

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

In the Matter of Remedial Action by:

AGREED ORDER

City of Bothell at Bothell Riverside
MTCA Site - HVOC Area

No. DE 16541

TO: Jennifer Phillips
City Manager
City of Bothell
18415 101st Avenue NE
Bothell, WA 98011

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I. INTRODUCTION

The mutual objective of the State of Washington, Department of Ecology (Ecology) and the City of Bothell (City) 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 requires the City to implement the Scope of Work (Exhibit B). 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 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. The City agrees to undertake all actions required by the terms and conditions of this Order. No change in ownership or corporate status shall alter the City's responsibility under this Order. The City 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 RCW 70.105D, WAC 173-204, and WAC 173-340 shall control the meanings of the terms in this Order.

A. Site: The Site is referred to as Bothell Riverside MTCA Site - HVOC Area. The Site constitutes a facility under RCW 70.105D.020(8). The Site is defined by where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed, or otherwise come to be located. Based upon factors currently known to Ecology, the Site is generally located at Woodinville Drive (SR 522) and NE 180th Street, Bothell, WA, as shown in the Site Location Diagram (Exhibit A). The Bothell Riverside MTCA Site - TPH Area

is being addressed under Agreed Order No. DE 16306 and is not part of the Site for purposes of this Order.

- B. Parties: Refers to Ecology and the City.
- C. Potentially Liable Person (PLP): Refers to the City.
- 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.

V. FINDINGS OF FACT

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

- A. The City owns the property at Woodinville Drive (SR 522) and NE 180th Street, Bothell, WA. The City acquired the property in 1990.
- B. The Site is now part of King County Tax Parcel No. 0826059120.
- C. The Site is currently used for parking and access to a public park and the Burke-Gilman Trail.
- D. Ecology entered an Agreed Order No. DE 6295 with the City, effective February 3, 2009, to address concentrations of TPH and HVOC at the Bothell Riverside MTCA Site. Under the Agreed Order No. DE 6295, the City was to perform a Remedial Investigation, Feasibility Study, and complete a preliminary draft Cleanup Action Plan.
- E. The City has completed several studies of the Site under Agreed Order No. DE 6295 that document the release of hazardous substances at the Site which present a threat to human health or the environment. These documents, and other reports related to the Site, are available at Ecology's Northwest Regional Office and include: HWA Geosciences, *Final Remedial Investigation Report, Bothell Riverside Site, Bothell, WA* (Oct. 9, 2015) and HWA Geosciences, *Ground Water Monitoring Results Year 4, Quarter 1 - April 2017, Riverside HVOC Site, Bothell, WA* (May 8, 2017).
- F. Under Agreed Order No. DE 6295 Amendments No. 1 and 2, the City conducted interim actions at the Bothell Riverside MTCA Site. Under Agreed Order No. DE 6295,

Amendment No. 1, the City excavated soil contamination from the Bothell Riverside MTCA Site - TPH Area, which is now addressed by a separate Agreed Order.

G. Under Agreed Order No. DE 6295, Amendment No. 2, the City initiated an interim action at the Site (Bothell Riverside MTCA Site - HVOC Area) to address HVOCs in groundwater that included installation of wells to control the groundwater gradient. The groundwater pumping system was intended to prevent HVOCs in groundwater from discharging to the Sammamish River. Pumped water is discharged to the King County sanitary sewer system for treatment pursuant to King County Wastewater Discharge Authorization No. 4268-02 (expires Oct. 9, 2023).

H. The City prepared an Interim Action Work Plan (Exhibit D) in 2013, which received public notice and comment from March 1 through April 1, 2013. Ecology issued a State Environmental Policy Act (SEPA) Determination of Non-Significance (DNS) for the 2013 Interim Action Work Plan which received public notice and comment from March 1 through April 1, 2013. Ecology finalized the 2013 Interim Action Work Plan, and determined no changes were necessary for the SEPA DNS, after review of public comments.

I. Ecology subsequently approved minor changes to the 2013 Interim Action Work Plan, including installation of additional groundwater pumping wells within the Site. The City documented these changes in a technical memorandum, relevant excerpts of which are provided as the Addendum to the Interim Action Work Plan (Exhibit F).

VI. ECOLOGY DETERMINATIONS

Ecology makes the following determinations, without any express or implied admissions of such determinations (and underlying facts) by the City.

A. The City is an “owner or operator” as defined in RCW 70.105D.020(22) of a “facility” as defined in RCW 70.105D.020(8).

B. Based upon all factors known to Ecology, a “release” or “threatened release” of “hazardous substance(s)” as defined in RCW 70.105D.020(32), and (13), respectively, has occurred at the Site.

C. Based upon credible evidence, Ecology issued a PLP status letter to the City dated November 20, 2008, pursuant to RCW 70.105D.040, .020(26), and WAC 173-340-500. By letter dated November 25, 2008, the City voluntarily waived its rights to notice and comment and accepted Ecology's determination that the City is a PLP under RCW 70.105D.040.

D. Pursuant to RCW 70.105D.030(1) and .050(1), Ecology may require the PLP 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.

E. Ecology has determined that it is appropriate to address the release of TPH and the release of HVOC at the property under separate administrative orders. This Agreed Order will address the release of HVOC at the Site. Once Ecology has issued Agreed Orders for the Site and the Bothell Riverside MTCA Site TPH Area, Agreed Order No. DE 6295 will be terminated.

F. Under WAC 173-340-430, an interim action is a remedial action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance, that corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed, or that is needed to provide for completion of a site hazard assessment, remedial investigation/feasibility study, or design of a cleanup action. Previous environmental and remedial investigations have identified a solvent plume that is discharging into the Sammamish River. Such circumstances warrant an interim action consistent with WAC 173-340-430. Either party may propose an additional interim action under this Order. If the Parties are in agreement concerning the additional interim action, the Parties will follow the process in Section VII.G (Work to be Performed). If the Parties are not in agreement, Ecology reserves its authority to require additional interim action(s) under a separate order or other enforcement action under RCW 70.105D, or to undertake the interim action(s) itself.

VII. WORK TO BE PERFORMED

Based on the Findings of Fact and Ecology Determinations, it is hereby ordered that the City take the following remedial actions at the Site. These remedial actions must be conducted in accordance with WAC 173-340 and 173-204:

A. The City will complete a supplemental remedial investigation, feasibility study, interim action, and preliminary draft cleanup action plan in accordance with the terms of the Scope of Work (Exhibit B) and Schedule (Exhibit C), and all other requirements of this Order. The following naming conventions shall be used for documents: Agency Review Draft (designation for the first time Ecology receives a document); Public Review Draft (designates a document ready for public comment); Final (designation for a document after public comment and Ecology approval); and the preliminary Draft Cleanup Action Plan (designation for the PLP's version of the DCAP).

B. The City will continue to implement the 2013 Interim Action Work Plan (Exhibit D) and Addendum (Exhibit F) and submit quarterly groundwater sampling reports.

C. If the City learns of a significant change in conditions at the Site, including but not limited to a statistically significant increase in contaminant and/or chemical concentrations in the soil, groundwater, surface water, sediments, or air, the City, within seven (7) days of learning of the change in condition, shall notify Ecology in writing of said change and provide Ecology with any reports or records (including laboratory analyses, sampling results) relating to the change in conditions.

D. The City shall submit to Ecology written quarterly Progress Reports that describe the actions taken during the previous quarter to implement the requirements of this Order. All Progress Reports shall be submitted by the tenth (10th) day of the month in which they are due after the effective date of this Order. Unless otherwise specified by Ecology, Progress Reports and any other documents submitted pursuant to this Order shall be sent by certified mail, return receipt requested, to Ecology's project coordinator. The Progress Reports shall include the following:

1. A list of on-site activities that have taken place during the quarter;

2. Detailed description of any deviations from required tasks not otherwise documented in project plans or amendment requests;
3. Description of all deviations from the Scope of Work and Schedule (Exhibits B and C) during the current quarter and any planned deviations in the upcoming quarter;
4. For any deviations in schedule, a plan for recovering lost time and maintaining compliance with the schedule;
5. All raw data (including laboratory analyses) received by the City during the past quarter and an identification of the source of the sample; and
6. A list of deliverables for the upcoming quarter if different from the schedule.

E. Ecology may require institutional controls at the Site. If so, Environmental (Restrictive) Covenants will be used to implement the institutional controls.

1. In consultation with the City, Ecology will prepare the Environmental (Restrictive) Covenants consistent with WAC 173-340-440, RCW 64.70, and any policies or procedures specified by Ecology. The Environmental (Restrictive) Covenants shall restrict future activities and uses of the Site as agreed to by Ecology and the City.
2. After approval by Ecology, the City shall immediately record the Environmental (Restrictive) Covenant for affected properties it owns with the office of the King County Auditor. The City shall provide Ecology with the original recorded Environmental (Restrictive) Covenants within thirty (30) days of the recording date.

F. All plans or other deliverables submitted by the City for Ecology's review and approval under the Scope of Work and Schedule (Exhibits B and C) shall, upon Ecology's approval, become integral and enforceable parts of this Order.

G. If the Parties agree on a further interim action under Section VI.E (Ecology Determinations), the City shall prepare and submit to Ecology an Interim Action Work Plan, including a scope of work and schedule, by the date determined by Ecology. Ecology will provide

public notice and opportunity to comment on the Interim Action Work Plan in accordance with WAC 173-340-600(16). The City shall not conduct the interim action until Ecology approves the Interim Action Work Plan. Upon approval by Ecology, the Interim Action Work Plan becomes an integral and enforceable part of this Order, and the City is required to conduct the interim action in accordance with the approved Interim Action Work Plan.

H. If Ecology determines that the City has failed to make sufficient progress or failed to implement the remedial action, in whole or in part, Ecology may, after notice to the City, perform any or all portions of the remedial action or at Ecology's discretion allow the City opportunity to correct. In an emergency, Ecology is not required to provide notice to the City, or an opportunity for dispute resolution. The City shall reimburse Ecology for the costs of doing such work in accordance with Section VIII.A (Payment of Remedial Action Costs). Ecology reserves the right to enforce requirements of this Order under Section X (Enforcement).

I. Except where necessary to abate an emergency situation, or where required by law, the City 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. In the event of an emergency, or where actions are taken as required by law, the City must notify Ecology in writing of the event and remedial action(s) planned or taken as soon as practical but no later than within twenty-four (24) hours of the discovery of the event.

J. Ecology hereby incorporates into this Order the previous remedial actions described in Section V (Findings of Fact). Reimbursement for specific project tasks under a grant agreement with Ecology is contingent upon a determination by Ecology's Toxics Cleanup Program that the retroactive costs are eligible under WAC 173-322A-320(6), the work performed complies with the substantive requirements of WAC 173-340, and the work is consistent with the remedial actions required under this Order. The costs associated with Ecology's determination on the past independent remedial actions described in Section V (Findings of Fact), are recoverable under this Order.

VIII. TERMS AND CONDITIONS

A. Payment of Remedial Action Costs

The City 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 RCW 70.105D, 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. 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 Ecology costs incurred, the City 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.

B. Designated Project Coordinators

The project coordinator for Ecology is:

Sunny Becker
Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008-5452
Phone: 425-649-7187
Email: sunny.becker@ecy.wa.gov

The project coordinator for the City is:

Nduta Mbuthia
Senior Capital Project Engineer
City of Bothell, Public Works Department
18415 101st Avenue NE

Bothell, WA 98011
Phone: 425-806-6829
Email: Nduta.Mbuthia@bothellwa.gov

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 the City, 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 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.

C. Performance

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

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

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

The City 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.

D. Access

Ecology or any Ecology authorized representative shall have access to enter and freely move about all property at the Site that the City 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 the City'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 the City. The City shall make all reasonable efforts to secure access rights for those properties within the Site not owned or controlled by the City 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 the City 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.

E. Sampling, Data Submittal, and Availability

With respect to the implementation of this Order, the City 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, the City shall allow Ecology and/or its authorized representative to take split or duplicate samples of any samples collected by the City pursuant to implementation

of this Order. The City shall notify Ecology seven (7) days in advance of any sample collection or work activity at the Site. Ecology shall, upon request, allow the City 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.D (Access), Ecology shall notify the City 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 WAC 173-50 for the specific analyses to be conducted, unless otherwise approved by Ecology.

F. Public Participation

Ecology shall maintain the responsibility for public participation at the Site. However, the City 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 meetings related to remedial action work to be performed at the Site with the interested public and/or local governments. Likewise, Ecology shall notify the City prior to the issuance of all press releases and fact sheets related to the Site, and before meetings related to the Site with the interested public and local governments. For all press releases, fact sheets, meetings, and other outreach efforts by the City that do not receive prior Ecology approval, the City 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. King County Bothell Library
18215 98th Avenue NE
Bothell, WA 98011
- b. Ecology's Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452
Call for an appointment:
Sally Perkins
Phone: 425-649-7109
Fax: 425-649-4450
E-mail: nwro_public_request@ecy.wa.gov
- c. City of Bothell – City Hall
18415 101st Avenue NE
Bothell, WA 98011
Phone: 425-486-7811

At a minimum, copies of all public notices, fact sheets, and documents relating to public comment periods shall be promptly placed in these repositories. A copy of all documents related to this Site shall be maintained in the repository at Ecology's Northwest Regional Office in Bellevue, Washington.

G. 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, the City shall preserve all records, reports, documents, and underlying data in its possession relevant to the implementation of this Order and shall insert a similar record retention requirement into all contracts with project contractors and subcontractors. Upon request of Ecology, the City shall make all records available to Ecology and allow access for review within a reasonable time.

Nothing in this Order is intended to waive any right the City may have under applicable law to limit disclosure of documents protected by the attorney work-product privilege and/or the attorney-client privilege. If the City withholds any requested records based on an assertion of privilege, the City shall provide Ecology with a privilege log specifying the records withheld and the applicable privilege. No Site-related data collected pursuant to this Order shall be considered privileged.

H. Resolution of Disputes

1. In the event that the City elects to invoke dispute resolution the City must utilize the procedure set forth below.

a. Upon the triggering event (receipt of Ecology's project coordinator's written decision or an itemized billing statement), the City has fourteen (14) calendar days within which to notify Ecology's project coordinator in writing of its dispute (Informal Dispute Notice).

b. The Parties' project coordinators shall then confer in an effort to resolve the dispute informally. The parties shall informally confer for up to fourteen (14) calendar days from receipt of the Informal Dispute Notice. If the project coordinators cannot resolve the dispute within those fourteen (14) calendar days, then within seven (7) calendar days Ecology's project coordinator shall issue a written decision (Informal Dispute Decision) stating: the nature of the dispute; the City's position with regards to the dispute; Ecology's position with regards to the dispute; and the extent of resolution reached by informal discussion.

c. The City may then request regional management review of the dispute. This request (Formal Dispute Notice) must be submitted in writing to the Northwest Region Toxics Cleanup Section Manager within seven (7) calendar days of receipt of Ecology's Informal Dispute Decision. The Formal Dispute Notice shall include a written statement of dispute setting forth: the nature of the dispute; the disputing Party's position with respect to the dispute; and the information relied upon to support its position.

d. The Section Manager shall conduct a review of the dispute and shall issue a written decision regarding the dispute (Decision on Dispute) within thirty (30) calendar days of receipt of the Formal Dispute Notice. The Decision on Dispute 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.

4. In case of a dispute, failure to either proceed with the work required by this Order or timely invoke dispute resolution may result in Ecology's determination that insufficient progress is being made in preparation of a deliverable, and may result in Ecology undertaking the work under Section VII.H (Work to be Performed) or initiating enforcement under Section X (Enforcement).

I. Extension of Schedule

1. The City's request for 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 the City 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 the City 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 the City;

b. Acts of God, including fire, flood, blizzard, extreme temperatures, storm, or other unavoidable casualty; or

c. Endangerment as described in Section VIII.K (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 the City.

3. Ecology shall act upon any City written request for extension in a timely fashion. Ecology shall give the City 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.J (Amendment of Order) when a schedule extension is granted.

4. At the City's request, 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.K (Endangerment).

J. 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.L (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 the City. Ecology will provide its written consent to a formal amendment only after public notice and opportunity to comment on the formal amendment.

When requesting a change to the Order, the City shall submit a written request to Ecology for approval. Ecology shall indicate its approval or disapproval in writing and in a timely manner after the written request is received. If Ecology determines that the change is substantial, then the Order must be formally amended. Reasons for the disapproval of a proposed change to this Order shall be stated in writing. If Ecology does not agree to a proposed change, the disagreement may be addressed through the dispute resolution procedures described in Section VIII.H (Resolution of Disputes).

K. Endangerment

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

In the event the City determines that any activity being performed at the Site under this Order is creating or has the potential to create a danger to human health or the environment, the City may cease such activities. The City 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, the City shall provide Ecology with documentation of the basis for the determination or cessation of such activities. If Ecology disagrees with the City's cessation of activities, it may direct the City to resume such activities.

If Ecology concurs with or orders a work stoppage pursuant to this section, the City'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.I

(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.

L. Reservation of Rights

This Order is not a settlement under RCW 70.105D. 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 the City to recover remedial action costs paid to and received by Ecology under this Order. In addition, Ecology will not take additional enforcement actions against the City regarding remedial actions required by this Order, provided the City complies with this Order.

Ecology nevertheless reserves its rights under RCW 70.105D, including the right to require additional or different remedial actions at the Site should it deem such actions necessary to protect human health or 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.

By entering into this Order, the City does not admit to any liability for the Site. Although the City is committing to conducting the work required by this Order under the terms of this Order, the City expressly reserves all rights available under law, including but not limited to the right to seek cost recovery or contribution against third parties, and the right to assert any defenses to liability in the event of enforcement.

M. 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 the City 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 the City's transfer of any interest in all or any portion of the Site, and during the effective period of this Order, the City 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, the City shall notify Ecology of said transfer. Upon transfer of any interest, the City shall notify all transferees of the restrictions on the activities and uses of the property under this Order and incorporate any such use restrictions into the transfer documents.

N. Compliance with Applicable Laws

1. *Applicable Laws.* All actions carried out by the City pursuant to this Order shall be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits or approvals, except as provided in RCW 70.105D.090. At this time, no federal, state, or local requirements have been identified as being applicable to the Remedial Investigation/Feasibility Study work required by this Order. The permits or specific federal, state, or local requirements that Ecology has determined are applicable to the interim action required by this Order and that are known at the time of entry of this Order have been identified in Exhibit E. The City has a continuing obligation to identify additional applicable federal, state, and local requirements which apply to actions carried out pursuant to this Order, and to comply with those requirements. As additional federal, state, and local requirements are identified by Ecology or the City, Ecology will document in writing if they are applicable to actions carried out pursuant to this Order, and the City must implement those requirements.

