STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

In the Matter of Remedial Action by: Mr. Kenneth D. (Ken) Peterson RE: Ken's Auto Wash II 1013 East University Way Ellensburg, WA 98926	AGREED ORDER No. DE 10350

TO: Mr. Kenneth D. Peterson
PO Box 677
Ellensburg, WA 98926

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I. INTRODUCTION

The mutual objective of the State of Washington, Department of Ecology (Ecology) and Ken Peterson 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 Ken Peterson to continue groundwater monitoring and to additionally perform anaerobic bioremediation if deemed necessary by Ecology to reduce restoration timeframe for the site to meet MTCA Cleanup Standards. Ecology believes the actions required by this Agreed Order are in the public interest.

II. JURISDICTION

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

III. PARTIES BOUND

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

IV. DEFINITIONS

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

A. Site: The Site is referred to as Ken's Auto Wash II and is generally located at 1013 East University Way, in Ellensburg with contamination extending into the City of Ellensburg University Way right-of-way and adjacent properties to the south. The Site is defined

by the extent of contamination caused by the release of hazardous substances at the Site and identified in original Agreed Order DE 03 TCPCR-5763. The Site constitutes a Facility under RCW 70.105D.020(5).

B. Parties: Refers to the State of Washington, Department of Ecology and Ken Peterson.

C. Potentially Liable Person (PLP): Refers to Ken Peterson.

D. Agreed Order or Order: Refers to Order, together with any amendment(s) and each of the exhibits to Order. All exhibits and amendments are integral and enforceable parts of the Order. The terms "Agreed Order" or "Order" shall include all exhibits to this Order.

V. FINDINGS OF FACT

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

A. On November 14, 2006 Hart Crowser completed a Remedial Investigation and Feasibility Study on behalf of Ken Peterson for the Ken's Auto Wash II Site (Remedial Investigation and Feasibility Study, Ken's Auto Wash, 1013 East University Way, Ellensburg, Washington, Hart Crowser, Inc., November 14, 2006, 7168-04) as required by the previous Agreed Order DE 03 TCPCR-5763. The Feasibility Study portion of that report concluded that monitored natural attenuation was the preferred remedy for the site, following the prior removal of tanks and 'hot spot' soil contamination and some contaminated groundwater at the site. Hart Crowser, Inc. acting for Ken Peterson engaged in groundwater monitoring according to the provisions in Section IV of Agreed Order DE 03 TCPCR-5763.

B. Groundwater monitoring data in 2010 indicated that natural attenuation was not occurring at a rate that would result in an acceptable restoration timeframe for achieving MTCA Method A cleanup standards for groundwater at the site. Groundwater data that formed the basis for this decision is included in the Groundwater Monitoring Report, Ken's Auto Wash, 2012 Annual Report, 7168-10, Hart Crowser, Inc., June 13, 2013.

C. In 2011, Hart Crowser implemented an enhanced bioremediation program consisting of three remedial injection events which occurred on January 31, May 3, and November 30. The remediation product injected into the subsurface was composed of hydrocarbon-degrading microbes, surfactants, and nutrients. Following the series of injections, groundwater performance monitoring was conducted in February 2012 to evaluate the effectiveness of the remedial action.

D. Ken Peterson agreed to complete a supplemental feasibility study, and this Supplemental Feasibility Study, Ken's Auto Wash, Ellensburg, Washington, June 13, 2013, 7168-11, Hart Crowser, Inc., is included as Exhibit A to this Agreed Order. The Supplemental Feasibility Study concludes that the preferred alternative is enhanced biodegradation with monitored attenuation after comparison in that document with monitored natural attenuation, monitored natural attenuation with passive product recovery and air sparging with soil vapor extraction.

E. Following the in-situ enhanced bioremediation, Ecology requested completion of an interim action plan documenting a proposed approach to assess the methodology. The Interim Action Plan (IAP), In Situ Enhanced Attenuation of Petroleum Hydrocarbons, Ken's Auto Wash, Ellensburg, Washington, Hart Crowser, June 13, 2013, is included as Exhibit C to this Order.

VI. ECOLOGY DETERMINATIONS

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

A. The previously selected remedy, monitored natural attenuation did not show evidence of being able to achieve groundwater cleanup standards at the site within a reasonable restoration timeframe as required under WAC 173-340-360(1)(b)(ii) and (4). WAC 173-340-360(4)(f) states that extending the restoration timeframe shall not be used as a substitute for active remedial measures when such actions are practicable.

B. Pursuant to RCW 70.105D.030(1) and .050(1), Ecology may require PLPs to investigate or conduct other remedial actions with respect to any release or threatened release of

hazardous substances, whenever it believes such action to be in the public interest. Based on the foregoing facts, Ecology believes the remedial actions required by this Order are in the public interest.

C. 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. The IAP is a plan to assess an active remedial measure as described in WAC 173-340-360(4)(f). This IAP is a Treatability Study as described in WAC 173-340-350-(9)(c) and is required by this Order. Based on these circumstances, Ecology has determined that an interim action is warranted under WAC 173-340-430.

Ecology or Ken Peterson may propose additional interim actions at the Site. After consulting with Ken Peterson, Ecology will determine if the interim action(s) are warranted under WAC 173-340-430. Any interim action must be approved by Ecology under Section VII.C.

VII. WORK TO BE PERFORMED

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

A. Ken Peterson shall continue to implement the Interim Action described in the IAP (Exhibit C) for Ken's Auto Wash II for a minimum of at least one year beginning within 90 days of issuance of this Agreed Order. Groundwater sampling during implementation of the IAP shall be designed to evaluate and document reductions in contaminant concentration, and post-treatment rebound in contaminant concentrations, if any. The current Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) from the Bioremediation Work Plan

(Exhibit B) shall be used. The groundwater compliance monitoring schedule is included at the end of this Section.

B. Annual IAP reports shall be prepared and submitted to Ecology to assess the effectiveness of the interim action as determined by the groundwater compliance monitoring results. Ecology will provide comments on the annual reports, if needed. Within thirty (30) days of receiving Ecology comments, Ken Peterson shall submit a final report to Ecology for approval, which document shall be responsive to Ecology's comments to the satisfaction of Ecology.

C. Following evaluation of the IAP Report in 2014, Ecology will determine whether or not the in-situ enhanced attenuation of petroleum hydrocarbons has been demonstrated to be capable of achieving a reasonable restoration timeframe at the site based on performance during the treatability study. Ecology will notify Ken Peterson in writing of its finding in that regard. If Ecology determines that the IAP actions can achieve cleanup in a reasonable restoration timeframe, Ecology may authorize Ken Peterson to continue the in-situ enhanced attenuation as a final cleanup action under this Agreed Order without further public notice or amendment of this Order.

D. The annual IAP Report shall include as-built documentation, detailed description(s) of remedial actions, analytical results for groundwater contamination levels and forward projection of trends, if any, in contaminant concentrations.

E. If Ecology determines that additional interim action is warranted under Section VI.C. and this additional interim action is distinctly different from that proposed in the previously submitted IAP; Ken Peterson shall prepare and submit to Ecology a revised 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 additional Interim Action Work Plan(s) in accordance with WAC 173-340-600(16). The PLP shall not conduct the additional interim action(s) until Ecology approves the revised Interim Action Work Plan. Upon approval by Ecology, the revised Interim Action Work Plan becomes an integral and enforceable

part of this Order, and Ken Peterson is required to conduct the additional interim action in accordance with the approved Interim Action Work Plan.

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

G. All documents required under this Agreed Order shall be submitted first in draft form for Ecology review and comment. Ecology will seek to be timely in responding with comments. Final documents shall be responsive to Ecology comments to Ecology's satisfaction before finalization. All documents shall be provided in hard copy (3 copies) and electronic form, except that electronic data provided to EIM under Ecology's Toxics Cleanup Program Policy 840 (Data Submittal Requirements) need not be concurrently provided in hard copy if previously provided in other reports. Documents must comply with Section VIII. D. (Performance) of Agreed Order.

Groundwater Compliance Monitoring Schedule

Monitoring Well	Purpose	2013 - 2017 [a]	2018 - 2021	2022 [b]
MW-2	Bound Plume - East	Annual [c]		Quarterly
MW-3	Background	Annual [c]	Biannual [e]	Quarterly
MW-4/4R	Source Area (Upgradient Edge)	Quarterly [d]	Biannual [e]	Quarterly
MW-5	Bound Plume – West	Annual [c]		Quarterly
MW-6	Plume Extent	Quarterly [d]	Biannual [e]	Quarterly
MW-12[f]	Bound Plume – Southwest	NA	NA	NA
MW-13	Downgradient Point of Compliance	Quarterly [d]	Biannual [e]	Quarterly
MW-14	Source Area	Quarterly [d]	Biannual [e]	Quarterly
MW-15	Bound Plume - Southeast	Annual [c]		Quarterly

Notes:

Monitoring will include groundwater sample collection (for chemical analyses specified below) and measurement of groundwater levels and field parameters. If injections are performed into the well, the well will be field-tested for nitrate, nitrite, ammonium, and ferrous iron.

[a] Timeline assumes injections are performed and amendment concentrations have not reduced to pre-injection levels. If the site enters monitored attenuation, sampling defaults to 2018 scope.

[b] Final compliance monitoring would include analysis for NWTPH-Gx, BTEX, and total lead.

[c] Annual monitoring includes analysis of NWTPH-Gx, BTEX, nitrate, sulfate and total lead.

[d] Quarterly monitoring includes analysis of NWTPH-Gx, BTEX, nitrate, and sulfate.

[e] Biannual refers to twice per year and would be based on typical high and low groundwater elevations at the site. Includes analysis of NWTPH-Gx, BTEX, nitrate, sulfate, and total lead.

[f] MW-12 was either buried or destroyed after February 2012.
Schedule assumes 5-year review by Ecology following 2013 sampling round.
Schedule after 2018 is tentative pending Ecology 5-year review.
Monitoring schedule after 2022, if necessary, will be based on review of previous data.
Blank entries indicate no monitoring planned in specific wells.

VIII. TERMS AND CONDITIONS OF ORDER

A. Remedial Action Costs

Ken Peterson shall pay to Ecology costs incurred by Ecology pursuant to this Order consistent with WAC 173-340-550(2). These costs shall include work performed by Ecology or its contractors for, or on, the Site under Chapter 70.105D RCW, including remedial actions and Order preparation, negotiation, oversight, and administration. These costs shall include work performed both prior to and subsequent to the issuance of this Order. Ecology's costs shall include costs of direct activities and support costs of direct activities as defined in WAC 173-340-550(2). Ecology has not accumulated any remedial action costs related to this facility as of October 1, 2013. For all costs incurred subsequent to October 1, 2013, Ken Peterson 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. Implementation of Remedial Action

If Ecology determines that Ken Peterson has failed without good cause to implement the remedial action, in whole or in part, Ecology may, after notice to Ken Peterson, perform any or all portions of the remedial action that remain incomplete. If Ecology performs all or portions of

the remedial action because of Ken Peterson's failure to comply with its obligations under this Order, Ken Peterson shall reimburse Ecology for the costs of doing such work in accordance with Section VIII.A (Remedial Action Costs), provided that Ken Peterson is not obligated under this Section to reimburse Ecology for costs incurred for work inconsistent with or beyond the scope of this Order.

Except where necessary to abate an emergency situation, Ken Peterson 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.

C. Designated Project Coordinators

The project coordinator for Ecology is:

John Mefford, LG
15 W. Yakima Ave., Ste. 200, Yakima, WA 98902-3452
509-454-7836

The project coordinator for Ken Peterson is:

Angie Goodwin, LG, LHG
Hart Crowser, Inc.
1700 Westlake Avenue, North, Suite 200
Seattle, WA 98109-6212
206-826-4495

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 Ken Peterson, 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.

D. Performance

All geologic and hydrogeologic work performed pursuant to this Order shall be under the supervision and direction of a geologist or hydrogeologist licensed in the State of Washington or

under the direct supervision of an engineer registered in the State of Washington, except as otherwise provided for by Chapters 18.220 and 18.43 RCW.

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

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

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

Ken Peterson 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. Notification of the identity of those carrying out the terms of this newly issued Order previously submitted under the original Order need not be resubmitted.

E. Access

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

F. Sampling, Data Submittal, and Availability

With respect to the implementation of this Order, Ken Peterson 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, Ken Peterson shall allow Ecology and/or its authorized representative to take split or duplicate samples of any samples collected by Ken Peterson pursuant to implementation of this Order. Ken Peterson shall notify Ecology seven (7) days in advance of any sample collection or work activity at the Site. Ecology shall, upon request, allow Ken Peterson 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.E. (Access), Ecology shall notify Ken Peterson prior to any sample collection activity unless an emergency prevents such notice.

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

G. Public Participation

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

considerations which indicate to Ecology that this Order is inadequate or improper in any respect.

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

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

2. Notify Ecology's project coordinator prior to the preparation of all press releases and fact sheets, and before major meetings with the interested public and local governments. Likewise, Ecology shall notify Ken Peterson prior to the issuance of all press releases and fact sheets, and before major meetings with the interested public and local governments. For all press releases, fact sheets, meetings, and other outreach efforts by Ken Peterson that do not receive prior Ecology approval, Ken Peterson 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. Ellensburg Public Library
209 N. Ruby St., Ellensburg, WA 98926

b. Ecology's Central Regional Office
15 W. Yakima Ave., Ste. 200, Yakima, WA 98902-3452

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 Central Regional Office in Yakima, Washington.

H. 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, Ken Peterson 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, Ken Peterson shall make all records available to Ecology and allow access for review within a reasonable time.

Nothing in this Order is intended by Ken Peterson to waive any right it may have under applicable law to limit disclosure of documents protected by the attorney work-product privilege and/or the attorney-client privilege. If Ken Peterson withholds any requested records based on an assertion of privilege, Ken Peterson 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.

I. Resolution of Disputes

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

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

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

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

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

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

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

J. Extension of Schedule

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

a. The deadline that is sought to be extended;

b. The length of the extension sought;

c. The reason(s) for the extension; and

d. Any related deadline or schedule that would be affected if the extension were granted.

2. The burden shall be on Ken Peterson 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 Ken Peterson 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 Ken Peterson;

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

c. Endangerment as described in Section VIII. L (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 Ken Peterson.

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

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

a. Delays in the issuance of a necessary permit which was applied for in a timely manner;

b. Other circumstances deemed exceptional or extraordinary by Ecology; or

c. Endangerment as described in Section VIII. L. (Endangerment).

K. 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. M. (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 Ken Peterson. Ken Peterson shall submit a written request for amendment to Ecology for approval. Ecology shall indicate its approval or disapproval in writing and in a timely manner after the written request for amendment is received. If the amendment to this Order represents a substantial change, Ecology will provide public notice and opportunity to comment. Reasons for the disapproval of a proposed amendment to this Order shall be stated in writing. If Ecology does not agree to a proposed amendment, the disagreement may be addressed through the dispute resolution procedures described in Section VIII. I. (Resolution of Disputes).

L. 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 Ken Peterson to cease such activities for such period of time as it deems necessary to abate the danger. Ken Peterson shall immediately comply with such direction.

In the event Ken Peterson 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, Ken Peterson may cease such activities. Ken Peterson 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 Ken Peterson shall provide Ecology with documentation of the basis for the determination or cessation of such activities. If Ecology disagrees with Ken Peterson's cessation of activities, it may direct Ken Peterson to resume such activities.

If Ecology concurs with or orders a work stoppage pursuant to Section VIII. L. (Endangerment), Ken Peterson'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. J. (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.

M. Reservation of Rights

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

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

By entering into this Order, Ken Peterson does not admit to any liability for the Site. Although Ken Peterson is committing to conducting the work required by this Order under the terms of this Order, Ken Peterson 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.

N. 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 Ken Peterson 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 Ken Peterson's transfer of any interest in all or any portion of the Site, and during the effective period of this Order, Ken Peterson 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, Ken Peterson shall notify Ecology of said transfer. Upon transfer of any interest, Ken Peterson shall notify all transferees of the restrictions on the activities and uses of the property under this Order and through the appropriate transfer mechanism, assure that any activities and uses inconsistent with this Order are prohibited.

O. Compliance with Applicable Laws

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

2. Pursuant to RCW 70.105D.090(1), Ken Peterson is exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals. However, Ken Peterson shall comply with the substantive requirements of such permits or approvals. At this time, no state or local permits or approvals have been identified as being applicable but procedurally exempt under this section.

Ken Peterson has a continuing obligation to determine whether additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order. In the event either Ecology or Ken Peterson determines that additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order, it shall promptly notify the other party of its determination. Ecology shall determine whether Ecology or Ken Peterson shall be responsible to contact the

appropriate state and/or local agencies. If Ecology so requires, Ken Peterson 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 Ken Peterson and on how Ken Peterson must meet those requirements. Ecology shall inform Ken Peterson in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Order. Ken Peterson shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination.

