	2,600	Use Standard	190	290	B-42	11/3/1998	58	B-39	10/20/2010	no
Acetone	67-64-1	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	30,000	B-30	9/17/1992	Not Measured			no
Chloroform	67-66-3	µg/L	-	-	-	-	-	-	-	470	470	Use Standard	470	13,000	B-07	10/8/1990	24	B-60	2/16/2010	no
Methyl ethyl ketone	78-93-3	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	170,000	B-15	4/29/1992	Not Measured			no
Methyl isobutyl ketone	108-10-1	µg/L	-	-	-	-	-	-	-	0	-	No Tox Data	No Tox Data	12,000	B-30	9/17/1992	Not Measured			no
Methylene chloride	75-09-2	µg/L	-	-	-	-	-	-	-	590	1,600	Use Standard	590	43,000	B-08	9/28/1990	Non Detect			no
Total Petroleum Hydrocarbons, Benzene, Toluene, Ethylbenzene, Xylene & Alkylated Benzenes																				
Total Petroleum Hydrocarbons²																				
TPH-Mineral Spirits Range		µg/L	-	-	-	-	-	-	-	-	-	800	800	230,000	B-12	10/15/1990	6,400	B-30	1/29/2010	YES
TPH-Diesel Range		µg/L	-	-	-	-	-	-	-	-	-	500	500	5,000	B-30	9/17/1992	360	B-30	1/29/2010	no
TPH-Heavy Oil		µg/L	-	-	-	-	-	-	-	-	-	500	500	1,100	B-30	1/29/2010	1,100	B-30	1/29/2010	YES, at 1 well
Benzene, Toluene, Ethylbenzene, Xylene																				
Benzene	71-43-2	µg/L	-	-	-	-	-	-	-	51	71	Use Standard	51	53,000	B-49	10/25/1995	64	GP-26	12/1/2008	YES
Toluene	108-88-3	µg/L	-	-	-	-	-	-	-	15,000	200,000	Use Standard	15,000	1,500	B-30	9/17/1992	3,100	GP-38	12/8/2008	no
Ethylbenzene	100-41-4	µg/L	-	-	-	-	-	-	-	2,100	29,000	Use Standard	2,100	4,500	B-07	10/8/1990	1,000	MW-10	1/26/2009	no
Xylene (total)	1330-20-7	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	14,000	B-07	10/8/1990	920	GP-38	12/8/2008	no
Xylene (meta & para)		µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	5,300	B-47	6/22/1998	Not Measured			no
Xylene (ortho)	95-47-6	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	2,500	B-49	11/3/1998	Not Measured			no
Alkylated Benzenes																				
1,2,4-Trimethylbenzene	95-63-6	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	11,000	B-49	10/18/1999	Not Measured			no
1,3,5-Trimethylbenzene	108-67-8	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	9,600	B-49	10/18/1999	Not Measured			no
Styrene	100-42-5	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	1,800	B-49	11/3/1998	Not Measured			no
n-Propylbenzene	103-65-1	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	2,200	B-49	10/18/1999	Not Measured			no
iso-Propylbenzene	98-82-8	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	100	Multiple ³	Multiple ³	Not Measured			no
sec-Butylbenzene	135-98-8	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	2,300	B-49	10/18/1999	Not Measured			no
Semivolatile Organic Compounds																				
High Molecular Weight Polycyclic Aromatic Hydrocarbons																				
Benzofluoranthenes (total)	56832-73-6	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	2	B-12	12/19/1997	Not Measured			no
Pyrene	129-00-0	µg/L	-	-	-	-	-	-	-	4,000	11,000	Use Standard	4,000	23	B-12	6/29/1998	Not Measured			no
Low Molecular Weight Polycyclic Aromatic Hydrocarbons																				
2-Methylnaphthalene	91-57-6	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	130	B-10A	10/25/1995	Not Measured			no
Acenaphthene	83-32-9	µg/L	-	-	-	-	-	-	-	990	-	Use Standard	990	17	B-12	6/29/1998	Not Measured			no
Fluorene	86-73-7	µg/L	-	-	-	-	-	-	-	5,300	14,000	Use Standard	5,300	32	B-49	7/9/1993	Not Measured			no
Naphthalene	91-20-3	µg/L	-	-	-	-	-	-	-	-	-	4,900	4,900	6,700	B-44	6/22/1998	Non Detect			no
Phenanthrene	85-01-8	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	46	B-12	6/29/1998	Not Measured			no
Phthalates																				
bis(2-ethylhexyl)phthalate	117-81-7	µg/L	-	-	-	-	-	-	-	2.2	5.9	Use Standard	2.2	1,900	B-30	10/25/1995	Not Measured			YES (old data)
Butyl benzyl phthalate	85-68-7	µg/L	-	-	-	-	-	-	-	1,900	No data	Use Standard	1,900	400	B-27	9/3/1992	Not Measured			no
Diethylphthalate	84-66-2	µg/L	-	-	-	-	-	-	-	44,000	120,000	Use Standard	44,000	27	B-30	10/25/1995	Not Measured			no
Di-n-butyl phthalate	84-74-2	µg/L	-	-	-	-	-	-	-	4,500	12,000	Use Standard	4,500	880	B-30	9/17/1992	Not Measured			no
Chlorinated Phenols																				
Pentachlorophenol	87-86-5	µg/L	7.9	15.0	7.9	13.0	7.9	12.8	-	3.0	8.2	Use Standard	3.0	31,000	B-38	9/14/1992	116	B-49	8/6/2007	YES
2,4,5-Trichlorophenol	95-95-4	µg/L	-	-	-	-	-	-	-	3,600	-	Use Standard	3,600	5.1	B-20	10/21/1998	Not Measured			no
Tetrachlorophenols (total)	58-90-2	µg/L	-	-	-	-	-	-	-	-	-	No Tox Data	No Tox Data	600	B-31	5/4/1992	Not Measured			no

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Table 3.1
Groundwater Cleanup Levels for Organic Compounds¹

Chemical	CAS Number	Unit	Protection of Aquatic Species						Protection of Human Health				Screening Criterion (Lowest Standard)	Maximum Detected in Groundwater Since Measurements Began			Maximum Detected Since 2007 (Post ChemOx Interim Measures)			Maximum Post-IM Concentration Exceeds Criterion? ⁵
			Federal Standards			Washington			Federal Standards		Washington			Value	Location	Date	Value	Location	Date	
			National Recommended Water Quality ² Criteria CWA §304		National Toxics Rule ² 40 CFR 131	Surface Water Quality Standards ² WAC 173-201A		National Recommended Water Quality Criteria CWA §304	National Toxics Rule 40 CFR 131	MTCA Method B Surface Water WAC 173-340-730										
			Marine Chronic	Fresh Chronic	Marine Chronic	Fresh Chronic	Marine Chronic	Fresh Chronic	Marine (Organism Only)	Marine (Organism Only)	Fish Consumption									
Other Semivolatile Organic Compounds																				
2,4-Dimethylphenol	105-67-9	µg/L	-	-	-	-	-	-	-	850	No Data	Use Standard	850	500	B-29	5/6/1992	Not Measured		no	
2-Methylphenol	95-48-7	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	750	B-29	5/6/1992	Not Measured		no	
3-Methylphenol	108-37-4	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	130	B-12	12/19/1997	Not Measured		no	
4-Methylphenol	106-44-5	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	650	B-39	10/25/1995	Not Measured		no	
Benzoic acid	65-85-0	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	1,700	B-39	8/13/1993	Not Measured		no	
Benzyl alcohol	100-51-6	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	260	B-12	9/17/1992	Not Measured		no	
Carbazole	86-74-8	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	23	B-49	7/9/1993	Not Measured		no	
Dibenzofuran	132-64-9	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	24	B-49	7/9/1993	Not Measured		no	
Phenol	108-95-2	µg/L	-	-	-	-	-	-	-	1,700,000	4,600,000	Use Standard	1,700,000	140	B-27	7/9/1993	Not Measured		no	
Glycols & Alcohols																				
Glycols																				
Ethylene glycol	107-21-1	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	22,000	B-15	4/29/1992	Not Measured		no	
Diethylene glycol	111-46-6	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	8,100	B-33A	9/21/1992	Not Measured		no	
Alcohol																				
Methanol	67-56-1	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	72,000	B-30	9/17/1992	Not Measured		no	
Ethanol	64-17-5	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	30,000	B-11	9/15/1992	Not Measured		no	
iso-Propanol	67-63-0	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	23,000	B-30	9/17/1992	Not Measured		no	
1-Propanol	71-23-8	µg/L	-	-	-	-	-	-	-	-	-	-	No Tox Data	6,700	B-11	9/15/1992	Not Measured		no	

Notes:

- The 2007–2010 maximum concentration is compared to the lowest screening criteria or background.
- Criteria Chronic Concentration used unless otherwise noted.
- No surface water criteria are available for the TPH fractions; therefore MTCA Method A values for groundwater have been used as surrogates.
- Well B-47 (6/22/1998), Wells B-18, WH-10, WH-11, WH-12, and WH-8 (8/11/10).

Abbreviations:

- CFR Code of Federal Regulations
- CWA Clean Water Act
- IM Interim measure
- MTCA Model Toxics Cleanup Act
- TPH Total petroleum hydrocarbons
- WAC Washington Administrative Code

**Table 3.2
Groundwater Cleanup Levels for Metals**

Chemical	CAS Number	Unit	Lower Duwamish Corridor Groundwater Metals Background	Protection of Aquatic Species						Protection of Human Health			Screening Criterion (Lowest Standard Corrected for Background)	Maximum Detected in Groundwater Since Measurements Began			Maximum Detected Since 2007 (Post ChemOx Interim Measures)			Maximum Post-IM Concentration Exceeds Criterion? ⁴	
				Federal Standards			Washington Standards			Federal Standards		Washington		Value	Location	Date	Value	Location	Date		
				National Recommended Water Quality ¹ Criteria CWA §304		National Toxics Rule ¹ 40 CFR 131	Surface Water Quality Standards ¹ WAC 173-201A		National Recommended Water Quality ¹ Criteria CWA §304	National Toxics Rule ¹ 40 CFR 131	MTCA Method B Surface Water ¹ WAC 173-340-730										
				Marine Chronic	Fresh Chronic	Marine Chronic	Fresh Chronic	Marine Chronic	Fresh Chronic	Fish Consumption	Fish Consumption	Fish Consumption									
Antimony	7440-36-0	µg/L		-	-	-	-	-	-	640	4,300	Use Standard	640	3.0	B-34	1/26/2009	3.0	B-34	1/26/2009	No	
Arsenic	7440-38-2	µg/L	8.0	36	150	36	190	36	190	0.14	0.14	Use Standard	8	8.8	B-15	9/14/1992	5.0	B-59	1/27/2009	No	
Barium	7440-39-3	µg/L		-	-	-	-	-	-	-	-	No tox data	No data	80	B-29	5/6/1992	Not Measured				-
Beryllium	7440-41-7	µg/L		-	-	-	-	-	-	-	-	270	270	7.0	B-33A	1/26/2009	7.0	B-33A	1/26/2009	No	
Cadmium	7440-43-9	µg/L		8.8	0.25	9.3	1	9.3	0.37	-	-	20	0.25	0.50	B-19	5/5/1992	Not Detected at 0.4 µg/L				No
Chromium	7440-47-3	µg/L		-	-	-	-	-	-	-	-	No tox data	No data	41	B-34	1/26/2009	41	B-34	1/26/2009	No	
Copper	7440-50-8	µg/L	8.0	3.1	9	2.4	11	3.1	3.5	-	-	2,700	8.0	55	B-34	1/26/2009	55	B-34	1/26/2009	YES	
Molybdenum	7439-98-7	µg/L		-	-	-	-	-	-	-	-	No tox data	No data	98	B-34	1/26/2009	98	B-34	1/26/2009	No	
Nickel	7440-02-0	µg/L		8.2	52	8.2	160	8.2	49	4,600	4,600	Use Standard	8.2	90	B-15	9/14/1992	21	B-34	1/26/2009	YES	
Selenium	7782-49-2	µg/L		71	5	71	5	71	5	4,200	-	Use Standard	5.0	4.0	B-33A	1/26/2009	4.0	B-33A	1/26/2009	No	
Silver	7440-22-4	µg/L		-	-	-	-	-	-	-	-	26,000	26,000	0.40	B-65,B-60	1/26-27/2009	0.40	B-65,B-60	1/26-27/2009	No	
Zinc	7440-66-6	µg/L		81	120	81	100	81	32	26,000	No data	Use Standard	32	110	B-15	9/14/1992	23	B-65	1/26/2009	No	

Notes:

- 1 Criteria Chronic Concentration used unless otherwise noted.
- 2 Wells B-18, WH-10, WH-11, WH-12, and WH-8.
- 3 Well B-47 (6/22/1998), Wells B-18, WH-10, WH-11, WH-12, and WH-8 (8/11/10).
- 4 The 2007-2010 maximum concentration is compared to the lowest screening criteria or background.