2. *Relevant and Appropriate Requirements.* All actions carried out by the City pursuant to this Order shall be done in accordance with relevant and appropriate requirements identified by Ecology. At this time, no relevant and appropriate requirements have been identified as being applicable to the Remedial Investigation/Feasibility Study work required by this Order. The relevant and appropriate requirements that Ecology has determined are applicable to the interim action are identified in Exhibit E. If additional relevant and appropriate requirements are identified by Ecology or the City, Ecology will document in writing if they are applicable to actions carried out pursuant to this Order and the City must implement those requirements.

3. Pursuant to RCW 70.105D.090(1), the City may be exempt from the procedural requirements of RCW 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 and of any laws requiring or authorizing local government permits or approvals. However, the City shall comply with the substantive requirements of such permits or approvals. For permits and approvals covered under RCW 70.105D.090(1) that have been issued by local government, the Parties agree that Ecology has the non-exclusive ability under this Order to enforce those local government permits and/or approvals. At this time, no state or local permits or approvals have been identified as being applicable but procedurally exempt for the Remedial Investigation/Feasibility Study work or interim actions required by this Order.

4. The City 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 actions under this Order. In the event either Ecology or the City determine that additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial actions under this Order, it shall promptly notify the other party of its determination. Ecology shall determine whether Ecology or the City shall be responsible to contact the appropriate state and/or local agencies. If Ecology so requires, the City 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 the City and on how they must meet those requirements. Ecology shall inform the City in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Order. The City shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination. 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 the City 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 or approvals.

O. Indemnification

The City 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 (1) for death or injuries to persons, or (2) for loss or damage to property, to the extent arising from or on account of acts or omissions of the City, its officers, employees, agents, or contractors in entering into and implementing this Order. However, the City 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 the City's receipt of written notification from Ecology that the City has completed the remedial activity required by this Order, as amended by any modifications, and that the City 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. A liable party who refuses, without sufficient cause, to comply with any term of this Order 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.

EXHIBIT A
SITE LOCATION DIAGRAM

THE UNIVERSITY OF CHICAGO
LIBRARY

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: _____

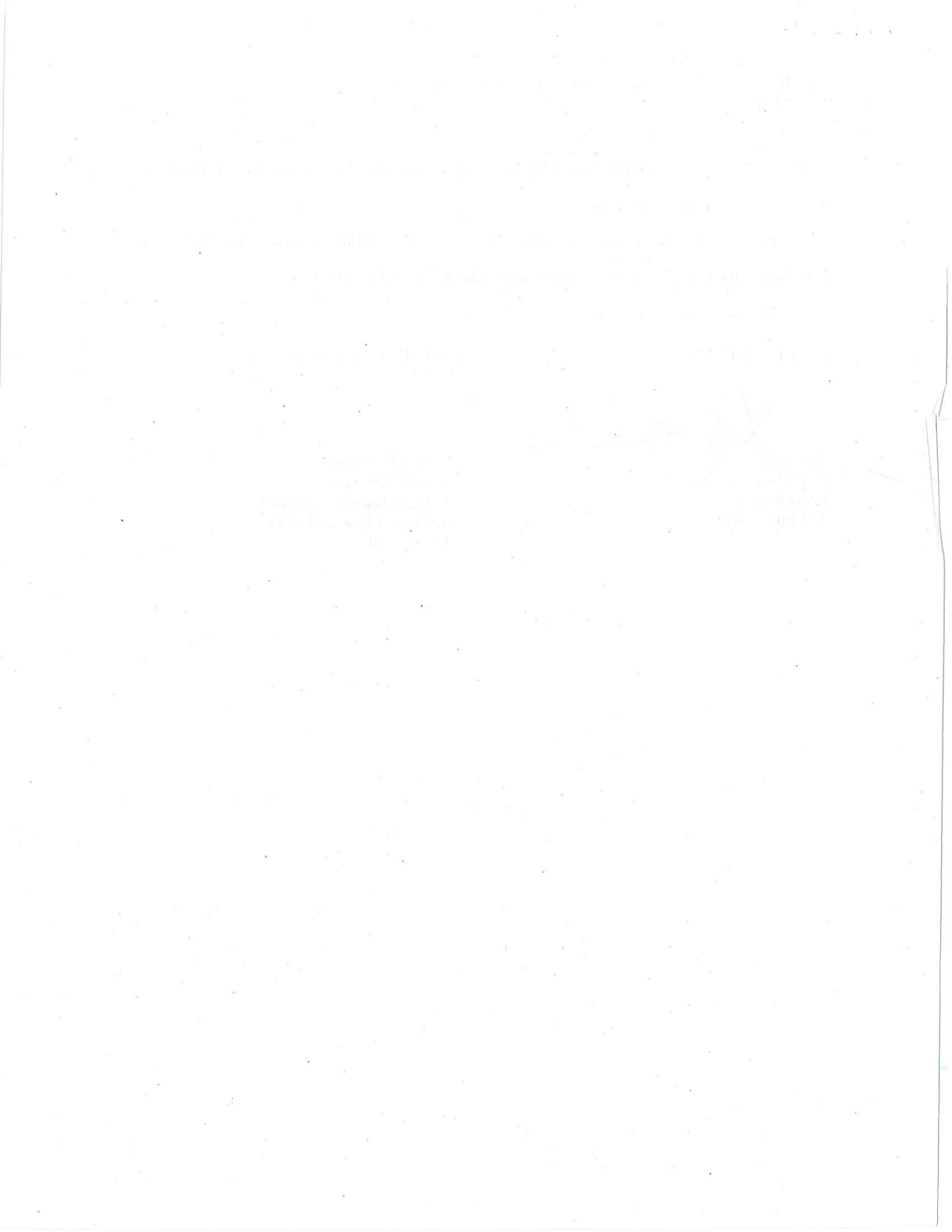
CITY OF BOTHELL

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY



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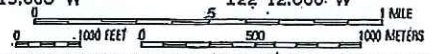


Site Location Diagram

TOPOI map printed on 01/06/06 from "Washington.tpo" and "Untitled.tpg"



TIN/MN 18



Printed from TOPOI ©2001 National Geographic Holdings (www.topo.com)

EXHIBIT B

Scope of Work

Bothell Riverside Site - HVOC Area

The Potentially Liable Persons (PLPs) shall take the following remedial actions per the Schedule detailed in Exhibit C of this Agreed Order (Order): conduct interim remedial actions, produce a supplemental remedial investigation (RI) report and a feasibility study (FS), and prepare a preliminary draft cleanup action plan (CAP). The PLPs will work cooperatively with Ecology to support public participation in the scoping and implementation of the work performed under this Agreed Order in accordance with Section VIII.F of the Agreed Order. All deliverables will adhere to Ecology Executive Policy 1-81 (Establishing Plain Talk at Ecology).

This Scope of Work is to evaluate alternatives to address contamination at the Bothell Riverside Site - HVOC Area (Site) located at Woodinville Drive (SR 522) and NE 180th Street, Bothell, Washington. This Scope of Work is to be used by the potentially liable person (PLP) to complete a Supplemental RI Report and a FS at the Site as required by the Model Toxics Control Act Cleanup Regulation (Chapter 173-340 WAC).

The Supplemental RI Report is to supplement existing reports on the nature and extent of contamination at the Site. The FS will evaluate remedial alternatives that are applicable for the Site. The information and data reported in the Supplemental RI will be used to identify if additional data need to be collected and determine an appropriate remedial action. The PLP will furnish all personnel, materials, and services necessary for, or incidental to, completing the Supplemental RI Report, FS Report, and preliminary draft CAP for the Site.

Task I: Interim Action and Reporting

A. Implement Approved Interim Action

Continue implementing approved interim action(s) per Exhibits D and F.

B. Interim Action Report

An Interim Action Report shall be prepared as a separate deliverable. The Interim Action Report shall:

- Present, summarize, and evaluate quarterly groundwater data collected between 2014 and 2017;
- Present and evaluate soil and groundwater data collected in October 2018;
- Incorporate Ecology's comments, dated May 16, 2018;
- Evaluate effectiveness of the current pump and treat system;

- Recommend final cleanup actions to be presented in the supplemental RI/FS report.

The Interim Action Report shall be submitted in word (.doc) and adobe (.pdf) formats electronically.

- C. Report groundwater sampling conducted under the interim action to Ecology quarterly.

The Supplemental RI/FS work must include the following tasks:

Task II: Supplemental Remedial Investigation

The purpose of the RI is to obtain the information necessary to understand site conditions in relationship to known or suspected releases of contaminants. The City has previously collected data, as summarized in the following reports: HWA Geosciences, *Final Remedial Investigation Report, Bothell Riverside Site, Bothell, WA* (Oct. 9, 2015) and HWA Geosciences, *Ground Water Monitoring Results Year 4, Quarter 1 - April 2017, Riverside HVOC Site, Bothell, WA* (May 8, 2017). During the Supplemental RI, the City will review its existing data and may collect additional data and/or conduct additional analysis related to site characterization. All of the data and analysis will be presented in the Supplemental RI and FS Report (see Task IV).

Specifically, new and existing information will be used to characterize the Site, identify known and potential contaminant sources, and establish the nature and extent of contamination present to sufficiently complete a FS and select an appropriate remedial action. The RI data must be of sufficient quality to support the development of an appropriate remedial action for the Site. The investigation will meet the requirements stated in WAC 173-340-350.

Task III: Feasibility Study

The purpose of the FS is to evaluate potential remedial technologies and approaches to enable selection of an appropriate remedial action for the Site. The selected remedy will be established by Ecology with the Draft Cleanup Action Plan (DCAP), to be developed following completion and approval of the final RI/FS Report. Ecology will provide an evaluation of preliminary cleanup standards for the Site, as appropriate, to guide cleanup alternatives development. The FS must meet the requirements stated in WAC 173-340-350(8).

Task IV: Supplemental RI and FS Report

The PLP will complete a report documenting the Supplemental RI and FS as required by WAC 173-340-350(7) and (8). This report will evaluate remedial alternatives for site cleanup, consistent with MTCA to ensure protection of human health and the environment by eliminating, reducing, or otherwise controlling risk posed through each exposure pathway and migration route. This report will include the following elements:

A. Remedial Investigation

1. Background Information

- a. Site History.
- b. Previous Studies.

2. Nature and Extent of Contamination

The PLP will prepare an assessment and description of the degree and extent of contamination. This should include:

- a. Data Analysis - Analyze all data collected during previous Tasks and prepare supporting maps and tables.
- b. Lab reports, previous investigations, well and boring logs, and any other documentation of characterization activities must be included.
- c. Presentation of conceptual site models.

3. Applicable Relevant and Appropriate Requirements (ARARs) Analysis

Identify Applicable State and Federal Laws for cleanup of the Site in accordance with WAC 173-340-710.

4. Cleanup Levels/Risk Assessment Analysis

Perform a baseline Model Toxics Cleanup Act (MTCA) cleanup levels analysis/baseline risk assessment characterizing the current and potential threats to public health and the environment that may be posed by hazardous substances at the facility. The assessment will integrate cleanup standards and risk assessment as required by WAC 173-340-357 and WAC 173-340-708.

5. Discussion and Recommendations

- a. Interpret and discuss data to determine the nature and extent of the contamination and to support final recommendations for the Site.
- b. A summary of all possible and suspected source areas of contamination based on the data collected will be included.

- c. Any known or potential risks to the public health, welfare, and the environment should be discussed.
- d. Recommendations should be provided identifying additional data requirements.

B. Feasibility Study

- a. Identification of contamination to be remediated.
- b. Identification and initial screening of treatment technologies.
- c. Proposed remedial alternatives and evaluation with respect to MTCA criteria in WAC 173-340-360.
- d. Recommended alternative, with justification for the recommendation.

The PLPs shall prepare electronic copies of the agency review draft Supplemental RI and FS report in Word (.doc) and Adobe (.pdf) formats, to Ecology for review and comment. After addressing Ecology's comments on the agency review draft Supplemental RI and FS report and after Ecology approval, the PLPs shall prepare three hard copies of the public review Supplemental RI and FS report and submit them, as well as electronic copies in Word (.doc) and Adobe (.pdf) formats, to Ecology for distribution and public comment.

Task V: Preliminary Draft Cleanup Action Plan

The PLPs will submit a preliminary draft CAP for Ecology's review and approval (the Agency Review preliminary draft CAP). The preliminary DCAP shall include a general description of the proposed remedial actions, cleanup standards developed from the RI/FS and rationale regarding their selection, a schedule for implementation, description of any institutional controls proposed, and a summary of applicable local, state, and federal laws pertinent to the proposed cleanup actions. The CAP will include, but not be limited to, the information listed under WAC 173-340-380.

The PLPs shall submit copies of the Agency Review preliminary draft CAP in Word (.doc) and Adobe (.pdf) formats, to Ecology for review and approval.

After receiving Ecology's comments on the Agency Review preliminary draft CAP, if any, the PLPs shall revise the preliminary draft CAP to address Ecology's comments and submit five (5) hard copies of the Public Review preliminary draft CAP as well as electronic copies in Word (.doc) and Adobe (.pdf) formats.

Task VI: Progress Reports

The PLPs shall submit progress reports every three (3) months or as appropriately scheduled with Ecology. Progress reports shall be submitted to Ecology until satisfaction of the Order in accordance with Section IX of the Order. At a minimum, progress reports shall contain the following information regarding the preceding reporting period:

- A description of the actions which have been taken to comply with the Order.
- Summaries of sampling and testing reports and other data reports received by the PLPs.
- Summaries of deviations from approved work plans.
- Summaries of contacts with representatives of the local community, public interest groups, press, and federal, state, or tribal governments.
- Summaries of deviations, problems or anticipated problems in meeting the schedule or objectives set out in the Scope of Work and Work Plan.
- Summaries of solutions developed and implemented or planned to address any actual or anticipated problems or delays.
- Changes in key personnel.
- A description of work planned for the next reporting period.

EXHIBIT C
Schedule of Deliverables

<u>Deliverables.</u> Refer to Exhibit B (Scope of Work) for Key Components.	<u>Date Due</u>
1. Continue implementing the Interim Action under the Interim Action Work Plan (Jan. 7, 2013) as amended (see Exhibits D and F) to address chlorinated solvents/halogenated volatile organic compounds (HVOCs)	Effective Date of Order
2. Progress Reports and groundwater sampling reports	Quarterly
3. Interim Action Report	1 month after the Effective Date of this Order Delivery of these reports does not relieve PLP of its ongoing duty to implement the interim action under this Agreed Order.
4. PLP to submit Agency Review Draft Supplemental RI and FS Report	3 months after the Effective Date of this Order
5. PLP to submit Public Review Supplemental RI and FS Report	3 months after PLP receives the final round of Ecology comments/modifications on the Agency Review Draft Supplemental RI and FS Report
6. PLP to submit Agency Review preliminary draft Cleanup Action Plan for Ecology review and approval	30 days after completion of Public Review Supplemental RI and FS Report
7. PLP to submit Public Review preliminary draft Cleanup Action Plan for Ecology review and approval	30 days after PLP receives the final round of Ecology comments/modifications on the Agency Review preliminary draft Cleanup Action Plan

EXHIBIT D

2013 INTERIM ACTION WORK PLAN

**INTERIM ACTION WORK PLAN
BOTHELL RIVERSIDE SITE
BOTHELL, WASHINGTON**

**Prepared for
City of Bothell
January 7, 2013**



HWA GEOSCIENCES INC.

- *Geotechnical Engineering*
- *Hydrogeology*
- *Geoenvironmental Services*
- *Inspection & Testing*

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**INTERIM ACTION WORK PLAN
BOTHELL RIVERSIDE SITE
BOTHELL, WASHINGTON**

1.0 INTRODUCTION

This interim action work plan is prepared for the Bothell Riverside site (Site) in Bothell, Washington (Figure 1). The interim action is being conducted under Agreed Order DE 6295, as amended in April 2010 between the City of Bothell (City) and the Washington State Department of Ecology (Ecology). The purpose of the Agreed Order is to conduct a remedial investigation/feasibility study (RI/FS), submit a cleanup plan to address known soil contamination related to historical releases of hazardous substances at the Site, and implement interim remedial action(s):

The City currently owns the Riverside property, a portion of which will accommodate the realignment of State Route (SR) 522, which is currently under construction through 2013. Remnant portions of the property will be redeveloped as part of the City's overall Downtown Revitalization Plan. Final delineation of the Riverside Site has not been defined, and will be established during the RI process.

The Riverside Site is currently in the RI process (RI/FS work plans, draft RI/FS Report and dCAP Report completed in 2009), with one interim action for petroleum contaminated soil already completed in 2010; however, Ecology has requested another interim action to address chlorinated solvents / halogenated volatile organic compounds (HVOCs) in ground water discharging to the Sammamish River at the Riverside property. The HVOC impacts are not collocated with the Riverside Site petroleum impacts, and likely originate from, and are part of, another site. This interim action work plan presents a description of the interim action. Alternatives evaluated for the interim action are described in the HWA Riverside site Focused Feasibility Study (HWA, 2012).

1.1 PURPOSE

This interim action work plan will be completed per Amendment No. 2 of the Agreed Order and Washington Administrative Code (WAC) 173-340-380, Model Toxics Control Act (MTCA) (Ecology 2007). Under WAC 173-340-430, an interim action is a remedial action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance, that corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed, or that is needed to provide for completion of a site hazard assessment, RI/FS, or design of a cleanup action.

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The purpose of the interim action work plan is to present a general description of the interim action developed to address HVOCs in ground water discharging to the Sammamish River at the Riverside property. Any additional cleanup action that may be required will be addressed as an additional interim action and/or as a final cleanup action after this interim action is completed. The interim action work plan was developed using information obtained during Site investigations that began in 1990 and are ongoing. The contaminated media at the site are described in detail in the draft RI/FS submitted by the City (Parametrix, 2009). This interim action work plan includes the following:

- Applicable state and federal laws for the cleanup action.
- Cleanup standards for each hazardous substance and for each medium of concern.
- A description of the proposed interim action.
- A schedule for implementation of the interim action.

This interim action work plan also includes the Quality Assurance Project Plan (Appendix A), which will be used during completion of interim action at the Site, and includes required elements of a compliance monitoring plan and sampling and analysis plan. The health and safety plan (submitted under separate cover) guidelines will also be followed.

1.2 SITE LOCATION AND DESCRIPTION

The Riverside property is located on the south side of SR 522, between downtown Bothell and the Sammamish River, and is approximately two acres in area. The property is currently undeveloped and used for parking. A portion of the property will accommodate the realignment of State Route (SR) 522, scheduled for construction in 2012-2013. Remnant portions of the property will be redeveloped as part of the City's overall Downtown Revitalization Plan. Figure 1 shows the site vicinity; Figures 2 and 3 show site features and the locations of previous explorations at and near the Riverside property.

2.0 SITE CONDITIONS

This section summarizes the Site conditions and the human health and environmental concerns with respect to the HVOCs in ground water. The site history, contaminated media, soil and ground water conditions at the Riverside Site are described in detail in the draft RI/FS submitted by the City (Parametrix, 2009).