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

P. Periodic Review

As remedial action, including groundwater monitoring, continues at the Site, the Parties agree to review the progress of remedial action at the Site, and to review the data accumulated as a result of monitoring the Site as often as is necessary and appropriate under the circumstances. At least every five (5) years after the initiation of cleanup action at the Site the Parties shall meet to discuss the status of the Site and the need, if any, for further remedial action at the Site.

At least ninety (90) days prior to each periodic review, Ken Peterson shall submit a report to Ecology that documents whether human health and the environment are being protected based on the factors set forth in WAC 173-340-420(4). Ecology reserves the right to require further remedial action at the Site under appropriate circumstances. This provision shall remain in effect for the duration of this Order.

Q. Indemnification

Ken Peterson 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 Ken Peterson, its officers, employees, agents, or contractors in entering into and implementing this Order. However, Ken Peterson 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 Ken Peterson's receipt of written notification from Ecology that Ken Peterson has completed the remedial activity required by this Order, as amended by any modifications, and that Ken Peterson has complied with all other provisions of this Agreed 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:

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

b. 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: December 23, 2013

Kenneth D. (Ken) Peterson

Kenneth D. Peterson
Owner, Ken's Auto Wash II
1013 East University Way (aka E. 10th Ave)
Ellensburg, WA 98926
509-962-8500

STATE OF WASHINGTON,
DEPARTMENT OF ECOLOGY

Valerie Bound
Section Manager
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Central Regional Office
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Supplemental Feasibility Study
Ken's Auto Wash
Ellensburg, Washington

Prepared for
Ken's Auto Wash

June 13, 2013
7168-11

HARTCROWSER

Supplemental Feasibility Study
Ken's Auto Wash
Ellensburg, Washington

Prepared for

June 13, 2013
7168-11

Prepared by
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SUPPLEMENTAL FEASIBILITY STUDY
KEN'S AUTO WASH
ELLENSBURG, WASHINGTON

1.0 INTRODUCTION

This Supplemental Feasibility Study (SFS) presents an updated review of key technical considerations for addressing petroleum hydrocarbon impacts at the Ken's Auto Wash site in Ellensburg, Washington (Figure 1). This review includes an expanded evaluation of remedial alternatives identified in Hart Crowser's November 14, 2006, Remedial Investigation and Feasibility Study (RI/FS).

The 2006 RI/FS presented detailed results of the sampling and analysis program and detailed evaluations of a range of potential cleanup actions at the site. This SFS builds upon, but does not duplicate, the RI/FS. Please refer to the RI/FS for a more complete discussion of site characterization, data, analysis, and previous engineering evaluations.

1.1 Updated Site Description and Use

Ken's Auto Wash (the site) is located at 1013 East University Way in Ellensburg, Washington (Figure 2), at the northwest corner of East University Way and Alder Street. The property, a former gas and service station, covers approximately 15,000 square feet (0.35 acre). The site is currently occupied by Ken's Auto Wash (a three-stall car wash) and Winegar's, (a retail ice cream and coffee shop). The site is paved with concrete beneath the car wash on the southern half of the site and with asphalt to the north and east of the car wash and retail shop. Properties to the west and south are unpaved and are commonly used for parking.

1.2 Previous Preferred RI/FS Cleanup Alternative

When the RI/FS was submitted to the Washington State Department of Ecology (Ecology) in 2006, monitored natural attenuation (MNA) with passive product recovery was identified as the most practicable option for addressing historical petroleum hydrocarbon releases at the site. While the submitted RI/FS did not complete the formal Ecology review process, the preferred RI/FS cleanup action was implemented. MNA performance has been assessed through periodic groundwater monitoring that includes ongoing

assessment of plume stability, monitoring for free product, and evaluating natural petroleum degradation.

1.3 Interim Action Plan Summary

During 2010, Hart Crowser reviewed MNA progress since 2006. The review determined that the flux of native electron acceptors (e.g., dissolved oxygen, nitrate, and sulfate) may not be sufficient to achieve remediation within a reasonable time frame, altering conclusions related to remedy cost and effectiveness. A summary of this review is provided in Section 2.1. Since the RI/FS was submitted, several enhanced attenuation technologies have increased the applicability of more aggressive techniques to address residual contamination at the site.

During 2011, an Interim Action was conducted to evaluate applicability of a new bioremediation technology: enhanced anaerobic oxidation (EAO). As part of this evaluation, groundwater concentrations of natural oxidants (nitrate and sulfate) were increased. Additional petroleum-degrading microbes, nutrients, and conservative tracers were introduced, and surfactant was injected at strategic locations along the petroleum plume axis. Based on the results of the Interim Action, EAO has been additionally identified as a viable cleanup technology for the site. This SFS incorporates the new EAO approach and reevaluates these technologies to select a final remedy.

2.0 CURRENT NATURE AND EXTENT OF CONTAMINATION

Groundwater monitoring has been conducted since submittal of the RI/FS in accordance with the schedule in Table 1. The focus of the monitoring program was to assess natural attenuation performance as it relates to the RI/FS list of potential chemicals of concern. These include gasoline-range total petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, xylene (BTEX), and lead. No additional soil data have been collected since the RI/FS.

Based on groundwater elevation and TPH-G concentration data trends, most of the residual contamination remains in two areas, in unexcavated soil between MW-4R and MW-14 and near the top of the smear zone under the street and sidewalk north of MW-6 (Figure 2 and Table 2). This remaining source material is likely contributing to periodic exceedances of Model Toxics Control Act (MTCA) Method A groundwater cleanup levels for TPH-G near wells MW-14 and MW-6. Benzene has not been detected in groundwater at the site since October 2008, including during surfactant application that was

implemented as part of the 2011 EAO Interim Action. Measurable free product has not been identified at the site since 2004 (Table 3), making free product recovery unnecessary.

2.1 Natural Attenuation Assessment

A comprehensive summary of data related to natural attenuation parameters are presented in Table 4, including dissolved oxygen (DO), nitrate, nitrite, sulfate, and ferrous iron concentrations. The groundwater concentration of key natural attenuation oxidants were averaged from September 2003 through November 2010 and presented in Table 5. This data aided in evaluating natural oxidant flux through on to the site, oxidant utilization across the site, and more accurately predict project-specific attenuation time frames. For averaging purposes, non-detect results used the detection limit. Ferrous iron data was not assessed. The migration of oxidized iron into contaminated areas is not likely to be a significant source of petroleum oxidation.

Complete attenuation calculations are presented in Table 6. In general, the concentrations presented in Table 5 represent a very low mass of available natural electron acceptors moving onto the site. Therefore, the ability of native microbes to generate appreciable natural attenuation activity is very limited. Ideal background oxidant concentrations would be 9 mg/L of DO, 10 mg/L of nitrate, and 100-200 mg/L of sulfate. These higher concentrations of electron acceptors would support more aggressive petroleum oxidation.

In addition to poor natural electron acceptor availability, the small concentration declines indicate that use of available oxidants across the petroleum plume is incomplete. Ideally, DO would be 0 mg/L, nitrate would be non-detect (0.1 mg/L), and sulfate would be non-detect (0.4 mg/L). Incomplete oxidant use can indicate poor microbial activity or poor petroleum bioavailability. As a result of low acceptor availability and poor oxidant use, the more comprehensive assessment of natural attenuation time frames suggests it may be as long as 30 years before concentrations consistently meet cleanup levels.

Calculation Assumptions. Natural electron acceptor data and estimated petroleum concentrations were converted to hydrogen equivalents in order to compare influences equally. Hydrogen equivalent data was then coupled with previous seepage velocity estimates for the site (1.2 feet/day) to more accurately estimate the flux of used oxidants through the estimated residual petroleum mass. During this microbial respiration process, we assumed that 50 percent of natural electron acceptor flux would be used for complete

petroleum respiration (destruction) while the energy present in the remainder of the petroleum would be used for cellular maintenance, division, or released as volatile fatty acids (VFAs) for downgradient oxidation.

Although the mixed monitoring well interval may have concentrations of only 1.0 to 2.0 mg/L, calculations assumed that a discrete, 3-foot interval of the upper smear zone would exhibit a higher seasonal TPH-G pore volume concentration. Diffusion and dispersion reduces this discrete concentration on an aquifer-wide basis, but degradation rates are dictated by the flux of oxidants through this contaminated zone. To reliably achieve cleanup goals, calculations assumed an effective reduction of 3.0 mg/L in the top 3 feet of smear zone across an estimated 5,500 square feet of impacted soil. Calculations were not adjusted to account for seasonal contact of natural oxidants with the top of the smear zone.

2.2 IAP Performance Assessment Summary

Interim Action-related parameters are also presented in Table 4, including bromide and chloride tracers, and pre-injection screening for ferrous iron, nitrate, nitrite, and ammonia via colorimetric field kits. This data was used to assess petroleum response, amendment distribution, groundwater travel times, and amendment consumption across the treatment zone. The data suggest that methods deployed during the Interim Action did not result in mobilization of petroleum or migration of amendment outside of the existing plume footprint.

Groundwater data (Table 2) suggest that significant petroleum destruction was achieved because of the EAO remediation technique. This conclusion is based on the following observations.

- Decreasing petroleum concentrations during seasonal high water table levels (late spring) while under the influence of surfactants and microbially mediated desorption. Lower maximum concentrations under these conditions are an indirect indicator of lower petroleum mass adsorbed to the soil matrix.

- Field observations of significant bicarbonate formation. Under neutral pH conditions, carbon dioxide produced from petroleum oxidation can spontaneously form bicarbonate anions. These observations were made during attempts to preserve some samples collected in petroleum-impacted areas after EAO amendment injections. The addition of acid preservative to bicarbonate-rich groundwater caused carbon dioxide bubbling in the samples.

Note that petroleum concentrations observed in monitoring well MW-14 are believed to be biased high through November 2012 because the source area is still under the influence of amendment injections into MW-4R and MW-3. Under more normal two-phase equilibrium (i.e., adsorbed versus dissolved), petroleum concentrations are likely to be much lower and more directly indicative of reduced petroleum mass. We would expect to see a more normal equilibrium once oxidant concentrations and conductivity return to baseline (pre-injection) conditions. While oxidant loading is a more direct measure of inferred biological activity/desorption, conductivity is an indirect measure of amendment movement due to nutritive salts, iron-cycling, and VFA formation. We typically assume this amended/altered groundwater may still contain some concentration of introduced surfactant.

3.0 UPDATED IDENTIFICATION OF CLEANUP TECHNOLOGIES

The 2006 RI/FS developed a range of cleanup alternatives for possible application at the site. Since the 2006 RI/FS preparation, additional technologies have been developed or refined, potentially making them applicable to the site. An updated assessment of these technologies is provided below.

3.1 Technology Screening

We identified the following remediation technologies to be potentially applicable for addressing remaining petroleum contamination.

- **Natural Attenuation.** Natural attenuation relies on the natural flux of electron acceptors such as molecular oxygen, nitrate, sulfate, and carbon dioxide to biologically degrade remaining petroleum hydrocarbons. This process relies on native bacteria to use these electron acceptors over time without any intervention.

- **Enhanced *In Situ* Bioremediation.** This technology relies primarily on the addition of electron acceptors (oxidants) into soil and/or groundwater to biologically degrade residual petroleum hydrocarbons. Surfactants, nutrients, or specialized microbes may also be added and introduced via periodic slug injections or continuous recirculation. Oxygen could be added to groundwater using air or ozone sparging, direct oxygen infusion, or oxygen release compound (ORC) injection. Nitrate and sulfate could also be added as lower-energy electron acceptors, as was completed during the EAO interim action.

- ***In Situ* Chemical Oxidation.** This technology relies on the introduction of strong chemical oxidants such as ozone, persulfate, or peroxides, to chemically react and destroy residual petroleum hydrocarbons. As part of this process, the oxidation byproducts (e.g., molecular oxygen, sulfate) can provide secondary degradation via enhanced bioremediation.

- **Soil Vapor Extraction.** Soil vapor is physically removed from the subsurface. Volatile contaminants in soil evaporate, and the vapor is treated above ground. An increased flow of oxygen that is induced by a vacuum into the subsurface stimulates secondary biodegradation of petroleum hydrocarbons.

- **Air Sparging.** Atmospheric air or air that is enriched with oxygen or ozone is bubbled into the groundwater. Oxygen in the introduced air dissolves into the groundwater and stimulates biodegradation of remaining petroleum hydrocarbons. Ozone provides some level of chemical oxidation, which produces oxygen as a byproduct. Some volatile contaminants in groundwater evaporate into the injected air and are transported into the vadose zone.

While *in situ* chemical oxidation is a potentially applicable technology, this alternative was screened from further consideration due to uncertain reliability and the cost-effectiveness of the technology to treat the small mass of residual contamination. Chemical oxidation requires direct physical contact between the reactive amendment and petroleum hydrocarbons to be effective. Given that the most recent soil data is from 2005, updated and detailed soil sampling would be required to accurately assess the current distribution of residual petroleum mass to provide cost-effective treatment. This additional cost, along with the high cost of implementation and potential risk to utilities within the treatment zone, eliminated chemical oxidation from further evaluation.

3.2 Remedial Alternative Descriptions

In this section, we reiterate remedial action objectives presented in the 2006 RI/FS and compare updated estimated project costs and preliminary remediation time frames for the four remedial alternatives that could achieve these objectives. MTCA requires, at a minimum, that cleanup actions protect human health and the environment, comply with cleanup standards, comply with applicable state and federal laws, and provide for compliance monitoring. Using the updated technologies identified in Section 3.1, we refined our assessment of remedial alternatives that meet these

requirements. These alternatives are listed below and are compared in Table 7.

- Alternative 1 – Monitored Natural Attenuation;
- Alternative 2 – Monitored Natural Attenuation with Passive Product Recovery;
- Alternative 3 – Enhanced Biodegradation with Monitored Attenuation; and
- Alternative 4 – Air Sparging and Soil Vapor Extraction.

Table 7 also provides updated cost estimates for each of the evaluated alternatives. The level of accuracy of these estimated costs is "order of magnitude," as defined by the American Association of Cost Engineers. The target accuracy of an order of magnitude estimate is plus 50 percent and minus 30 percent. Construction cost estimates at this level may be used to compare alternatives, but should not be used to plan, finance, or develop projects. Estimated alternative costs were calculated using a present worth analysis assuming a discount rate of 1.1 percent for 5-year returns or less, 2.0 percent for returns between 5 and 10 years, and 2.7 percent for returns greater than 10 years. These discount rates are based on rates from December 2012 listed in the Office of Management and Budget Circular A-94. Nominal estimated Ecology oversight costs are included for each alternative. Costs include a contingency for replacing up to three monitoring wells over the lifetime of each alternative.

Note that estimated costs are for comparing alternatives and do not include costs for preparation and review of deliverables associated with a second Agreed Order, if issued by Ecology, to complete remediation. Tasks may include preparation of a Cleanup Action Plan, interaction with Ecology, and related project management. Costs are expected to be comparable for Alternatives 1 and 2, which are estimated to be in the $15,000 to $30,000 range. Costs for Alternatives 3 and 4 may also be comparable and are estimated to be in the $25,000 to $50,000 range.

Alternative 1 - Monitored Natural Attenuation

Monitored natural attenuation consists of allowing naturally occurring processes such as dilution, dispersion, adsorption, and subsequent biodegradation to destroy petroleum mass and reduce concentrations. As discussed above, this process is currently occurring at the site under extended time frames due to low natural oxidant flux and incomplete use of

available oxidants. However, this approach is potentially effective at the site under extended time frames.

Continued periodic groundwater monitoring would be required to verify the destruction of contaminants and to confirm that the contaminant plume in groundwater does not expand. Continued monitoring for DO, nitrate, and sulfate constituents would indicate the degree of microbial use of these natural oxidants for ongoing biodegradation.

This approach provides minimal site or area impacts. Note that for comparison with Alternative 2, Alternative 1 does not include removal of residual free product that may appear near the source area. As a MTCA requirement, removal of residual free product was included in Alternative 2, as discussed below. A free product monitoring program would continue to ensure that free product does not reappear at well MW-14 and confirm that any potential product is not migrating to downgradient wells. Free product has not been detected in well MW-14 since 2004, which was immediately followed by the UST removal and ORC injection in 2005. There is no indication that free product is present or migrating in the subsurface.

Assuming there are no pockets of free product within the soil matrix at the site, the projected remediation time frame could range between 20 and 30 years. While a current assessment of remaining petroleum mass following the Interim Action is difficult because of stimulated conditions, the 30-year time frame is accurate based on pre-interim action concentrations and natural oxidant use. Estimated costs range from $468,000 to $595,000.