Abbreviations:

- CFR Code of Federal Regulations
- CWA Clean Water Act
- IM Interim measure
- MTCA Model Toxics Cleanup Act
- WAC Washington Administrative Code

**Table 4.1
Preliminary Screening of Technologies**

Remedial Technology	Media	Benefits	Constraints	Site-specific Considerations	Technology Retained/Rejected for Further Evaluation
No Action	<ul style="list-style-type: none"> Soil Groundwater 	<ul style="list-style-type: none"> No cost to implement. No long-term monitoring cost. Does not cause significant impacts to site operations. 	<ul style="list-style-type: none"> Does not reduce or remove chemical concentrations. Does not protect human health and the environment. Does not meet cleanup goals in a reasonable restoration time frame. 	<ul style="list-style-type: none"> Does not meet RAOs or minimum threshold requirements of the Model Toxics Control Act. 	<ul style="list-style-type: none"> No Action is Rejected as it does not meet RAOs.
Monitored Natural Attenuation	<ul style="list-style-type: none"> Groundwater 	<ul style="list-style-type: none"> Low cost associated with implementation. Does not cause impacts to site operations. 	<ul style="list-style-type: none"> Long-term monitoring required in perpetuity. Does not increase rate of contaminant mass removal occurring through reductive dechlorination. Does not control chemical migration. 	<ul style="list-style-type: none"> Chemicals in groundwater have migrated off-site. Existing impacts to surface water (Duwamish River) will not be addressed by MNA. 	<ul style="list-style-type: none"> Monitored Natural Attenuation is Retained for application in combination with other more aggressive technologies, and as a baseline for comparison of other technologies, but as a stand-alone remedy, does not address RAOs, or achieve cleanup goals.
Permeable Reactive Barrier Wall	<ul style="list-style-type: none"> Groundwater 	<ul style="list-style-type: none"> Passively treats contaminated groundwater as it passes through the reactive barrier area. Can be straightforward to implement, except at significant depths. Is relatively inexpensive to implement at shallow depths and does not cause significant disruption to site operations. 	<ul style="list-style-type: none"> PRB technology does not address cleanup of contaminated soil. PRB can become "clogged" depending on migration of fines in groundwater and can be costly to maintain. Depending on the concentrations in groundwater, the PRB may require replacement once the reaction capacity of the material in the wall is reached or the wall pores become clogged. PRB does not address contamination that has already migrated past the point of treatment. 	<ul style="list-style-type: none"> Site conditions would require construction of a deep and wide PRB wall to capture all site groundwater exiting the source area. Groundwater may require further downgradient treatment (ERD) to meet remediation objectives, and address contamination that has migrated off-site. 	<ul style="list-style-type: none"> Permeable Reactive Barrier Wall is Retained for further evaluation for shallow 1st WBZ groundwater, assuming design criteria for treatment of contamination does not make construction of the wall infeasible.
Low Permeability Barrier Wall	<ul style="list-style-type: none"> Groundwater 	<ul style="list-style-type: none"> Attains RAOs by containing soil and groundwater contaminants, and restricting continued migration of contaminated groundwater. 	<ul style="list-style-type: none"> Is relatively costly to implement. May impact site operations, or require relocation of existing operations and/or utilities. Requires hydraulic control (pumping) inside the barrier wall to maintain an inward gradient of groundwater in perpetuity. 	<ul style="list-style-type: none"> Groundwater contamination has already migrated downgradient, so any containment wall installed would not fully encapsulate all contamination at the Site. Site use and the location of multiple utilities surrounding the Site would complicate installation, and may require utility relocation or replacement. Additional treatment technologies would be required to address the downgradient groundwater plume. Site geology does not allow for complete isolation of COCs; hanging wall structure would be constructed and issues with groundwater migration would need to be addressed. Pumping to maintain hydraulic control and an inward groundwater gradient would generate large volumes of contaminated groundwater requiring treatment and disposal in perpetuity. 	<ul style="list-style-type: none"> Barrier Wall technology is Retained for further evaluation as the only feasible containment technology proposed, assuming construction of a hanging wall system is feasible, and hydraulic control is obtainable.
Surface Capping	<ul style="list-style-type: none"> Soil 	<ul style="list-style-type: none"> Contains contaminated soil below the ground surface and provides protective barrier from surface water infiltration. 	<ul style="list-style-type: none"> Chemicals remain in place and are not removed/destroyed. Surface Cap maintenance required in perpetuity. 	<ul style="list-style-type: none"> The Site is currently nearly 100 percent paved or covered by existing structures. 	<ul style="list-style-type: none"> Surface Cap technology is Retained for further evaluation.

**Table 4.1
Preliminary Screening of Technologies**

Remedial Technology	Media	Benefits	Constraints	Site-specific Considerations	Technology Retained/Rejected for Further Evaluation
Pump and Treat	<ul style="list-style-type: none"> Groundwater 	<ul style="list-style-type: none"> Removes dissolved-phase chemicals from groundwater. Technology will result in minimal impacts to site operations. 	<ul style="list-style-type: none"> Does not treat soil source contamination. High groundwater pumping rates may be required resulting in high volumes of groundwater for treatment and disposal. Significant cost associated with treatment and discharge of treated waste stream. Long-term operation and maintenance required for extraction system in perpetuity. 	<ul style="list-style-type: none"> A high volume of mass present in soil will not be addressed by this technology alone. The groundwater plume footprint is expansive at this Site, and treatment of the entire plume area would generate large volumes of water. 	<ul style="list-style-type: none"> Pump and Treat is Rejected from further evaluation because the technology is not effective at treating soil source, the volume of water extracted across the entire groundwater plume would be substantial, is expensive to treat and dispose, and this technology does not meet the RAOs.
Thermal Treatment	<ul style="list-style-type: none"> Soil Groundwater 	<ul style="list-style-type: none"> Capable of removal of majority of CEA contaminant mass within treatment area. Can be implemented in 1–2 years. Proven effective at sites with similar conditions. Can be implemented at depth. Treats both soil and groundwater contamination simultaneously. No long-term maintenance required. 	<ul style="list-style-type: none"> High cost associated with implementation. Does not treat pentachlorophenol or metals contamination, or heavy end mineral spirits. Polishing with another remedial technology may be required following thermal treatment to further reduce chemical concentrations to achieve cleanup goals. 	<ul style="list-style-type: none"> Requires temporary relocation of some site activities (i.e., flammables storage and rail loading/unloading over heated area). Installation complicated by active facility. 	<ul style="list-style-type: none"> Thermal Treatment is Retained for further evaluation. Technology has been proven effective at sites with similar conditions and COCs.
Excavation and Landfill Disposal	<ul style="list-style-type: none"> Soil 	<ul style="list-style-type: none"> Results in immediate removal of chemicals from the Site, reducing mass in a short time frame. Effectively removes all COCs associated with soil contamination. Does not require long-term monitoring and maintenance. 	<ul style="list-style-type: none"> Expensive to implement due to high landfill disposal costs of hazardous materials. Technology is limited by contaminant depth. May require shoring for stability if open cuts cannot be made. Can present short-term risk to workers via exposure to contaminated soil, groundwater, and DNAPLs. Technology does not address remediation of groundwater beyond the excavation area. 	<ul style="list-style-type: none"> Large percentage of contaminant source area is located beneath active facility buildings and active rail spurs. Technology requires destruction and relocation of all operational areas where it will be implemented. Site structures will require removal/replacement for access to source area contamination. Shoring and building support will be required for excavations near structures left in place. 	<ul style="list-style-type: none"> Excavation and Landfill Disposal is Rejected because the majority of shallow source soils are located beneath buildings and are inaccessible. Excavation of limited areas would still require implementation of other remedial actions for the remainder of the soil and groundwater plume, and excavation of these limited areas would not improve the environmental benefit of applying other technologies site wide. Excavation is also infeasible for removal of deep soil contamination.
Soil Vapor Extraction	<ul style="list-style-type: none"> Soil 	<ul style="list-style-type: none"> Can be implemented with limited disturbance to existing facilities. System can be easily turned on and off to optimize performance and cost. 	<ul style="list-style-type: none"> Limited to treatment of vadose zone soils. Relatively expensive to install and maintain. Does not address groundwater contamination. 	<ul style="list-style-type: none"> The majority of the Site contains contamination that is below groundwater and unaffected by this technology. SVE may be applicable in areas where low to moderate amounts of vadose zone contamination is present, such as the NW Corner plume. Site also contains soil and groundwater contamination that cannot be addressed by SVE. 	<ul style="list-style-type: none"> Soil Vapor Extraction is Retained for site areas with shallow, vadose zone soil contamination only that have not yet been subject to SVE and where SVE may be used in conjunction with other technologies for remediation of the Site.

**Table 4.1
Preliminary Screening of Technologies**

Remedial Technology	Media	Benefits	Constraints	Site-specific Considerations	Technology Retained/Rejected for Further Evaluation
Chemical Oxidation / Permanganate Injection	<ul style="list-style-type: none"> • Soil • Groundwater 	<ul style="list-style-type: none"> • Technology reduces chemical concentrations and mass in place. • Low cost associated with implementation (i.e., no landfill disposal fees). • Technology does not cause significant impacts to site operations. 	<ul style="list-style-type: none"> • Technology does not treat all soil— injected solutions can follow preferential pathways. • Effectiveness limited by subsurface conditions and site heterogeneity. • Requires multiple rounds of injection. • Contaminant rebound may be observed when source concentrations and volume are elevated and insufficient source treatment has occurred. 	<ul style="list-style-type: none"> • Chemical Oxidation as been implemented unsuccessfully at the Site in the past and did not reduce chemical concentrations to acceptable levels. 	<ul style="list-style-type: none"> • Chemical Oxidation is Rejected from further evaluation because the technology has been applied at the Site in the past and did not result in measurable reduction of chemical concentrations/mass.
Soil Flushing	<ul style="list-style-type: none"> • Soil 	<ul style="list-style-type: none"> • In-situ technology that can be implemented with minimal disturbance to existing operations. 	<ul style="list-style-type: none"> • Requires injection of large volumes of water and surfactant to release soil contamination into groundwater. • Requires downgradient capture via pumping and treatment of impacted water. • High risk associated with capturing all downgradient groundwater/surfactant to insure chemicals are not mobilized, then transported downgradient. • Technology is expensive to implement due to requirement for pumping and treatment of water. 	<ul style="list-style-type: none"> • Depth of contamination at this Site will require significant volumes of water to be pumped for flushing treatment. • Subsurface conditions are not supportive of a downgradient groundwater capture system due to depth and wide extent of contamination. • High risk associated with inability to capture downgradient groundwater due to the Site's location relative to a surface water body. 	<ul style="list-style-type: none"> • Soil Flushing is Rejected from further evaluation because of the significant level of pumping and treatment that would be required (resulting in excessive waste streams and difficulty of flushing chemicals from siltier soil lenses), and the risk associated with capture of all downgradient groundwater.
Soil Mixing by Auger	<ul style="list-style-type: none"> • Soil 	<ul style="list-style-type: none"> • Technology promotes in-situ destruction of contaminant mass by addition of zero-valent iron or oxidants directly to contaminated soil brought up by augers. • Can reach soil contamination at depth. 	<ul style="list-style-type: none"> • Technology will require destruction and relocation of facility operations during implementation. • Technology results in generation of excess contaminated soil that must be disposed of in a landfill facility. • Disposal of contaminated material at a landfill facility can result in significant cost. • Wedges of contaminated material may be left in place between auger locations, depending on the degree of overlap of locations. 	<ul style="list-style-type: none"> • Site operations will be difficult to relocate to accommodate full implementation of this remedy. • Depth of contamination will result in generation of significant volumes of contaminated soil requiring landfill disposal. 	<ul style="list-style-type: none"> • Deep Soil Mixing is Rejected from further evaluation because of the impracticability of relocating site facilities and disposing of contaminated soil. Deep soil mixing would also likely not be effective in meeting site RAOs.
Dual-phase Extraction	<ul style="list-style-type: none"> • Soil • Groundwater 	<ul style="list-style-type: none"> • Removes contamination from vadose zone soil and shallow groundwater. • Technology is moderate in cost to implement. • Technology is capable of treating source soils together with groundwater at shallow depth. 	<ul style="list-style-type: none"> • Implementation results in extraction of contaminated groundwater that requires treatment prior to disposal. • Cost of treatment and disposal of extracted water can be significant. • Technology typically has high maintenance costs. • Technology cannot treat source at deeper intervals in primary source area. 	<ul style="list-style-type: none"> • Technology will not be beneficial for treatment of the primary source area because contamination extends to depths greater than 20 feet below ground surface. Significant water volumes would be generated and require treatment if this technology was selected for implementation. 	<ul style="list-style-type: none"> • Dual Phase Extraction is Rejected from further evaluation because this technology is not applicable to DNAPL contamination and would only be applicable in very limited areas of the Site for vadose soil treatment only.