2.1 PHYSICAL CONDITIONS / TOPOGRAPHY

The Riverside property is predominantly a flat gravel-covered area with landscaped strips along the northern and southern property boundaries. A portion of the western boundary consists of vegetated ground sloping down to Horse Creek. The gravel area is used by the City as a parking lot for the adjacent park. The Sammamish River is between 50 and 100 feet south of the property line and is separated from the property by NE 180th Street.

2.2 GEOLOGY / HYDROGEOLOGY

Based on observations during investigations, soil at the Site typically consists of approximately four to nine feet of silty sand to sandy silt fill with occasional debris over alluvial soil consisting of interbedded silt, sandy silt, peat, and silty sand to a depth of up to 50 feet below ground surface (bgs). A buried soil (paleosol) horizon was observed at some locations at the fill-alluvium contact. Much of the fill material is likely dredged spoils placed on the property from realignment of the Sammamish River in the 1960s (HWA, 2008). Below the fill is predominantly medium dense to dense sand with variable gravel, silty sand, silt and peat to a depth of up to 50 feet bgs. Peat or silt beds with high organic content up to 2 feet thick are present within the alluvial soil, generally at depths greater than 10 feet bgs. These organic-rich beds appear to underlie most of the property but may not represent a contiguous layer.

Beneath these alluvial deposits is a stiff to hard clay or silt with a thickness of at least 14 feet. This unit is inferred to be a drift deposit of glacial-lacustrine origin.

2.3 AQUIFER AND SOIL PROPERTIES

Ground water typically occurs in soil borings at depths of approximately 8 to 16 feet bgs. During summer 2009 field activities, depth to water during monitoring well installation ranged from approximately 12.5 to 25 feet bgs. Per results from Parametrix's 2009 RI/FS, the measured ground water gradient at the Site ranged from approximately 0.032 to 0.042 feet/feet, with ground water flow to the southeast.

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The horizontal hydraulic conductivity for the Site was estimated using slug test data collected during the 2009 RI/FS. Based on the results of the slug test data analyses, the estimated hydraulic conductivity for the water-bearing zone ranged from 4.8×10^{-3} to 1.8×10^{-2} feet per minute (7 to 26 feet/day); the mean hydraulic conductivity determined from the slug test data is 13.1 feet/day.

HWA estimated the travel time of shallow ground water at the site. Ground water particle velocity is described by the following relationship:

$$V = K i / P, \text{ where: } V = \text{particle velocity}$$

K = hydraulic conductivity
i = hydraulic gradient
P = effective porosity

Based on estimates of horizontal hydraulic conductivity of around 7 to 26 feet/day, an assumed effective porosity of 0.25 (typical of sands), and measured gradients of 0.032 to 0.042 foot/foot, estimated horizontal ground water particle flow velocity may range from approximately 1 to 4 feet per day in the shallow aquifer.

Other physical characteristics of the water-bearing material include an estimated porosity (based on ex-situ analysis) ranging from 0.25 to 0.32, wet density ranging from 123.2 to 139.5 pounds per cubic foot, and dry density ranging from 107.2 to 127.4 pounds per cubic foot (Parametrix, 2009).

2.4 SURFACE WATER HYDROLOGY

Horse Creek daylights from beneath the adjacent Bothell Landing Site at the midway point of the western Riverside property boundary and runs south along the boundary. The Sammamish River is located approximately 100 feet south of the Riverside property and is separated from the property by NE 180th Street. Horse Creek discharges directly into the Sammamish River in this area, although a new Horse Creek Channel is under construction which will divert much of this flow to a new creek and outfall to the Sammamish River some 600 feet to the west.

3.0 NATURE AND EXTENT OF CONTAMINATION

This section summarizes the nature and extent of HVOC impacts to ground water and surface water; petroleum and other impacts to soil are described in the RI (Parametrix, 2009). Petroleum impacts (which are not collocated with HVOC impacts) were remediated during a previous interim action.

3.1 CHEMICALS OF CONCERN (COCS)

Chemicals of concern for this interim action include the HVOCs tetrachloroethene (a.k.a., perchloroethene or PCE), and associated degradation compounds trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and vinyl chloride.

3.1.1 Soil

Soil samples were analyzed for HVOCs during both the 2008 Phase II Environmental Site Assessment (ESA) (HWA, 2008) and the 2009 RI/FS (Parametrix, 2009). While some HVOC compounds were present in the ground water, none were detected at concentrations greater than the MTCA Method A cleanup level in soil.

During HWA's 2008 Phase II ESA, PCE and TCE were detected in the soil sample from boring BC-3 at 17.5 feet bgs at 5.9 micrograms per kilogram ($\mu\text{g}/\text{kg}$). PCE was detected in the soil sample from boring R-4 at 8 feet bgs at 9 $\mu\text{g}/\text{kg}$. Both of these samples were collected from within the water-bearing zone. For the 2009 RI/FS, minimal HVOC concentrations were detected in collected soil samples. In RMW-6 cis-1,2-dichloroethene (DCE) was detected at 4.5 $\mu\text{g}/\text{kg}$ at 15 feet bgs. During the 2009 CDM Phase II ESA (CDM, 2009), three borings (B14 through B16) were advanced just north of the Site. PCE was detected in B15 (27 $\mu\text{g}/\text{kg}$) at 10 feet bgs and B16 (4.1 $\mu\text{g}/\text{kg}$) at 13 feet bgs. These concentrations did not exceed MTCA Method A PCE soil cleanup level of 50 $\mu\text{g}/\text{kg}$.

It is likely that the low HVOC concentrations identified in soil samples are associated with ground water contamination and not an onsite source. The locations and concentrations of the soil contamination are consistent with the areas that had the highest concentrations of HVOCs in ground water.

3.1.2 Ground Water

PCE and breakdown (daughter) products (e.g., TCE, cis-1,2-DCE, and vinyl chloride) were detected in ground water collected from borings R-2, R-3, R-4, R-5, and R-10 during HWA's 2008 Phase II ESA. These borings were completed between 12 and 20

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feet bgs. Concentrations of PCE ranged from 3.9 µg/L in R-10 to 320 µg/L in R-4. TCE was detected at several locations with a maximum concentration of 140 µg/L at R-4. This concentration exceeded the MTCA Method A cleanup level of 5 µg/L for TCE. Vinyl chloride exceeding the MTCA Method A cleanup level of 0.2 µg/L was detected in R-5.

Monitoring wells BC-3 and BC-5 were also sampled during the 2008 Phase II ESA. PCE (110 µg/L) and TCE (120 µg/L) were detected in BC-3 at concentration exceeding their respective MTCA Method A cleanup levels for ground water. No HVOCs were detected above laboratory reporting limits in the sample collected from BC-5.

During Parametrix's 2009 RI/FS, eight new monitoring wells were installed to better assess the nature and extent of the HVOC contamination previously identified at the Site. The wells were installed at depths ranging from approximately 22 to 42 feet bgs. Monitoring wells RMW-7, RMW-8, and RMW-9 were installed to better assess migration of the HVOC plume in shallow ground water. Monitoring well RMW-7 is located southeast of the Site on the north bank of the Sammamish River. PCE (50 µg/L) and TCE (120 µg/L) were detected in RMW-7 at concentrations exceeding their respective MTCA Method A cleanup levels. Vinyl chloride was also detected in RMW-7 at 22 µg/L, which exceeded the MTCA Method A cleanup level. In RMW-7 cis-1,2-DCE was also detected at a concentration of 190 µg/L. RMW-8 is located east of the Riverside property. PCE, TCE, and DCE were detected in RMW-8, but at concentrations below their MTCA Method A cleanup levels. No HVOCs were detected in RMW-9, located north of the Riverside property.

RMW-10 was completed to approximately 42 feet bgs and was completed in the lower portion of the water-bearing zone. Only PCE was detected in RMW-10 (0.24 µg/L), but was below the MTCA Method A cleanup level. All other HVOCs were below laboratory reporting limits. The absence of elevated HVOC concentrations in RMW-10, located in between other shallow wells with much higher HVOC concentrations, indicates the HVOCs are mostly in shallow ground water, at depths of 10 to 25 feet.

Existing well BC-3 was also sampled during the 2009 RI/FS. This well is located roughly 25 feet east of RMW-10. PCE (130 µg/L), TCE (120 µg/L), and cis-1,2-DCE (49 µg/L) were detected in the sample collected from BC-3. PCE and TCE exceeded their respective MTCA Method A cleanup levels. The HVOC concentration at BC-3 and RMW-10 varied significantly, possibly indicating that these wells were completed in different water-bearing zones or that the HVOCs detected in BC-3 have not migrated vertically to reach the screened interval in RMW-10. As mentioned in Section 3.1.1, during the 2009 CDM Phase II ESA, three borings (B14 through B16) were installed just north of the Site. PCE was detected in ground water from B14 (5.9 µg/L) at concentrations exceeding MTCA Method A cleanup levels. PCE was also detected in

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B15 (3.9 µg/L) and B16 (0.21 µg/L), but at concentrations that did not exceed MTCA Method A cleanup levels. TCE and cis-1,2-DCE were also detected in B14 and B15.

The existing data have not identified any up gradient source for the solvent plume at Riverside site. Additional exploration is planned to determine if there is any potential preferential pathway existing between the upgradient Case property solvent plume and Riverside property.

4.0 CLEANUP OBJECTIVES AND CLEANUP STANDARDS

4.1 OVERVIEW OF CONCEPTUAL SITE MODEL

The Site characteristics and environmental data summarized in Section 3 were evaluated to develop a conceptual site model for the Site. This conceptual site model relates contamination sources, affected media, and potential transport pathways between the Site and potential human health and ecological receptors.

4.1.1 Contaminant Source

Based on the results from the 2008 and 2009 Phase II ESAs and the 2009 RI/FS, it is unclear that the HVOC ground water contamination is related to an upgradient source, although additional explorations are planned to verify this. The presence of PCE daughter products indicates that natural biological degradation and attenuation of PCE are occurring in shallow ground water.

4.1.2 Potential Exposure Pathways

Potential exposure pathways for the Riverside site are described in the RI/FS (Parametrix, 2009). The main potential exposure pathway with respect to this interim action is ground water to surface water, specifically via discharge of HVOC-impacted ground water into the Sammamish River.

Soil pathways (e.g., direct contact, ingestion, soil to ground water) are not considered for this interim action because soil HVOC concentrations in this area do not exceed cleanup levels or appear to be a concern. Vapor pathways (e.g., inhalation, indoor air) are similarly not considered, due to the absence of present or planned buildings in this area.

4.1.3 Potential Receptors

Potential exposure to human and ecological receptors at the Site is described below. Human receptors include:

- **Recreational users of the Sammamish River.** The river is used for boating, kayaking, fishing, and swimming. Users may be exposed to impacted surface water via, dermal contact, ingestion of water, or ingestion of fish prior to implementation of remedial actions.

Potential ecological receptors include:

- **Aquatic species.** Aquatic biota in the Sammamish River may be exposed to impacted surface water.

4.2 CLEANUP STANDARDS

Cleanup standards consist of appropriate cleanup levels applied at a defined point of compliance that meet applicable state and federal laws (WAC 173-340-700). Due to the main concern for impacts to surface water, surface water cleanup levels were evaluated in addition to ground water values. Proposed cleanup levels are described below and shown on Table 1. The rationale for selecting cleanup levels is as follows:

- MTCA Method B surface water cleanup levels
- MTCA Method B ground water cleanup levels if there is no surface water cleanup level
- Method PQL (practical quantitation limit) if the PQL is higher than MTCA cleanup levels

Due to the proximity of the HVOC-impacted ground water to the river, surface water cleanup levels are proposed, although the preliminary point of compliance and sampling locations/methods (i.e., ground water monitoring wells) are in ground water. Direct sampling of surface water in the river is unlikely to detect any HVOCs due to the relatively low concentrations in ground water and dilution in the river.

Method B surface water cleanup levels. Standard Method B cleanup levels for surface waters shall be at least as stringent as all of the following:

- Surface water quality criteria per WAC 173-201A, including referenced Clean Water Act and EPA standards.

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- Drinking water standards per WAC 173-340-720, for surface waters classified as suitable for domestic water supplies

Table 1 provides the basis for surface water cleanup levels, including MTCA Method B cleanup levels, and available federal and state Applicable or Relevant and Appropriate Requirements (ARARs), including Department of Ecology Surface Water Quality Standards WAC 173-201A and referenced Clean Water Act and EPA standards.

4.3 POINT OF COMPLIANCE

The point of compliance is the specific location(s) at which a particular cleanup level must be met in order to demonstrate compliance of a cleanup action. MTCA defines standard and conditional points of compliance. Proposed preliminary points of compliance are described below.

4.3.1 Ground Water

The standard ground water point of compliance under MTCA (WAC 173-340-720(8)(b)) is in ground water throughout the Site from the uppermost level of the saturated zone to the lowest depth which could potentially be affected (as determined during the RI). For properties near or adjoining surface water bodies, a conditional point of compliance off the property may be approved, as close as practicable to the source and not to exceed the point or points where the ground water flows into the surface water (typically at the ground water to surface water discharge area).

For this interim action, a preliminary conditional point of compliance is proposed as near as practicable to the river, i.e., at RMW-7 located on the north bank of the river, and at four new ground water extraction wells near the river. Final point(s) of compliance will be established in the RI/FS.

4.4 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are cleanup goals established for environmental media (soil or ground water) designed to protect human health and the environment under a specified land use. The RAOs take into account potential exposure pathways, receptors, and provide acceptable concentrations for COCs that are protective of all potential exposure pathways. The primary objective of site remediation will be to minimize all applicable exposure pathways, including:

- Ground water to surface water
- Human health, direct contact
- Human health, ingestion

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- Aquatic species

RAOs are based on the findings of the remedial investigation, and guide the development and evaluation of cleanup alternatives. Potential risks used to establish RAOs include:

- Ground water – Potential risks include migration of impacted ground water to adjacent surface water
- Surface water – Potential risks associated with surface water include those from direct contact with or ingestion of water, by human and ecological receptors, and ingestion of aquatic species by humans

5.0 PROPOSED INTERIM ACTION

The proposed interim action consists of pumping ground water from a line of wells placed to intercept the HVOC plume before it reaches the river, and treating the extracted ground water via discharge to sanitary sewer system.

5.1 OTHER CLEANUP METHODS EVALUATED

Alternatives evaluated for the interim action are described in the HWA Focused Feasibility Study (HWA, 2012), and included:

- Source Control
- In situ ground water treatment
 - Chemical oxidation
 - Chemical reduction
 - Bioremediation
 - Air sparging with soil vapor extraction
- Ground water gradient control
 - Pump, treat, and discharge
 - Carbon adsorption
 - Air stripping
 - Discharge to sanitary sewer
 - Pump, treat (using one of the above-listed methods), and recirculate
- Permeable reactive barriers
 - Zero valent iron
 - Funnel and gate with zero valent iron
- Monitored Natural attenuation

Soil cleanup methods at the Riverside property were not considered, because 1) soil does not appear to be impacted by HVOCs on the Riverside property, and 2) the source is very far from the river (approximately 900 feet north), at the Case property / Ultra Custom Care Cleaners site.

The cleanup method selected for this interim action was gradient control via pumping, with treatment via discharge to sanitary sewer. In situ and reactive barrier methods were ruled out due to the high potential for adversely impacting the nearby river. Gradient control via a series of pumping wells was determined to be the preferred option for capturing the HVOC plume before it reaches the river. Discharge of the pumped ground water to sanitary sewer, for treatment at an off site wastewater treatment plant was the preferred treatment option due to its simplicity, reliability, and straightforward permitting requirements.

5.2 GENERAL TECHNOLOGY DESCRIPTION

Achieving hydraulic control of the ground water involves a sufficient number, location, and spacing of wells, with pumping rates sufficient to modify the gradient such that impacted ground water flows into the wells, and not into the river. Well spacing and pumping rates were determined via a capture zone analysis using numerical ground water modeling (HWA, 2012), with input parameters derived from previous remedial investigation work (e.g., gradient mapping, aquifer testing (Parametrix, 2009)). Actual pumping rates will be determined after additional pumping / interference tests at the site, and would be adjusted during operation of the system based on measured water levels. The optimal pumping rate would be that which captures HVOC impacted water headed for the river, but does not pump too much river water into the wells.

Pumped ground water will be discharged to sanitary sewer for treatment at the King County wastewater treatment plant. HVOC contaminants at the concentrations detected are acceptable by King County Industrial Waste Division (KCIWD) for discharge and treatment. The KCIWD discharge criteria for HVOCs are as follows:

Compound	Discharge Limit (µg/L)
PCE	240
TCE	500
1,1, DCA	1700
1,2 DCA	170
1,1, DCE	3
1,2, DCE	2000
Vinyl chloride	12

The HVOCs will likely be treated by the standard primary and secondary wastewater treatment processes (e.g., activated sludge, facultative lagoons, etc.), or will volatilize prior to reaching the treatment areas, in the sewer lines, manholes, treatment plant headworks, solids removal, and aeration basins.

5.3 TREATMENT SYSTEM DESCRIPTION

Elements of the treatment system include the following:

- **Permitting** – Anticipated permitting requirements include the following:
 - Notice of intent to construct resource protection wells under Chapter 173-160 WAC, Minimum Standards for Construction and Maintenance Of Wells

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- Obtaining a discharge authorization from KCIWD. This may include limitations of discharge volumes allowed per day, and specified discharge points
- **Extraction Wells** – Based on the capture area analysis performed, four wells are planned at roughly 40 foot spacing. Figure 2 shows the extraction well locations. The wells will be constructed of four-inch diameter PVC, with 20 feet of mill-slotted well screen set at a depths of 15 to 35 feet below grade.
- **Well Development** - After well installation, each well will be developed by surging and pumping to remove fines from around the well screen.
- **Well sampling**– After development, each well will be sampled for HVOCs and field parameters
- **Well testing** – After sampling, a short pumping test will be conducted at each well to measure its specific capacity and maximum predicted pumping rate. This will be accomplished by pumping the wells at successively higher discharge rates and measuring the resulting drawdown in the pumping and adjacent wells.
- **Pump controls** will include a down-well float switch that shuts off each pump if water level goes below the pump intake. Controls will be housed in a NEMA weather-proof enclosure, in either a locked container or within a locked chain link fenced enclosure.
- **Pump sizing** – Based on the well testing results, downhole electric submersible pumps will be specified, purchased and installed in each well. Pumping / discharge rates will be made adjustable by adjusting the pumping level (float switch level), using valves in the discharge lines, timers, variable frequency drive motors and controllers, or some combination of these methods.
- **Piping and wiring** to and from the wells will be underground, and installed per City of Bothell code for underground utilities.
- **Well discharge lines** from each well will contain a sampling port to collect individual well water samples.
- **Discharge to sanitary sewer** will be via a nearby sanitary sewer manhole, per City of Bothell and King County Industrial Waste Division requirements; and will include a totalizing water meter and sample collection port. Discharge to the sanitary sewer will be under permit to King County Industrial Waste Division, who

will impose a limitation on allowable daily discharge volumes based on system capacity.