Alternative 2 - Monitored Natural Attenuation with Passive Free Product Recovery

This alternative is similar to Alternative 1 except that a sorbent sock or similar passive recovery device would be placed in any well where free product was observed. If free product remains in the subsurface, natural attenuation time frames to meet MTCA Method A groundwater cleanup levels would likely be much longer. Free product represents a substantial petroleum mass to be degraded under site-specific conditions. Although not observed since 2004, free product may still be present near the southern border of the UST excavation or may have migrated over time to locations under University Way. Active free product recovery is not viable, nor is it expected to be necessary because only a small amount of free product has been historically observed at the site. Passive free product recovery would minimize the potential for petroleum product migration and would reduce

natural attenuation time frames compared to not removing measurable product.

Assuming no product is present, a 20-year minimum was used for cost estimating purposes, consistent with Alternative 1. If free product is still present, for cost estimating purposes, a 50-year period would be required for reaching target groundwater cleanup levels. Estimated costs range from about $468,000 (assuming no free product is present) to $808,000 (assuming free product is present).

Alternative 3 - Enhanced Biodegradation and Monitored Attenuation

Several treatment strategies were initially considered as part of this alternative. These include direct injection of amendments into areas of suspected contamination; closed-loop groundwater recirculation of soluble amendments; and a series of amendment injections. These technologies were all considered as potentially viable approaches to enhancing biodegradation. However, because of the extensive gravel fill material in key areas of contamination at the site, amendment injections into existing infrastructure was selected as the preferred approach for accelerating petroleum biodegradation. Based on the apparent success of the EAO interim action, alternative 3 is modeled after lessons learned during implementation.

The preferred enhanced biodegradation approach complements anaerobic processes already occurring at the site, including denitrification and sulfate reduction. The preferred approach includes introduction of high-solubility nitrate and sulfate salts into groundwater to improve oxidant availability; introducing non-pathogenic microbes and nutrients to rapidly populate the subsurface with microbes capable of using natural and injected oxidants; and surfactants to improve bioavailability of weathered petroleum hydrocarbons. Amendments would be dosed into the aquifer using existing infrastructure and based upon anticipated changes in groundwater elevations over the subsequent quarter. Passive migration of oxidants along the plume axis and through gravel backfill areas would rapidly degrade remaining petroleum hydrocarbons in groundwater and on soil.

This approach has a couple of advantages over oxygen delivery methods such as ORC, direct oxygen introduction via recirculation, or oxygen infusion. First, nitrate and sulfate have saturation limits that are orders of magnitude higher than dissolved oxygen, resulting in greater potential treatment effectiveness per injection. Second, native microbes are more likely to use

dissolved oxygen for shifting geochemistry back to aerobic conditions, including re-oxidation of sulfides, mineralized ferrous iron, manganese (II), or ammonium/nitrite within the treatment zone. All these processes compete with petroleum oxidation and increase treatment effort/duration. While nitrate can re-oxidize iron and manganese, once nitrate is consumed and sulfate dominates as the most abundant oxidant, these minerals are reduced again to help oxidize petroleum. This process is known as metals cycling and engages a broader group of microbes than relying on sulfate alone.

Because the preferred nitrate/sulfate approach has minimal impact on site geochemistry, there is greater risk of overtreatment and subsequent migration of amendment beyond the plume boundary and in to the redox recovery zone south of University Way. Once in this area, there is increased risk that the oxidants won't be consumed and will dilute out into the broader aquifer. To address this risk, this alternative assumes wet season amendment injections and includes the option of monitored natural attenuation polishing. With microbes more active, natural oxidant use is likely to be enhanced.

To assess performance, quarterly groundwater monitoring would be conducted during periods of amendment application or while nitrate and/or sulfate concentrations are high enough that they could pose a risk of off-site migration. Any incidental amendment mass that does migrate off the site poses minimal risk to the public based on our review of well logs in the area. During preparation of the underground injection permit required to perform the interim action, we found the nearest groundwater supply was approximately 1,500 feet west of the site and was used for irrigation. No surface water impacts are anticipated.

If the site entered monitored attenuation and the risk of off-site migration no longer exists, semiannual seasonal monitoring would resume. The active injection monitoring scope is comparable to that of monitored natural attenuation except the field kit sampling would be discontinued.

For cost-comparison purposes, we estimate that amendment application would be completed within 5 years, 200 pounds of free product is present, five injection wells would be redeveloped, and monitored attenuation could continue for another 5 years after active treatment. Under this alternative, the presence of free product has a reduced influence on total alternative costs and duration as the introduced surfactants and microbial activity would quickly dissolve the product and make it more bioavailable for oxidation/destruction. Small increases in amendment dosing could successfully address this additional mass. Amendment applications may be

limited to high-water periods of the year to maximize contact with upper reaches of the smear zone. The full estimated cost of this alternative is up to $490,000. If post-interim action data suggests only 5 years of natural attenuation and no well replacements are required, the low end of anticipated costs is $194,000.

Alternative 4 - Air Sparging and Soil Vapor Extraction

Two aggressive technologies were identified in the Focused Feasibility Study and detailed in the 2006 RI/FS: (1) air sparging; and (2) air sparging combined with soil vapor extraction (SVE). These technologies remain applicable for the site and no substantive updates in 2006 RI/FS Alternative 4 scope or effort were identified. However, during implementation of the Interim Action, changes at the site obscured the location of the previously installed air sparging pipe, potentially burying the pipe under new asphalt and concrete. We assume that another set of sparge lines would need to be installed, if necessary.

Implementing this alternative would require installing four vapor extraction wells, five sparging wells, piping, and a secure equipment compound containing a sparging blower, SVE blower, knockout drum, 500-gallon condensate collection tank, and control panel. Sound enclosures would be placed around the blowers, but the blowers would still be audible when running.

The updated estimated cost for this alternative, based on an operating lifetime of 5 to 7 years for comparative purposes including 1 year of monitoring, ranges from about $448,000 to $530,000. The estimated operating lifetime is based on our experience at similar sites with comparable conditions, and is intended for cost comparison and planning purposes only.

3.3 Evaluation of Alternatives

These four proposed alternatives would meet the threshold requirements for cleanup actions outlined in WAC 173-340-360 (2)(a): they protect human health and the environment, comply with cleanup standards, comply with applicable state and federal laws, and provide for compliance monitoring. In Table 7, we evaluate each of the four alternatives described in Section 7.2 based on their use of permanent solutions to the maximum extent practicable and on the ability of each alternative to provide for restoration in a reasonable time frame following the criteria described in WAC 173-340-360.

Alternative 1 meets the criteria described in WAC 173-340-360, except if free product is discovered in the future. Alternative 2 provides additional control and removal of free product, but the presence of free product may result in a substantially elongated project lifetimes due to slow attenuation rates. Alternatives 3 and 4 would provide significantly faster source removal than Alternative 1 or 2, but Alternative 4 has disproportionately higher costs and resource utilization.

It should be noted that Alternatives 3 or 4 could achieve cleanup goals faster than the conservatively estimated time projections. While there have been significant advancements in *in situ* treatments, there is no assurance of this outcome.

4.0 PREFERRED REMEDIAL ALTERNATIVE IDENTIFICATION

Alternative 3 - Enhanced Biodegradation and Monitored Natural Attenuation was identified as the preferred remedial alternative. This alternative provides for a more reasonable restoration time frame in accordance with WAC 173-340-360(4).

Recent monitoring data indicates that the Interim Action mobilized a substantial petroleum mass from the source area soil matrix and was successful in stimulating more aggressive oxidation. Injected oxidants have not been detected at MW-13, the downgradient compliance monitoring well, through 2012. While above-baseline levels of sulfate persist in the former source area, additional treatments may be desired to further accelerate attenuation.

This alternative meets site RAOs: it prevents direct contact with contaminated soil by maintaining the existing asphalt and concrete surfaces; eliminates free product to the extent practicable using surfactants and microbial activity; and in relatively short time frames, reduces soil and groundwater concentrations below cleanup levels by natural degradation processes.

Alternative 3 would be sufficiently protective of human health and the environment and is the most cost-effective alternative. It is highly unlikely that injected amendments would migrate to beneficially used groundwater wells, exit to surface water, or pose a risk due to incidental groundwater contact by future construction workers. Contaminants will be completely destroyed *in situ* while using a minimum of energy and natural resources.

Monitoring would be conducted to ensure that this alternative remains protective of human health and the environment.

A preliminary monitoring schedule is included in Table 8. This schedule includes the continuation of periodic monitoring for natural attenuation parameters to demonstrate that introduced oxidants are being consumed and contaminants are degraded *in situ*. Monitoring frequency for wells along the treated plume axis will continue on a quarterly basis while amendments persist above background levels (i.e., historical pre-interim plan concentration ranges). For wells demonstrated to not be influenced by amendment injections along the axis plume, monitoring would be performed annually. Following sufficient oxidant treatment, monitored attenuation of residual concentrations will be conducted on a biannual basis, during wet and dry season conditions.

Every 5 years, in accordance with Ecology policy, we assume that the site data would be reviewed by Ecology to ensure the alternative is still protective of human health and the environment, that the contaminant plume is still contained, that injected amendments have not migrated outside the historical plume boundary, and that groundwater concentration trends show constituent concentrations are decreasing.

5.0 REFERENCES

AFCEE 2004. Principles and Practices of Enhanced Anaerobic Bioremediation of Chlorinated Solvents. Prepared by Air Force Center for Engineering.

DEQ 2006. Risk-Based Concentrations for Individual Chemicals. August 16, 2006.

Hart Crowser 2006. Remedial Investigation and Feasibility Study, Ken's Auto Wash, 1013 East University Way, Ellensburg, Washington. November 14.

Hart Crowser 2013. Draft Interim Action Plan, *In Situ* Enhanced Attenuation of Petroleum Hydrocarbons, Ken's Auto Wash, Ellensburg, Washington. March 1, 2013.

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Table 1 - Groundwater Monitoring Schedule Since 2006 RI/FS
Ken's Auto Wash
Ellensburg, Washington

Well	Purpose	2007	2008	2009	2010	2011	2012
MW-2	Bound Plume - East	Biannual	Biannual	[a]	Annual	Annual [b]	Annual
MW-3	Background	Biannual	Biannual	[a]	Annual	Quarterly [b]	Annual
MW-4/4R	Source Area (Upgradient Edge)	Biannual	Biannual	Annual	Annual	Quarterly [b]	Quarterly
MW-5	Bound Plume - West	Biannual	Biannual	Annual	Annual	Annual [b]	Annual
MW-6	Plume Extent	Biannual	Biannual	[a]	Annual	Quarterly [b]	Quarterly
MW-12	Bound Plume - Southwest	Biannual	Biannual	Annual	Annual	Annual [b]	Annual
MW-13	Bound Plume - South	Biannual	Biannual	[a]	Annual	Annual [b]	Quarterly
MW-14	Source Area	Biannual	Biannual	Annual	Annual	Quarterly [b]	Quarterly
MW-15	Bound Plume - Southeast	Biannual	Biannual	[a]	Annual	Annual [b]	Annual

Notes:

Biannual refers to twice yearly events targeted during spring (Q2) and fall (Q4). Annual refers to the fall (Q4) event. Biannual and annual monitoring schedules were based on estimated seasonal high and low groundwater elevations.

Monitoring includes measurement of groundwater elevation and dissolved oxygen and collection of a groundwater sample for analysis by NWTPH-G/BTEX and total lead.

Monitoring also includes field and/or laboratory analysis for natural attenuation parameters nitrate/nitrite, sulfate, and/or ferrous iron.

a Although not required, wells MW-2, MW-3, MW-6, MW-13, and MW-15 were monitored during the fall of 2006 and 2009.

b Quarterly monitoring conducted May 2011 through February 2012 as part of the Interim Action Plan evaluating enhanced anaerobic oxidation. Additional laboratory analysis included nitrate, sulfate, chloride, and bromide.

Table 2 - Summary of Groundwater Analytical Data - TPH-G, BTEX, and Lead
Ken's Auto Wash
Ellensburg, Washington

		Concentration in µg/L					Concentration in µg/L	
Well ID	Date Sampled	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-1	4/8/1996	**160,000**	**2,500**	**19,000**	**3,000**	**21,000**	**65**	--
	1/5/1998	--	--	--	--	--	--	--
	4/6/1998	**100,000**	**180**	260	**940**	**9,800**	**180**	--
	7/6/1998	**93,000**	**110**	200	**760**	**8,800**	**220**	--
	10/5/1998	--	--	--	--	--	--	--
	12/29/1999	**21,600**	**87.4**	47.7	657	**3,900**	--	**21.3**
	3/21/2000	**19,800**	**94.1**	59.6	479	**2,710**	--	**16.5**
	6/14/2000	**18,800**	**94.9**	26.4	471	**2,870**	--	8
	9/12/2000	**21,400**	**111**	35.1	496	**2,930**	--	6.54
MW-14	1/30/2001	**7,450**	**19.3**	14	424	673	--	--
(Replaces MW-1)	4/26/2001	**26,100**	**37.2**	29.7	580	**2,680**	--	--
	7/29/2001	**14,200**	**10.3**	14.2	318	**1,480**	--	--
	10/27/2001	**9,970**	**46.4**	4.55	187	707	--	--
	11/15/2002	**8,380**	**11**	2.5 U	122	357	--	--
	5/9/2003	**4,520**	2.62	0.5 U	0.775	172	5.33	--
	9/30/2003	**6,230** J	**11.7** J	1.61 J	151 J	369 J	4.56	--
	12/11/2003	**5,890**	**12.6**	5.0 U	5.0 U	271	12.4	--
	3/31/2004	**6,270**	**12.6**	5 U	80.4	168.4	4.85	--
	6/2/2004	**3,790** J	2.36 J	0.5 U	26.9 J	88.1 J	4.12	--
	9/30/2004	**5,700** J	**5.52**	2.5 U	82.1	256	4.29	--
	12/14/2004	**5,500** J	4.36	0.643	66.1	178	--	--
	4/4/2005	**8,100** J	**6.89**	0.746	75.8	221	--	--
	10/6/2005	**4,070** J	**7.85**	0.5 U	43.1	62.8	3.7	--
	6/28/2006	533	0.545	0.5 U	0.593	5.34	3.41	--
	11/13/2006	496	0.933	0.5 U	6.89	5.99	3.03	--
	5/25/2007	54	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	**3,050**	**7.6**	2.58	28.1	20	2.31	--
	6/4/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	**2,040**	4.76	0.5 U	16.6	15.1	1.85	--
	10/14/2009	**2,030**	12.2 U	0.844 U	18.9	33.8	2 U	--
	11/15/2010	**2,500**	0.25 U	1.0 UJ	7.6	10.7	1	--
	5/2/2011	**3,100**	1.0 U	1.7	1.4	1.3	--	--
	7/27/2011	**3,700**	1.0 U	1.2	3.0	2.8	--	--
	11/2/2011	**1,200**	0.25 U	0.3 U	3.4	1.8	2.0	--
	2/13/2012	**2,200**	0.25 U	0.25 U	1.8	8.6	--	--
	5/23/2012	250 U	1.00 U	1.00 U	1.00 U	2.00 U	**--**	--

Table 2 - Summary of Groundwater Analytical Data - TPH-G, BTEX, and Lead
Ken's Auto Wash
Ellensburg, Washington

		Concentration in µg/L					Concentration in µg/L	
Well ID	Date Sampled	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-14 (cont.)	8/22/2012	**870**	0.25 U	0.26	0.27	0.81	**--**	--
	11/6/2012	**1,200**	0.25 U	0.40	3.60	2.81	10.9	--
MW-2	4/8/1996	50 U	1 U	1 U	1 U	1 U	5 U	--
	1/5/1998	50 U	1 U	1 U	1 U	1 U	15	5 U
	4/6/1998	50 U	1 U	1 U	1 U	1 U	5 U	--
	7/6/1998	50 U	1 U	1 U	1 U	1 U	**21**	--
	10/5/1998	50 U	1 U	1 U	1 U	1 U	**34**	--
	12/29/1999	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	3/21/2000	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	6/14/2000	50 U	0.5 U	0.5 U	0.55	3.41	--	1 U
	9/12/2000	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	1/30/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/26/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	7/29/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/27/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/15/2002	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	5/9/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	2.61	--
	12/11/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	3/31/2004	**13,000**	10 U	119	180	**2,541** J	1 U	--
	6/2/2004	**1,480**	2.10	0.5 U	0.5 U	11.0	1 U	--
	9/30/2004	**1,290** J	2.40	0.5 U	0.859	5.11	1 U	--
	12/14/2004	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	101	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/6/2005	160	0.741	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	--	--	--	--	--	--	--
	11/13/2006	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/4/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	**20.8**	--
	10/14/2009	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
	11/15/2010	100 U	0.25 U	0.5 U	0.25 U	0.75 U	1 U	--
	11/2/2011	100 U	0.25 U	0.25 U	0.25 U	0.75 U	0.3	--
	11/6/2012	100 U	0.25 U	0.25 U	0.25 U	0.75 U	0.1	