**Table 4.1
Preliminary Screening of Technologies**

Remedial Technology	Media	Benefits	Constraints	Site-specific Considerations	Technology Retained/Rejected for Further Evaluation
Enhanced Reductive Dechlorination	<ul style="list-style-type: none"> Soil Groundwater 	<ul style="list-style-type: none"> Technology will result in minimal impacts to site operations. Technology is comparatively inexpensive to implement. ERD can serve as a long-term treatment technology when used in combination with other aggressive source control remedial technologies. Technology is an effective treatment mechanism for groundwater contamination. 	<ul style="list-style-type: none"> The effectiveness of ERD for treatment of soils with DNAPL-level concentrations is unknown, but not expected to be effective in a reasonable restoration time frame. Technology takes a long period of time to meet remediation levels or cleanup levels when used as a stand-alone technology. Technology is still in the development stage. 	<ul style="list-style-type: none"> ERD is currently being implemented for treatment of downgradient groundwater at the Site, and data indicates accelerated destruction of dissolved plume contamination is occurring. 	<ul style="list-style-type: none"> ERD is Retained for further evaluation because current implementation suggests ERD is effectively reducing chemical concentrations at the Site in downgradient groundwater.
Air Sparging	<ul style="list-style-type: none"> Groundwater 	<ul style="list-style-type: none"> Removes dissolved-phase chemicals from groundwater. Strips dissolved-phase chemicals from groundwater and transmits to vadose soil. Relatively low cost to implement technology. 	<ul style="list-style-type: none"> Technology has limited benefit in areas with elevated groundwater contamination concentrations. Implementation does not result in destruction of contamination. Significant reductions in contamination concentration may be difficult to achieve. Air sparge points typically have a small radius of influence, requiring a large network of wells to implement. 	<ul style="list-style-type: none"> Technology is not efficient at treating to the depths of contamination at the Site. Technology may be applicable in limited applications such as a point of discharge treatment option in shallow groundwater. Technology adds oxygen to subsurface so does not work well with ERD. 	<ul style="list-style-type: none"> Air Sparging is Retained for further evaluation as a point of discharge treatment in a curtain or wall type scenario for 1st WBZ groundwater only.

Abbreviations:

- COC Chemical of concern
- CVOC Chlorinated volatile organic compound
- DNAPL Dense non-aqueous phase liquid
- ERD Enhanced reductive dechlorination
- LNAPL Light non-aqueous phase liquids
- MNA Monitored Natural Attenuation
- PRB Permeable reactive barrier
- RAO Remedial Action Objective
- SVE Soil vapor extraction
- WBZ Water Bearing Zone

**Table 4.2
Summary of Retained Technologies by Cleanup Action Area**

Remedial Technology	Main Source Area	Downgradient Groundwater Plume	Northwest Corner Plume
Monitored Natural Attenuation <i>(retained for baseline comparison)</i>	X	X	X
Permeable Reactive Barrier Wall		X	X
Low Permeability Barrier Wall	X		
Surface Capping	X		
Thermal Treatment	X		
Soil Vapor Extraction	X		X
Enhanced Reductive Dechlorination	X	X	X
Air Sparging		X	X

**Table 6.1
Summary of Cleanup Action Compliance Testing and Contingencies by Media**

Impacted Media	Pathway/Exposure	Primary Chemicals of Concern	Proposed Media Cleanup Level	Proposed Point of Compliance	Compliance Measured By	Remediation By	Remediation Level	Expected Restoration Time Frame	Contingency Action ^{1,2}
Air	Inhalation	PCE, TCE	MTCA Method C Air: Cascade Columbia Standard MTCA Method B Air ³ : Seattle Boiler Works	Site-wide indoor air at Cascade Columbia and Seattle Boiler Works	Direct sampling of indoor air at each facility ⁴	Thermal and post-thermal ERD in Main Source Area and Downgradient Plume	None, thermal and ERD expected to result in achievement of applicable cleanup levels in air	Cascade Columbia: 1 year—using thermal to meet MTCA Method C Seattle Boiler Works: 10–15 years of post-thermal ERD to meet Standard MTCA Method B	Sealing of floor cracks, upgraded passive or active building or sub-slab ventilation; further treatment of soil or groundwater sources. Refer to Notes 3 and 4 for contingency action trigger levels.
Soil	Direct contact by ingestion, industrial worker	PCE	MTCA Method C Ingestion (240 mg/kg)	Upper 15 feet site-wide	Sampling in source areas following thermal	Thermal in Main Source Area	None needed, the thermal remediation level is less than the direct contact cleanup level	1 year—thermal	Capping, institutional controls.
	Cross Media: Soil vapor in contaminated vadose zone soils causing vapor intrusion to indoor air for industrial worker at Cascade Columbia	PCE, TCE	Empirical demonstration (i.e., no numeric value) that indoor air is in compliance with MTCA Method C levels	Indoor air at Cascade Columbia	Compliance in indoor air empirically demonstrates vadose zone soil concentrations are protective site-wide	Thermal in Main Source Area	None needed, indoor air expected to achieve cleanup level using thermal to remediate source soils	1 year—thermal	Cascade Columbia: Upgraded ventilation.
	Cross Media: Soil leaching to groundwater	PCE, TCE, DCE, TPH	Empirical demonstration (i.e., no numeric value) by testing groundwater for chemicals of concern at POC	Groundwater at Fox Avenue	Compliance in groundwater empirically demonstrates soil concentrations throughout the aquifer are protective	Source Area: Thermal followed by ERD then MNA Downgradient: ERD followed by MNA	Soil RL for Thermal: Average soil concentration in each thermal zone of 10 mg/kg PCE +TCE Post Thermal and ERD Groundwater RL: < 250 µg/L total CEAs	Soil RL: 1 year—thermal Groundwater RL: 10–15 years of post-thermal ERD	Continued ERD in Main Source Area, and/or 1 st WBZ PRB wall in localized areas of groundwater remediation level exceedance.
Surface Water	Aquatic species AND human health through the consumption of contaminated fish/shellfish	PCE, TCE, VC	Lowest of federal/state surface water ARARs	Surface water column	None planned at this time	None planned at this time	None, surface water currently meets cleanup level	S. Myrtle Street Embayment surface water already in compliance	None needed.
Groundwater	Direct ingestion, drinking water (NOT APPLICABLE)	The groundwater at this Site is considered non-potable and its maximum beneficial use is discharge into a tidal estuary, which is also non-potable (refer to RI/FS text for details).							
	Cross Media: Groundwater causing vapor intrusion— inhalation	PCE, TCE	Empirical demonstration (i.e., no numeric value) that indoor air is in compliance with proposed indoor air CULs	Indoor air at Cascade Columbia Facility and Seattle Boiler Works	Compliance in indoor air at both facilities demonstrates that 1 st WBZ groundwater is in compliance site-wide	Thermal followed by ERD then MNA	Post Thermal/ERD Groundwater RL: Less than 250 µg/L (total CEAs) at Fox Avenue and in downgradient wells	10–15 years of post-thermal ERD	Continued ERD in downgradient plume in localized plume hot spot areas that may be contributing to vapor intrusion.

**Table 6.1
Summary of Cleanup Action Compliance Testing and Contingencies by Media**

Impacted Media	Pathway/Exposure	Primary Chemicals of Concern	Proposed Media Cleanup Level	Proposed Point of Compliance	Compliance Measured By	Remediation By	Remediation Level	Expected Restoration Time Frame	Contingency Action ^{3,4}
Groundwater	Cross Media: Groundwater discharges to surface water via seeps into the S. Myrtle Street Embayment—POC at the seeps	PCE, TCE, VC	Lowest of federal/state surface water ARARs	Seeps: Location of groundwater discharge into Lower Duwamish Waterway	Seeps	Thermal followed by ERD then MNA	None, groundwater will meet surface water CUL at seeps	15 years to reach CULs in seeps	Re-evaluation of potential exposure pathway that assumes bioconcentration in fish/shellfish (i.e., new science, clam survey/testing, impact of fishing restriction, etc.).
	Cross Media: Groundwater discharges to surface water into the S. Myrtle Street Embayment conditional POC at Fox Avenue	PCE, TCE, VC, DCE, TPH (as mineral spirits), Penta	Lowest of federal/state surface water ARARs, MTCA Method A for TPH (as mineral spirits)	Conditional POC at Fox Avenue	Groundwater samples from monitoring wells along the west side of Fox Avenue and on Seattle Boiler Works property	Thermal followed by ERD then MNA	Post Thermal/ERD Groundwater RL: Less than 250 µg/L (total CEAs) at Fox Avenue and Downgradient Groundwater Plume wells	10 years to reach RLs at Fox Avenue and Downgradient Groundwater Plume wells Approximately 50 years to meet CULs at Fox Avenue and Downgradient Groundwater Plume wells	Continued ERD in downgradient plume in localized areas of groundwater RL exceedance. Both the groundwater RL and the approximate 50-year restoration time frame to reach CULs result in no unacceptable risk and/or exposure.

Notes:

- 1 If indoor air levels are found to exceed MTCA Method C at the Cascade Columbia property, then contingency measures as described in Section 6.6 of this document will be evaluated and implemented.
- 2 If indoor air levels are found to exceed Modified MTCA Method B CULs at Seattle Boiler Works during active remediation (thermal and ERD) or exceed standard MTCA Method B CULs following active remediation or if land use at any time changes to residential then contingency measures as described in Section 6.6 of this document will be evaluated and implemented. Modified MTCA Method B concentrations account for worker exposure based on 8 hours per day exposure for 5 days per week for 49 weeks per year for 15 years. The expected restoration time frame for indoor air to achieve standard MTCA Method B CULs is 15 years.
- 3 MTCA Method B CULs are being used for the indoor air at Seattle Boiler Works property because the property owner will not accept institutional controls.
- 4 Contaminant concentrations in indoor air will be adjusted downward to account for ambient concentrations of PCE and TCE in accordance with Ecology's 2009 Draft Guidance for Vapor Intrusion (Ecology 2009).