- **Operation and maintenance (O&M)** will include periodic inspection of the system. The only mechanical components are the down-hole submersible pumps, which require no regular maintenance. The treatment system will be inspected for proper operation, leaks, etc., and repairs conducted as needed.

5.3 COMPLIANCE MONITORING

This section describes protection, performance, and confirmation monitoring to be performed during the interim action.

5.3.1 Protection Monitoring

Protection monitoring will be conducted to confirm that human health and the environment are adequately protected during construction and operation of the interim action. This includes any sampling or testing performed for health and a safety purposes during the interim action, and is detailed in the site specific Health and Safety Plan. The only element of the interim action anticipated to require protection monitoring is the drilling and installation of the ground water extraction wells. Air monitoring of the work space will be conducted during drilling and installation per the site specific Health and Safety Plan.

Construction of the above-ground components of the treatment system is not anticipated to require any protection monitoring, although construction-related health and safety procedures will be followed (e.g., construction, electrical and mechanical safety issues).

5.3.2 Performance Monitoring

Performance monitoring is required to confirm that the interim action has attained cleanup standards. Performance monitoring will include collection of ground water samples from the extraction wells and selected monitoring wells, as follows:

Performance Monitoring

Sample type	Sampling location	Sampling Frequency / Rationale
Preliminary Point of Compliance	Extraction well 1 Extraction well 2 Extraction well 3 Extraction well 4 RMW-7	Quarterly for one year, then modify based on results and consultation with Ecology (e.g., move to semiannual if concentrations stabilize)
Combined discharge	Combined discharge at sewer manhole or manifold	As required by KCIWD permit
Nearby wells	BC-3 RMW-4 RMW-5 RMW-6 RMW-8 RMW-9 RMW-10	Semiannual for one year, then modify based on results and consultation with Ecology to check for water quality impacts due to pumping

Performance monitoring samples will be analyzed for HVOCs and field parameters, as detailed in Appendix A. Other elements of performance monitoring include:

- Meter readings recording volumes of water discharged to sewer
- Ground water levels in all pumping and nearby monitoring wells
- Preparation of ground water gradient maps to confirm plume capture

5.3.3 Confirmation Monitoring

Confirmation monitoring is required to confirm the long-term effectiveness of the interim action once cleanup standards have been attained. Confirmation monitoring will include similar sampling to performance monitoring, after cleanup levels have been reached.

Confirmation Monitoring

Sampling location	Sampling Frequency
RMW-7 RMW-6 BC-3 Extraction well 1 Extraction well 2 Extraction well 3 Extraction well 4 Note: due to the seven wells in a row at close spacings, only selected wells will be sampled after initial monitoring, based on ongoing results	Semiannual one year, rest period of one year, then one sampling event. Cease interim action if cleanup levels have been met after this sampling event. If cleanup levels have not been met, then repeat cycle - begin semiannual sampling for another year followed by one year rest period. Cease interim action one month after Ecology's concurrence that the cleanup levels have been met, or if HVOC concentrations stabilize long term.

Confirmation samples will be analyzed for HVOCs and field parameters, as detailed in Appendix A.

6.0 SCHEDULE

The proposed interim action is planned to be implemented in 2013, per the following preliminary schedule.

	Month 0	1	2	3	4	5	6
Approval of work plan	x	.	.	.	.	.	.
Design system	xxxxxx	.	.	.	.	.	.
Bidding	.	xxxxxx	.	.	.	.	.
Construction/install wells	.	.	xxxxxx	.	.	.	.
Develop, sample & test wells	.	.	.	xxxx	.	.	.
Spec/order pumps	.	.	.	.	xxxxxxxx	.	.
Install pumps	.	.	.	.	.	xx	.
System startup	.	.	.	.	.	.	x

7.0 REFERENCES

CDM, 2009, *Phase II Environmental Site Assessment City of Bothell Crossroads Redevelopment Project Bothell, Washington, May 2009.*

HWA GeoSciences, 2008, *Phase II Environmental Site Assessment Riverside Property Bothell, Washington, July 2008.*

HWA GeoSciences, 2012, *Focused Feasibility Study Bothell Riverside Site Bothell, Washington, September 5, 2012.*

Parametrix, 2009, *Bothell Riverside Remedial Investigation/Feasibility Study, Revision No. 0, Prepared by Parametrix, Bellevue, Washington, November 2009.*

Washington State Department of Ecology, 2007, *Model Toxics Control Act Cleanup Regulation, Chapter 173-340 WAC, Publication No. 94-06, dated October 12.*

Table 1
Site Cleanup Level Summary (µg/L)

	PCE	TCE	1,2-DCE (mixed isomers)	cis-1,2- DCE	trans- 1,2-DCE	VC
Ground Water Standards						
Ground Water ARAR - State Primary Maximum Contaminant Level (MCL)	5	5	NR	70	100	2
Ground Water, Method A, Table Value	5	5	RND	RND	RND	0.2
Ground Water, Method B, Carcinogen, Standard Formula Value	5*	4*	NR	NR	NR	**
Ground Water, Method B, Non-carcinogen, Standard Formula Value	80	**	72	16	160	24
Surface Water Standards						
Surface Water, Method B, Carcinogen, Standard Formula Value	**	6.7	NR	NR	NR	0.025
Surface Water, Method B, Non-Carcinogen, Standard Formula Value	840	**	NR	NR	33000	6.60E+03
Surface Water ARAR - Aquatic Life - Fresh/Acute - Ch. 173-201A WAC	NR	NR	NR	NR	NR	NR
Surface Water ARAR - Aquatic Life - Fresh/Chronic - Ch. 173-201A WAC	NR	NR	NR	NR	NR	NR
Surface Water ARAR - Aquatic Life - Fresh/Chronic - Clean Water Act §304	NR	NR	NR	NR	NR	NR
Surface Water ARAR - Human Health - Fresh Water - Clean Water Act §304 (	0.69	2.50	NR	NR	140000	0.03
Surface Water ARAR - Aquatic Life - Fresh/Acute - Clean Water Act §304	NR	NR	NR	NR	NR	NR
Surface Water ARAR - Human Health - Fresh Water - National Toxics Rule, 40 CFR 131	0.80	2.70	NR	NR	RND	2.00
Surface Water ARAR - Aquatic Life - Fresh/Acute - National Toxics Rule - 40 CFR 131	NR	NR	NR	NR	NR	NR
Surface Water ARAR - Aquatic Life - Fresh/Chronic - National Toxics Rule, 40 CFR 131	NR	NR	NR	NR	NR	NR
PQL / RL achievable by local accredited labs	0.2	0.2	0.2	0.2	0.2	0.2

NR – Not researched

RND – Researched-No Data

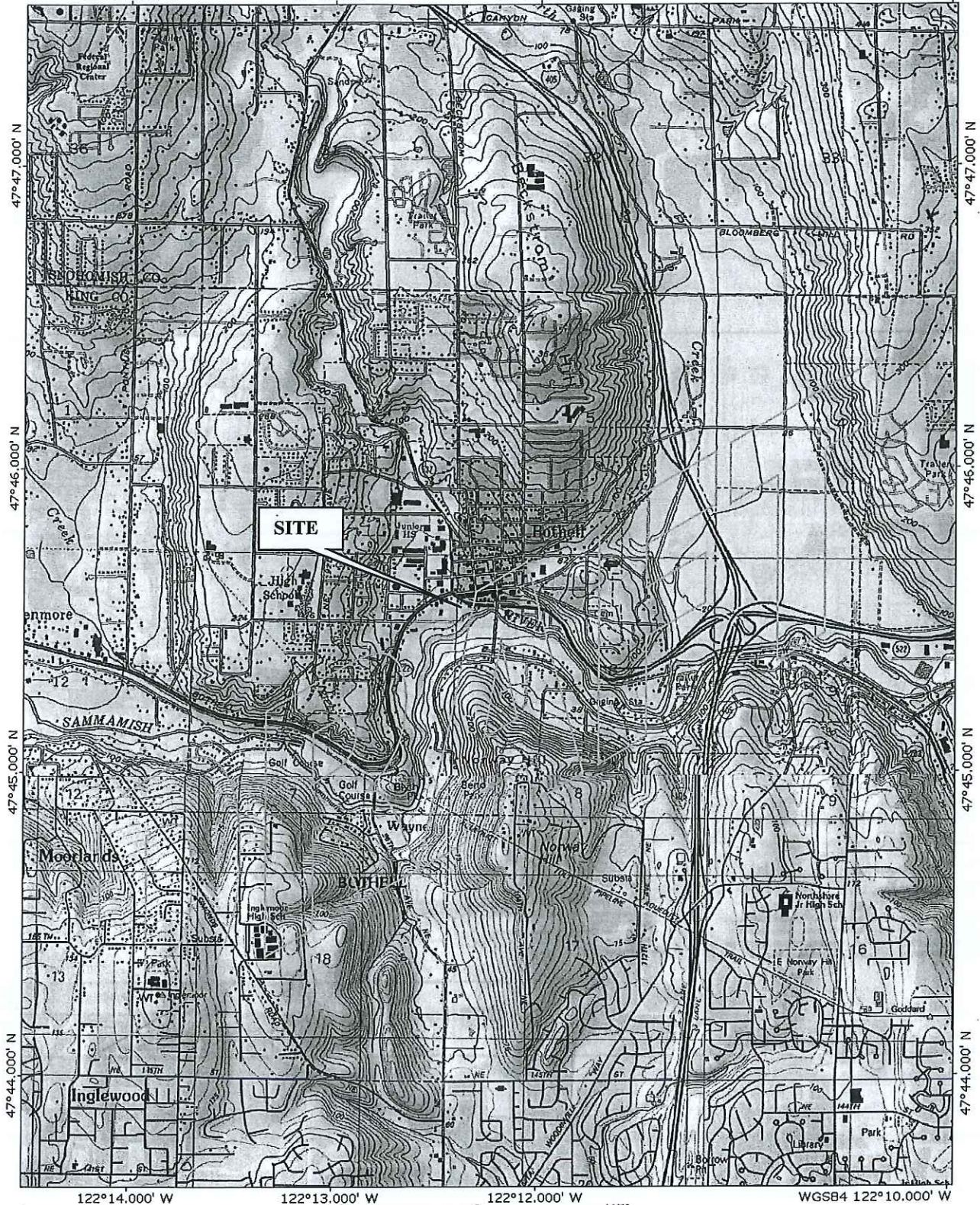
* Per Sunny Becker at Ecology

** See additional information per CLARC

Highlighted – lowest value

Bold Highlighted – selected value

PQL – practical quantitation limit



47°47.000' N

47°47.000' N

47°46.000' N

47°46.000' N

47°45.000' N

47°45.000' N

47°44.000' N

47°44.000' N

122°14.000' W

122°13.000' W

122°12.000' W

WGS84 122°10.000' W

TN 18° MN



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SITE VICINITY

BOTHELL RIVERSIDE SITE
INTERIM ACTION WORK PLAN
BOTHELL, WASHINGTON

FIGURE NO.

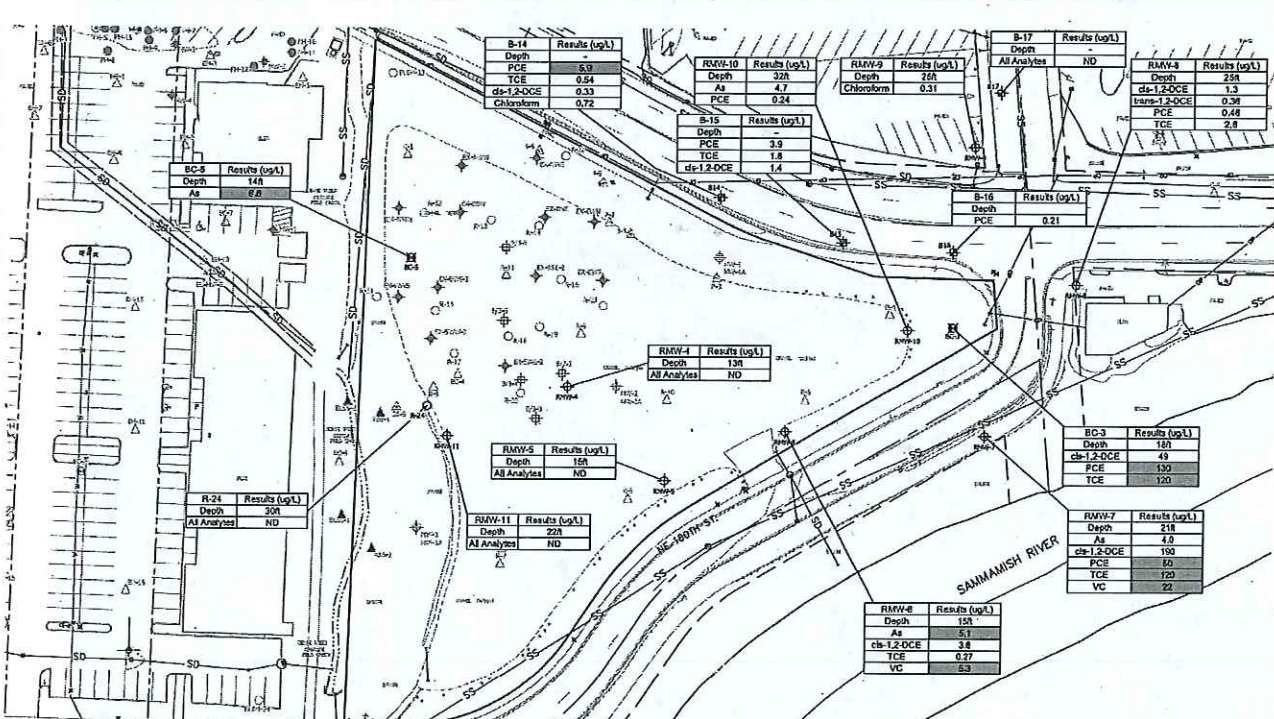
1

PROJECT NO.

2007-098



HWA GEOSCIENCES INC.



- LEGEND**
- ⊙ PSI 1993 CLOSURE SAMPLE LOCATIONS
 - ⊙ KLENFELDER 1999 BORING LOCATIONS
 - ⊙ KLENFELDER 1999 WELL LOCATIONS
 - ⊙ HWA 2007 PHASE II ESA BORINGS
 - ⊙ HWA 2007 WELL LOCATIONS
 - ⊙ PMX 2009 RI/FS BORING LOCATIONS
 - ⊙ PMX 2009 RI/FS WELL LOCATIONS
 - ⊙ PMX 2009 RI/FS SURFACE SOIL LOCATIONS
 - ⊙ CDI 2009 ROW BORING LOCATIONS
 - ⊙ SEACOR 1990 & 1991 TEST PIT LOCATIONS
 - ⊙ RZA AGRA 1991 EXCAVATION CONFIRMATION SAMPLE LOCATIONS
 - ⊙ GROUNDWATER TECHNOLOGY 1992 EXCAVATION CONFIRMATION SAMPLE LOCATIONS
 - ⊙ SITE BOUNDARY
 - ⊙ EXCEEDS MITCA METHOD A CLEAN UP LEVEL



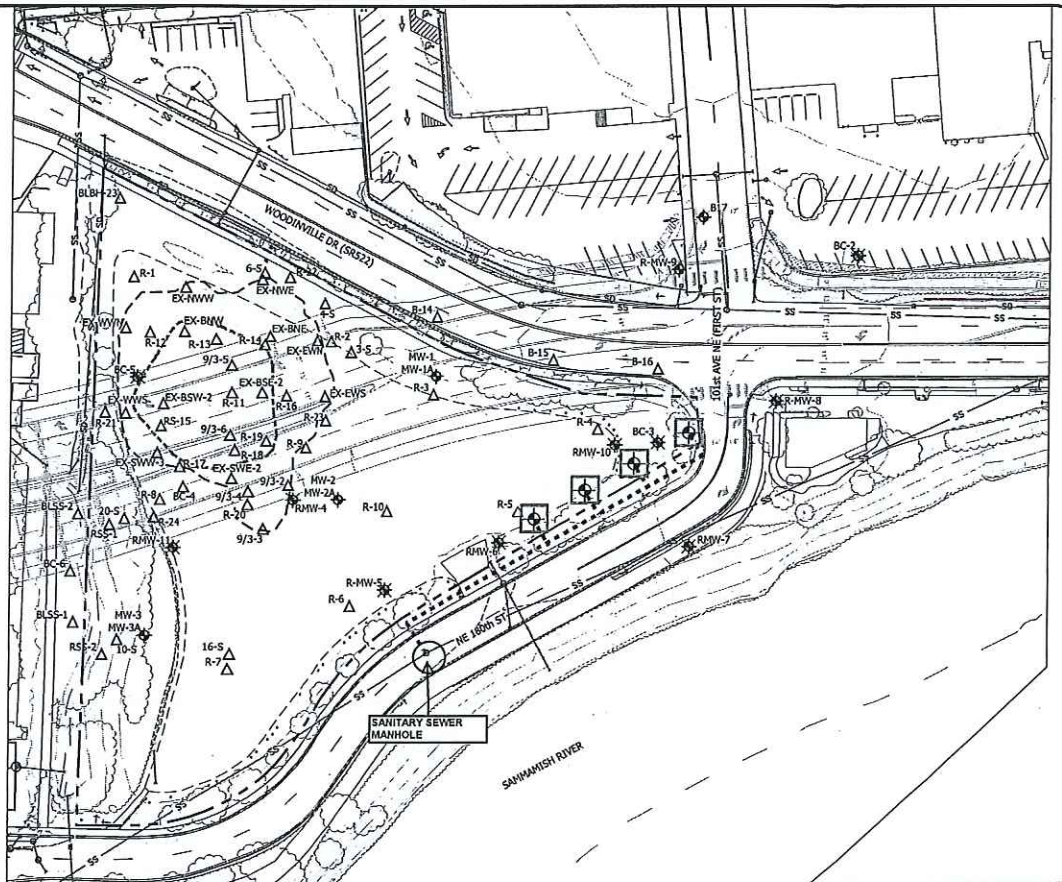
Figure Source: Parametric, 2009

HWA GEOSCIENCES INC.	GROUND WATER RESULTS	PROJECT NO. 2007-098
	BOTHELL RIVERSIDE SITE INTERIM ACTION WORK PLAN BOTHELL, WASHINGTON	FIGURE NO. 2



EXPLANATION OF SYMBOLS

- APPROXIMATE EXTENT OF 2010 CLEANUP EXCAVATION
- APPROXIMATE EXTENT OF 1990'S CLEANUP
- - - - - APPROXIMATE PROPERTY BOUNDARY
- R-8 SOIL BORING OR TEST PIT LOCATIONS
- R-MW-10 MONITORING WELL LOCATIONS
- PLANNED EXTRACTION WELL
- DISCHARGE LINES



JWA HWA GEOSCIENCES INC.