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Ken's Auto Wash
Ellensburg, Washington

		Concentration in µg/L										Concentration in µg/L			
Well ID	Date Sampled	TPH-Gasoline		Benzene		Toluene		Ethyl-benzene		Total Xylenes		Total Lead		Diss. Lead	
MW-3	4/8/1996	50	U	1	U	1	U	1	U	1	U	5	U	--	
	1/5/1998	50	U	1	U	1	U	1	U	1	U	5	U	--	
	4/6/1998	50	U	1	U	1	U	1	U	1	U	5	U	--	
	7/6/1998	50	U	1	U	1	U	1	U	1	U	5	U	--	
	10/5/1998	50	U	1	U	1	U	1	U	1	U	3.8		--	
	12/29/1999	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	3/21/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	6/14/2000	50	U	0.5	U	0.85		0.5	U	1	U	--		1	U
	9/12/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	1/30/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/26/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	7/29/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/27/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/15/2002	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	5/9/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/11/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	3/31/2004	50	U	0.2	U	0.2	U	0.2	U	0.5	U	1	U	--	
	6/2/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2004	50	UJ	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/14/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/4/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/6/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/28/2006	--		--		--		--		--		--		--	
	11/13/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	5/25/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/8/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/4/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/21/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/14/2009	80	U	0.5	U	0.5	U	0.5	U	1	U	2	U	--	
	11/15/2010	100	U	0.25	U	0.5	U	0.25	U	0.75	U	1	U	--	
	5/2/2011	250	U	1.0	U	1.0	U	1.0	U	2.0	U	--		--	
	7/27/2011	250	U	1.0	U	1.0	U	1.0	U	2.0	U	--		--	
	11/2/2011	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.1	U	--	
	2/13/2012	100	U	0.25	U	0.25	U	0.25	U	0.75	U	--		--	
	11/6/2012	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.1	U	--	

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Ken's Auto Wash
Ellensburg, Washington

		Concentration in µg/L					Concentration in µg/L	
Well ID	Date Sampled	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-4	1/5/1998	200	1 U	27	1	3	10	5 U
	4/6/1998	400	3	14	1	6	5 U	--
	7/6/1998	50 U	1 U	3	1 U	1 U	5 U	--
	10/5/1998	150	1 U	7	1 U	1 U	2	--
	12/29/1999	301	**51.4**	32.5	0.5 U	6.08	--	1 U
	3/21/2000	414	**44.8**	28.2	1.92	3.2 U	--	1 U
	6/14/2000	439	**69.7**	4.91	2.01	6.8	--	1 U
	9/12/2000	101	4.49	0.5 U	0.5 U	0.5 U	--	1 U
	1/31/2001	182	2.22	1.17 U	0.5 U	1.33 U	--	--
	4/26/2001	673	**8.79**	4.73	4.28	28.6	--	--
	7/29/2001	402	**24.3**	16.3	2.84	14.8	--	--
	10/27/2001	200	**24.9**	2.62	1.15	6.57	--	--
	11/15/2002	75.6	0.858	0.5 U	0.5 U	1 U	--	--
	5/9/2003	61.8	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	161	0.730	0.5 U	2.59	2.59	1 U	--
	12/11/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	3.22	--
	3/31/2004	267	**29.0**	1.43	1 U	2.94	1 U	--
	6/2/2004	140	**46.4**	4.2	0.5 U	1 U	1 U	--
	9/30/2004	88.7 J	0.5 U	0.5 U	1.83	1 U	1 U	--
	12/14/2004	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
MW-4R	4/4/2005	112	1.93	0.5 U	0.5 U	1 U	--	--
(Replaces MW-4)	10/6/2005	744	0.929	0.5 U	9.31	3.57	19	--
	6/28/2006	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	11/13/2006	107	0.5 U	0.5 U	0.5 U	1 U	5.82	--
	5/25/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	75.2	0.5 U	0.5 U	0.5 U	1 U	0.325	--
	6/4/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	6.98	--
	10/14/2009	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
	11/15/2010	100 U	0.25 U	0.5 U	0.25 U	0.75 U	1 U	--
	5/2/2011	250 U	1.0 U	1.6	1.0 U	2.0 U	--	--
	7/27/2011	980	1.0 U	250	1.0 U	2.0 U	--	--
	11/2/2011	100 U	0.25 U	14	0.25 U	0.75 U	0.1	--
	2/13/2012	100 U	0.25 U	0.25 U	0.25 U	0.75 U	--	--
	5/23/2012	250 U	1.00 U	1.00 U	1.00 U	2.00 U	--	--
	8/22/2012	100 U	0.25 U	0.25 U	0.25 U	0.75 U	--	--

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Ellensburg, Washington

		Concentration in µg/L										Concentration in µg/L			
Well ID	Date Sampled	TPH-Gasoline		Benzene		Toluene		Ethyl-benzene		Total Xylenes		Total Lead		Diss. Lead	
MW-4R (cont.)	11/6/2012	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.1	U	--	
MW-5	1/5/1998	**6200**		1		57		3		160		5	U	--	
	4/6/1998	**2800**		2		30		2		27		5	U	--	
	7/6/1998	50	U	1	U	1	U	1	U	1	U	10		--	
	10/5/1998	**4700**		2		39		16		94		7.4		--	
	12/29/1999	779		2.96		0.69		9.03		27.4		--		1	U
	3/21/2000	519		0.5	U	13.9		4.95		3.6		--		1	U
	6/14/2000	708		3.45	U	1.17	U	1.08		1	U	--		1	U
	9/12/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	4/26/2001	**831**		**7.35**		0.516		15.3		1	U	--		--	
	7/29/2001	53.8		0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/27/2001	552		3.29		0.5	U	1.28		1.58		--		--	
	11/15/2002	108		0.5	U	0.5	U	0.5	U	0.5	U	--		--	
	5/9/2003	78.7		0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2003	229		0.5	U	0.5	U	0.5	U	1.61		1	U	--	
	12/11/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	3/31/2004	53		0.2	U	0.2	U	0.2	U	0.5	U	1	U	--	
	6/2/2004	92.8		0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/14/2004	308		0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/4/2005	620		1.45		0.5	U	0.5	U	1.07		--		--	
	10/6/2005	114		0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/28/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	11/13/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	5/25/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/7/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/4/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/22/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/15/2009	80	U	0.5	U	0.5	U	0.5	U	1	U	2	U	--	
	11/15/2010	170		0.25	U	0.5	U	0.25	U	0.75	U	1	U	--	
	11/2/2011	100	U	0.25	U	0.25	U	0.25	U	0.75	U	2.1		--	
	11/6/2012	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.1			
MW-6	1/5/1998	**2,200**		**53**		17		9		93		5	U	--	
	4/6/1998	**4,200**		**51**		16		25		110		5	U	--	
	7/6/1998	**6,900**		**11**		19		1		510		11		--	
	10/5/1998	**5,800**		**43**		22		48		240		12		--	
	12/29/1999	**2,090**		**11.5**		2		35.1		65.1		--		1	U

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Well ID	Date Sampled	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-6 (cont.)	3/21/2000	**1,580**	0.75 U	14.3	28.7	61	--	1 U
	6/14/2000	**2,170**	**9.78**	1.03 U	33.1	101	--	1 U
	9/12/2000	**1,630**	**12.8**	1.2 U	27.9	75.7	--	1 U
	4/26/2001	**1,320**	**11.3**	0.906	1.41	3.37	--	--
	7/29/2001	**5,050**	**8.71**	4.99	189	536	--	--
	10/27/2001	**1,910**	**15.3**	0.786	1.67	5.49	--	--
	11/15/2002	**1,270**	**9.01**	0.5 U	0.594	1.85	--	--
	5/9/2003	**1,710**	1.79	0.5 U	1.29	21.2	1.29	--
	9/30/2003	**1,610**	**16.7**	2.50 U	2.91	7.96	1 U	--
	12/11/2003	624	**5.67**	0.50 U	0.737 J	2.19 J	1 U	--
	3/31/2004	**1,160**	0.520	0.2 U	0.350	0.5 U	1 U	--
	6/2/2004	**2,300** J	4.78 J	0.5 U	54.0 J	75.5 J	1.29	--
	9/30/2004	**1,150** J	**8.34** J	0.5 J	0.553 J	2.92 J	1 U	--
	12/14/2004	672	3.57	0.5 U	0.5 U	1.42	--	--
	4/4/2005 [b]	**1,010**	**5.91**	0.5 U	0.5 U	1.86 [c]	--	--
	10/6/2005	**1,380** J	**8.10**	0.5 U	0.632	1.94	1 U	--
	6/28/2006	--	--	--	--	--	--	--
	11/13/2006	**826**	3.3	0.5 U	0.5 U	1.89	1 U	--
	5/25/2007	**1,460**	0.5 U	0.5 U	25.6	1.22	--	--
	11/7/2007	729	3.53	0.5 U	0.5 U	1.69	1 U	--
	6/4/2008	**1,550**	1.93	0.5 U	30.8	2.78	1 U	--
	10/22/2008	**855**	3.1	0.5 U	0.933	3.37	1 U	--
	10/14/2009	501	7.59 U	0.5 U	1.18 U	1 U	2 U	--
	11/15/2010	450	0.25 U	0.49	0.25 U	0.75 U	1 U	--
	5/2/2011	490	1.0 U	1.0 U	1.0 U	2.0 U	--	--
	7/27/2011	610	1.0 U	1.0 U	1.0 U	2.0 U	--	--
	11/2/2011	590	0.25 U	0.25 U	0.25 U	0.75 U	4	--
	2/13/2012	**1,600**	0.25 U	0.25 U	0.25 U	1.5	--	--
	5/23/2012	**930**	1.00 U	1.00 U	6.50	2.00 U	**--**	--
	8/22/2012	500	0.25 U	0.25 U	0.31	0.75 U	**--**	--
	11/6/2012	410	0.25 U	0.25 U	0.25 U	0.75 U	0.4	--
MW-12	12/29/1999	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	3/21/2000	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	6/14/2000	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	9/12/2000	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U

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		Concentration in µg/L										Concentration in µg/L			
Well ID	Date Sampled	TPH-Gasoline		Benzene		Toluene		Ethyl-benzene		Total Xylenes		Total Lead		Diss. Lead	
MW-12 (cont.)	4/26/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	7/29/2001	50	U	0.5	U	0.5	U	1.74		4.83		--		--	
	10/27/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/15/2002	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	5/9/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/11/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1.47		--	
	3/31/2004	50	U	0.2	U	0.2	U	0.2	U	0.5	U	1	U	--	
	6/2/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2004	50	UJ	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/14/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/4/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/12/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/28/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	2.98		--	
	11/13/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	5/25/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/8/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/4/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/22/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/14/2009	80	U	0.5	U	0.5	U	0.5	U	1	U	2	U	--	
	11/15/2010	100	U	0.25	U	0.5	U	0.25	U	0.75	U	1	U	--	
	11/2/2011	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.1	U	--	
MW-13	12/29/99	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	3/21/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	6/14/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	9/12/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	4/26/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	7/29/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/27/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	9/30/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/11/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1.56		--	
	3/31/2004	50	U	0.2	U	0.2	U	0.2	U	0.5	U	1	U	--	
	6/2/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2004	50	UJ	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/14/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/4/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	

Table 2 - Summary of Groundwater Analytical Data - TPH-G, BTEX, and Lead
Ken's Auto Wash
Ellensburg, Washington

		Concentration in µg/L										Concentration in µg/L		
Well ID	Date Sampled	TPH-Gasoline		Benzene		Toluene		Ethyl-benzene		Total Xylenes		Total Lead		Diss. Lead
MW-13 (cont.)	10/6/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	6/28/2006	--		--		--		--		--		--		--
	11/13/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	5/25/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--
	11/8/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	6/4/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	10/22/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	10/15/2009	80	U	0.5	U	0.5	U	0.5	U	1	U	2	U	--
	11/15/2010	100	U	0.25	U	0.5	U	0.25	U	0.75	U	1	U	--
	11/2/2011	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.2		--
	5/23/2012	250	U	1.00	U	1.00	U	1.00	U	2.00	U	--		--
	8/22/2012	100	U	0.25	U	0.25	U	0.25	U	0.75	U	--		--
	11/6/2012	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.1	U	--
MW-15	1/30/2001	161		1.53		0.5	U	0.5	U	1.18	U	--		--
	4/26/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--
	7/29/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--
	10/27/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--
	11/15/2002	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--
	5/9/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	9/30/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	12/11/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	3/31/2004	50	U	0.2	U	0.2	U	0.2	U	0.5	U	1	U	--
	6/2/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	9/30/2004	50	UJ	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	12/14/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--
	4/4/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--
	10/6/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	6/28/2006	--		--		--		--		--		--		--
	11/13/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	5/25/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--
	11/7/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	6/5/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--
	10/22/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--

Table 2 - Summary of Groundwater Analytical Data - TPH-G, BTEX, and Lead
Ken's Auto Wash
Ellensburg, Washington

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Concentration in µg/L Total Lead	Diss. Lead
MW-15 (cont.)	10/14/2009	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
	11/15/2010	100 U	0.25 U	0.5 U	0.25 U	0.75 U	1 U	--
	11/2/2011	100 U	0.25 U	0.25 U	0.25 U	0.75 U	0.1 U	--
	11/6/2012	100 U	0.25 U	0.25 U	0.25 U	0.75 U	0.1 U	
MTCA Method A Groundwater Cleanup Level		800/1,000 [a]	5	1000	700	1000	15	15

Notes:
Gasoline-range TPH analyzed by EPA Method 8015 prior to 1999. After that, analyzed by NWTPH-G; BTEX Analyzed by EPA Method 8021B
BTEX analyzed by EPA Method 8260B in March 2004.
Total and Dissolved Lead analyzed by EPA Method 6010 or 6020.
-- Not analyzed.
U = Not detected at specified reporting limit.
J = Estimated concentration.
Bolded concentrations exceed MTCA Method A cleanup levels.
Access to well MW-13 obstructed in November 2002 and May 2003.
Access to well MW-5 obstructed in September 2004.
Data from 1996 and 1998 collected by Sage Environmental.
Well MW-1 was removed during the October 2000 excavation. Wells MW-14 and MW-15 were installed in January 2001 after the excavation.
Well MW-4 was replaced as well MW-4R by Hart Crowser in October 2005, following removal of the well during UST removal activities in April 2005.
First dashed line indicates soil was excavated in November 2000.
Second dashed line indicates bioremediation amendments were injected in January 2011.
a) Cleanup level for TPH-G with/without detectable benzene
b) Values shown are the average of the results for the sample and its field duplicate.
c) The value is the result for the field duplicate. The result for the sample was ND (not detected at the detection limit of 1.0 µg/L).