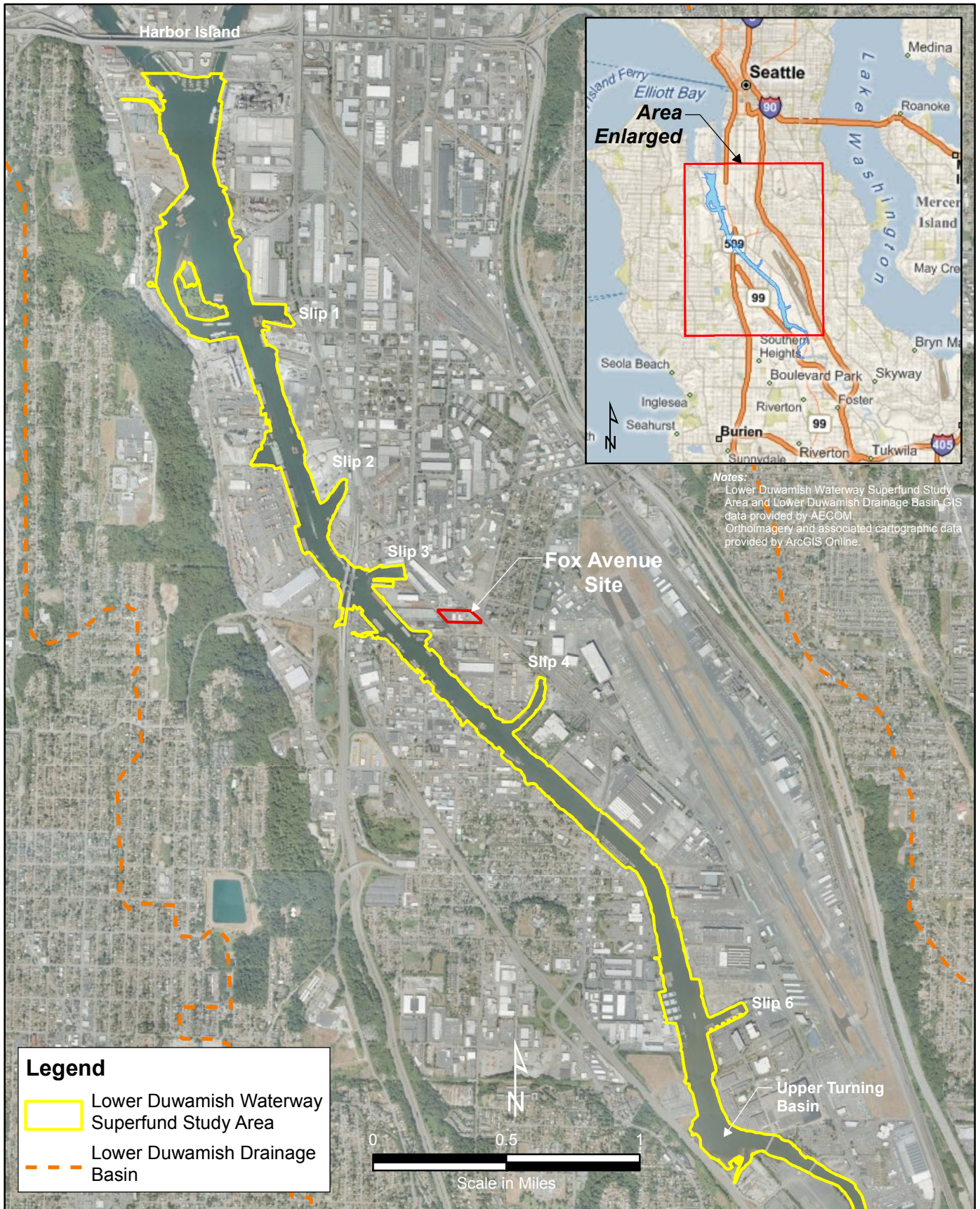
Abbreviations:

- ARAR Applicable or relevant and appropriate requirement
- CEA Chlorinated ethene and ethane
- CUL Cleanup level
- DCE Dichloroethene
- Ecology Washington State Department of Ecology
- ERD Enhanced reductive dechlorination
- MNA Monitored natural attenuation
- MTCA Model Toxics Control Act
- PCE Tetrachloroethene
- Penta Pentachlorophenol
- POC Point of compliance
- PRB Permeable Reactive Barrier
- RL Remediation level
- TCE Trichloroethene
- TPH Total petroleum hydrocarbons
- VC Vinyl chloride
- VOC Volatile organic compound
- WBZ Water Bearing Zone

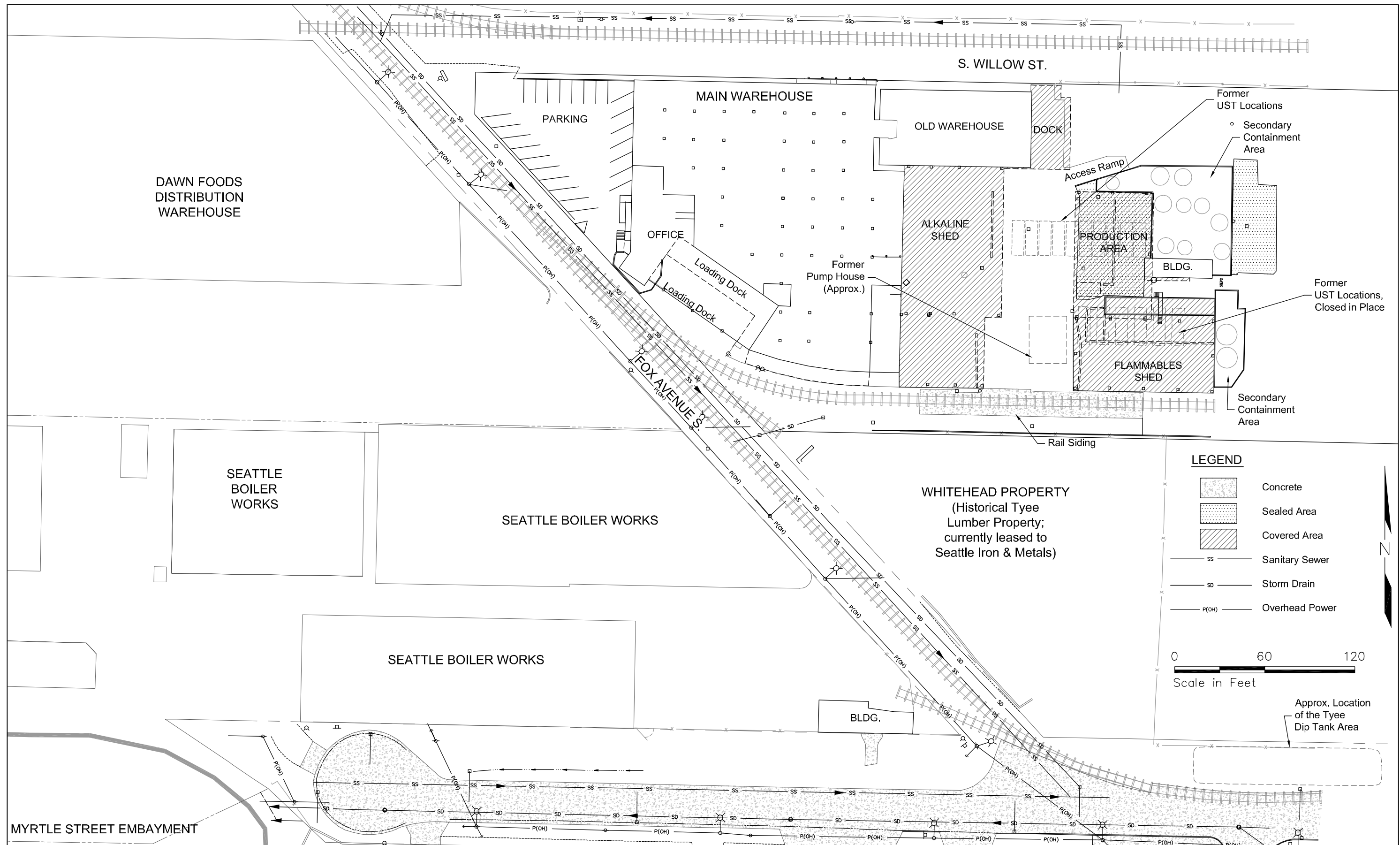
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Seattle, Washington**