BOTHELL RIVERSIDE SITE
INTERIM ACTION
BOTHELL, WASHINGTON

SITE PLAN

DRAWN BY EES	FIGURE NO.
CHECK BY AS	3
DATE	PROJECT NO.
09.13.12	2007-098 T978

BASE MAP PROVIDED BY PARAMETRIX
S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD\HWA 2007-098-21 T978.DWG <REVISED 4/2/11/14> PLOT# 12/4/2012 9:45 AM

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

**INTERIM ACTION
QUALITY ASSURANCE PROJECT PLAN
BOTHELL RIVERSIDE SITE
BOTHELL, WASHINGTON**

HWA Project No. 2009-098

January 7, 2013

Prepared for:
City of Bothell



HWA GEOSCIENCES INC.

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**INTERIM ACTION
QUALITY ASSURANCE PROJECT PLAN
BOTHELL RIVERSIDE SITE
BOTHELL, WASHINGTON**

1.0 INTRODUCTION

This interim action work plan has been prepared for the Bothell Riverside site (Site) in Bothell, Washington (Figure 1). The interim action is being conducted under Agreed Order DE 6295, as amended in April 2010 between the City of Bothell (City) and the Washington State Department of Ecology (Ecology). The purpose of this interim action is to reduce/eliminate the discharge of a chlorinated solvent plume that is migrating into the Sammamish River. The purpose of the Agreed Order is to conduct a remedial investigation/feasibility study (RI/FS), submit a cleanup plan to address known soil contamination related to historical releases of hazardous substances at the Site, and implement interim remedial action(s).

The City currently owns the Riverside property, a portion of which will accommodate the realignment of State Route (SR) 522, which is currently under construction. Remnant portions of the property will be redeveloped as part of the City's overall Downtown Revitalization Plan. Final delineation of the Riverside Site has not been defined, and will be established during the RI process.

This Quality Assurance Project Plan (QAPP) is incorporated within the Interim Action Work Plan (IAWP) for the property, and has been prepared to fulfill the requirements of the Agreed Order per Washington Administrative Code (WAC) 173-340-410(1)(b). This QAPP describes the sample collection procedures, analysis, and defines the Data Quality Objectives (DQOs) and criteria for the project. HWA GeoSciences Inc. prepared this QAPP in accordance with the U.S. Environmental Protection Agency (EPA) and Ecology requirements contained in the following:

- EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans, Final, March 2001
- EPA QA/G-5, EPA Guidance for Quality Assurance Project Plans, December 2002
- EPA QA/G-4, EPA Guidance on Systematic Planning Using the Data Quality Objectives Process, February 2006
- Ecology Model Toxics Control Act (Ecology 2007)

2.0 PROJECT ORGANIZATION AND MANAGEMENT

2.1 PROJECT ORGANIZATION

Specific project roles and responsibilities for oversight and sampling are described in Table 2-1.

Table 2-1
Project Roles and Responsibilities

Personnel	Responsibilities
City of Bothell (Owner) Project Manager	Provides project and construction oversight and performs contract administration.
Contractor	Implements cleanup/remedial actions and coordinates with environmental consultant for confirmational sampling during construction.
Owner's Representative (Environmental Consultant)	Coordinates with Contractor to obtain confirmational sampling during interim action; coordinates analytical laboratory testing of samples; prepares interim action reports.

2.2 PROBLEM DEFINITION/BACKGROUND

The Riverside property is located on the south side of SR 522, between downtown Bothell and the Sammamish River, and is approximately two acres in area. The property is currently undeveloped and used for parking. A portion of the property will accommodate the realignment of State Route (SR) 522, which is currently under construction through 2013. Remnant portions of the property will be redeveloped as part of the City's overall Downtown Revitalization Plan. Figure 1 shows the site vicinity; Figure 2 shows site features and the locations of previous explorations at and near the Riverside property.

Chemicals of concern (COCs) for this interim action include the HVOCs tetrachloroethene (a.k.a., perchloroethene or PCE), and associated degradation compounds trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and vinyl chloride.

The Interim Action is designed to remediate COCs which are present in ground water and discharging to the Sammamish River

This QAPP describes sample collection procedures and quality assurance and control methods to ensure representative data is collected during the interim action.

2.3 TASK DESCRIPTION

Based on the results of the environmental investigations and a focused feasibility study, the recommended alternative for ground water cleanup is gradient control via pumping, and treatment via discharge to sanitary sewer.

2.4 QUALITY OBJECTIVES AND CRITERIA

2.4.1 Data Quality Objectives

DQOs were developed according to EPA’s DQOs Process (EPA 2006), to provide data of known and appropriate quality. The DQO process is a seven-step planning approach to develop sampling designs for data collection activities that support decision-making. It provides a systematic procedure for defining the criteria that a data collection design should satisfy. The DQOs for the project are shown in Table 2-2.

**Table 2-2
Design Characterization Sampling DQOs**

DQO	Description
State the Problem	Is contaminated ground water reaching the River?
Identify the Goal of the Study	Reduce contaminant concentrations reaching the river Is the collected chemical data adequate to identify and determine if contamination still exists?
Identify Information Inputs	Analytical results (what are the detected concentrations? are they above cleanup levels? was QA/QC criteria met?). Actual sample locations (correct location and depth?).
Define the Study Boundaries	The selected locations.
Develop the Analytic Approach	Sampling and analysis strategies will be developed to support the decision making process. Analytical results will be used to determine the presence or absence of contamination. Results will be compared to site specific cleanup levels established in the interim action work plan
Specify Performance or Acceptance Criteria	The tolerable limits of uncertainty regarding the cleanup of contamination at the site will be based on exceedance or non-exceedance of cleanup levels. Tolerable limits on analytical results are determined by the Quality Assurance/Quality Control (QA/QC) criteria defined in this QAPP.
Develop the Plan to Obtain Data	Presented in this QAPP.

2.4.2 Data Quality Indicators

Data quality and usability are evaluated in terms of performance criteria. Performance and acceptance criteria are expressed in terms of data quality indicators (DQIs). The principal indicators of data quality are precision, accuracy, bias, sensitivity, completeness, comparability, and representativeness. Table 2-3 provides a description of project DQIs.

**Table 2-3
General Description of DQIs**

DQI	Description
Precision:	A measure of agreement among repeated measurements of the same property under identical conditions. Usually assessed as a relative percent difference (RPD) between duplicate measurements. RPD guidelines for laboratory duplicate analyses are contained in the standard operating procedures (SOPs) for each analytical method and will be obtained from the laboratory for validation purposes.
Accuracy:	A measure of the overall agreement of a measurement to a known value. Analytical accuracy is assessed as percent recovery from matrix spike or reference material measurements. Percent recovery guidelines are contained in laboratory SOPs for each analytical method.
Bias:	The systematic or persistent distortion of a measurement process that causes error in one direction. Usually assessed with reference material or matrix spike measurements. Bias as reported by the laboratory will be used to assess data validity.
Sensitivity:	The capability of a method or instrument to meet prescribed reporting limits. Assessed by comparison with risk-based reporting limits, method reporting limits, instrument reporting limits, or laboratory quantitation limits, as appropriate. In general, reporting limits for the analytical methods used will be at or below applicable criteria.
Completeness:	A measurement of the amount of valid data needed to be obtained for a task. Assessed by comparing the amount of valid results to the total results set. Project requirements for completeness are 90%.
Comparability:	A qualitative term that expresses the measure of confidence that one data set can be compared to another. Assessed by comparing sample collection and handling methods, sample preparation and analytical procedures, holding times, reporting units, and other QA protocols. To ensure comparability of data collected for the Bus Barn to previous data, standard collection and measurement techniques will be used.
Representativeness:	A qualitative term that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sample point, or environmental condition. To ensure representativeness, the sampling design will incorporate sufficient samples so that contamination is detected, if present. Additionally, all sampling procedures detailed in this QAPP will be followed.

2.5 SPECIAL TRAINING AND CERTIFICATION

All personnel conducting sampling activities on the project site must be 40-hour Hazardous Waste Operation (HAZWOPER) trained per 29 Code of Federal Regulations (CFR) 1910.120 and be current with their annual 8-hour refresher course.

All personnel working at the project site will be briefed on potential site hazards, health and safety procedures, and sampling procedures. Following completion of this training, all personnel

will be required to sign an acknowledgement form verifying that they have completed the task-specific training.

A Health and Safety Plan (HSP) will also be prepared for this site, as required by WAC 296-62-3010. The Contractor and Owner’s Representative will prepare their own HSPs to be consistent with the HSP.

2.6 SAMPLING DOCUMENTATION AND RECORDS

Sampling documentation will be accomplished according to the procedures provided in Table 2-4.

**Table 2-4
Sampling and Sample Handling Records**

Record	Use	Responsibility/Requirements
Field Notebook	Record significant events and observations.	Maintained by field sampler/geologist; must be bound; all entries must be factual, detailed, objective; entries must be signed and dated.
Sampling Field Data Sheet	Provide a record of each sample collected (Appendix A).	Completed, dated, and signed by sampler; maintained in project file.
Sample Label	Accompanies sample; contains specific sample identification information.	Completed and attached to sample container by sampler.
Chain-of-Custody Form	Documents chain-of-custody for sample handling (Appendix A).	Documented by sample number. Original accompanies sample. A copy is retained by QA Manager.
Chain-of-Custody Seal	Seals sample shipment container (e.g., cooler) to prevent tampering or sample transference. Individual samples do not require custody seals, unless they are to be archived, before going to the lab for possible analysis at a later date.	Completed, signed, and applied by sampler at time samples are transported.
Sampling and Analysis Request	Provides a record of each sample number, date of collection/transport, sample matrix, analytical parameters for which samples are to be analyzed.	Completed by sampler at time of sampling/transport; copies distributed to laboratory project file.

2.6.1 Field Logs and Forms

A bound field notebook will be maintained to provide daily records of significant events and observations that occur during field investigations. All entries are to be made in waterproof ink, signed, and dated. Pages of the field notebook are not to be removed, destroyed, or thrown away. Corrections will be made by drawing a single line through the original entry (so that the original

entry can still be read) and writing the corrected entry alongside. The correction will be initialed and dated. Most corrected errors will require a footnote explaining the correction.

If an error made on a document is assigned to one person, that individual may make corrections simply by crossing out the error and entering the correct information. The erroneous information should not be obliterated. Any error discovered on a document should be corrected by the person who made the entry.

All field logs and forms will be retained in the project files.

2.6.2 Photographs

All photographs taken of field activities will be documented with the following information noted in the field notebook:

- Date, time, and location of photograph taken
- Description of photograph taken
- Reasons photograph was taken
- Viewing direction

Digital photographs will be reviewed in the field to assess quality and need to re-shoot the photograph.

2.7 REPORTING

Following completion of the confirmation sampling and analysis, the results will be included in an interim remedial action report. Reporting will include the following:

- Summary of field activities completed.
- Figures showing sampling locations.
- Summary of laboratory analytical results and a comparison to relevant regulatory criteria.
- Field log forms and sampling forms.
- Laboratory data sheets and the results of data review/validation.
- Recommendations for further sampling, if needed.

Preliminary results will be communicated verbally as they become available.

3.0 SAMPLING PROCESS DESIGN

3.1 SAMPLING APPROACH

A site-specific sampling approach has been developed to provide performance and confirmational sampling in support of the interim action. The interim action will target the area of ground water near the Sammamish River identified during the RI (Figure 3 of the IAWP). The approach used for the interim action is pumping and treatment of ground water in this area.

A summary of the sampling approach for the interim action is provided in Table 3-1.

**Table 3-1
Sampling Approach**

Sample type	Sampling location	Sampling Frequency / Rationale	Analytes
Performance Monitoring			
Preliminary Point of Compliance	Extraction well 1 Extraction well 2 Extraction well 3 Extraction well 4 RMW-7	Quarterly for one year, then modify based on results and consultation with Ecology (e.g., move to semiannual if concentrations stabilize)	HVOCs Field parameters Water level Discharge (gallons)
Combined discharge	Combined discharge at sewer manhole or discharge manifold	As required by KCIWD permit	HVOCs Settleable solids pH Discharge (gallons)
Nearby wells	BC-3 RMW-4 RMW-5 RMW-6 RMW-8 RMW-9 RMW-10	Semiannual for one year, then modify based on results and consultation with Ecology, to check for water quality impacts due to pumping	HVOCs Field parameters Water level
Confirmation Monitoring			
Preliminary Point of compliance and selected nearby wells	Extraction well 1 Extraction well 2 Extraction well 3 Extraction well 4 RMW-7 RMW-6 BC-3 Note: due to the seven wells in a row at close spacings, only selected wells will be sampled after initial monitoring, based on ongoing results	Semiannual one year, rest period of one year, then one sampling event. Cease interim action if cleanup levels have been met after this sampling event. If cleanup levels have not been met, then repeat cycle - begin semiannual sampling for another year followed by one year rest period. Cease interim action one month after Ecology's concurrence that the cleanup levels have been met, or if HVOC concentrations stabilize long term.	HVOCs Field parameters Water level

The objective of the sampling is to confirm that all COCs have met cleanup levels in ground water. Cleanup levels are provided in the IAWP.

Descriptions of the specific sampling methods for the above activities are presented in Sections 3.2. In addition, all sampling will be conducted in accordance with standard operating procedures.

3.2 SAMPLING METHODS AND PROCEDURES

Descriptions of the specific sampling and laboratory methods for the project are presented in this section.

3.2.1 Ground Water Sampling Procedures

Monitoring wells will be purged before sample collection to obtain ground water samples that are representative of the formation water rather than stagnant water from the well casing. Ground water that has occupied the well casing is often under oxidizing conditions, and thus may be chemically different from true formation water.

Monitoring wells will be purged and sampled using low-flow purging methods (Barcelona et al. 1994). Sampling staff will measure ground water levels to the nearest 0.01-foot using a decontaminated electronic well probe prior to collection of samples. Prior to collection of ground water samples, the wells will be purged by pumping a small volume of water to ensure sampled water represents aquifer conditions. The volume pumped will be determined in the field based on stabilization of field parameters: specific conductance, dissolved oxygen, and pH. Wells will be purged by very slowly lowering semi-rigid polyethylene tubing to a depth corresponding to roughly the midpoint of the screen, securing the tubing to prevent vertical movement, connecting it to a peristaltic pump, and then pumping at a rate not to exceed 0.5 liters/minute (0.132 gallons/minute). At a minimum, two pump and tubing volumes will be purged (1/2" I.D. tubing = 0.010 gallon/lineal foot). Samples from all wells will be collected once the parameter values have stabilized over the course of three sets of measurements as follows:

specific conductance	10 uS
dissolved oxygen	2 mg/L
pH	0.1

If a well can be pumped dry prior to reaching the desired purge volume, it will be allowed to recover prior to sampling, using the minimum time between purging and sampling that would allow collection of sufficient sample volume. Samples will be pumped directly into the appropriate containers, as provided by the laboratory. A Field Data Sampling Sheet (provided in Appendix A) will be filled out for each well. New tubing will be used for each well. All purge water will be collected and discharged to the sanitary sewer.

After collection, all samples will be labeled, chilled in a cooler to 4°C, and shipped to the testing laboratory for analysis. Full chain-of-custody and field documentation procedures will be employed, as described in Section 2.6. The laboratory will analyze the water samples for the constituents listed on Table 2.

3.2.2 Sample Collection

When filling the sample bottles, the following procedures and precautions will be adhered to:

- Sample bottles will be filled directly from dedicated pump tubing or sampling ports with minimal air contact.
- Bottle caps will be removed carefully so that the inside of the cap is not touched. Caps must never be put on the ground. Caps for volatile organic compound (VOC) vials will contain a Teflon-lined septum. The Teflon side of the septum must be facing the sample to prevent contamination of the sample through the septum.
- The sampling team will wear appropriate nonpowdered latex or nitrile gloves (PVC or vinyl gloves can leave trace levels of phthalate or vinyl chloride). Gloves will be changed between wells or more often.
- Tubing or hoses from the sampling systems must not touch or be placed in the sample bottles.
- VOC vials must be filled so that they are headspace-free. These sample bottles therefore need to be slightly overfilled (water tension will maintain a convex water surface in the bottle). The caps for these bottles will be replaced gently, to eliminate air bubbles in the sample. The bottles must then be checked by inverting them and tapping them sharply with a finger. If air bubbles appear, open the bottle, add more water, and repeat the process until all air bubbles are gone. Do not empty the bottle and refill it, as VOC bottles already contain preservatives.
- Sample bottles, caps, or septums that fall on the ground before filling will be discarded.

WATER LEVEL MONITORING

Samplers will measure ground water levels at each of the monitoring wells at the start of each sampling round in order to monitor changes in seasonal or long-term water elevations and ground water flow directions.

3.2.3 Sample Containers, Preservation, and Holding Times

Table 3-2 provides a summary of sample analyses and specifications for containers, preservation, and holding times. The analytical laboratory will provide the sample containers and necessary preservation.

Table 3-2
Sample Containers, Preservation, and Holding Times

Analysis	Method	Matrix	Container	Preservation	Holding Time
HVOCs	EPA 8260	Water	2 –40 mL VOA vials w/ Teflon-lined silicon septum cap	HCL to pH 2 Cool to 4°C	14 days

3.2.4 Field Screening

During excavation, periodic screening of the excavation sidewalls and will be conducted using a PID and visual/olfactory methods. Each periodic sample will be placed in a re-sealable plastic bag for headspace screening using the PID. The headspace sample will be allowed to heat in the sun for approximately 10 minutes and will then be shaken vigorously. A headspace vapor measurement will be then be collected and recorded on the field sampling form. During sampling, observations will also be made for signs of contamination such as odors, staining, or sheen on saturated samples from below the water table. Such observations will also be recorded on the field sampling form. Field screening information will be used to aid in the determination of the excavation limits.

3.2.5 Decontamination Procedures

Decontamination of all non-disposable tools and equipment will be conducted prior to each sampling event and between each sampling location in accordance with the standard operating procedures. The following steps will be taken during decontamination of sampling equipment used during field investigations:

- Scrub with non-phosphate detergent (i.e., Alconox or similar)
- Rinse with tap water
- Rinse thoroughly with deionized water
- Allow to air dry and place in a new plastic bag for storage

For decontamination of larger tools and equipment, such as push-probe rods, a high-pressure, hot water washer or similar device will be used. Loose soil materials will be removed from equipment using a “dry” decontamination technique consisting of the removal of loose soil using a shovel or brush.

3.2.6 Investigation-Derived Waste

Soil - Soil cuttings from the extraction wells will be containerized onsite in 55-gallon drums and staged onsite. Two composite samples of drummed soil will be collected for waste characterization. Disposal options for the soil IDW will be based on the analytical results of the samples. Disposal shall be managed by the Owner's representative using a licensed waste disposal contractor.