Table 3 - Measured Free Product Thickness in Wells MW-1/MW-14
Ken's Auto Wash
Ellensburg, Washington

Date Measured	Product Thickness in Well in Inches	
4/8/1996	0	
4/6/1998	6	
10/5/1998	6	
12/29/1999	0.2	
3/21/2000	5	
6/14/2000	1	
9/12/2000	1	
1/30/2001	0	Hotspot Excavation
4/26/2001	0	
7/29/2001	0	
10/27/2001	4	
11/15/2002	3	
5/9/2003	0	
9/30/2003	0	
12/12/2003	1	
3/31/2004	1.80	
6/2/2004	0	
9/30/2004	0	
12/14/2004	0.18	
4/4/2005	0	UST Removal
10/6/2005	0	
6/28/2006	0	
5/25/2007	0	
11/7/2007	0	
6/4/2008	0	
10/21/2008	0	
10/14/2009	0	
11/15/2010	0	
5/2/2011	0	Bioremediation Injections
7/27/2011	0	
11/2/2011	0	
2/13/2012	0	
11/6/2012	0	

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-1/MW-14	3/21/2000	0.60	--	--	--	--	--	--	--	--	--	--
	6/14/2000	1.00	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.40	--	--	--	--	--	--	--	--	--	--
	1/30/2001	2.40	--	--	--	--	--	--	--	--	--	--
	4/26/2001	--	--	--	--	--	--	--	--	--	--	--
	7/29/2001	2.30	--	--	--	--	--	--	--	--	--	--
	10/27/2001	0.80	--	--	--	--	--	--	--	--	--	--
	11/15/2002	--	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.20	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.29	--	--	--	--	0.349	0.400 U	--	--	0.200 U	1.6
	12/11/2003	3.20	--	--	--	--	0.200 U	1.14	--	--	0.200 U	4
	3/31/2004	0.12	--	--	--	--	0.200 U	1.08	--	--	0.200 U	5.2
	6/2/2004	0.02	--	--	--	--	0.200 U	4.24	--	--	0.200 U	7.2
	9/30/2004	0.11	--	--	--	--	0.200 U	0.635	--	--	0.200 U	5.6
	12/14/2004	0.07	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	6.3
	4/4/2005	--	--	--	--	--	0.200 U	0.464	--	--	0.200 U	4.82 J
	10/6/2005	--	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	9.74
	6/28/2006	0.60	--	--	--	--	0.556	13.4	--	--	0.400 U	0.25 U
	11/13/2006	0.39	3.5-3.75	--	--	--	0.200 U	1.4	--	--	0.200 U	2.16
	5/25/2007	3.47	ND	--	--	--	3.120	12.200	--	--	0.200 U	0.25 U
	11/7/2007	4.84	5.2	--	--	--	0.010 U	0.900	--	--	0.010 U	--
	6/4/2008	6.01	ND	--	--	--	1.870	9.970	--	--	0.200 U	--
	10/21/2008	5.09	2.9	--	--	--	0.200 U	0.680	--	--	0.200 U	--
	10/14/2009	0.00	3.6	--	--	--	0.90 UJ	1.2 U	--	--	1.6 J	--
	11/15/2010	0.00	5	--	--	--	0.1 U	0.4	--	-- --	--	--
	5/2/2011	0.00	0.8	4	100	6	63.2	541	35.1	0.2	--	--
	7/27/2011	0.16	1.9	0	10	6	0.1 U	550	40.2	1.0 U	--	--
	11/2/2011	0.86	2	ND	ND	0.75	0.1 U	63.6	17.2	0.8	--	--
	2/13/2012	2.41	2	5	160	2	99.0	671	208	0.2	--	--
	5/23/2012	3.06	ND	--	--	--	120.00	211.00	1.00 U	60.30	--	--
	8/22/2012	7.31	ND	--	--	--	11.60	380.00	44.40	0.20	--	--
	11/6/2012	1.12	1.10	--	--	--	1.60	137.00	24.50	0.10 U	--	--

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-2	3/21/2000	2.60	--	--	--	--	--	--	--	--	--	--
	6/14/2000	2.80	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.80	--	--	--	--	--	--	--	--	--	--
	1/30/2001	1.50	--	--	--	--	--	--	--	--	--	--
	4/26/2001	4.50	--	--	--	--	--	--	--	--	--	--
	7/29/2001	3.30	--	--	--	--	--	--	--	--	--	--
	10/27/2001	2.00	--	--	--	--	--	--	--	--	--	--
	11/15/2002	1.50	--	--	--	--	--	--	--	--	--	--
	5/9/2003	2.30	--	--	--	--	--	--	--	--	--	--
	9/30/2003	1.51	--	--	--	--	0.489	3.38	--	--	0.200 U	1.2
	12/11/2003	3.90	--	--	--	--	1.08	3.79	--	--	0.200 U	0.0
	3/31/2004	0.82	--	--	--	--	0.912	4.60	--	--	0.200 U	0.0
	6/2/2004	1.63	--	--	--	--	0.467	3.23	--	--	0.200 U	0.0
	9/30/2004	0.52	--	--	--	--	0.443	2.93	--	--	0.200 U	0.2
	12/14/2004	6.05	--	--	--	--	0.922	3.05	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.719	3.52	--	--	0.200 U	0.25 R
	10/6/2005	--	--	--	--	--	0.219	3.75	--	--	0.200 U	0.25 U
	6/28/2006	--	--	--	--	--	--	--	--	--	--	--
	11/13/2006	0.64	ND	--	--	--	0.410	5.26	--	--	0.200 U	0.25 U
	5/25/2007	7.11	ND	--	--	--	2.740	8.57	--	--	0.200 U	0.25 U
	11/7/2007	4.95	ND	--	--	--	0.275	4.32	--	--	0.010 U	--
	6/4/2008	4.60	ND	--	--	--	1.440	6.14	--	--	0.200 U	--
	10/21/2008	--	ND	--	--	--	0.200 U	3.21	--	--	0.200 U	--
	10/14/2009	0.00	ND	--	--	--	0.90 U	6.5	--	--	1.3 J	--
	11/15/2010	0.33	ND	--	--	--	0.3	3.9	--	--	--	--
	11/2/2011	1.08	ND	--	--	--	0.6	9.1	5.8	0.1 U	--	--
	11/6/2012	1.45	ND	--	--	--	1.3	6.8	3.4	0.1 U		

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-3	3/21/2000	2.00	--	--	--	--	--	--	--	--	--	--
	6/14/2000	2.10	--	--	--	--	--	--	--	--	--	--
	9/12/2000	1.40	--	--	--	--	--	--	--	--	--	--
	1/30/2001	2.70	--	--	--	--	--	--	--	--	--	--
	4/26/2001	1.80	--	--	--	--	--	--	--	--	--	--
	7/29/2001	4.40	--	--	--	--	--	--	--	--	--	--
	10/27/2001	2.30	--	--	--	--	--	--	--	--	--	--
	11/15/2002	2.10	--	--	--	--	--	--	--	--	--	--
	5/9/2003	2.70	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.44	--	--	--	--	0.228	4.39	--	--	0.200 U	0.0
	12/11/2003	3.20	--	--	--	--	0.200 U	4.79	--	--	0.200 U	0.0
	3/31/2004	1.59	--	--	--	--	0.812	5.53	--	--	0.200 U	0.0
	6/2/2004	0.89	--	--	--	--	0.816	5.61	--	--	0.200 U	0.0
	9/30/2004	0.54	--	--	--	--	0.253	4.43	--	--	0.200 U	0.0
	12/14/2004	2.10	--	--	--	--	0.206	4.69	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.358	4.23	--	--	0.200 U	0.25 R
	10/6/2005	--	--	--	--	--	0.200 U	3.67	--	--	0.200 U	0.25 U
	6/28/2006	--	--	--	--	--	--	--	--	--	--	--
	11/13/2006	1.19	ND	--	--	--	0.370	6.1	--	--	0.200 U	0.25 U
	5/25/2007	8.13	ND	--	--	--	1.520	6.43	--	--	0.200 U	0.25 U
	11/8/2007	5.15	ND	--	--	--	0.168	4.13	--	--	0.010 U	--
	6/4/2008	5.51	ND	--	--	--	0.920	4.59	--	--	0.200 U	--
	10/21/2008	8.29	ND	--	--	--	0.250	3.84	--	--	0.200 U	--
	10/14/2009	0.81	ND	--	--	--	0.90 UJ	3.2	--	--	1.3 J	--
	11/15/2010	1.86	ND	--	--	--	0.2	4.1	--	--	--	--
	5/2/2011	0.00	ND	2	10	1	3.4	12.4	36.0	0.1 U	--	--
	7/27/2011	0.06	0.6	2	10	1.5	1.8	21.6	12.6	0.1 U	--	--
	11/2/2011	0.90	1.5	ND	ND	1	0.1 U	24.0	9.5	0.1	--	--
	2/13/2012	2.14	ND	0.25	10	0.5	6.8	8.9	12.3	0.1 U	--	--
	11/6/2012	2.18	ND	--	--	--	0.7	4.9	5.1	0.1 U		

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-4	3/21/2000	0.60	--	--	--	--	--	--	--	--	--	--
	6/14/2000	1.00	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.40	--	--	--	--	--	--	--	--	--	--
	1/30/2001	2.40	--	--	--	--	--	--	--	--	--	--
	4/26/2001	--	--	--	--	--	--	--	--	--	--	--
	7/29/2001	2.30	--	--	--	--	--	--	--	--	--	--
	10/27/2001	0.80	--	--	--	--	--	--	--	--	--	--
	11/15/2002	--	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.20	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.12	--	--	--	--	0.200 U	4.57	--	--	0.200 U	1.4
	12/11/2003	1.40	--	--	--	--	1.05	15.3	--	--	0.200 U	0.5
	3/31/2004	0.11	--	--	--	--	0.200 U	7.41	--	--	0.200 U	5.4
	6/2/2004	0.03	--	--	--	--	0.200 U	8.32	--	--	0.200 U	5.2
	9/30/2004	0.06	--	--	--	--	0.200 U	4.91	--	--	0.200 U	3.8
	12/14/2004	0.12	--	--	--	--	0.200 U	5.13	--	--	0.200 U	2.0
	4/4/2005	--	--	--	--	--	0.200 U	5.79	--	--	0.200 U	3.47 J
MW-4R	10/6/2005	--	--	--	--	--	0.200 U	8.07	--	--	0.200 U	1.39
	6/28/2006	0.60	--	--	--	--	0.200 U	16	--	--	0.400 U	0.25 U
	11/13/2006	0.24	2.9-3.0	--	--	--	0.200 U	16.2	--	--	0.200 U	0.25 U
	5/25/2007	2.63	ND	--	--	--	2.290	17.6	--	--	0.200 U	0.25 U
	11/7/2007	4.78	3.7	--	--	--	0.031	10.3	--	--	0.010 U	--
	6/4/2008	3.87	ND	--	--	--	2.030	14.1	--	--	0.200 U	--
	10/21/2008	8.98	1.4	--	--	--	0.200 U	6.52	--	--	0.200 U	--
	10/14/2009	4.83	ND	--	--	--	0.90 UJ	5.9	--	--	1.7 J	--
	11/15/2010	0.00	2.2	--	--	--	0.1 U	7.3	--	--	--	--
	5/2/2011	0.00	2.4	5	20	2	18.7	78.9	30.8	8.6	--	--
	7/27/2011	0.14	2	ND	10	4	4.2	12.4	24.7	0.9	--	--
	11/2/2011	0.76	1.9	ND	ND	5	0.2	13.1	14.3	1.0	--	--
	2/13/2012	2.95	1.3	3	120	2	74.9	174	20.2	0.5	--	--
	5/23/2012	3.64	1.40	--	--	--	5.20	37.00	0.10 U	38.10	--	--
	8/22/2012	4.91	1.80	--	--	--	0.20	11.30	9.40	0.30	--	--
	11/6/2012	1.84	1.2	--	--	--	1	42.7	21.3	0.2	--	--

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-5	3/21/2000	0.60	--	--	--	--	--	--	--	--	--	--
	6/14/2000	0.70	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.60	--	--	--	--	--	--	--	--	--	--
	4/26/2001	0.80	--	--	--	--	--	--	--	--	--	--
	7/29/2001	3.00	--	--	--	--	--	--	--	--	--	--
	10/27/2001	0.90	--	--	--	--	--	--	--	--	--	--
	11/15/2002	0.70	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.20	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.30	--	--	--	--	0.200 U	8.61	--	--	0.200 U	1.8
	12/11/2003	1.30	--	--	--	--	0.200 U	6.85	--	--	0.200 U	0.0
	3/31/2004	0.42	--	--	--	--	1.32	16.1	--	--	0.200 U	0.0
	6/2/2004	0.20	--	--	--	--	1.36	11.7	--	--	0.200 U	0.0
	12/14/2004	0.49	--	--	--	--	0.200 U	7.57	--	--	0.200 U	2.95
	4/4/2005	--	--	--	--	--	0.200 U	9.92	--	--	0.200 U	3.06 J
	10/6/2005	--	--	--	--	--	0.200 U	9.50	--	--	0.200 U	0.25 U
	6/28/2006	2.40	--	--	--	--	2.59	16	--	--	0.400 U	0.25 U
	11/13/2006	3.60	ND	--	--	--	2.99	11.7	--	--	0.200 U	0.25 U
	5/25/2007	6.60	ND	--	--	--	3.400	19.9	--	--	0.200 U	0.25 U
	11/7/2007	5.18	ND	--	--	--	0.110	7.75	--	--	0.010 U	--
	6/4/2008	5.44	ND	--	--	--	1.730	11.8	--	--	0.200 U	--
	10/22/2008	6.75	ND	--	--	--	0.220	6.35	--	--	0.200 U	--
	10/15/2009	1.13	ND	--	--	--	0.90 U	5.2	--	--	1.5 J	--
	11/15/2010	0.00	ND	--	--	--	0.1	6.6	--	-- --	-- --	--
	11/2/2011	0.87	2	--	--	--	0.4	21.7	16.7	0.1	--	--
	11/6/2012	2.06	--	--	--	--	0.3	7.2	7.9	0.1 U	--	--
MW-6	3/21/2000	1.80	--	--	--	--	--	--	--	--	--	--
	6/14/2000	0.50	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.50	--	--	--	--	--	--	--	--	--	--
	4/26/2001	--	--	--	--	--	--	--	--	--	--	--
	7/29/2001	2.60	--	--	--	--	--	--	--	--	--	--
	10/27/2001	0.70	--	--	--	--	--	--	--	--	--	--
	11/15/2002	0.60	--	--	--	--	--	--	--	--	--	--

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-6 (cont.)	5/9/2003	1.80	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.12	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	2.2
	12/11/2003	1.50	--	--	--	--	0.200 U	0.685	--	--	0.200 U	3.8
	3/31/2004	0.15	--	--	--	--	0.200 U	3.02	--	--	0.200 U	3.4
	6/2/2004	0.09	--	--	--	--	0.200 U	0.557	--	--	0.200 U	5.2
	9/30/2004	0.12	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	6.4
	12/14/2004	0.42	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	3.2
	4/4/2005 [a]	--	--	--	--	--	0.200 U	3.19	--	--	0.200 U	9.33 J
	10/6/2005	--	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	9.33
	4/4/2005	--	--	--	--	--	0.200 U	3.20	--	--	0.200 U	9.53
Dup	4/4/2005	--	--	--	--	--	0.200 U	3.17	--	--	0.200 U	14.4
	6/28/2006	--	--	--	--	--	2.6	18.6	--	--	0.400 U	--
	11/13/2006	0.48	0.9-1.0	--	--	--	0.200 U	1.11	--	--	0.200 U	6.95
	5/25/2007	1.11	4.2	--	--	--	0.200 U	2.67	--	--	0.200 U	0.5 U
	11/7/2007	5.18	5.4	--	--	--	0.010 U	2.24	--	--	0.010 U	--
	6/4/2008	5.76	5.2	--	--	--	0.200 U	3.68	--	--	0.200 U	--
	10/22/2008	4.15	5.4	--	--	--	0.200 U	0.40 U	--	--	0.200 U	--
	10/14/2009	0.00	6.0	--	--	--	0.90 UJ	1.2 U			1.7 J	--
	11/15/2010	0.00	3.4	--	--	--	0.1 U	1.5			--	--
	5/2/2011	0.00	1	ND	10	0.5	2.6	79.6	83.0	0.3	--	--
	7/27/2011	0.48	2	ND	5	6	2.0 U	879	97.8	2.0 U	--	--
	11/2/2011	1.01	ND	ND	ND	5	0.1	14.8	25.1	0.2	--	--
	2/13/2012	2.62	1.6	3	15	2	3.1	68.0	25.7	0.1	--	--
	5/23/2012	4.96	ND	--	--	--	0.10 U	12.90	0.10 U	41.00	--	--
	8/22/2012	7.09	2.00	--	--	--	0.10	2.40	12.40	0.10	--	--
	11/6/2012	0.69	1.8	--	--	--	0.1 U	2.2	7.5	0.1 U	--	--
Dup	11/6/2012	0.69	1.8	--	--	--	0.1 U	2.3	7.5	0.1 U	--	--
MW-12	3/21/2000	5.00	--	--	--	--	--	--	--	--	--	--
	6/14/2000	4.90	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.60	--	--	--	--	--	--	--	--	--	--
	4/26/2001	4.00	--	--	--	--	--	--	--	--	--	--
	7/29/2001	3.00	--	--	--	--	--	--	--	--	--	--