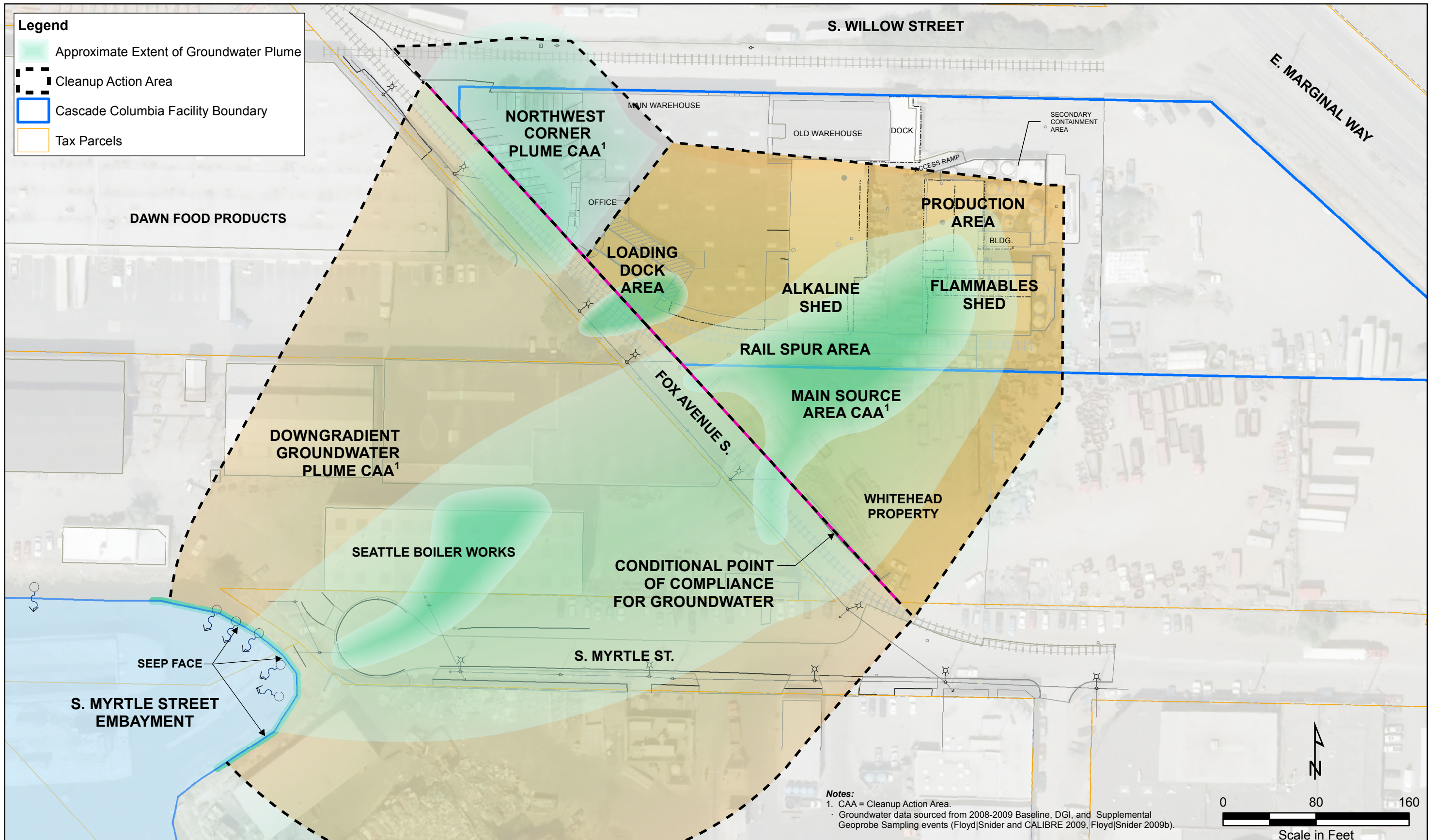
Cleanup Action Plan

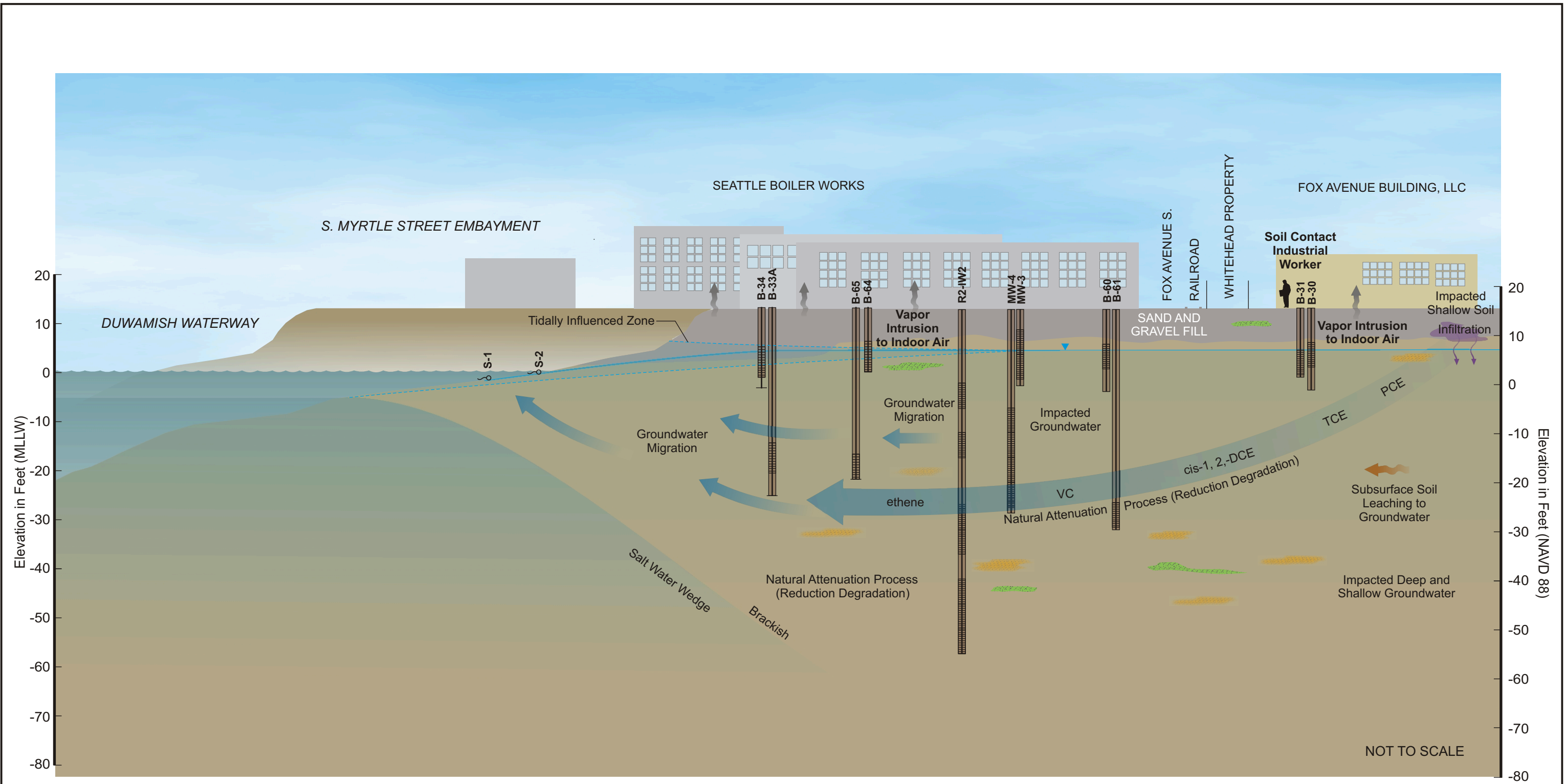
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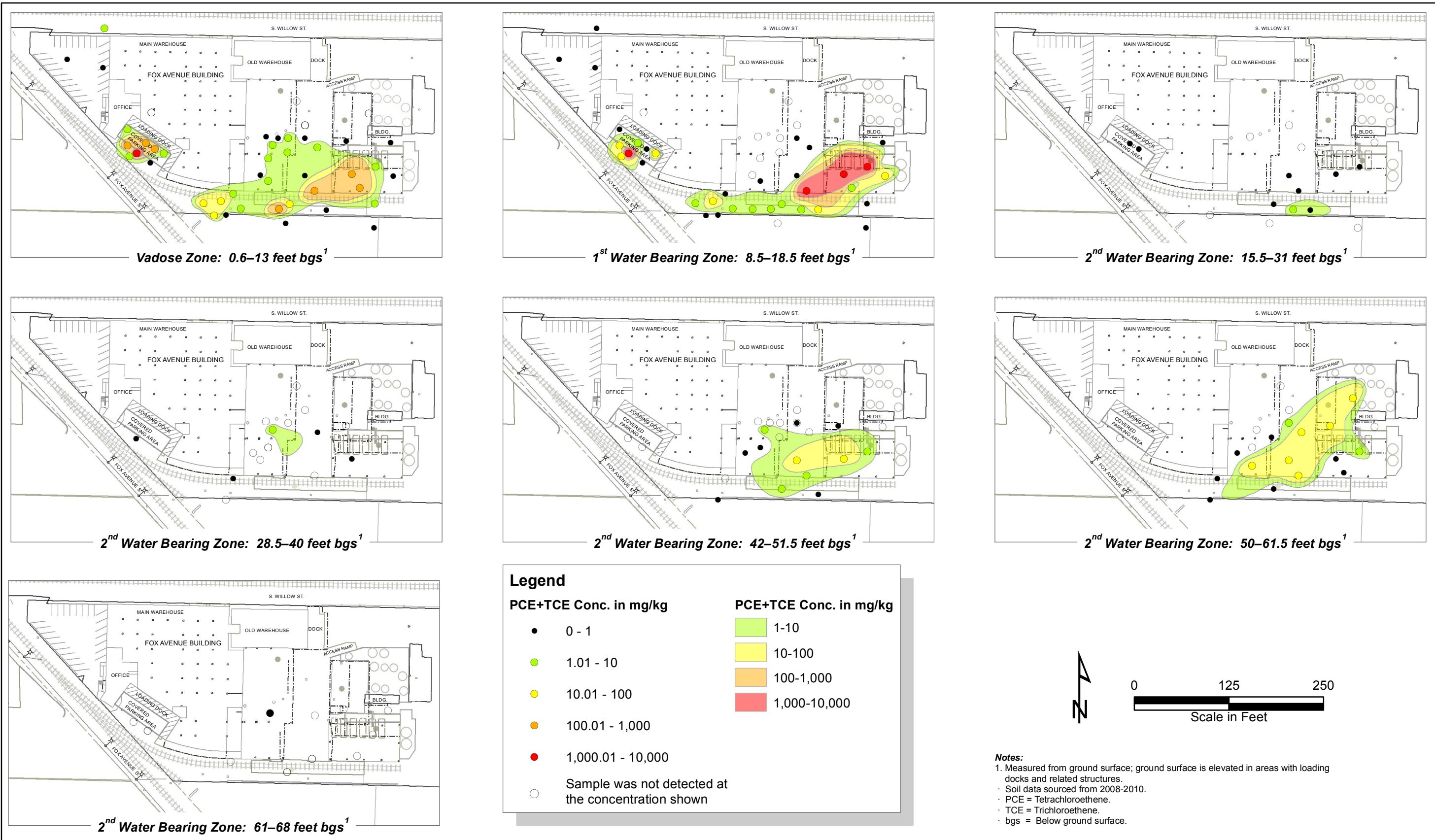


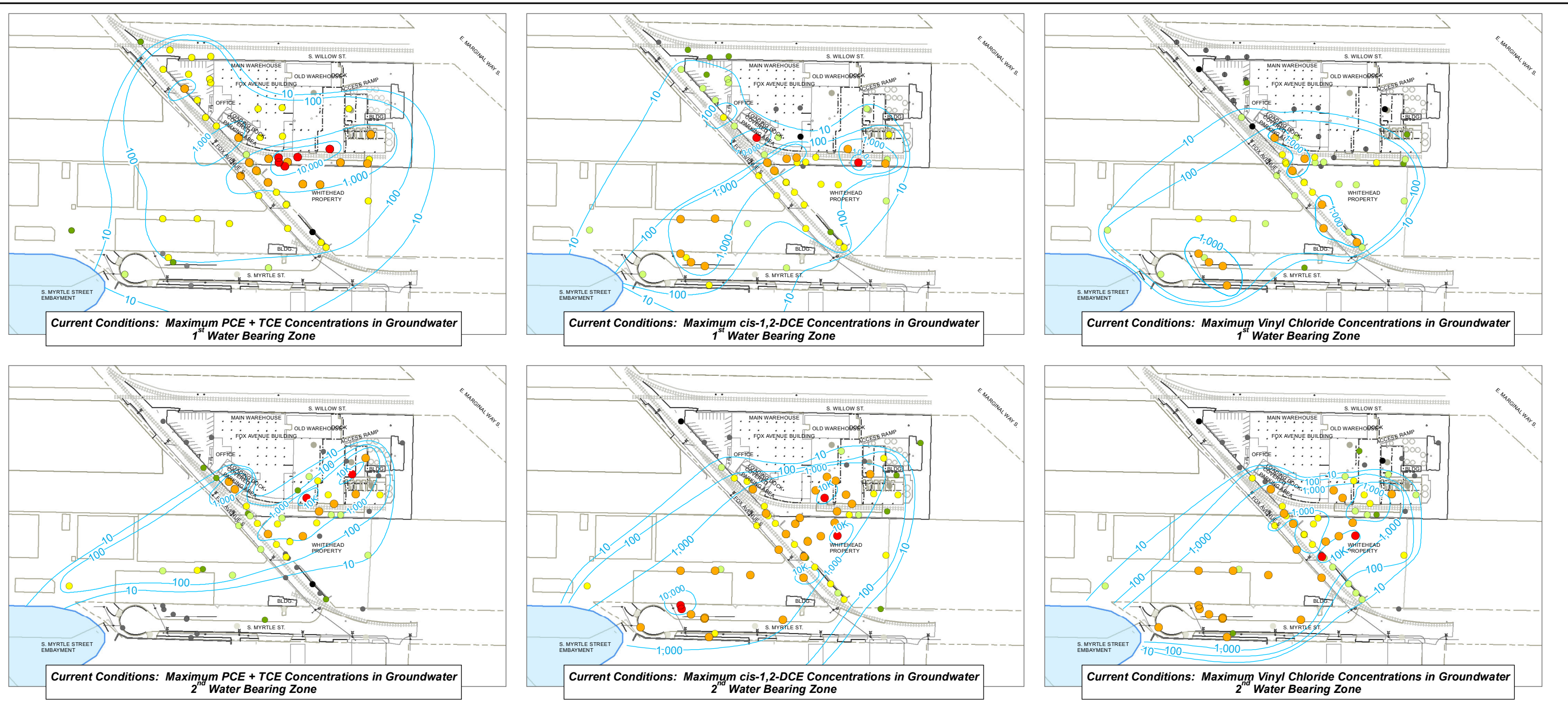






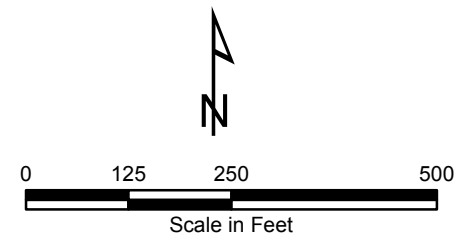






Legend

- Concentration in Groundwater in µg/L**
- 0 - 1
 - 1 - 10
 - 10.01 - 100
 - 100.01 - 1,000
 - 1,000.01 - 10,000
 - > 10,000
- Location where Analyte was Not Detected
 - ~ Concentration Contour in µg/L
 - ☞ Myrtle Street Embayment