Water - Drilling decontamination water will be containerized onsite in 55-gallon drums and staged onsite. Once the treatment system is operations, it will be discharged to the sanitary sewer under permit. Sampling purge water will also be discharged to the sanitary sewer.

Drums - All drums will be labeled indicating date filled, content, location, company, and a unique identification number. All drums and containers will be tracked on a waste-tracking log.

Solid waste - All disposable sampling materials and personal protective equipment, such as disposable coveralls, gloves, and paper towels used in sample processing will be placed inside polyethylene bags or other appropriate containers. Disposable materials will be placed in a normal refuse container and disposed of as normal solid waste in accordance with standard operating procedures for IDW.

3.3 SAMPLE HANDLING AND CUSTODY

The following sections describe sample handling and custody procedures.

3.3.1 Sample Identification and Labeling

Prior to the field investigation, each sample location will be assigned a unique code. Each sample collected at that location will be pre-assigned an identification code using the sampling site followed by other specific information describing the sample. The sample numbering protocol is shown in Table 3-3.

Table 3-3
Sample Numbering Protocol

Sample designations	R = Riverside Site MW= Monitoring well EX = Extraction well DISCH = Total discharge DUP= blind duplicate sample TB = trip blank
Examples	RMW-7-030513: Monitoring well MW-7, collected on 05/09/2013 REXW-2-030513: Extraction well 2, collected on 05/09/2013 RDISCH-030513: Total system discharge sample collected on 05/09/2013 Dupe 1-030513: Blind duplicate collected on 05/09/2013

3.3.2 Sample Storage, Packaging, and Transportation

Samples will be placed in a cooler following collection and chilled to approximately 4°C. Following completion of each days sampling, all samples will be transported and/or shipped to the analytical laboratory, as appropriate. Samples which are routinely delivered to the laboratory on the same day as collection may not have sufficient time to chill to 4°C.

3.3.3 Sample Custody

The chain-of-custody procedures used for this project provide an accurate written or computerized record that can be used to trace the possession of each sample from the time each is collected until the completion of all required analyses. A sample is in custody if it is in any of the following places:

- In someone's physical possession
- In someone's view
- In a secured container
- In a designated secure area

The following information will be provided on the chain-of-custody form:

- Sample identification numbers
- Matrix type for each sample
- Analytical methods to be performed for each sample

- Number of containers for each sample
- Sampling date and time for each sample
- Names of all sampling personnel
- Signature and dates indicating the transfer of sample custody

All samples will be maintained in custody until formally transferred to the laboratory under a written chain-of-custody. Samples will be kept in sight of the sampling crew or in a secure, locked vehicle at all times. Samples that leave the custody of field personnel will be sealed by placing a signed and dated Custody Seal across the seam of the shipping container.

3.4 ANALYTICAL METHODS

All samples will be submitted to a commercial analytical laboratory certified by Ecology to perform the required analyses. Analytical methods are listed in Table 3-4. Laboratory reporting limits will be verified prior to analyses to ensure that, at a minimum, reporting limits for each analyte are equal to or lower than MTCA Method A cleanup levels for soil and ground water. Matrix interferences may make it impossible to achieve the desired reporting limits and associated quality control (QC) criteria. In such instances, the laboratory shall report the reason for noncompliance with QC criteria or elevated detection limits.

3.5 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance (QA)/QC checks consist of measurements performed in the field and laboratory. The analytical methods referenced in Section 3.4 specify routine methods required to evaluate data precision and accuracy, and determine whether the data are within acceptable limits.

3.5.1 Field Methods

Guidelines for minimum samples for field QA/QC sampling are summarized in Table 3-4.

Table 3-4
Guidelines for Minimum QA/QC Samples for Field Sampling

Media	Field Duplicate	Trip Blank	Equipment Blank
Water	1 per batch (Max 20 samples)	1 per cooler containing water VOCs	None – no reusable equipment

Field Duplicates

A minimum of one blind field duplicate will be analyzed per 20 samples. Field duplicates will be collected following field samples. Duplicate samples will be coded so the laboratory cannot discern which samples are field duplicates.

Trip Blanks

A trip blank shall accompany each cooler containing ground water samples for HVOC analysis. The trip blank shall be obtained from the laboratory or will be made by filling the appropriate sample containers with certified analyte-free deionized water. Trip blanks will be analyzed for HVOCs with the field samples.

3.5.2 Equipment/Rinsate Blanks

No equipment blanks will be collected because no non-disposable sampling equipment will be used.

3.5.3 Laboratory Methods and Quality Control

Specific procedures and frequencies for laboratory QA procedures and QC analyses are detailed in the laboratory's QA Plan and SOPs for each method. QC analyses will be performed by the laboratory according to their Ecology-approved SOPs.

Accuracy and precision are determined through QC parameters such as surrogate recoveries, matrix spikes, QC check samples, and blind field duplicates. A blind field duplicate sample will be analyzed as a QC sample for verification of precision and accuracy. If results of the blind field duplicate are outside the control limits, corrective action and/or data qualification will be determined after review by the Data QA Manager or his/her designee. Blind field duplication can be of poor quality because of sample heterogeneity. Therefore, the Data QA Manager will determine corrective action. QC sample requirements are listed in Table 3-2.

All analyses performed for this project must reference QC results to enable reviewers to validate (or determine the quality of) the data. Sample analysis data, when reported by the laboratory, will include QC results. All data will be checked for internal consistency, transmittal errors, laboratory protocols, and for complete adherence to the QC elements.

3.5.4 Laboratory Instruments

All instruments and equipment used during analysis will be operated, calibrated, and maintained according to manufacturer's guidelines and recommendations, and in accordance with procedures in the analytical method cited, as documented in the laboratory QA plan. Properly trained personnel will operate, calibrate, and maintain laboratory instruments. Calibration blanks

and check standards will be analyzed daily for each parameter to verify instrument performance and calibration before beginning sample analysis.

Where applicable, all calibration procedures will meet or exceed regulatory guidelines. The Data QA Manager must approve any variations from these procedures before beginning sample analysis.

After the instruments are calibrated and standardized within acceptable limits, precision and accuracy will be evaluated by analyzing a QC check sample for each analysis performed that day. Acceptable performance of the QC check sample verifies the instrument performance on a daily basis. Analysis of a QC check standard is also required. QC check samples containing all analytes of interest will be either purchased commercially or prepared from pure standard materials independently from calibration standards. The QC check samples will be analyzed and evaluated according to the EPA method criteria.

Instrument performance check standards and calibration blank results will be recorded in a laboratory instrument logbook that will also contain evaluation parameters, benchmark criteria, and maintenance information. If the instrument logbook does not provide maintenance information, a separate maintenance logbook will be maintained for the instrument.

3.6 FIELD INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

The types of field instruments and equipment that are anticipated to be used during sampling include, but are not limited to:

- PIDs
- Personal air monitors, as needed
- GPS

Equipment maintenance will be performed according to manufacturers' specifications. The frequency of inspection, testing, and maintenance will be established, based on operation procedures and manufacturers' specifications. Field personnel will be responsible for inspection, testing, and maintenance of field equipment. A hard copy of procedures and manufacturer's specifications will be provided to all field personnel working with the equipment. All equipment will be inspected and tested prior to use.

The results of inspection and testing, as well as any problems encountered and corrective actions, will be documented in the activity field notebook. The equipment serial number and date of activity will be included in notebooks so that a complete record is maintained. If problems are encountered, they will be reported to the Manager. .

3.7 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Field supplies such as sample containers and trip/rinsate blank water shall be obtained from reputable suppliers and shall be certified analyte-free. Records of certification shall be kept by the laboratory (for laboratory-supplied supplies) or by the Owner's Representative in the project file. Sampling spoons and bowls shall be food-grade and shall be purchased new.

3.8 NON-DIRECT MEASUREMENTS

The need for non-direct measurements is not anticipated for the Site Investigation. However, if the need does arise during task execution, the previously collected data will be evaluated to assess consistency with project DQOs and DQIs. Data from non-direct sources will be evaluated by the Data QA Manager prior to the data being used in analyses or in data reports.

3.9 DATA MANAGEMENT

The objectives of data management are to assure that large volumes of information and data are technically complete, accessible, and efficiently handled.

3.9.1 Field Data

The original hard (paper) copies of all field notes and laboratory reports will be stored in the project file. Photocopies of these documents should be prepared for working copies as needed.

Field data should be recorded in bound notebooks or individual sampling sheets. The field team members should review the field data for completeness prior to placing it in the files.

3.9.2 Laboratory Data

The laboratory data reports will be archived in the project files. The electronic data will be incorporated into Excel spreadsheets and archived on electronic media and placed in the project file.

4.0 ASSESSMENT AND OVERSIGHT

This section describes activities to be conducted to assess the effectiveness of project implementation and associated QA/QC activities. The purpose of the assessment is to ensure the QAPP is properly implemented.

4.1 ASSESSMENTS AND RESPONSE ACTIONS

A performance and system audit may be conducted at any time. Audits will consist of direct observation of work being performed and inspection of field and laboratory equipment. The performance and system audits will also review the sample custody procedures in the field and laboratory.

If implemented, internal audits of both the field and laboratory activities will be conducted by the Data QA Manager. Audits will be unannounced to assure a true representation of the technical and QA procedures employed.

Checklists for both field and laboratory audits will be based on National Enforcement Investigation Center (EPA 1984) Audit Checklists. The audits will be performed by persons having no direct responsibilities for the activities being performed.

The auditor or designee will prepare an audit report that includes findings, non-conformances, observations, and recommended corrective action, and a schedule for completion of such action.

For each identified nonconformance, a corrective action report will be issued as part of the audit report to notify the individual responsible for implementing the recommended corrective action and its schedule for completion. If a field corrective action is required, the Manager will be notified. If a laboratory corrective action is required, the Data QA Manager will be notified.

The audit will be distributed to the Manager.

Corrective actions may be needed for two categories of nonconformance:

- Deviations from the methods or QA requirements established in the QAPP.
- Equipment or analytical malfunctions.

During field operations and sampling procedures, the Field Sampler will be responsible for taking and reporting required corrective action. A description of any such action taken will be entered in the field notebook. If field conditions are such that conformance with the QAPP is not possible, the Manager will be consulted immediately. Any corrective action or field condition resulting in a major revision of the QAPP will be communicated to the Manager for review and concurrence.

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During laboratory analysis, the Laboratory QA Manager will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet data quality goals outlined in the QAPP, corrective action will follow the guidelines in SW-846 (EPA 1986). If analytical conditions do not conform to this QAPP, the Data QA Manager will be notified as soon as possible so that additional corrective actions can be taken.

Corrective Action Reports will document response to any reported non-conformances. These reports may be generated from internal or external audits or from informal reviews of project activities. Corrective Action Reports will be reviewed for appropriateness of recommendations and actions by the Data QA Manager for QA matters, and the Task Manager for matters of technical approach.

4.2 REPORTS TO MANAGEMENT

The Data QA Manager will be responsible for data quality assessments and associated QA Reports. All reports will be submitted to the Manager for review. Final task or investigative reports will contain a separate QA section summarizing data quality information.

5.0 DATA VERIFICATION AND VALIDATION

Data verification is confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Validation is confirmation by examination and provision of objective evidence that the particular requirement for a specific intended use have been fulfilled. Techniques for data verification and validation will be in accordance with the Guidance on Environmental Data Validation and Verification (EPA 2001b).

5.1 DATA REVIEW, VERIFICATION AND VALIDATION

All data packages provided by the laboratory must provide a summary of quality control results adequate to enable reviewers to validate or determine the quality of the data. The Data QA Manager is responsible for conducting checks for internal consistency, transmittal errors, and for adherence to the quality control elements specified in the QAPP.

Field measurements (pH, specific conductance, temperature) will be verified and checked through review of instrument calibration, measurement, and recording procedures.

A verification level validation will be performed on all field documentation and analytical data reports. The data validation process will be used to verify the data quality. The following QC elements will be reviewed, as appropriate:

- Trip blank and rinsate blank results.
- Analytical holding times.
- Preparation blank contamination.
- Check standard precision.
- Analytical accuracy (blank and matrix spike recoveries and laboratory control sample recoveries).
- Analytical precision (comparison of replicate sample results, expressed as relative percent difference [RPD]).
- Each data package will be assessed to determine whether the required documentation is of known and verifiable quality. This includes the following items:
 - Field chain-of-custody record is present, complete and signed.
 - Certified analytical report.
 - QA/QC sample results.

Data will be qualified using guidance provided in the Contract Laboratory Program (CLP) functional guidelines for assessing data (EPA 1994a, 1994b).

The Data QA Manager will prepare a quality assurance memorandum for each site describing the results of the data validation and describing any qualifiers that are added to the data.

5.2 VERIFICATION AND VALIDATION METHODS

The Data QA Manager will review the following:

- Chain-of-custody documentation
- Holding times
- Equipment/trip blank results
- Field Duplicate results
- Method blank results

A limited review (minimum 10 percent) of the following laboratory QC data results will be conducted:

- Laboratory matrix spike/matrix spike duplicate (MS/MSD) and/or matrix duplicate results
- Laboratory surrogate recoveries
- Laboratory check samples

If, based on this limited review the QC data results indicate potential data quality problems, further evaluations will be conducted.

5.2.1 Precision

Precision measures the mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. QA/QC sample types that measure precision include field duplicates, MSD, and matrix duplicates. The estimate of precision of duplicate measurements is expressed as a RPD (Relative Percent Difference), which is calculated:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2) \div 2} \times 100$$

Where D1 = First sample value
D2 = Second sample value.

The RPDs will be routinely calculated and compared with DQOs.

5.2.2 Accuracy

Accuracy is assessed using the results of standard reference material, linear check samples, and MS analyses. It is normally expressed as a percent recovery, which is calculated:

$$\text{Percent Recovery} = \frac{(\text{Total Analyte Found} - \text{Analyte Originally Present}) \times 100}{\text{Analyte Added}}$$

The percent recovery will be routinely calculated and checked against DQOs.

5.2.3 Bias

Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias will be assessed with field duplicate and laboratory matrix spike samples, similar to that described for accuracy. Bias measurements are usually carried out with a minimum frequency of 1 in 20, or one per batch of samples analyzed, under the same sampling episode.

5.2.4 Sensitivity

Sensitivity expresses the capability of a method or instrument for meeting prescribed measurement reporting limits. Sensitivity will be assessed by comparing data reporting limits with applicable cleanup criteria and analytical or instrument method reporting limits.

5.2.5 Completeness

The amount of valid data produced will be compared with the total analyses performed to assess the percent of completeness. Completeness will be routinely calculated and compared with the DQOs.

5.2.6 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data will be comparable with other measurement data for similar samples and sample conditions. Comparability of the data will be maintained by using consistent methods and units.

5.2.7 Representativeness

Sample locations and sampling procedures will have been chosen to maximize representativeness. A qualitative assessment (based on professional experience and judgment) will be made of sample data representativeness based on review of sampling records and QA audit of field activities.

5.3 RECONCILIATION AND USER REQUIREMENTS

The Data QA Manager will prepare a technical memorandum for each data package describing the results of the data review and describing any qualifiers that were added to the data. The technical memorandum will also summarize the laboratory's QC criteria and will include

recommendations on whether additional actions such as re-sampling are necessary. Technical memoranda will be submitted with the final report.

5.4 DATA REPORTING

All laboratory data packages will contain the following information:

- Cover letter
- Chain-of-custody forms
- Summary of sample results
- Summary of QC results
- Ecology Environmental Information Management (EIM) electronic data deliverable (EDD)

The minimum information to be presented for each sample for each parameter or parameters group:

Client sample number and laboratory sample number

- Sample matrix
- Date of analysis
- Dilution factors (as reflected by practical quantitation limits (PQL))
- Analytical method
- Detection/quantitation limits
- Definitions of any data qualifiers used

Additionally, sample weights/volumes used in sample preparation/analysis and identification of analytical instrument will not be reported but will be kept in laboratory records for future reference.

The minimum QC summary information to be presented for each sample for each parameters or parameter group will include:

- Surrogate standard recovery results
- Matrix QC results (matrix spike/matrix spike duplicate, duplicate)
- Method blank results

EIM EDDs will be in accordance with the most recent version of the results spreadsheet submittal capable of being quickly uploaded into the Ecology EIM database.

6.0 REFERENCES

- Ecology. 1995. Guidance for Remediation of Petroleum Contaminated Soils. November 1995.
- Ecology. 2007. Model Toxics Control Act Cleanup Regulations. Washington Administrative Code (WAC) 173-340. November 2007.
- EPA. 1983. Methods for chemical analysis of water and wastes.
- EPA. 1984. NEIC procedures manual for the evidence audit of enforcement investigations by contractor evidence audit teams. Technical Report EPA-330/9-81-003-R. U.S. Environmental Protection Agency, Washington, D.C.
- EPA. 1986. Test methods for evaluating solid waste, 3rd edition. U.S. Environmental Protection Agency, Washington, D.C. November 1986, as updated.
- EPA. 1994a. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. Office of Emergency and Remedial Response. USEPA, Washington, D.C.
- EPA. 1994b. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. Office of Emergency and Remedial Response. USEPA, Washington, D.C.
- EPA. 2001a. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5, EPA/240/B-01/003, March 2001.
- EPA. 2001b. Guidance on Environmental Data Validation and Verification. EPA QA/G-8.
- EPA. 2002. Guidance for Quality Assurance Project Plans. EPA QA/G-5. EPA/240/R-02/009, December 2002.
- EPA. 2004. Contract Laboratory Program (CLP) Guidance for Field Samplers. Appendix B. EPA/540/R-00003. August 2004.
- EPA. 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA QA/G-4. February 2006.
- HWA, 2008a Phase I Site Assessment, Hertz Rentals Property, Bothell, WA.. Prepared by HWA Geosciences, Inc. October 8, 2008
- HWA, 2008b. Phase II Site Assessment, Hertz Rentals Property, Bothell, WA.. Prepared by HWA Geosciences, Inc. October 10, 2008

APPENDIX A
OF QUALITY ASSURANCE PROJECT PLAN

Chain of Custody Form
Field Sampling Data Sheet



HWA GEOSCIENCES INC.
 21312 30th Drive SE, Suite 110, Bothell, WA 98021
 Tel: 425-774-0106 / Fax: 425-774-2714

FIELD SAMPLING DATA SHEET

Project Name: _____
 Project Number: _____
 Project Location: _____
 Client/Contact: _____

Well Number: _____
 Sample Number: _____
 Weather: _____
 Date: _____

WELL MONITORING:

Time	Well Depth	Depth to Water	Measuring Point (TOC?)	Measuring Point Elevation	Water Level Elevation	Gallons in Well (Pore Volume)	(2" case = 0.163 gal/ft) (4" case = 0.653 gal/ft)

WELL PURGING:

Time	Method	Gallons	Pore Volume	pH	Conductivity	Temperature	Dissolved Oxygen		

WELL SAMPLING:

Time	Sampling Method	Sample Analysis	Container Number	Container Volume	Container Type	Field Filtered (Y/N)	Preservative	Iced (Y/N)

COMMENTS/NOTES: (Include equipment used: Bailers, Filters, Well Probe, pH/Conductivity, Meter, etc.)