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-12 (cont.)	10/27/2001	5.20	--	--	--	--	--	--	--	--	--	--
	11/15/2002	2.70	--	--	--	--	--	--	--	--	--	--
	5/9/2003	6.00	--	--	--	--	--	--	--	--	--	--
	9/30/2003	1.66	--	--	--	--	0.452	5.32	--	--	0.200 U	0.8
	12/11/2003	2.70	--	--	--	--	0.200 U	2.77	--	--	0.200 U	0.0
	3/31/2004	3.91	--	--	--	--	3.88	8.45	--	--	0.200 U	0.0
	6/2/2004	5.20	--	--	--	--	3.64	11.7	--	--	0.200 U	0.0
	9/30/2004	6.00	--	--	--	--	0.573	5.66	--	--	0.200 U	0.0
	12/14/2004	1.32	--	--	--	--	0.200 U	2.95	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.200 U	3.32	--	--	0.200 U	0.25 R
	10/12/2005	--	--	--	--	--	0.200 U	3.37	--	--	0.200 U	0.25 U
	6/28/2006	0.42	--	--	--	--	2.57	11.5	--	--	0.400 U	0.25 U
	11/13/2006	2.61	ND	--	--	--	0.590	6.89	--	--	0.200 U	0.25 U
	5/25/2007	6.71	ND	--	--	--	7.140	18.4	--	--	0.200 U	0.25 U
	11/8/2007	6.33	ND	--	--	--	0.121	11.5	--	--	0.010 U	--
	6/4/2008	9.50	ND	--	--	--	6.020	16.4	--	--	0.200 U	--
	10/22/2008	8.88	ND	--	--	--	0.330	10.1	--	--	0.200 U	--
	10/14/2009	2.23	ND	--	--	--	0.90 UJ	5.2	--	--	1.4 J	--
	11/15/2010	2.73	ND	--	--	--	0.2	13.4	--	--	--	--
	11/2/2011	3.01	ND	--	--	--	0.7	60.3	493	0.3	--	--
MW-13	3/21/2000	4.60	--	--	--	--	--	--	--	--	--	--
	6/14/2000	1.50	--	--	--	--	--	--	--	--	--	--
	9/12/2000	3.30	--	--	--	--	--	--	--	--	--	--
	4/26/2001	5.00	--	--	--	--	--	--	--	--	--	--
	7/29/2001	3.80	--	--	--	--	--	--	--	--	--	--
	10/27/2001	3.40	--	--	--	--	--	--	--	--	--	--
	9/30/2003	3.04	--	--	--	--	0.455	4.91	--	--	0.200 U	--
	12/11/2003	6.70	--	--	--	--	0.477	5.56	--	--	0.200 U	0.0
	3/31/2004	4.87	--	--	--	--	1.60	8.04	--	--	0.200 U	0.0
	6/2/2004	1.85	--	--	--	--	1.05	6.52	--	--	0.200 U	0.0
	9/30/2004	2.69	--	--	--	--	0.496	4.49	--	--	0.200 U	0.0
	12/14/2004	5.57	--	--	--	--	0.412	5.10	--	--	0.200 U	0.0

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-13 (cont.)	4/4/2005	--	--	--	--	--	0.582	4.99	--	--	0.200 U	0.547 J
	10/6/2005	--	--	--	--	--	0.348	3.68	--	--	0.200 U	0.25 U
	6/28/2006	--	--	--	--	--	--	--	--	--	--	--
	11/13/2006	3.49	ND	--	--	--	0.940	6.18	--	--	0.200 U	0.25 U
	5/25/2007	4.14	ND	--	--	--	1.670	7.57	--	--	0.200 U	0.25 U
	11/8/2007	6.93	ND	--	--	--	0.490	4.09	--	--	0.010 U	--
	6/4/2008	6.90	ND	--	--	--	1.280	5.51	--	--	0.200 U	--
	10/22/2008	9.35	ND	--	--	--	0.440	3.56	--	--	0.200 U	--
	10/15/2009	4.61	ND	--	--	--	0.90 U	3.3	--	--	1.2 J	--
	11/15/2010	4.38	ND	--	--	--	0.4	3.7	--	--	--	--
	5/2/2011	4.87	ND	ND	5	ND	2.4	7.3	20.7	0.1 U	--	--
	7/27/2011	1.47	ND	ND	10	0.25	1.3	5.8	9.4	0.1 U	--	--
	11/2/2011	5.11	ND	0.5	ND	ND	0.4	4.7	6.3	0.1	--	--
	2/13/2012	4.58	ND	ND	ND	ND	0.9	5.6	21.7	0.1 U	--	--
	5/23/2012	7.47	ND	--	--	--	0.90	5.00	0.10 U	11.30	--	--
	8/22/2012	8.13	ND	--	--	--	0.30	4.00	5.40	0.10 U	--	--
	11/6/2012	4.97	ND	--	--	--	0.3	4.5	5.8	0.1 U	--	--
MW-15	1/30/2001	1.30	--	--	--	--	--	--	--	--	--	--
	4/26/2001	--	--	--	--	--	--	--	--	--	--	--
	7/29/2001	2.60	--	--	--	--	--	--	--	--	--	--
	10/27/2001	1.40	--	--	--	--	--	--	--	--	--	--
	11/15/2002	0.80	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.50	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.56	--	--	--	--	0.282	5.02	--	--	0.200 U	2.6
	12/11/2003	2.80	--	--	--	--	0.415	8.52	--	--	0.200 U	0.0
	3/31/2004	0.88	--	--	--	--	0.200 U	8.42	--	--	0.200 U	0.0
	6/2/2004	0.40	--	--	--	--	1.67	8.32	--	--	0.200 U	0.0
	9/30/2004	0.33	--	--	--	--	0.429	4.56	--	--	0.200 U	0.0
	12/14/2004	1.40	--	--	--	--	0.200 U	6.68	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.200 U	7.45	--	--	0.200 U	0.254 J
	10/6/2005	--	--	--	--	--	0.340	4.14	--	--	0.200 U	0.25 U
	6/28/2006	--	--	--	--	--	--	--	--	--	--	--

Table 4 - Summary of Groundwater Natural Attenuation and Interim Action Data
Ken's Auto Wash
Ellensburg, Washington

		Field Test Results - Concentration in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-15 (cont.)	11/13/2006	1.06	ND	--	--	--	0.450	6.48	--	--	0.200 U	0.25 U
	5/25/2007	2.63	ND	--	--	--	3.070	10.4	--	--	0.200 U	0.25 U
	11/7/2007	5.66	ND	--	--	--	0.220	5.21	--	--	0.010 U	--
	6/5/2008	6.50	ND	--	--	--	2.010	8.02	--	--	0.200 U	--
	10/22/2008	5.61	ND	--	--	--	0.280	3.81	--	--	0.200 U	--
	10/14/2009	0.00	ND	--	--	--	0.90 UJ	3.1	--	--	1.2 J	--
	11/15/2010	0.67	ND	--	--	--	0.2	4.1	--	--	--	--
	11/2/2011	1.30	ND	--	--	--	0.4	6.0	8.7	0.1 U	--	--
	11/6/2012	2.03	ND	--	--	--	0.3	4.9	5.4	0.1 U	--	--
MTCA Method A Cleanup Level							na	na	na	na	na	na

Notes:
Nitrate, sulfate, chloride, bromide, and nitrite analyzed by EPA Method 300.0.
MTBE, EDB, and EDC analyzed by EPA Method 8260B.
-- Not analyzed.
U = Not detected above specified reporting limit.
J = Estimated concentration.
R = Rejected concentration.
ND = Analyte not detected.
Bolded concentrations exceed MTCA Method A cleanup levels.
a) Values shown are the average of the results for the sample and its field duplicate.
na = No MTCA Method A or B value available.
First dashed line indicates soil was excavated in November 2000.
Second dashed line indicates bioremediation amendments were injected in January 2011.

Table 5 - September 2003 to November 2010 Averaged Data
Ken's Auto Wash
Ellensburg, Washington

Well Name	Natural Electron Acceptors (Oxidants) in mg/L		
	DO	Nitrate	Sulfate
Background Wells			
MW-3	3.1	0.49	4.6
MW-5	2.6	1.05	10.4
MW-2	2.7	0.77	4.4
Plume Axis			
MW-4R	2	0.53	9.6
MW-14	1.7	0.54	3
MW-6	1.5	0.36	2.6

Table 6 - Natural Attenuation Electron Acceptor/Demand Calculations
Ken's Auto Wash
Ellensburg, Washington

Treatment Target Area Specifications			
Vertical Treatment in Feet	3		
Treatment Width in Feet	110		
Treatment Length in Feet (parallel w/ GW flow)	50		
Effective Porosity	0.25		
Foc	0.010	**Estimated Total Project Duration in Days**	
Estimated Seepage Velocity in Feet/Year	438		**10,950**
Bulk Soil Density in pcf	120	**Project Duration in Years**	**30**
Treatment Area Pore Volume	116,738 Liters	30,801 Gallons	

Hydrogen/Electron Donor Availability

Constituent	Groundwater Concentration in mg/L	Molecular Weight in g/mol	Moles of H_2 to Oxidize / Mole Analyte	Moles of H_2 Donor In Treatment Area
Native Electron Donors				
Groundwater TPH-Gx	3.0	100	22	*77*
Approximate % Aromatic	1%			
Estimated Total Soil and GW TPH-Gx				17,790
Groundwater TPH-Dx	0.00	226	49	*0*
Estimated Total Soil and GW TPH-Dx				0
Estimated Oxidative Efficiency			**50%**	**8,895**

Native Hydrogen/Electron Acceptor Flux

Constituent	Groundwater Concentration in mg/L	Molecular Weight in g/mol	Moles of H_2 to Reduce Mole Analyte	Moles of H_2 Acceptor In Treatment Area
Native Electron Acceptors				
Dissolved Oxygen	1.6	32	2	12
Nitrate (as Nitrogen)	0.80	62	3	20
Sulfate		96.1	4	0
Hydrogen Acceptor (Oxidant) Flux of Estimated Total Project Duration				8,329
Estimated Oxidative Treatment Progress Based on Design Assumptions:				**94%**

NOTES:

mg/L = milligrams per liter; gal = gallons; gpm = gallons per minute; H_2 = hydrogen.

1cf = 7.48 gals = 28.3L; 3.79L = 1 gal.

Physical constants per Oregon DEQ Risk-Based Decision Making Guidance (DEQ 2006).

Electron and hydrogen equivalents per Principles and Practices of Enhanced Anaerobic Bioremediation of Chlorinated Solvents, Air Force Center for Environmental Excellence, August 2004.

Native Electron Acceptors estimated based on calculated average difference (consumption) between upgradient wells and downgradient wells prior to the redox recovery zone.

Table 7 - Updated Remedial Alternative Evaluation - Compliance with WAC 173-340-360
Ken's Auto Wash
Ellensburg, Washington

Evaluation Criterion	Alternative 1 Monitored Natural Attenuation	Alternative 2 Monitored Natural Attenuation and Passive Free Product Recovery	Alternative 3 Enhanced Biodegradation and Monitored Attenuation	Alternative 4 Air Sparging and Soil Vapor Extraction
Meets Definition of Permanent Cleanup Action	Yes	Yes	Yes	Yes
Protectiveness	Eliminates exposure pathways. Reduces soil and groundwater toxicity in the long term.	Eliminates exposure pathways. Reduces soil and groundwater toxicity in the long term.	Eliminates exposure pathways. Reduces soil and groundwater toxicity in the long term.	Eliminates exposure pathways. Reduces soil and groundwater toxicity in the long term.
Permanence	Natural attenuation will result in reduced soil and groundwater toxicity over the very long term.	Mobility and toxicity of contaminants will be reduced by collecting and properly disposing of free product. Natural attenuation will result in reduced soil and groundwater toxicity over the very long term.	Enhanced biodegredation will result in reduced soil and groundwater toxicity within the saturated and smear zone within a relatively short time frame.	Air sparging and soil vapor extraction will reduce contaminant mobility by removing and collecting or destroying contaminants from the subsurface. Natural attenuation will result in reduced soil and groundwater toxicity over the very long term for contaminants not removed by soil vapor extraction.
Estimated Cost[a]	$468,000 to $595,000	$468,000 to $808,000	$194,000 to $490,000	$448,000 to $530,000
Effectiveness over the Long Term and Restoration Time Frame	Will effectively remove contaminants over the long term. Estimated restoration time frame for groundwater, based on data through 2009, up to 30 years.	Will effectively remove contaminants over the long term. Estimated restoration time frame for groundwater, based on data through 2009, is up to 50 years if product is still present.	Will effectively remove significant contaminant mass within a relatively short time frame. Estimated restoration time frame for groundwater, based on Interim Action results, is 5 to 10 years.	Will effectively remove contaminants over the long term. Estimated restoration time frame for groundwater, based on professional experience, is 5 to 7 years.
Management of Short-Term Risks	Protection monitoring will confirm protection of human health and the environment during site activities that may encounter contaminated materials.	Protection monitoring will confirm protection of human health and the environment during site activities that may encounter contaminated materials, such as free product removal.	Protection monitoring will confirm protection of human health and the environment during site activities that may encounter contaminated materials.	Protection monitoring will confirm protection of human health and the environment during site activities that may encounter contaminated materials, such as construction of wells. Air monitoring will be performed during soil vapor extraction.
Technical and Administrative Implementability	Easily implemented.	Easily implemented.	Easily implemented; however, injection wells may require redevelopment to maintain connectivity to the aquifer.	Moderately easy to implement if adjacent property is available to stage equipment and treatment compound.

Table 8 - Monitoring Schedule for Preferred Alternative
Ken's Auto Wash
Ellensburg, Washington

Well	Purpose	2013-2017[a]	2018-2021	2022[b]
MW-2	Bound Plume - East	Annual[c]		Quarterly
MW-3	Background	Annual[c]	Biannual[e]	Quarterly
MW-4R	Source Area (Upgradient Edge)	Quarterly[d]	Biannual[e]	Quarterly
MW-5	Bound Plume - West	Annual[c]		Quarterly
MW-6	Plume Extent	Quarterly[d]	Biannual[e]	Quarterly
MW-12[f]	Bound Plume - Southwest	Annual[c]		Quarterly
MW-13	Downgradient Point of Compliance	Quarterly[d]	Biannual[e]	Quarterly
MW-14	Source Area	Quarterly[d]	Biannual[e]	Quarterly
MW-15	Bound Plume - Southeast	Annual[c]		Quarterly

Notes:

Monitoring will include groundwater level measurements, field parameter measurements, and groundwater sample collection for chemical analyses specified below. If injections are to be performed into the well, the well will be field-tested for nitrate, nitrite, ammonium, and ferrous iron.

[a] Timeline assumes injections are performed and amendment concentrations have not reduced to background levels. If the site enters monitored attenuation, sampling defaults to 2018 scope.

[b] Final compliance monitoring would include analysis for NWTPH-Gx, BTEX, and total lead.

[c] Annual monitoring includes analysis of NWTPH-Gx, BTEX, nitrate, sulfate, and total lead.

[d] Quarterly monitoring includes analysis of NWTPH-Gx, BTEX, nitrate, and sulfate.

[e] Biannual refers to twice per year and would be based on typical high and low groundwater elevations at the site. Includes analysis of NWTPH-Gx, BTEX, nitrate, sulfate, and total lead.

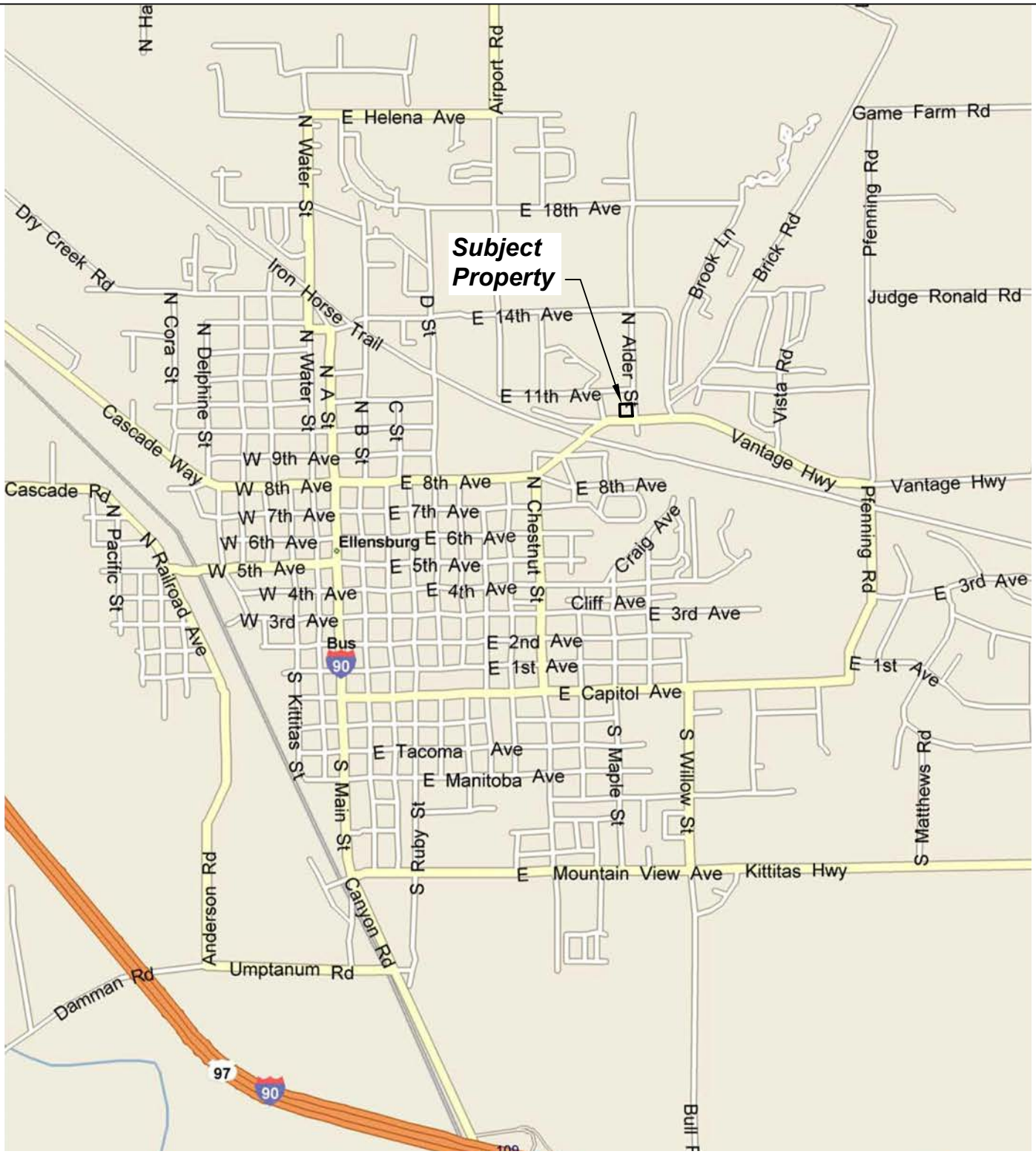
[f] Well not located in May, August, and November 2012 and possibly destroyed. Well status needs to be confirmed during monitoring events.