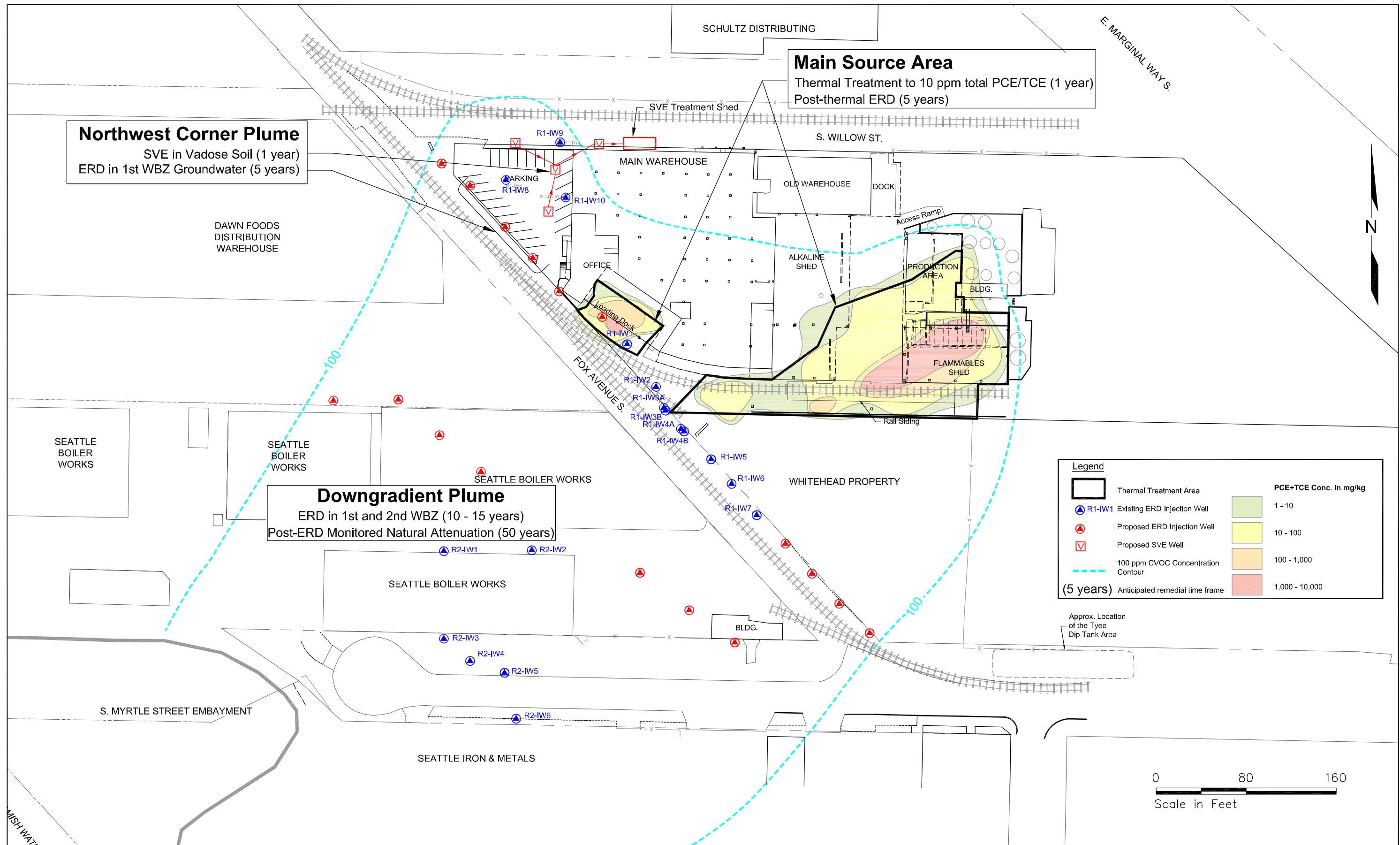


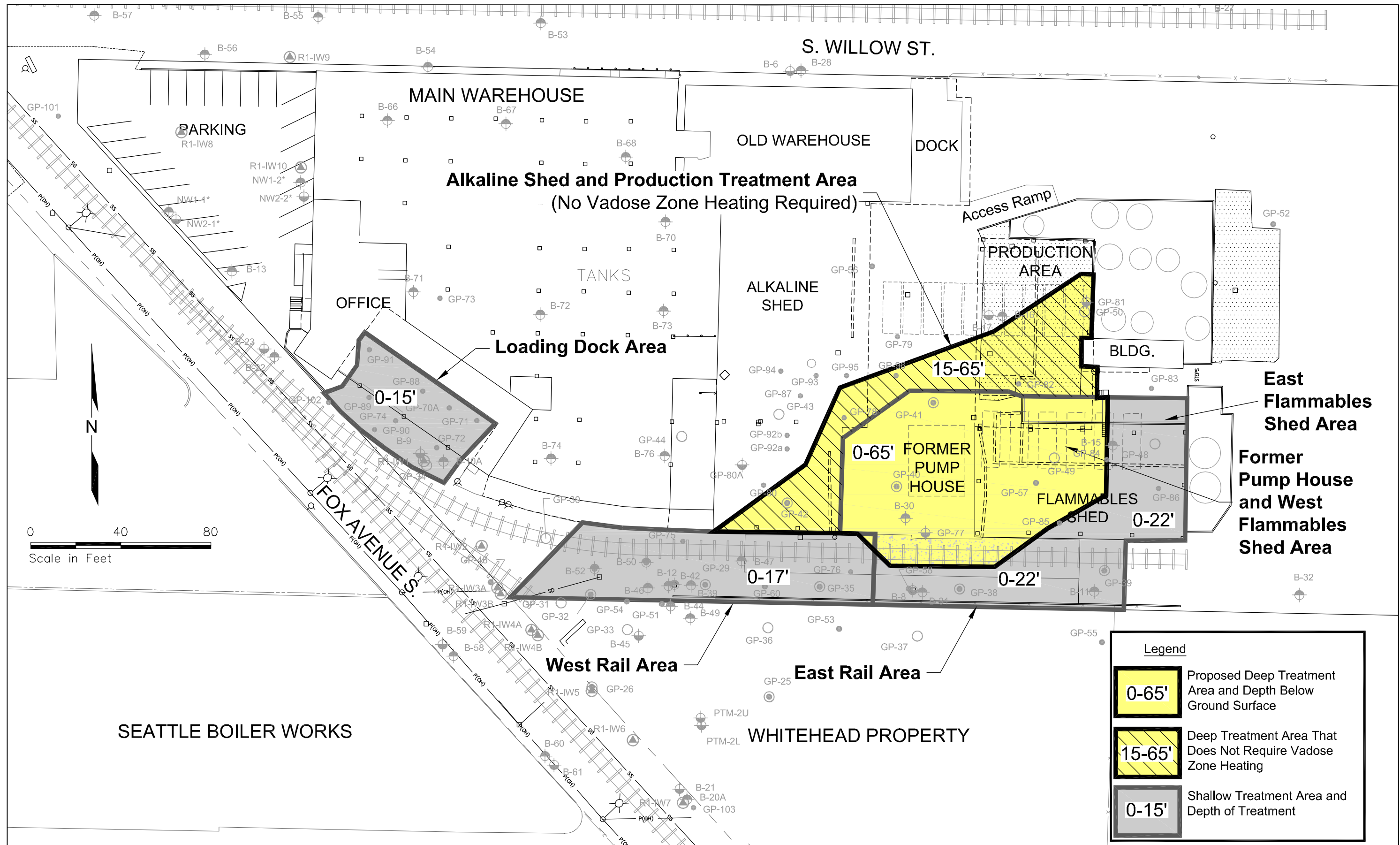
- Notes:**
- Groundwater data sourced from 2008–2010.
 - The 1st Water Bearing Zone is defined as the vertical region ≥ -2.346 ft. NAVD 88.
 - The 2nd Water Bearing Zone is defined as the vertical region < -2.346 ft. NAVD 88.
 - PCE = Tetrachloroethene.
 - TCE = Trichloroethene.
 - cis-1,2-DCE = cis-1,2-Dichloroethene.
 - VC = Vinyl Chloride.

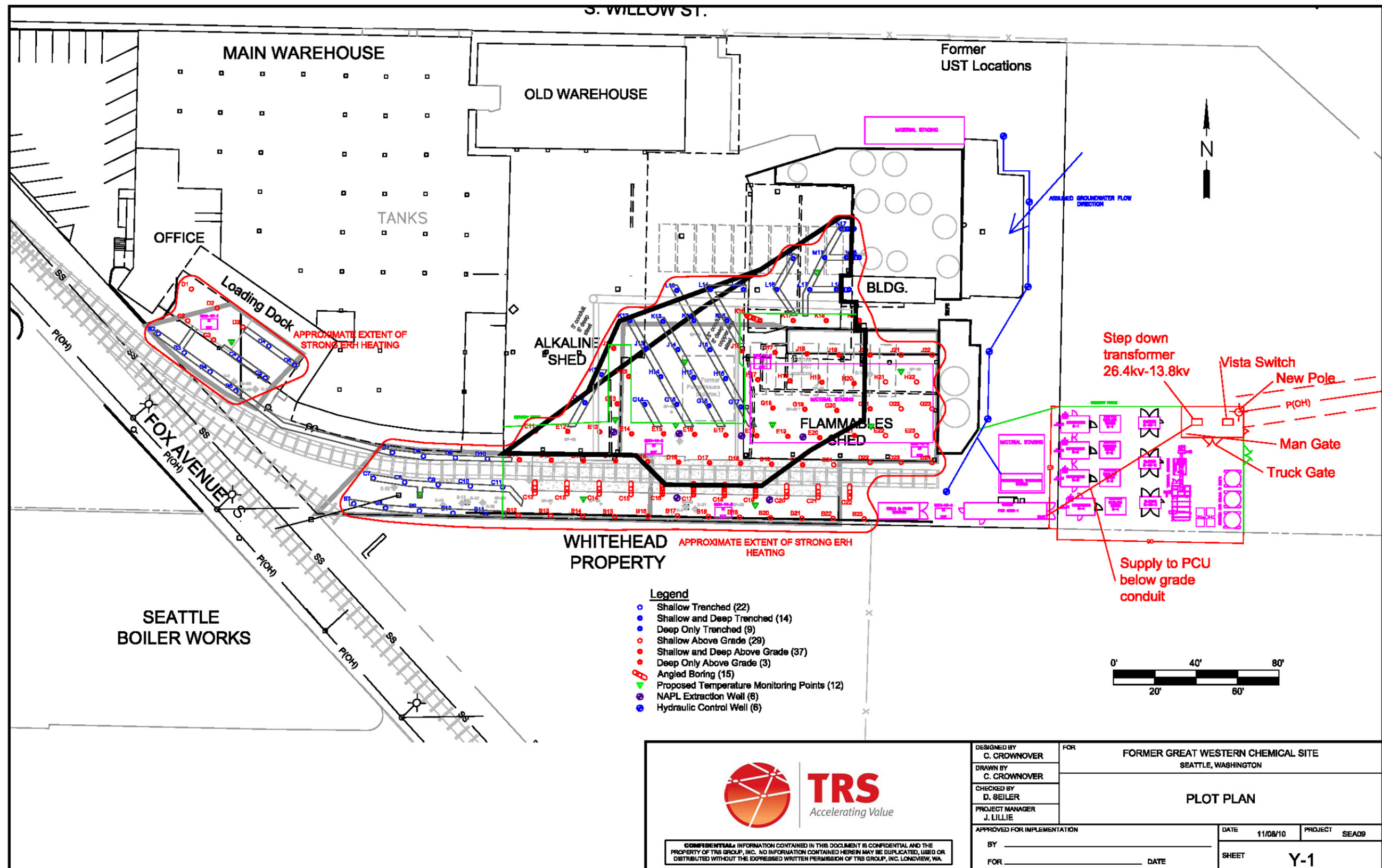


**Cleanup Action Plan
Fox Avenue Site
Seattle, Washington**

Figure 2.6
Current Conditions: Maximum PCE+TCE, Maximum cis-1,2-DCE,
and Maximum VC Concentrations in Groundwater







Note: Provided by TRS as part of initial planning.