Total # of Bottles: _____ Sampler: _____ Signature: _____

EXHIBIT E

APPLICABLE PERMITS AND REQUIREMENTS

Notice of intent to construct resource protection wells under Chapter 173-160 WAC, Minimum Standards for Construction and Maintenance of Wells

All drilling and well installation work will be performed in accordance with Chapter 173-160 WAC. Prior to any well drilling or installation, a subcontracted licensed well driller will complete and submit to the Department of Ecology a Notice of Intent to Construct Resource Protection Wells.

Sanitary Sewer Discharge permit from King County Industrial Waste Division

Prior to any water discharge to the sanitary sewer, the City will submit an Industrial Waste Program Wastewater Discharge Permit Application to King County Department of Natural Resources and Parks, Wastewater Treatment Division, to obtain a discharge authorization. All discharge and required monitoring will be conducted under the Permit.

State Environmental Policy Act Integrated Compliance (RCW 43.21C.036 and WAC 197-11-250 through 259)

Compliance with SEPA, Chapter 43.21C RCW, will be achieved by conducting SEPA review in accordance with applicable regulatory requirements, including WAC 197-11-268, and Ecology guidance as presented in Ecology Policy 130A (Ecology 2004). SEPA review will be conducted concurrent with public review of the AO. Ecology will act as the SEPA lead agency and will coordinate SEPA review. The City will coordinate closely with Ecology to ensure that the two public review processes are consistent and concurrent.

EXHIBIT F

ADDENDUM TO 2013 INTERIM ACTION WORK PLAN

Letter Report (9/2/2016) - Year 3, Quarter 2 Groundwater Monitoring Report for Riverside Site.



HWA GEOSCIENCES INC.

Geotechnical Engineering • Hydrogeology • Geoenvironmental Services • Inspection and Testing

September 2, 2016

HWA Project No. 2007 098- 2012

Ms. Sunny Becker
Washington Department of Ecology
Toxics Cleanup Program, Northwest Regional Office
3190 - 160th SE Bellevue, WA 98008

Subject: **GROUND WATER MONITORING AND NEW WELL RESULTS
YEAR 3, QUARTER 2 – JUNE/JULY 2016
Riverside Site
Bothell, Washington**

Dear Ms. Becker:

This report describes quarterly ground water monitoring results and the results of two new monitoring wells at the Riverside HVOC Site, hereafter referred to as “the Site”, located in downtown Bothell, Washington.

Ground water remediation is being performed as an interim action, in response to tetrachloroethene (PCE) and its degradation products in shallow ground water at concentrations exceeding Model Toxics Control Act (MTCA) Method A cleanup levels. The interim action is being performed in accordance with the Interim Action Work Plan (IAWP) dated January 7, 2013 and per the scope of work set forth in Amendment 2 to Agreed Order DE 6295, dated April 19, 2013, between the City of Bothell (City) and the Washington State Department of Ecology (Ecology). Remediation is being performed via pump-and-treat methods, which includes ground water extraction and discharge to the sanitary sewer via King County Industrial Waste Discharge permit 4268-01. The remediation system includes four extraction wells (EW-1 through EW-4) and ten monitoring wells (RMW-4 through RMW-13 and BC-3).

Figure 1 shows a site plan with well locations. Ground water monitoring and remediation activities are described below.

GROUND WATER REMEDIATION ACTIVITIES

The ground water extraction and treatment system began operation in December 2013 and is still operating. Ground water extraction from the remediation system is measured via a totalizing flow meter placed in the effluent pipe that discharges to the King County sanitary sewer.

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September 2, 2016

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September 2, 2016
HWA Project No. 2007 098- 2012 / 2040

Quarterly discharge reports are submitted to King County Industrial Waste Division using standard forms provided by King County. The first and second quarterly discharge reports for the year 2016 are attached for reference (Appendix A). Effluent samples were collected from extraction wells EW-1 through EW-4 and from the combined discharge effluent from the remediation system. Sampling dates for extraction wells are shown in Table 1.

COMPLIANCE GROUND WATER MONITORING

This section describes performance monitoring of ground water performed during the interim action.

- First year (2014) ground water monitoring events were performed in April, June, September and December 2014.
- Second year (2015) ground water monitoring events were performed in March, June, September, and December 2015.
- A third year (2016) ground water monitoring events were performed in March and June; with two subsequent rounds remaining and tentatively scheduled for September and December 2016.

All monitoring events have included sampling some wells on a quarterly basis and some wells on a semi-annual basis in accordance with the IAWP (see Table 1).

Performance monitoring is performed to confirm that the interim action has attained cleanup standards. Performance monitoring includes collection of ground water samples from the extraction wells and selected monitoring wells, as described in Table 1 (excerpted from the IAWP).

Performance monitoring samples are analyzed for halogenated volatile organic compounds (HVOCs) and field parameters (temperature, dissolved oxygen, oxygen reduction potential, specific conductivity, and pH).

GROUND WATER ANALYTICAL RESULTS

Analytical results for ground water samples are summarized in Table 2. Figures 2, 3, and 4 show graphs of HVOCs over time as follows:

- Figure 2 - Monitoring wells, PCE vs time
- Figure 3 - Extraction wells, PCE vs time
- Figure 4 - MW-7 HVOCs vs. time

Sampling events in September 2009 and May 2013 provide ground water chemistry data from when the wells were installed, and base-line ground water chemistry data prior to initial operation of the ground water treatment system. Review of analytical results for monitoring well samples provides the following observations:

September 2, 2016
HWA Project No. 2007 098- 2012 / 2040

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September 2, 2016

HWA Project No. 2007 098- 2012 / 2040

- HVOC concentrations in the monitoring wells, including RMW-7 at the point of compliance near the river, had decreased from 2009 to 2013, before the treatment system was installed.
- HVOC concentrations in the monitoring wells after the treatment system was started have changed seasonally, but have generally remained within the same range.
- HVOC concentrations at BC-3 generally show decreasing PCE and trichloroethene (TCE) concentrations, and the presence of degradation products indicating that groundwater remediation is progressing.
- Vinyl chloride concentrations exceeding MTCA Method A cleanup level were detected in well RMW-6 in September 2009 and May 2013. However, these and other HVOC concentrations have been non-detect or below the cleanup levels since then.

Review of analytical results for extraction well samples provides the following observations and trends:

- HVOC concentrations in the extraction wells after the treatment system was started have changed seasonally, but have generally remained within the same range.
- Wells EW-1, EW-2, and EW-3 have generally contained PCE and in some cases cis 1,2-dichloroethene ((cis) 1,2-DCE) exceeding the MTCA Method A cleanup level
- Well EW-4 has the lowest HVOC concentrations, with no PCE detected above cleanup levels in the last four rounds of sampling. Vinyl chloride has been detected above cleanup levels since pumping started in EW-4.

GROUND WATER TREATMENT SYSTEM PERFORMANCE DATA

Treatment system performance data is collected on at least a monthly basis. Total discharge to-date is 5,781,512 gallons based on totalizer readings at the discharge outlet to the sanitary sewer. Average flows have been around 8,000 gallons per day, with flows up to 15,000 gallons per day during periods of higher ground water and when all wells are functioning properly. Flows have remained between 10,000 and 15,000 gallons per day since February 2016.

NEW MONITORING WELLS

Following a meeting with Ecology's site manager on June 23, 2016, two additional monitoring wells were installed on July 22, 2016. The wells were installed and sampled in response to Ecology's request for additional remedial investigation to verify recent soil gas data. HWA conducted a passive soil gas survey in January and February 2016 at the south part of the Riverside HVOC Site. The survey included installation and analysis of 35 shallow, passive soil gas samplers.

The ground water monitoring well installation activities included advancing two borings to depths of approximately 25 feet below ground surface (bgs) utilizing a truck mounted hollow stem auger drill rig. Ground water monitoring wells, identified as RMW-12 and RMW-13, were constructed of 2-inch diameter, schedule 40 polyvinyl chloride (PVC) casing with 10 feet of mill-slotted well screen placed from 15 to 25 feet bgs. The new monitoring well locations are also shown on Figure 1.

RMW-12 was located in an area where a recent passive soil gas survey detected relatively higher HVOC concentrations in shallow soil gas. The new well serves to measure HVOC concentrations in shallow ground water in this area, as well as to confirm shallow ground water HVOC concentrations previously detected in this area in a direct push boring (R-4) installed and sampled in 2008.

RMW-13 was located at the downgradient end of the site, near the river, to further define the lateral extent of the HVOC plume as it nears the river. The soil gas survey sample at this location detected 8.2 nanograms (ng) of PCE, which was flagged by the lab as an estimated quantity, i.e., below the limit of quantitation (10 ng) but above the limit of detection (5 ng). For comparison, the soil gas survey sample near RMW-12 had 533 ng of PCE.

During drilling activities, soil samples were collected from 2.5-foot soil intervals to the completion depth of each of the borings. HWA conducted field screening of soil from the borings for the presence of volatile organic vapors using a Mini-Rae PGM 75 PID. Although the PID is not capable of quantifying or identifying specific organic compounds, this instrument is useful for providing qualitative information with respect to the presence and relative concentration of organic vapors. PID readings are shown on the boring logs (Appendix B).

After well completion (on July 22, 2016), each well was developed for approximately one hour. Ground water samples were collected from each well on July 25, 2016. Ground water samples were collected using low-flow purging techniques. Field parameters were measured during purging, and included: pH, temperature, oxidation/reduction potential, dissolved oxygen, specific conductivity, and depth-to-water. Field parameter measurements were recorded on HWA field forms and ground water samples were collected once field parameters stabilized.

Soil and ground water samples were collected in clean, unused, laboratory-supplied containers, labeled with pertinent sampling information, transferred to an ice-filled, insulated cooler, and transported to the analytical laboratory under chain-of-custody procedures. Select soil samples and the ground water samples were submitted for chemical analysis of HVOCs at OnSite Environmental of Redmond, Washington, an Ecology-accredited third-party analytical laboratory. Laboratory results are included in Appendix B of this letter report and are discussed below.

Soil Analytical Results

Soil analytical results are summarized in Table 3. HVOC detections of PCE, TCE, and (cis) 1,2-DCE were identified above laboratory detection limits in three of the four soil samples submitted from RMW-12. Of these detections, only one HVOC detection was above Ecology's MTCA Method A cleanup level. PCE was detected at a concentration of 0.590 milligrams per kilogram (mg/kg) in soil sample RMW-12-22.5 (collected at a depth of 22.5 feet bgs), which is above the cleanup level of 0.05 mg/kg.

One HVOC detection above laboratory detection limits was also identified in a soil sample submitted from RMW-13. Soil sample RMW-13-17.5 (collected from a depth of 17.5 feet bgs) had a detection of (cis) 1,2-DCE that was 0.0014 mg/kg, which is well below the cleanup level of 160 mg/kg.

Ground Water Analytical Results

Ground water analytical results are summarized in Table 2. HVOC detections of PCE, TCE, and (cis) 1,2-DCE were identified above laboratory detection limits in the ground water sample submitted from RMW-12. Of these detections, PCE was detected at 120 micrograms per liter ($\mu\text{g/L}$) and TCE was detected at 19 $\mu\text{g/L}$, both of which are above the MTCA Method A cleanup levels of 5 $\mu\text{g/L}$. (cis) 1,2-DCE was not detected above the cleanup level.

Two HVOC detections above the laboratory detection limit were identified in the ground water sample submitted from RMW-13. (cis) 1,2-DCE was detected at a concentration of 1.8 $\mu\text{g/L}$, below the cleanup level of 16 $\mu\text{g/L}$, and vinyl chloride was detected at 0.24 $\mu\text{g/L}$, exceeding the cleanup level of 0.2 $\mu\text{g/L}$.

Ground Water Vertical Gradient

The vertical ground water gradient between existing deep well RMW-10 (screened at 32 to 42 feet bgs) and RMW-12 (screened at 15 to 25 feet bgs) was calculated by dividing the difference in water level elevations by the vertical elevation difference of the well screens (assumed to be the midpoint of each screen). The vertical gradient was found to be 0.046 ft/ft downward. Ground water flow in alluvial soils is primarily horizontal, due

to the layering of soils, therefore the effect of vertical gradients is minimal, but the slight downward gradient is worth noting.

CONCLUSIONS AND RECOMMENDATIONS

Analytical results of the quarterly monitoring indicate all extraction wells have been and continue to recover HVOC-impacted ground water. Analytical results indicate decreasing trends in HVOC concentrations at EW-4 and BC-3, suggesting some shrinking of the plume, although the generally similar concentrations in the other wells suggest a steady state condition, where HVOCs from upgradient areas may be replacing ground water pumped from the system. The extraction system is, however, acting as a barrier and capturing HVOC-impacted ground water that might otherwise be discharging into the river, as intended.

Analytical results of the two new wells indicates elevated HVOCs in soil and ground water in RMW-12, which confirms the 2008 results in boring R-4 (soil: 9 µg/kg PCE at 8 feet bgs; ground water: 320 µg/L at 15 feet bgs), as well as the soil gas anomaly detected in this area. The low HVOC concentrations in ground water at RMW-13 indicates the plume is narrow at its point of contact with the river (near RMW-7), and/or that the ground water pump and treat system is working to prevent HVOC discharge to the river in the area near RMW-13.

HWA recommends that additional Phase II subsurface soil gas data be collected from the northern adjacent city right-of-way and nearby upgradient properties (see attached Figure 5) to assess if these areas may be impacting the Site. Additionally, deeper ground water sampling upgradient of the Site may establish if an upgradient source is reaching the Site via deeper zones.

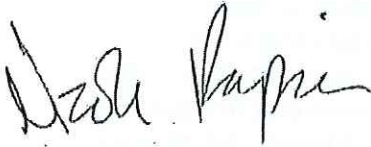
The City also plans to install two additional ground water extraction wells upgradient of RMW-7 to capture any HVOC impacted water near RMW-7 that may be outside the influence of the pumping system. These wells will be plumbed into the existing ground water treatment system already in operation at the Site, which discharges pumped ground water into a sanitary sewer under permit to King County Industrial Waste Division. The pump & treat system will be calibrated to balance the pumping from all the wells to achieve equilibrium to prevent a large amount of water from being pulled from the river. The proposed new extraction well locations are also shown on Figure 5.



September 2, 2016
HWA Project No. 2007 098- 2012 / 2040

We appreciate the opportunity to provide our services to you on this project. Please feel free to contact me if you have any questions or need additional information.

Sincerely,
HWA GEOSCIENCES INC.



Nicole Kapise
Senior Environmental Geologist



Arnie Sugar, LG, LHG
Principal Hydrogeologist

Attachments:

Table 1, Performance Monitoring per the IAWP
Table 2, Ground water analytical results, including new wells
Table 3: Analytical Results for Soil Samples, new wells

Figure 1, Site plan, well locations and HVOCs in ground water
Figure 2, Monitoring wells, PCE vs time
Figure 3, Extraction wells, PCE vs time
Figure 4, MW-7 HVOCs vs. time
Figure 5: Proposed Soil Gas Survey Exploration Plan and Proposed Extraction Well Locations

Appendix A: Year 2016 Quarterly King County Industrial Waste Reports
Appendix B: Subsurface Boring Logs, new wells
Appendix C: Laboratory Analytical Results, new wells

Table 1
Performance Monitoring
Bothell Riverside Site

Sample Type	Sampling Location	Sampling Frequency / Rationale
Preliminary Point of Compliance	Extraction well 1 Extraction well 2 Extraction well 3 Extraction well 4 RMW-7	Quarterly for one year, then modify based on results and consultation with Ecology (e.g. move to semi-annual if concentrations stabilize)
Combined discharge	Combined discharge at sewer manhole or manifold	As required by KCIWD permit
Nearby wells	BC-3 RMW-4 RMW-5 RMW-6 RMW-8 RMW-9 RMW-10	Semi-annual for one year, then modify based on results and consultation with Ecology to check for water quality impacts due to pumping

**Table 2
Bohiell Riverside Site
Ground Water Analytical Results**

Analytical Unit Identification	Screened Interval (ft top)	Date Sampled	Depth to Water (ft)	pH	Conductivity (µS)	Temp (°C)	Dissolved Oxygen (mg/L)	Oxygen Reduction Potential (ORP)	Settable Solids (mg/L)	fVOCs					Chloroform (µg/L)	NOTES	
										Tetrahalo Ethene (µg/L)	Trihalo Ethene (µg/L)	1,1-Dichloro Ethene (µg/L)	1,1,2-Dichloro Ethene (µg/L)	1,2-Dichloro Ethene (µg/L)			
MTCM Method A (Table 720-1, WAC 173-340-800) or Method B Cleanup Level										5	5	400 (B)	10 (B)	100 (B)	0.2		
KCWD Limits										7.00	240	500	1700	Total	<2000	12	
DISCH	NA	4/1/14	NA	6.48	443	15.3				25	6.3		3	<0.20	<0.20		
		6/25/14	NA	6.40	200	16.4	1.43			0.0	30	8.4	<0.20	5.9	<0.20	0.38	
		8/22/14	NA							0.2	79	18	<0.40	13	<0.40	<0.40	
		12/18/14	NA								11	2.7	<0.20	2.5	<0.20	<0.20	
		3/18/15	NA	6.54	230	15.1	1.89			0.1	25	7.4	<0.20	4.7	<0.20	<0.20	
		6/23/15	NA								11	2.3	<0.20	1.5	<0.20	<0.20	
		8/11/15	NA	6.23	245	20.55	2.68	-65.3	0	7.9	1.5	<0.20	0.77	<0.20	<0.20	0.39	
		12/8/15	NA	6.15	267	17.2	3.9	18		68	21	<0.20	15	0.33	0.91		
		3/31/16	NA	6.67	291	16.26	8.78	80.8		21	8.9	<0.20	4.4	<0.20	<0.20	0.31	
		6/29/16	NA	6.71	214	10.63	6.14	13.7		24	6.7	<0.20	4.6	<0.20	<0.20		
QC Samples										fVOCs					NOTES		
DUP	6/25/14	6/25/14								28	8.4	<0.20	6.4	<0.20	0.37	Duplicate of DISCH 6/25/14	
DUP	12/18/14	12/18/14								0.92	<0.20	<0.20	<0.20	<0.20	<0.20	Duplicate of RMW-8 12/18/2014	
Trip Blank	6/25/14									<0.20	<0.20	<0.20	<0.20	<0.20			
DUP	8/22/14	8/22/14								66	16	<0.40	<0.40	<0.40	<0.40	Duplicate of EX2 8/22/2014	
Trip Blank	3/18/15									<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
DUP	3/18/15	3/18/15								<0.40	1.0	<0.40	0.65	19	<0.40	Duplicate of RMW-7 3/18/2015	
Trip Blank	8/11/15									<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
DUP	8/11/15	8/11/15								23	1.7	<0.20	0.61	<0.20	<0.20	0.91	
Trip Blank	12/8/15									<0.2	<0.2	<0.20	<0.2	<0.20	<0.2		
DUP	12/8/15	12/8/15								2.8	0.8	<0.2	<0.2	<0.2	<0.2	Duplicate of RMW-4 12/8/15	