Schedule assumes 5-year review by Ecology following 2013 sampling round.

Schedule after 2018 is tentative pending Ecology 5-year review.

Monitoring schedule after 2022, if necessary, will be based on review of previous data.

Blank entries indicate no monitoring planned in specific wells.



Note: Base map prepared from Microsoft Streets and Trips 2005.

0 2000 4000

Scale in Feet

WASHINGTON

N

Ken's Auto Wash
Ellensburg, Washington

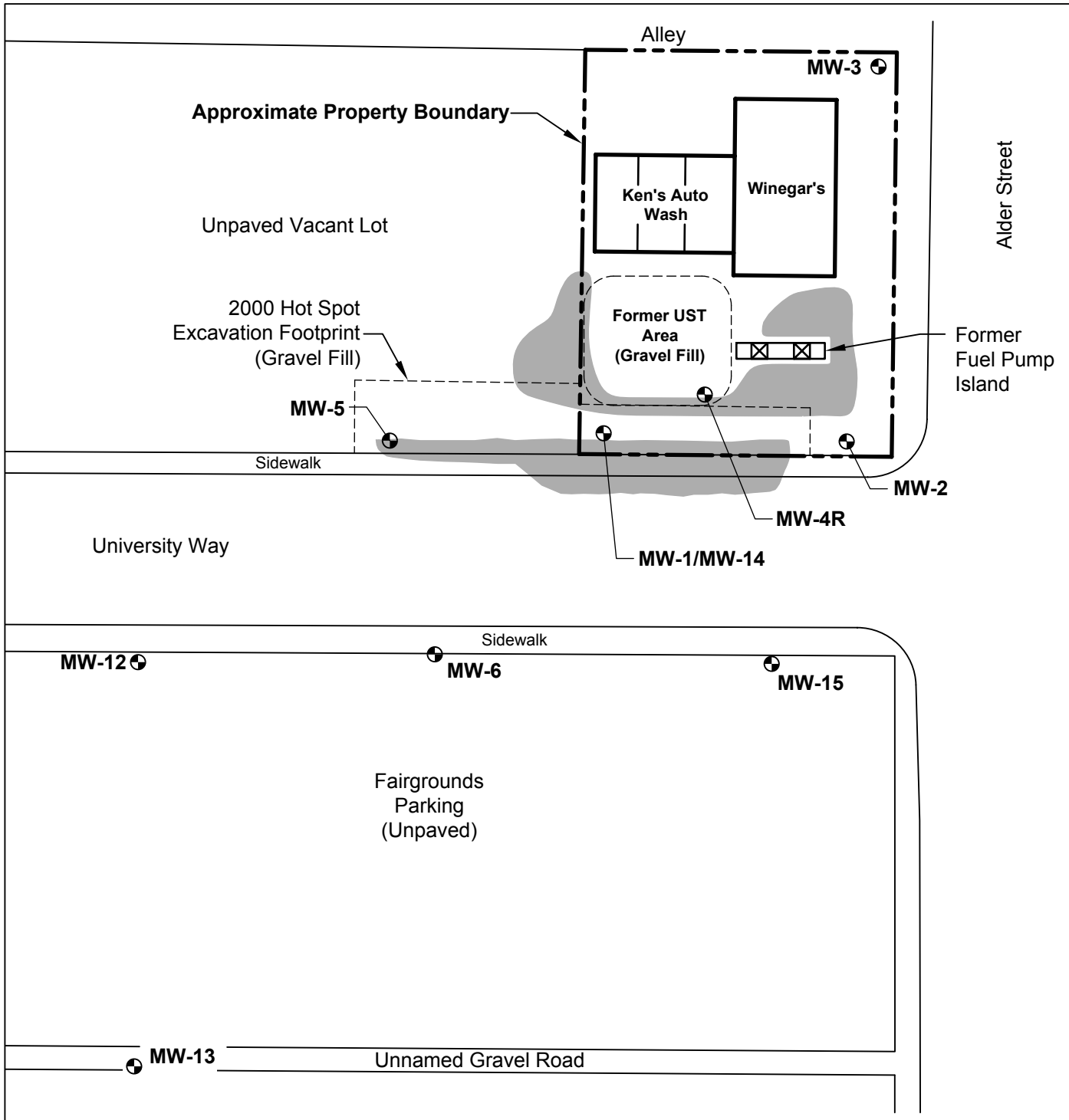
Vicinity Map

7168-11 3/13

HARTCROWSER

Figure
1

EAL 03/1/13 716811-001.dwg



Note: Base map prepared from drawing provided by Sage Earth Sciences titled "Proposed Addtional Monitoring Well and ORC Injections Locations," dated January 1998.

0 50 100

Scale in Feet

MW-6 Hart Crowser Monitoring Well Location and Number

Estimated Remaining Area with TPH-G and/or BTEX Concentrations above MTCA Method A Soil Cleanup Levels (Based on 2000-2005 Data)

N

Ken's Auto Wash
Ellensburg, Washington

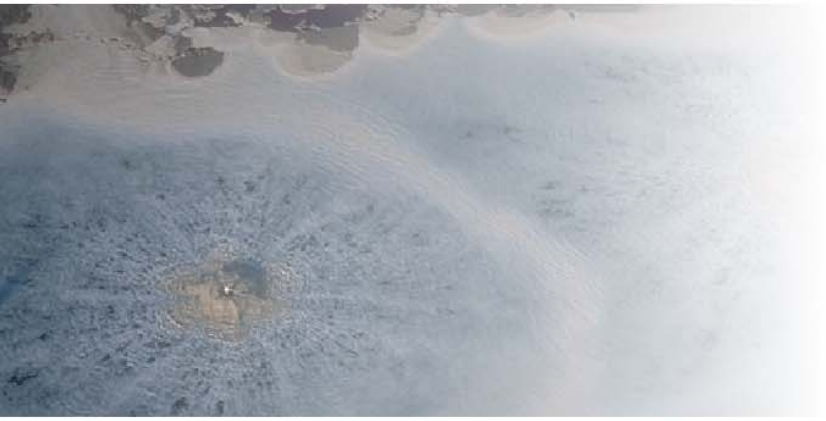
Site and Well Location Plan

7168-11 3/13

HARTCROWSER

Figure
2

EAL 03/20/13 716811-002.dwg



Bioremediation Data Report
In Situ Enhanced Natural Attenuation of Petroleum
Ken's Auto Wash
Ellensburg, Washington

Prepared for
Ken's Auto

May 16, 2012
7168-09

HARTCROWSER

Bioremediation Data Report
In Situ Enhanced Natural Attenuation of Petroleum
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BIOREMEDIATION DATA REPORT
IN SITU ENHANCED NATURAL ATTENUATION OF PETROLEUM
KEN'S AUTO WASH
ELLENSBURG, WASHINGTON

1.0 INTRODUCTION

This report was prepared on behalf of Mr. Ken Peterson and presents a summary of the *in situ* bioremediation injection program and groundwater monitoring at the Ken's Auto Wash site, located at 1013 East University Way in Ellensburg, Washington (Figure 1). The goal of this work is to accelerate biological degradation of residual gasoline-range hydrocarbons (TPH-G) in the former source area and reduce the likelihood of future groundwater concentration exceedances above the Washington State Model Toxics Control Act (MTCA) Method A cleanup levels (Chapter 173-340 WAC). The work performed was generally consistent with the scope outlined in our June 3, 2010, proposal and is in conformance with an Agreed Order with the Washington State Department of Ecology (Ecology) under MTCA (RCW 70.105D.040[5]).

A related site cleanup objective is to obtain a favorable regulatory opinion letter from Ecology at the completion of remediation and monitoring. Ideally, this would be in the form of a No Further Action (NFA) determination, but an NFA will require demonstration that residual soil contamination is not impacting groundwater quality relative to applicable MTCA Method A cleanup levels. A favorable Ecology opinion letter would also facilitate down-ranking of the MTCA site risk level.

2.0 PROJECT BACKGROUND

The site is affected by a petroleum hydrocarbon release discovered during UST tightness testing in 1996 (Figure 2). Corrective actions were taken at that time, and the site USTs were subsequently removed in April 2005, as documented in the June 7, 2005, Gasoline UST Closure Report. Petroleum-impacted soil was removed downgradient of the UST area in October and November 2000, but a small volume of affected soil remained because of infrastructure limitations at the site, as shown on Figure 2.

During the soil removal, oxygen-releasing compound (ORC) was added to the excavation backfill to promote biodegradation of residual petroleum hydrocarbons. ORC was also injected downgradient of the petroleum hydrocarbon-affected groundwater in February 2005, as documented in the

April 6, 2005, Supplemental Strataprobe Exploration Report. Although concentrations of TPH in groundwater continued to slowly decrease following UST removal, soil removal, and ORC injection, TPH-G concentrations in groundwater downgradient of the residual source area periodically exceed the MTCA Method A cleanup limit.

Remedial alternatives were presented and evaluated in a Remedial Investigation and Feasibility Study (RI/FS) completed in November 2006. The RI/FS addressed requirements of an Agreed Order issued by Ecology for site cleanup assessment following a MTCA site hazard ranking of 2. Remedial technologies evaluated in the RI/FS were based on results of site investigation, soil cleanup, and monitoring efforts through 2006.

Following Ecology's review of the RI/FS, monitored natural attenuation with free product removal was selected as the preferred RI/FS remedial alternative. Monitored natural attenuation is a process where hydrocarbon-degrading microbes that occur naturally in soil degrade petroleum hydrocarbons. Appreciable free product has not been identified at the site since 2004, so current remedial actions do not include free product removal. Site monitoring continues in accordance with the selected FS alternative. Table 1 outlines the past and current groundwater monitoring schedule. Ecology has not required any additional actions besides the monitored natural attenuation.

Petroleum-impacted soil remains downgradient of the former USTs beneath the sidewalk and portions of East University Way (Figure 2). According to groundwater elevation and TPH-G concentration data, most of the residual contamination is located in two areas: in unexcavated soil between MW-4 and MW-14, and near the top of the smear zone under the street and sidewalk north of MW-6. This remaining source material likely contributes to periodic exceedances of MTCA Method A cleanup criteria for TPH-G in groundwater near wells MW-14 and MW-6.

Natural attenuation appears to be progressing at the site within the relatively long-term, expected time frame. During natural attenuation, hydrocarbon-degrading microbes oxidize and metabolize petroleum hydrocarbons using electron acceptors such as dissolved oxygen, nitrate, ferric iron, manganese, sulfate, and carbon dioxide. Groundwater monitoring data indicate that dissolved oxygen, nitrate, and ferric iron are being used as electron acceptors; however, natural attenuation is limited by the slow groundwater transport of these acceptors from upgradient areas.

3.0 ENHANCED BIOREMEDIATION PROGRAM

The enhanced bioremediation program introduced remediation amendments over a series of three injection events to accelerate natural attenuation already occurring at the site. The contaminant degradation process is termed "anaerobic oxidation." These amendments included PetroBac™, OxEA-aq, and Ivey-Sol (Appendix A.) PetroBac is a liquid provided by ETEC, LLC, and contains a blend of hydrocarbon-degrading microbes (bioaugmentation) and a surfactant. Patent-pending OxEA-aq™ is a dry powder provided by Bioremediation Specialists, LLC, and contains a blend of highly soluble electron acceptors (oxidants) and macro-, and micro-nutrients. Patented Ivey-Sol is a liquid provided by Ivey International and is a highly concentrated, biodegradable, non-ionic surfactant to improve amendment distribution and enhance desorption of TPH-G from soil for microbe consumption.

The bioremediation program is based on site-specific conditions. These conditions include:

- The nature of the contaminant (TPH-G and aromatic hydrocarbons);
- The estimated mass of residual petroleum;
- The target soil matrix (silty sand to sandy gravel with areas of gravel backfill);
- Contaminant distribution (localized to shallow source area); and
- The availability of existing infrastructure (monitoring wells and air sparge line).

3.1 Amendment Injection Activities

Amendment distribution was achieved by injecting multiple amendments into multiple locations. Table 2 summarizes the three injection events for the bioremediation program, which occurred on January 31, May 3, and November 30, 2011. A total of 15 gallons of PetroBac, 1,750 pounds of OxEA-aq, and 7.25 gallons of Ivey Sol were injected. Conservative tracers were introduced into MW-4 (sodium bromide) and MW-3 (sodium chloride) during the first injection to track groundwater movement, flux, and amendment use. The injection strategy achieved passive, aqueous-phase transport of supplemental electron acceptors across the plume.

Our bioremediation design assumed access to the horizontal air sparge line, located immediately south of MW-14, in order to deliver amendments laterally across the area of highest residual contamination. Unfortunately, the access port to the air sparge line could not be located, so monitoring wells were used to inject amendments.

3.2 Injection Methodology

Amendment injections occurred in a prescribed sequence to achieve the goals of treatment traceability and amendment contact with residual contamination. All injections used municipal tap water to dilute and dissolve amendments. Field methods for injection protocols are provided in Appendix A.

During the first injection, conservative tracer solutions were introduced first. Twenty-five pounds of sodium chloride in 35.5 gallons of tap water was introduced into MW-3, followed by 25 gallons of tap water to flush the tracer out of the well. Fifteen pounds of sodium bromide in 17.5 gallons of tap water was introduced into MW-4R, followed by a 17.5 gallon tap water chase. Following the tracer injection, PetroBac was diluted to a 1:20 ratio in tap water and injected into MW-4R, MW-6, and MW-14. Wells MW-2, MW-3, MW-4R, MW-5, MW-6, and MW-14 then received the prescribed OxEA mass by dissolving the amendment at a rate of approximately one pound of OxEA to one gallon of tap water to make a master working solution. Master working solution was prepared in batches up to 55 gallons. This master solution was then injected into each location and chased with 9 gallons of tap water for each gallon of master working solution introduced.

Subsequent injections introduced OxEA-aq and Ivey Sol only. The OxEA-aq injection methodology for the second and third injection events followed the same master working solution method. For wells receiving Ivey Sol, the Ivey Sol was added full-strength to the first batch of master working solution. Subsequent master working solution was then injected (as required) and followed by the same 9 gallons of tap water per gallon of master working solution ratio.

4.0 GROUNDWATER MONITORING

Quarterly groundwater monitoring events were completed on May 2 and July 27, 2011, to monitor treatment progress in selected wells. Annual sampling was completed on November 2, 2011, for all monitoring wells. The post-injection monitoring event was completed on February 13, 2012, to monitor treatment progress in selected wells. Groundwater was sampled prior to any injection activities using low-flow sampling methods (Appendix A). Table 3 provides the groundwater monitoring schedule during the bioremediation program.

4.1 Groundwater Elevation Measurements

Table 4 presents the measured depth to groundwater from the top of the well casing and the calculated groundwater elevations. Groundwater levels were

monitored during the quarterly events in selected wells and in all nine wells during the annual event. The groundwater elevation trends show higher elevations in the late winter and spring months and lower elevations in the summer and fall months.