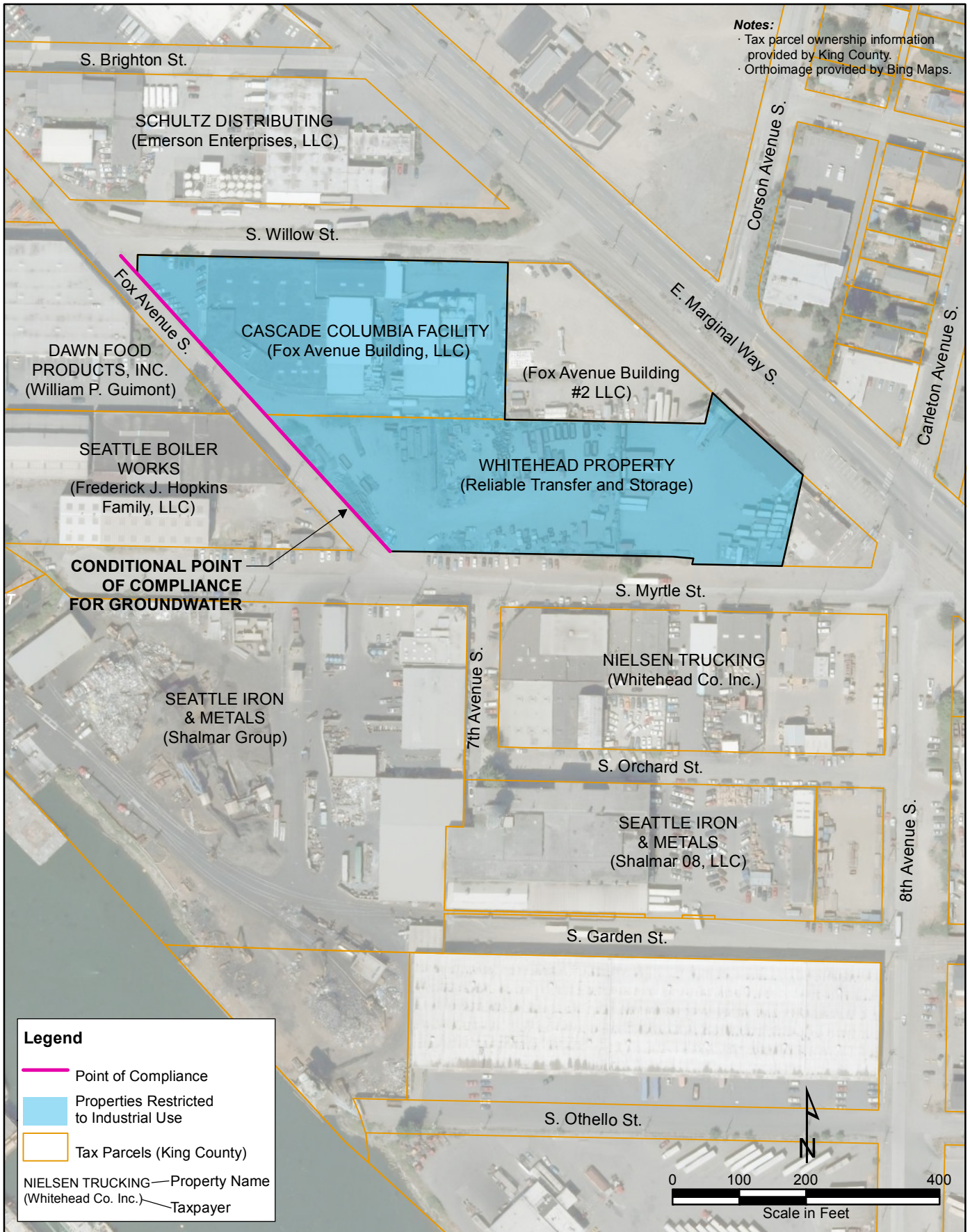


Exhibit C: Schedule to Agreed
Order for Fox Avenue

Construction and Monitoring Schedule

TASK	ESTIMATED START PERIOD	ESTIMATED MONTHS REQUIRED TO COMPLETE TASK AFTER START DATE
Engineering Design Report (EDR) (includes Thermal and SVE O&M and Performance Monitoring Plan)	Immediately following execution of Agreed Order	1–2
Thermal and SVE System Construction and Operations	Within 3 months following approval of EDR	16
Thermal and SVE Remedial Action Completion Report	Immediately following end of SVE and thermal heating	3
ERD ¹ Injections—Downgradient Plume	Ongoing	NA
ERD Injections—NW Plume	Ongoing	NA
ERD Injections in Source Area	1–2 months following end of thermal heating	Up to 60
Indoor Air Sampling—Before, During, and After Thermal Remediation	Before: Any time during thermal construction During: Mid-point of thermal heating After: 1 year after end of thermal heating	NA
Downgradient ERD and NW Corner Plume Expansion	6 months following end of thermal heating	2
Confirmation Groundwater Monitoring (until cleanup levels are met site-wide)	At end of active ERD	Up to 50 years

Exhibit C: Schedule to Agreed
Order for Fox Avenue

Restoration Timeframe Schedule ¹

Impacted Media	Expected Restoration Time Frame
Air	In Cascade Columbia office: 1 year to meet Method C Cleanup Levels In Seattle Boiler Works Buildings: 10–15 years to meet Method B Cleanup levels
Soil	1 year to meet the remediation level in soil
Seeps	15 years to reach the cleanup levels in seeps
Groundwater	10 years to reach the remediation levels at Fox Avenue and Downgradient Groundwater Plume wells Approximately 50 years to meet cleanup levels at Fox Avenue and Downgradient Groundwater Plume wells

Note:

1 Refer to Table 6.1 in the Cleanup Action Plan for further details

EXHIBIT D: List of Permits

Permits required:

1. Puget Sound Clean Air Agency permits for discharge of treated organic vapors from thermal oxidizer and SVE system
2. City of Seattle Electrical Permits for construction of the thermal remediation system and SVE system

WAC 197-11-960 Environmental Checklist.

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable: **FOX AVE THERMAL REMEDIATION PROJECT**
2. Name of applicant: **Floyd|Snider, Inc. on behalf of Fox Ave Trust**
3. Address and phone number of applicant and contact person: **601 Union Street, Suite 600, Seattle WA 98101. (206) 292-2078. Name: Tom Colligan**
4. Date checklist prepared: **1/03/12**
5. Agency requesting checklist: **Washington State Department of Ecology**
6. Proposed timing or schedule (including phasing, if applicable): **Spring 2012–Spring 2013**
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.
Fox Ave Remedial Investigation/Feasibility Study, June 2011, prepared by Floyd|Snider, Inc. Fox Ave draft Cleanup Action Plan, in progress. Fox Ave Engineering Design Report, in progress.
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.
 1. **Permit needed from Puget Sound Clean Air Agency to run thermal oxidizer and carbon treatment system to treat off gas vapors from remediation of subsurface contaminated soil.**
 2. **Electrical permit needed from the City of Seattle to install electrical equipment.**
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 project involves the cleanup of contaminated soil and groundwater at the former Great Western Chemical Company located in South Seattle on Fox Avenue. Past site use has resulted in significant solvent contamination of soil underlying the chemical warehouse. The proposed plan is to clean-up the contaminated soil using a subsurface heating technology called electrical resistance heating, or ERH. This involves the drilling of approximately 200 closely spaced electrodes on the contaminated portions of the property and applying voltage to the electrodes, which causes current to flow between electrodes thereby heating the soil until the groundwater turns to steam. This process boils off the solvent contaminants that are subsequently recovered along with the steam via extraction wells using a blower. The vapors are condensed to liquid and treated aboveground to

remove the contaminants before being discharged to the sewer or air. This technology takes a large amount of power, which will be supplied by a new temporary 4,500 KVA power supply installed by Seattle City Light. The project will take approximately 1 year to construct and operate. It is a temporary installation that will occur on some of the open lot in back of the current Cascade Columbia warehouse.

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.

Project will occur at 6900 Fox Ave South, Seattle, WA 98108

B. ENVIRONMENTAL ELEMENTS

1. Earth

- a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other. **Project site is flat and located in the Duwamish Industrial Corridor.**
- b. What is the steepest slope on the site (approximate percent slope)? **<1%**
- 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. **Mainly gravelly to sandy fill soils underlain by native alluvial fine sands and silts. Project is located in alluvial valley.**
- 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. **No filling or grading will occur.**
- f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. **No. Project will occur on paved surfaces.**
- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? **Not applicable. Project will not involve additions to existing surfacing.**
- h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: **Not applicable.**

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.

Air emissions consisting of solvent vapors (perchloroethylene, trichloroethylene, mineral spirits, benzene, toluene) and steam will be

generated at a rate of approximately 1200 cubic feet per minute during a six to nine month thermal remediation period, and solvents in vapors will be destroyed via a thermal oxidizer.

- 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:

The remediation system will generate approximately 1200 cubic feet per minute of vapor that will be treated in a thermal oxidizer to destroy solvents that are removed from the subsurface. The oxidizer will be supplemented by granular activated carbon to provide further treatment of the air emissions. This treatment of air emissions will be done under permit from the Puget Sound Clean Air Agency.

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.

Duwamish Waterway is 600 feet from 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.

Not applicable.

- 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.

No fill or dredge material will be placed or removed.

- 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.

Ground water pumping is not anticipated at this time but may be necessary to control heat losses during thermal remediation. If so, wells will be installed for this purpose. The pumping rate necessary to control heat loss is unknown but may range from 20–50 gpm. Approximately 5 gpm of treated groundwater will be dripped into the thermal electrodes to control drying out of soils.

- 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.

No wastes will be discharged to ground.

- 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.

No runoff expected.

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

Wastes generated by this project are expected to consist of soil cuttings during well drilling, which will be contained and sent off to landfills. No wastes will enter ground or surface waters.

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

No impacts expected. The purpose of the project is to cleanup soil and groundwater that is currently impacted from historical releases.

4. Plants

- a. Check or circle types of vegetation found on the site: **Not applicable, site is fully developed.**

_____ 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

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

None.

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

None.

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

None.

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: **None.**

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.

None.

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

No.

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

No measures necessary.

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.

Electrical energy will be used from Seattle City Light's grid to power the electrodes and natural gas will be used to fire the thermal oxidizer.

- 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:

Smart metering will be used to enable more electrical usage during off peak hours.

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.

During construction of the project, there is worker risk of exposure to solvents in soil generated via drilling of electrodes or removal of existing underground storage

tanks. Contractors working at the site will develop and implement Health and Safety Plans and use HAZWOPER-trained workers.

- 1) Describe special emergency services that might be required.

None anticipated.

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

All site work will be done under a Health and Safety Plan using HAZWOPER-trained workers.

b. Noise

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

Very noisy area due to truck traffic and nearby metal recycler and other heavy industry.

- 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.

Operation of the project will generate low level noise from operation of the blowers. Levels anticipated to be indistinguishable from the background noise in this industrial area.

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

None.

8. Land and shoreline use

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

Site is used as a chemical distribution warehouse. Adjacent properties are used for heavy industrial purposes.

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

No.

- c. Describe any structures on the site.

Existing concrete office building and associated chemical storage warehouse with truck loading and rail line.

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

No.

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

Industrial General (IG 1)

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

Duwamish Industrial Area

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

Not applicable.

- 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?

Not applicable.

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

None.

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

None necessary.

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

Not applicable.

9. Housing

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

Not applicable in heavy industrial area.

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

Not applicable.

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

Not applicable.

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?

Not applicable to remediation equipment.

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

None.

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

Not applicable.

11. Light and glare

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

Not applicable in heavy industrial area.

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

No.

- 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:

No measures necessary.

12. Recreation

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

None in heavy industrial area.

- b. Would the proposed project displace any existing recreational uses? **No.** If so, describe.

- c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Not applicable.

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.

None.

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

Not applicable.

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.

Access to Fox Avenue South will not be affected

- b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

East. Marginal Way has bus stops within ¼ mile.

- c. How many parking spaces would the completed project have? How many would the project eliminate?

Not applicable.

- 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.

Project is near rail tracks but rail transportation not needed.

- f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Not applicable.

- g. Proposed measures to reduce or control transportation impacts, if any:

Not applicable.

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.

Not applicable.

16. Utilities

- a. Circle or underline utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

See response to 16.b. below.

- 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.

Project will involve bringing in a new temporary 4,500 kVA power supply off of the power lines that run off E. Marginal Way. Two new power poles will be installed along with a new transformer for the new power service. The power poles and transformer will be removed by SCL at the end of the one-year project.

C. 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.

Signature:

Date Submitted:

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Purpose of project is the cleanup of solvent and other contaminants in soil and groundwater so there will be a net benefit to the environment.

Proposed measures to avoid or reduce such increases are:

No measures necessary.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

No impacts foreseen.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

None proposed.

3. How would the proposal be likely to deplete energy or natural resources?

No impact foreseen. This is a temporary project.

Proposed measures to protect or conserve energy and natural resources are:

None.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

No affect.