Bold indicates analysis detected at a concentration greater than the laboratory reporting limit.
 Yellow highlight indicates analysis exceeds MTCM cleanup level.
 MTCM = Model Toxics Control Act
 KCWD = King County Industrial Waste Discharge Limit
 Blank - Not analyzed
 NA - Not applicable

Table 3
Soil Analytical Results, New Wells

Sample Identifier	Date	Sample Depth (feet bgs)	PCE* (mg/kg)	TCE* (mg/kg)	(cis) 1,2-DCE* (mg/kg)	Vinyl Chloride* (mg/kg)
RMW-12-5'	7/22/16	5.0	<0.00088	<0.00088	<0.00088	<0.00088
RMW-12-12.5'	7/22/16	12.5	0.012	0.0061	0.0029	<0.00091
RMW-12-17.5'	7/22/16	17.5	0.024	0.0025	0.0011	<0.00099
RMW-12-22.5'	7/22/16	22.5	0.590	0.0058	<0.0010	<0.0010
RMW-13-5'	7/22/16	5.0	<0.00092	<0.00092	<0.00092	<0.00092
RMW-13-12.5'	7/22/16	12.5	<0.0015	<0.0015	<0.0015	<0.0015
RMW-13-17.5'	7/22/16	17.5	<0.00096	<0.00096	0.0014	<0.00096
RMW-22.5	7/22/16	22.5	<0.0010	<0.0010	<0.0010	<0.0010
MTCA Method A Cleanup Level			0.05	0.03	N/A	N/A
MTCA Method B Cleanup Level			476	12	160	0.67

Notes:

PCE – Tetrachloroethene

TCE – Trichloroethene

cis 1,2-DCE - cis 1,2-Dichloroethene

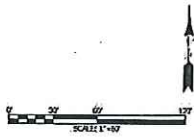
Bold – Analyte detected

Bold / highlighted – Analyte exceeds MTCA A cleanup level

mg/kg – milligrams per kilogram

N/A – Not available

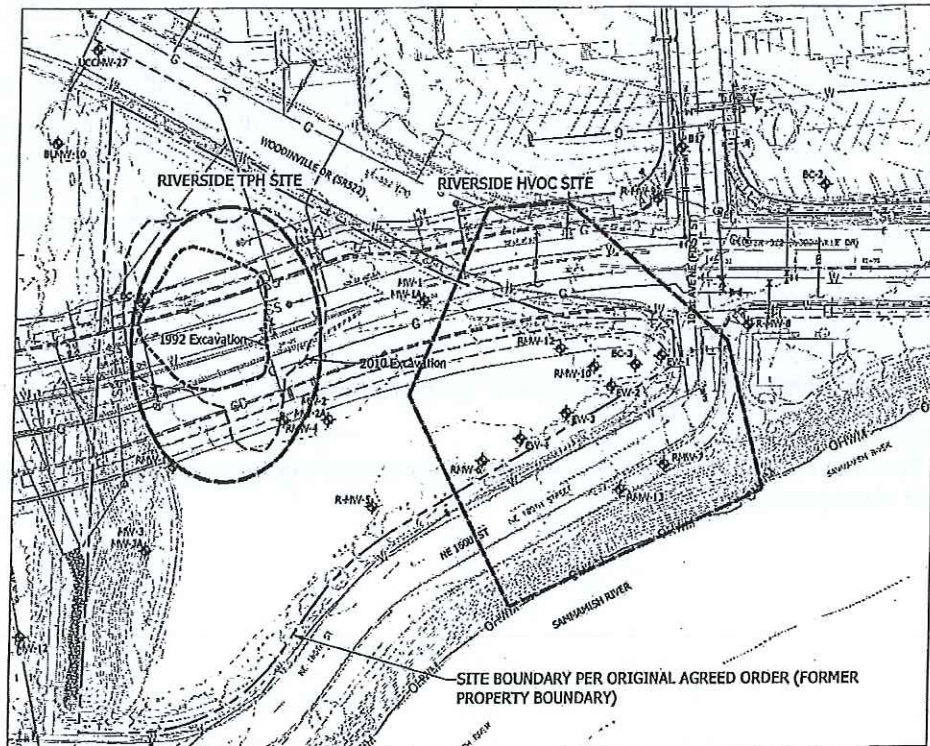
* No other HVOCs were detected above laboratory reporting limits (see Appendix B For complete list of compounds analyzed).



EXPLANATION OF SYMBOLS

- APPROXIMATE EXTENT OF 2010 CLEANUP EXCAVATION
- APPROXIMATE EXTENT OF 1990'S CLEANUP
- APPROXIMATE PROPERTY BOUNDARY
- SITE BOUNDARY

R-MW-10 MONITORING WELL LOCATIONS



SITE BOUNDARY PER ORIGINAL AGREED ORDER (FORMER PROPERTY BOUNDARY)



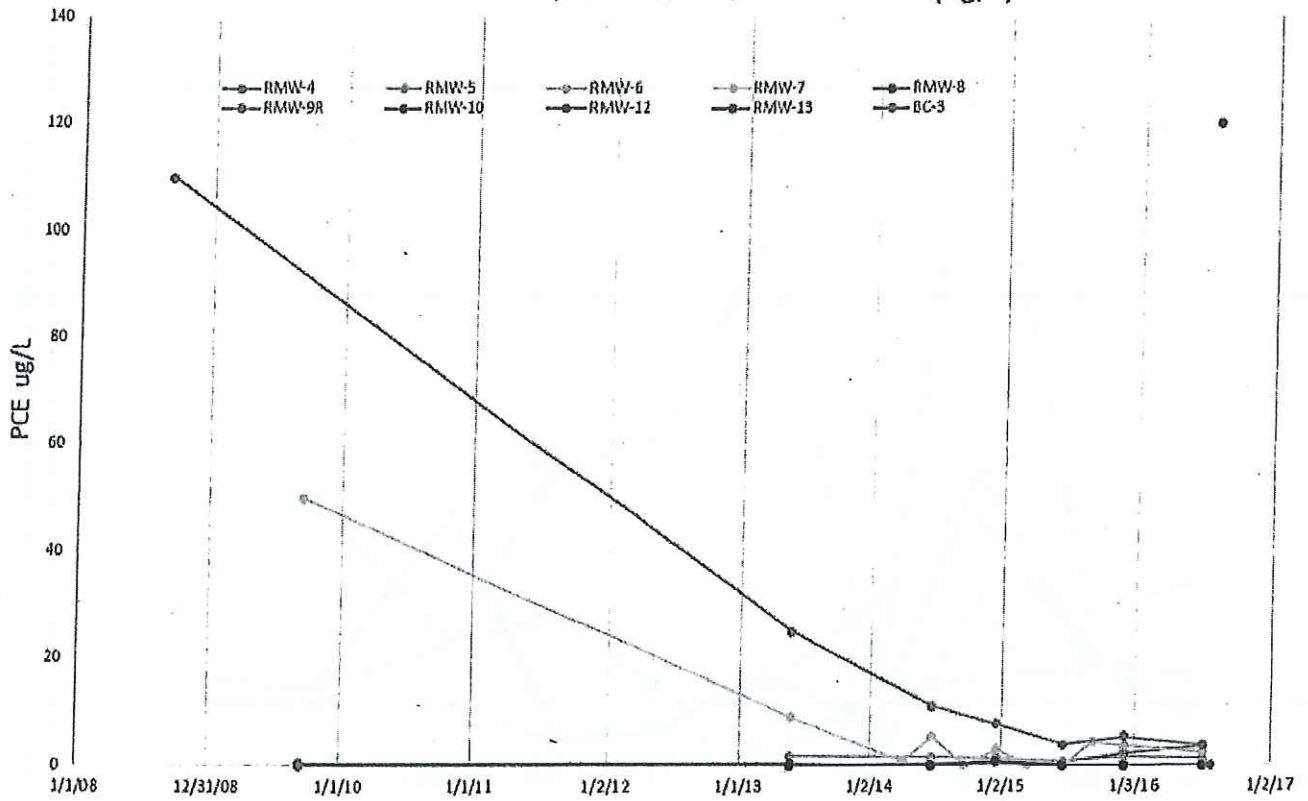
HWA GEOSCIENCES INC.

BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

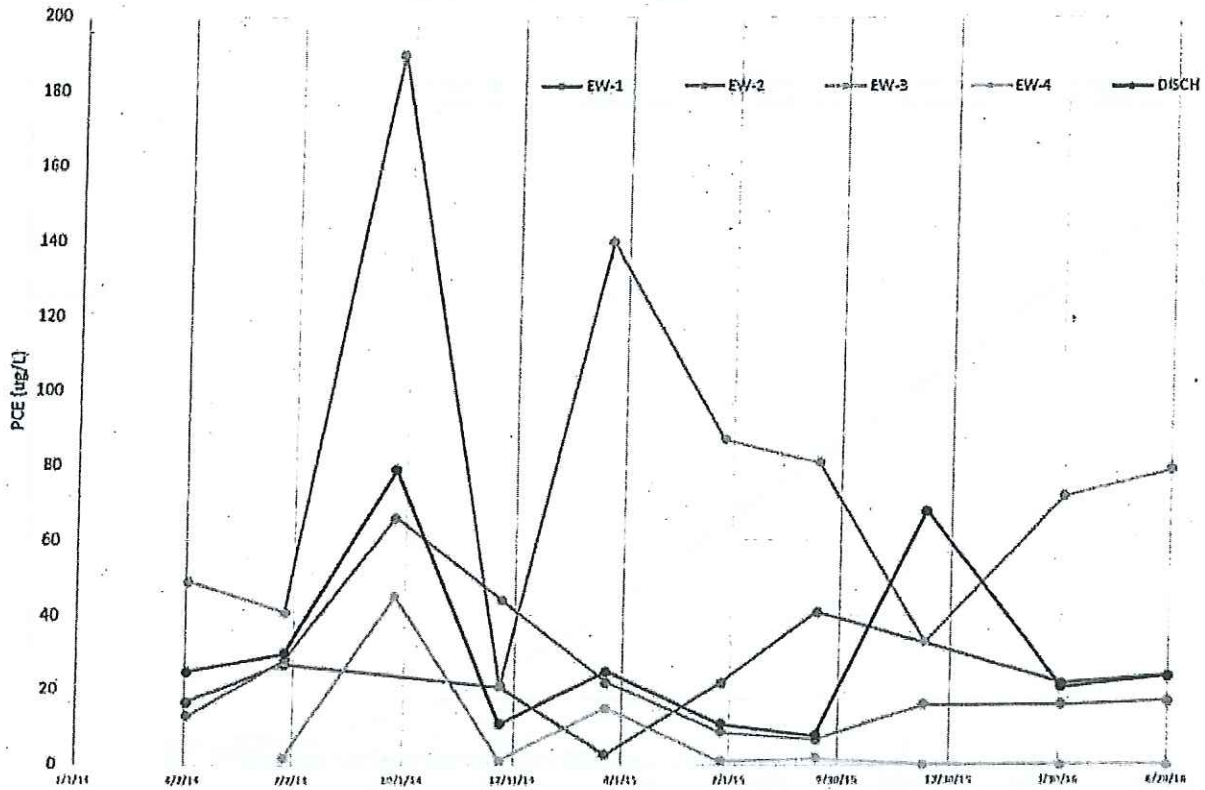
MONITORING WELL
LOCATIONS

DRAWN BY: SK	FIGURE NO. 1
CHECK BY: ES	PROJECT NO.
DATE 08,09,16	2007-098 T2012

RIVERSIDE MONITORING WELLS PCE (ug/L)



RIVERSIDE EXTRACTION WELLS PCE (UG/L)



EXTRACTION WELLS PCE (UG/L)

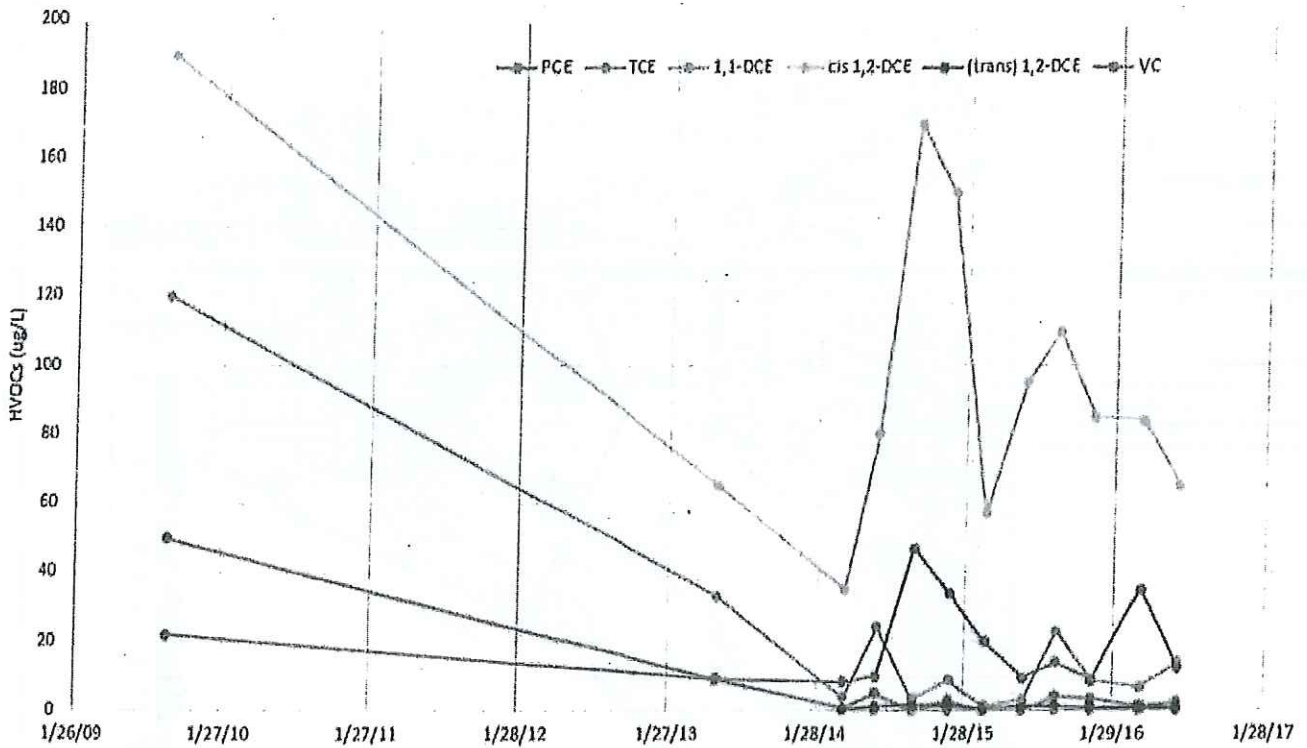
BOTHELL RIVERSIDE SITE
BOTHELL, WASHINGTON

FIGURE NO.

3

PROJECT NO
2007-098

RMW-7 HVOCs/Time



IWA | HWA GEOSCIENCES INC.

RMW-7 HVOCs (UG/L)

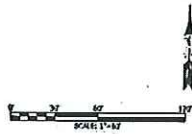
BOTHELL RIVERSIDE SITE
BOTHELL, WASHINGTON

FIGURE NO.

4

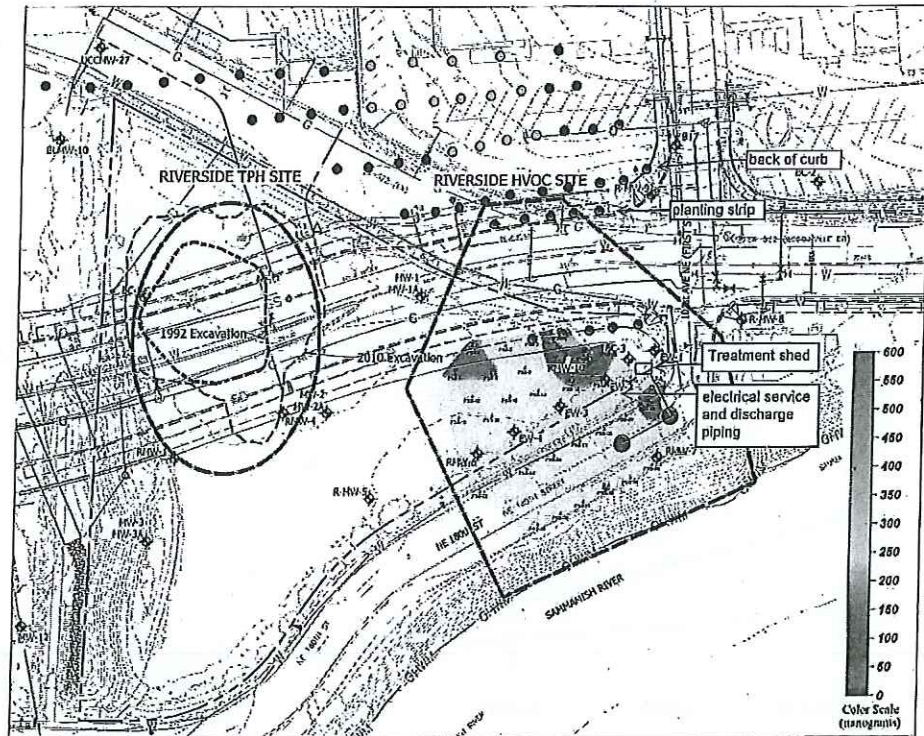
PROJECT NO

2007-098



EXPLANATION OF SYMBOLS

- APPROXIMATE EXTENT OF 2010 CLEANUP EXCAVATION
- APPROXIMATE EXTENT OF 1990S CLEANUP
- APPROXIMATE PROPERTY BOUNDARY
- SITE BOUNDARY
- R-NW-10 MONITORING WELL LOCATIONS
- ▲ PHASE 1 SOIL GAS SAMPLES, JANUARY 2016
- PROPOSED (April 2016) PHASE 2 SOIL GAS SAMPLES
- FORMER PROPOSED LOCATIONS NOT ACCESSIBLE
- ⦿ NEW (June 2016) PROPOSED PHASE 2 SOIL GAS SAMPLES



HWA GEOSCIENCES INC.

BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

SOIL GAS SURVEY
EXPLORATION PLAN

DESIGNED BY	ELLS	FIGURE NO.	1
CHECKED BY	ELLS	PROJECT NO.	2007-098 T2012
DATE	10.01.15		

8:\04\HWA\2007-098\T2012\DWG\2007-098-T2012-RI-RPT-FIG1.dwg 10/1/15 10:44 AM