Proposed measures to protect such resources or to avoid or reduce impacts are:

None necessary.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

No affect.

Proposed measures to avoid or reduce shoreline and land use impacts are:

No measures necessary.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

No impacts other than use of electrical power.

Proposed measures to reduce or respond to such demand(s) are:

No measures necessary.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

No conflicts identified.

STATE ENVIRONMENTAL POLICY ACT (SEPA)
DETERMINATION OF NONSIGNIFICANCE (DNS)Name of Proposal: **FOX AVE THERMAL REMEDIATION PROJECT**

Description of Proposal:

The project involves the cleanup of contaminated soil and groundwater at the former Great Western Chemical Company located in South Seattle on Fox Avenue. Past site use has resulted in significant solvent contamination of soil underlying the chemical warehouse. The proposed plan is to clean-up the contaminated soil using a subsurface heating technology called electrical resistance heating, or ERH. This involves the drilling of approximately 200 closely spaced electrodes on the contaminated portions of the property and applying voltage to the electrodes, which causes current to flow between electrodes thereby heating the soil until the groundwater turns to steam.

Location of Proposal:

Project will occur at 6900 Fox Ave South, Seattle, WA 98108Proponent / Applicant: **Floyd|Snider, Inc. on behalf of Fox Ave Trust**

Lead Agency: State of Washington Department of Ecology

Public Comment Period:

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.

This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal until the end of public comment period. Comments must be submitted to the contact person listed below. Email comments are acceptable.

Contact Person, if other than responsible official:

Sunny Becker (425) 649-7187, Email: hlin461@ecy.wa.gov

Responsible Official: Robert Warren

Position / Title: Section manager, Northwest Regional Office

Address: Department of Ecology
3190 – 160th Ave SE
Bellevue, WA 98008-5452

Date: _____ Signature: _____

Fox Avenue Financial Assurance Trust

Trust Agreement, the "Agreement," entered into as of June 8, 2012 by and between Fox Avenue Building LLC the "Grantor," and Daniel J Silver, the "Trustee."

Whereas, the Washington Department of Ecology, (hereinafter called WDOE), has established certain regulations applicable to the Grantor, requiring that an owner or operator shall provide financial assurances at sites where the cleanup action selected includes engineered and/or institutional controls,

Whereas, the Grantor has elected to establish a trust to provide all or part of such financial assurance for the facilities identified herein,

Whereas, the Grantor, acting through its duly authorized officers, has selected the Trustee to be the trustee under this agreement, and the Trustee is willing to act as trustee,

Now, Therefore, the Grantor and the Trustee agree as follows:

Section 1. Definitions.

As used in this Agreement:

(a) The term "Grantor" means the owner or operator who enters into this Agreement and any successors or assigns of the Grantor.

(b) The term "Trustee" means the Trustee who enters into this Agreement and any successor Trustee.

Section 2. Identification of Facilities and Cost Estimates.

This Agreement pertains to the facilities and cost estimates identified on attached Schedule A.

Section 3. Establishment of Fund.

The Grantor and the Trustee hereby establish a trust fund, the "Fund," for the benefit of WDOE. The Grantor and the Trustee intend that no third party have access to the Fund except as herein provided. The Fund is established initially as consisting of the property, which is acceptable to the Trustee, described in Schedule B attached hereto. Such property and any other property subsequently transferred to the Trustee is referred to as the Fund, together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible nor shall it undertake any responsibility for the amount or adequacy of,

nor any duty to collect from the Grantor, any payments necessary to discharge any liabilities of the Grantor established by WDOE.

The purpose of the Trust is to provide for protected financial assurance pursuant to WAC 173-340-440(11) for the long term monitoring, including operation and maintenance of the institutional controls and long-term compliance monitoring at the Fox Avenue Site, identified in Schedule A, as provided in WDOE Agreed Order DE 8985.

Section 4. Payment for Long Term Monitoring.

On or before January 1 after the effective date of when long-term monitoring begins the Trustee shall provide a proposed budget and statement of work for the following year. WDOE shall have the authority to approve or disapprove the proposed budget and statement of work. No expense may be paid by the Trustee that is inconsistent with the approved budget and statement of work unless WDOE approves a revised budget or statement of work.

The Trustee shall also make payments from the Fund as the WDOE Director or their designee shall direct, in writing, to provide for the payment of the costs of long-term monitoring at the facilities covered by this Agreement. The Trustee shall reimburse the Grantor or other persons as specified by the WDOE Director or their designee from the Fund for long-term monitoring expenditures in such amounts as the WDOE Director or designee shall direct in writing. In addition, the Trustee shall refund to the Grantor such amounts as the WDOE Director or their designee specifies in writing. Upon refund, such funds shall no longer constitute part of the Fund as defined herein.

Section 5. Payments Comprising the Fund.

Payments made to the Trustee for the Fund shall consist of cash or securities acceptable to the Trustee identified as trust property in the attached Schedule B.

Section 6. Trustee Management.

The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge his duties with respect to the trust fund solely in the interest of the beneficiary and with the care, skill, prudence, and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; *except that*:

(i) Securities or other obligations of the Grantor, or any other owner or operator of the facilities, or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2(a), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government;

(ii) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal or State government; and

(iii) The Trustee is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time and without liability for the payment of interest thereon; and

(iv) The Trustee is authorized to invest the Fund in commercial bonds rated BBB by Standard & Poor's or Baa if rated by Moody's. The overall average rating of the bonds held in bond strategies shall have a rating of A or better. This provision does not limit the Trustee to invest in only commercial bonds. The Trustee may diversify the trust assets in other investments consistent with this Agreement and applicable legal duties.

Section 7. Commingling and Investment.

The Trustee is expressly authorized in its discretion:

(a) To transfer from time to time any or all of the assets of the Fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and

(b) To purchase shares in any investment company registered under the Investment Company Act of 1940, 15 U.S.C. 80a-1 *et seq.*, including one which may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the Trustee. The Trustee may vote such shares in its discretion.

Section 8. Express Powers of Trustee.

Without in any way limiting the powers and discretion conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered:

(a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale. No person dealing with the Trustee shall be bound to see to the application of the purchase money or to inquire into the validity or expediency of any such sale or other disposition;

(b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;

(c) To register any securities held in the Fund in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depository with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the United States Government, or any agency or instrumentality thereof, with a Federal Reserve bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund;

(d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal or State government; and

(e) To compromise or otherwise adjust all claims in favor of or against the Fund.

Section 9. Taxes and Expenses.

All taxes of any kind that may be assessed or levied against or in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expenses incurred by the Trustee in connection with the administration of this Trust, including fees for legal services rendered to the Trustee, the compensation of the Trustee to the extent not paid directly by the Grantor, and all other proper charges and disbursements of the Trustee shall be paid from the Fund.

Section 10. Annual Valuation.

The Trustee shall annually, within 30 days of the beginning of the year, furnish to the Grantor and to the WDOE Director or their designee a statement confirming the value of the Trust, a financial statement for the preceding year, and a description of actions taken during the preceding year. In addition, the Trustee shall provide information as necessary for compliance with the requirement under Section R of the Agreed Order to provide updated information on financial assurance to Ecology. If the value of the Trust exceeds the amount necessary for sufficient and adequate financial assurance under the Agreed Order, taking into account inflation and changes in cost estimates, the Trustee may at its discretion, and upon written approval from WDOE Director or their designee, distribute the surplus amount to the Grantor.

Any securities in the Fund shall be valued at market value as of no more than 60 days prior to the anniversary date of establishment of the Fund. The failure of the Grantor to object in writing to the Trustee within 90 days after the statement has been furnished to the Grantor and the WDOE Director or their designee shall constitute a conclusively binding assent by the Grantor, barring the Grantor from asserting any claim or liability against the Trustee with respect to matters disclosed in the statement.

Section 11. Advice of Counsel.

The Trustee may from time to time consult with counsel of his choice with respect to any question arising as to the construction of this Agreement or any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting upon the advice of counsel.

Section 12. Trustee Compensation.

The Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing from time to time with the Grantor.

Section 13. Successor Trustee.

The Trustee may resign or the Grantor may replace the Trustee, but such resignation or replacement shall not be effective until the Grantor has appointed a successor trustee and this successor accepts the appointment. The successor trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. Upon the successor trustee's acceptance of the appointment, the Trustee shall assign, transfer, and pay over to the successor trustee the funds and properties then constituting the Fund. If for any reason the Grantor cannot or does not act in the event of the resignation of the Trustee, the Trustee may apply to a court of competent jurisdiction for the appointment of a successor trustee or for instructions. The successor trustee shall specify the date on which it assumes administration of the trust in a writing sent to the Grantor, the WDOE Director or their designee, and the present Trustee by certified mail 10 days before such change becomes effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this Section shall be paid as provided in Section 9.

Section 14. Instructions to the Trustee.

All orders, requests, and instructions by the Grantor to the Trustee shall be in writing, signed by such persons as are designated in the attached Exhibit A or such other designees as the Grantor may designate by amendment to Exhibit A. The Trustee shall be fully protected in acting without inquiry in accordance with the Grantor's orders, requests, and instructions. All orders, requests, and instructions by the WDOE to the Trustee shall be in writing, signed by the WDOE Director or their designee, and the Trustee shall act and shall be fully protected in acting in accordance with such orders,

requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the Grantor or WDOE hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the Grantor and/or WDOE, except as provided for herein.

Section 15. Amendment of Agreement.

This Agreement may be amended by an instrument in writing executed by the Grantor, the Trustee, and the WDOE Director or their designee, or by the Trustee and the WDOE Director or their designee if the Grantor ceases to exist.

Section 16. Irrevocability and Termination.

Subject to the right of the parties to amend this Agreement as provided in Section 15, this Trust shall be irrevocable and shall continue until terminated at the written agreement of the Grantor, the Trustee, and the WDOE Director or their designee or by the Trustee and the WDOE, if the Grantor ceases to exist. Upon termination of the Trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor.

Section 17. Immunity and Indemnification.

The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this Trust, or in carrying out any directions by the Grantor or the WDOE Director or their designee issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor or from the Trust Fund, or both, from and against any personal liability to which the Trustee may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its defense in the event the Grantor fails to provide such defense.

Section 18. Choice of Law.

This Agreement shall be administered, construed, and enforced according to the laws of the State of Washington.

Section 19. Interpretation.

As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each Section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement.

In Witness Whereof the parties have caused this Agreement to be executed by their respective officers duly authorized and their corporate seals to be hereunto affixed and attested as of the date first above written:

[Signature]
Signature of Grantor

Printed Name: Robert B Code

Grantor Acknowledgement:

State of Washington)

County of King)

I certify that I know or have satisfactory evidence that Robert Code is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the Managing Member of Fox Avenue Building LLC to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated: 6/7/2012

[Signature]
Signature

Notary Public in and for the State of Washington

My appointment expires: 12/15/2015

[Seal]



Daniel J Silver
Signature of Trustee

Printed Name: DANIEL J SILVER

Trustee Acknowledgement:

State of Washington)

County of Thurston)

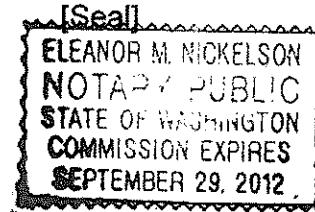
I certify that I know or have satisfactory evidence that Daniel J Silver is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the Trustee to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated: June 7, 2012

Eleanor M Nickelson
Signature

Notary Public in and for the State of Washington

My appointment expires: 9/29/12



SCHEDULE A

IDENTIFICATION OF FACILITIES

EFFECTIVE DATE: June 8, 2012

Ecology Facility Site ID Number:	2282
Facility Name:	Fox Ave Building Site
Facility Address:	6900 Fox Ave S Seattle, WA 98108
Cost Estimate:	\$300,000.00

SCHEDULE B

IDENTIFICATION OF TRUST PROPERTY

\$300,000 (Three hundred thousand dollars]

EXHIBIT A

INSTRUCTIONS TO THE TRUSTEE

All orders, requests, and instructions by the Grantor to the Trustee shall be in writing, signed by the following persons:

Robert Code, Managing Member; Fox Avenue Building LLC, or any person whom he designates in writing to act on his behalf.