Figure 3 illustrates the groundwater elevation and interpolated groundwater elevation contours based on measurements taken in November 2011. The contours indicate that the groundwater gradient continues to be toward the southwest, which is also consistent with historical observations. The November 2011 groundwater elevations were consistent with the November 2010 elevations, but show a 0.4- to 0.8-foot decrease in elevation compared to the October 2009 elevations. These fluctuations likely represent the natural annual variability in groundwater table elevations.

4.2 Groundwater Sampling

Monitoring included sampling groundwater from up to nine monitoring wells (Figure 2) for analysis of one or more of the following:

- TPH-G by Ecology Method NWTPH-G;
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8021B;
- Nitrogen as nitrate, sulfate, bromide, and chloride by EPA Method 300.0; and/or
- Total lead by EPA Method 6020.

In addition, ferrous iron was measured in the field using a Hach color disc. Nitrate, nitrite, and ammonia were measured in the field using colorimetric strips. These field measurements were used to evaluate and modify the injection schedule during the bioremediation program.

Analytical results are summarized in Table 5 for TPH-G, BTEX, and total and dissolved lead. Table 6 presents analytical data for field testing and other inorganic ions. Table 7 documents the observed thickness of free product from previous monitoring events. No free product has been observed since 2004, before removal of the USTs and ORC injection in 2005. Figures 4 and 5 illustrate the occurrence of TPH-G and benzene in groundwater, respectively. Figures 6 and 7 illustrate the long-term trends in TPH-G and benzene concentrations in groundwater, respectively. Chemical quality review and laboratory reports are provided in Appendix B.

5.0 ENHANCED BIOREMEDIATION PERFORMANCE

Bioremediation performance was assessed by reviewing tracer (sodium bromide and sodium chloride), oxidant loading (nitrate and sulfate), TPH-G, and BTEX data. Additional processes, including surfactant- and microbial-induced TPH-G mobilization and the preferential degradation of BTEX constituents by microbes, are assessed below.

5.1 Tracer Results

Tracer data was largely unsuccessful in distinguishing groundwater flow and direction. Only a small increase in bromide concentrations was noted during the monitoring program and did not trace well through the aquifer. Bromide was not detected near MW-4R in July 2011 and was never detected at the anticipated concentration in MW-14.

Chloride data does not present a compelling or consistent picture, either. Various elevated chloride concentrations were observed, including the May 2011 data from MW-6 (83.0 mg/L) and November 2011 data from MW-12 (493 mg/L). While the data is generally consistent with groundwater flow paths, the results may be biased due to the City of Ellensburg's use of sodium chloride for road de-icing. Therefore, overall tracer data is not considered reliable for assessment.

5.2 Oxidant Results

A more reliable method for assessing oxidant distribution is by monitoring concentrations of nitrate and sulfate, the primary bioremediation oxidants in OxEA-aq. Of these oxidants, nitrate tends to be consumed first and sulfate consumed last. Although both oxidants are typically used together, the rate of nitrate consumption is faster. Injected oxidants are typically first used by microbes to consume volatile fatty acids (partially degraded petroleum), then aromatics (BTEX), and then aliphatics (included in TPH-G analysis), providing a fairly predictable treatment process.

The presence of nitrate also induces the petroleum-degrading bacteria to produce natural surfactants. When OxEA-aq is combined with Ivey Sol surfactant, elevated nitrate concentrations are associated with much higher dissolved aromatic and TPH-G concentrations than the normal site environment. This is evident in the oxidant loading plots presented on Figures 8 and 9, where higher oxidant loading is directly associated with increases in TPH-G concentrations.

Preinjection groundwater monitoring showed nitrate concentrations up to 7.14 mg/L (MW-12, May 2007), but concentrations typically remained below 1 mg/L along the core plume axis. After OxEA-aq injections, elevated nitrate concentrations were noted in all injection wells. The most notable increases occurred during February 2012 in MW-14 (99.0 mg/L) and MW-4R (74.9 mg/L). As nitrate is used rapidly by petroleum-degrading microbes, including those provided in PetroBac, the continued presence of nitrate three months after the last injection in November 2011 suggests that much less petroleum is present in the soil matrix between these wells.

As sulfate tends to be used more slowly than nitrate, elevated sulfate concentrations can indicate amendment movement. For example, July 2011 groundwater samples from MW-14 did not contain nitrate, only elevated concentrations of sulfate (550 mg/L), confirming that amendment was being used along the plume axis 3 months after the May 2011 injection event. The origin of this sulfate is likely to be upgradient from MW-4R. A higher concentration of sulfate was noted in February 2012, 3 months after the heaviest amendment application (300 pounds) in MW-4R, supporting this conclusion.

Elevated sulfate was also noted in downgradient MW-5 (21.7 mg/L) and MW-12 (60.3 mg/L) during November 2011. The high sulfate concentration noted in MW-12 was concurrent with the high chloride concentration (493 mg/L), supporting the conclusion that groundwater flow from near MW-3 may have a more westerly component that previously estimated and with groundwater velocities greater than 1 foot per day. Elevated sulfate concentrations were not noted in downgradient monitoring wells MW-13 or MW-15, suggesting that amendment from the January 2011 MW-2 and MW-6 injections had been fully consumed before reaching MW-13.

5.3 Petroleum Hydrocarbon Results

Amendment injections typically mobilize and degrade aromatic BTEX constituents first, based on their higher solubility compared to aliphatic hydrocarbons and greater energy yield to the microbes when metabolized. The noteworthy absence of benzene during this process strongly supports the conclusion that little benzene, if any, remains in site soils.

In MW-14, February 2012 concentrations of ethylbenzene (1.8 µg/L) and total xylene (8.6 µg/L) were much lower compared to preinjection October 2009 results under comparable TPH-G concentrations. This supports the conclusion that significant aromatic and total petroleum degradation has occurred near MW-14. The elevated February 2012 petroleum results in MW-14 are likely directly linked to heavy surfactant and OxEA-aq application in MW-4R during

November 2011, effectively "wringing" the soil of remaining petroleum for microbe consumption. As shown on Figure 8, the previous inverse relationship between groundwater elevation and TPH-G concentrations stopped after amendment additions began. Instead, oxidant/amendment concentrations became a much more reliable predictor of TPH-G concentration trends. As oxidant/amendment concentrations drop, we anticipate that TPH-G concentrations will concurrently drop, as they did in MW-14 during November 2011. There is a good chance that the eventual TPH-G drop is likely to be maintained below the cleanup level.

Significant mobilization of petroleum from the soil is also evident in the July 2011 analytical results for MW-4R. This well had been generally non-detect for BTEX and TPH-G since October 2005. Relatively high concentrations of TPH-G (980 µg/L) and toluene (250 µg/L) occurred 6 months after injections into upgradient MW-3, demonstrating the ability of the surfactants to dissolve petroleum into groundwater for microbe consumption. The net effect is to sharply blunt any subsequent groundwater concentration rebounds following the eventual reduction in microbial activity and surfactant biodegradation. Reducing soil-bound petroleum also allows the natural oxidants, which fuel the natural attenuation process, to penetrate deeper into the plume and degrade residual petroleum in downgradient areas more rapidly.

The February 2012 groundwater data from MW-6 is very encouraging in the context of this remediation process. While groundwater TPH-G concentrations spiked above the cleanup level (1,600 µg/L), there is a notable lack of benzene, ethylbenzene, and xylene compared to June 2008 results collected under steady-state conditions and comparable TPH-G concentrations (1,550 µg/L). The February 2012 TPH-G spike is likely associated with the injections into either MW-2 or MW-14 during November 2011. The amendment source and treated zone is uncertain, given the absence of prior, comparable response in MW-6 to MW-14 injections. As shown on Figure 9, the previous pattern of higher water levels concurrent with TPH-G spikes in MW-6 was not as prevalent during periods of oxidant loading.

6.0 CONCLUSION AND RECOMMENDATIONS

Based on the data collected through February 2012, substantial petroleum destruction has occurred within the treatment zone. Although residual petroleum mass was aggressively mobilized from the soil matrix, few BTEX compounds remain. While MW-6 and MW-14 continue to have TPH-G concentrations above MTCA Method A cleanup levels, oxidants are still available for microbes to aggressively degrade dissolved petroleum. Data from

these wells are not likely to indicate steady-state concentrations for 6 months, but they should decline with lower oxidant availability and eventual surfactant biodegradation.

The injected bioremediation amendments do not appear to have migrated outside of the TPH-G plume footprint, as evidenced by data collected from MW-13. However, the presence of elevated chloride and sulfate in MW-12 suggests some component of groundwater flow from near MW-3 has a more westerly component than previously thought.

We recommend continued quarterly bioremediation performance sampling of MW-4R, MW-6, MW-13, and MW-14 through November 2012. Performance sampling includes analysis for TPH-G, VOCs, nitrate, and sulfate to assess oxidant consumption and final steady-state petroleum concentrations. This sampling is in addition to the normal annual monitoring, which should be held in November 2012. Depending on data through November 2012, the site may be ready for four quarters of compliance monitoring required for site closure.

7.0 LIMITATIONS

Work for this project was performed, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Ken's Auto Wash for specific application to the referenced property. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

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Table 1 - Previous and Current Groundwater Monitoring Schedule

Well	Purpose	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW-2	Bound Plume - East	Quarterly [a]	Quarterly [a]	Biannual	[b]	Biannual [a]	Biannual [a]	[b]	Annual [a]	Quarterly [c]	Quarterly [d]
MW-3	Background	Quarterly [a]	Quarterly [a]	Biannual	[b]	Biannual [a]	Biannual [a]	[b]	Annual [a]	Quarterly [c]	Quarterly [d]
MW-4/4R	Source Area (Upgradient Edge)	Quarterly [a]	Quarterly [a]	Biannual	Biannual	Biannual [a]	Biannual [a]	Annual [a]	Annual [a]	Quarterly [c]	Quarterly [d]
MW-5	Bound Plume - West	Quarterly [a]	Quarterly [a]	Biannual	Biannual	Biannual [a]	Biannual [a]	Annual [a]	Annual [a]	Quarterly [c]	Quarterly [d]
MW-6	Plume Extent	Quarterly [a]	Quarterly [a]	Biannual	[b]	Biannual [a]	Biannual [a]	[b]	Annual [a]	Quarterly [c]	Quarterly [d]
MW-12	Bound Plume - Southwest	Quarterly [a]	Quarterly [a]	Biannual	Biannual	Biannual [a]	Biannual [a]	Annual [a]	Annual [a]	Quarterly [c]	Quarterly [d]
MW-13	Bound Plume - South	Quarterly [a]	Quarterly [a]	Biannual	[b]	Biannual [a]	Biannual [a]	[b]	Annual [a]	Quarterly [c]	Quarterly [d]
MW-14	Source Area	Quarterly [a]	Quarterly [a]	Biannual	Biannual	Biannual [a]	Biannual [a]	Annual [a]	Annual [a]	Quarterly [c]	Quarterly [d]
MW-15	Bound Plume - Southeast	Quarterly [a]	Quarterly [a]	Biannual	[b]	Biannual [a]	Biannual [a]	[b]	Annual [a]	Quarterly [c]	Quarterly [d]

Notes:

Biannual refers to twice yearly events targeted during spring (Q2) and fall (Q4). Biannual and annual monitoring schedules will be based on estimated seasonal high and low groundwater elevations.

Monitoring will include measurement of groundwater elevation and dissolved oxygen and collection of a groundwater sample for analysis by NWTPH-G/BTEX and total lead.

a Monitoring also includes collection of groundwater samples for analysis for nitrate/nitrite, sulfate, and ferrous iron for the indicated sampling events.

b Although not strictly required, wells MW-2, MW-3, MW-6, MW-13, and MW-15 were monitored and sampled during the fall of 2006 and 2009.

c Quarterly monitoring is part of the Bioremediation Work Plan, dated November 22, 2010.

d Quarterly monitoring is recommended.

Table 2 - Enhanced Bioremediation Injection Schedule

Injection Location	Event 1 January 31, 2011			Event 2 May 3, 2011		Event 4 November 30, 2011		**3-Event OxEA-aq Subtotal**
	OxEA-aq	PetroBac	Tracer	OxEA-aq	Ivey-sol	OxEA-aq	Ivey-sol	
MW-2	25 lbs					100 lbs	0.25 gal	**125 lbs**
MW-3	250 lbs		Cl 25 lbs	200 lbs				**450 lbs**
MW-4R	250 lbs	5 gal		125 lbs	2.0 gal	300 lbs	2.0 gal	**675 lbs**
MW-5	25 lbs							**25 lbs**
MW-6	50 lbs	5 gal		25 lbs	0.4 gal			**75 lbs**
MW-14	200 lbs	5 gal	Br 15 lbs	100 lbs	1.6 gal	100 lbs	1.0 gal	**400 lbs**
Event Total	800 lbs	15 gal	40 lbs	450 lbs	4.0 gal	500 lbs	3.25 gal	**1,750 lbs**

Notes:

PetroBac contains biodegradable surface-active agents and petroleum-degrading microbes to enhance amendment consumption and petroleum destruction.

OxEA-aq is a soluble blend of oxidants with macro- and micronutrients to enhance petroleum degradation.

Ivey-sol is a biodegradable, nonionic surfactant formulated to improve bioremediation of petroleum hydrocarbons.

Event 3 was a monitoring event and no injections were performed.

Table presents actual injection masses and was based on performance and monitoring results.

Br = Food-grade sodium bromide

Cl = Food-grade sodium chloride

lbs = pounds

gal = gallons

Table 3 - Enhanced Bioremediation Groundwater Monitoring Schedule

Monitoring Well	Baseline November 2010				Event 2 May 2011				Event 3 July 2011				Event 4 November 2011					Post-Injection Event February 2012			
	G	V	Ions	F	G	V	Ions	F/N	G	V	Ions	F/N	G	V	Ions	F	N	G	V	Ions	F/N
Injection Wells																					
MW-2	X	X	X	X									X	X	X	X					
MW-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-4R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-5	X	X	X	X									X	X	X	X					
MW-6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Downgradient Wells																					
MW-12	X	X	X	X									X	X	X	X					
MW-13	X	X	X	X			X	X			X	X	X	X	X	X	X			X	X
MW-15	X	X	X	X									X	X	X	X					

Notes:
Monitoring was performed before any injection activities.
G = Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
V = Volatile organic compounds benzene, toluene, ethylbenzene, and xylene by EPA Method 8021B.
Ions = Nitrate as nitrogen, sulfate, bromide, and chloride by EPA Method 300.0.
F = Field kit testing of ferrous iron.
N = Field kit testing of nitrate.

Table 4 - Groundwater Elevation Data

Measured Depth to Groundwater in Feet

Well No.	8-Apr-96	5-Jan-98	5-Feb-98	5-Mar-98	6-Apr-98	5-May-98	5-Jun-98	6-Jul-98	5-Aug-98	4-Sep-98	5-Oct-98	5-Nov-98	29-Dec-99	21-Mar-00
MW-1	6.85	na	7.67	8.01	8.38	6.88	6.94	7.50	7.69	7.82	7.85	8.33	9.65	8.51
MW-14 (b)	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-2	6.70	7.53	6.50	6.88	7.18	5.69	5.79	6.19	6.55	6.58	7.70	7.06	7.23	7.18
MW-3	8.08	8.42	7.65	8.01	8.17	6.71	7.50	7.42	7.51	7.66	7.80	8.28	8.41	8.29
MW-4	---	7.84	7.17	7.43	7.67	6.42	6.57	6.90	7.01	7.14	7.21	7.62	7.68	7.60
MW-4R (c)	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-5	---	8.23	7.15	7.45	7.96	6.24	6.34	6.65	7.16	7.29	7.41	7.94	7.52	7.32
MW-6	---	9.70	8.67	9.13	9.46	8.14	8.21	8.66	8.87	9.01	9.05	9.51	8.60	8.36
MW-12	---	---	---	---	---	---	---	---	---	---	---	---	6.91	6.64
MW-13	---	---	---	---	---	---	---	---	---	---	---	---	5.42	5.33
MW-15	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Groundwater Elevation in Feet

Well No.	TOC Elev. (a)	8-Apr-96	5-Jan-98	5-Feb-98	5-Mar-98	6-Apr-98	5-May-98	5-Jun-98	6-Jul-98	5-Aug-98	4-Sep-98	5-Oct-98	5-Nov-98	29-Dec-99	21-Mar-00
MW-1	1588.38	1581.53	na	1580.71	1580.37	1580.00	1581.50	1581.44	1580.88	1580.69	1580.56	1580.53	1580.05	1578.73	1579.87
MW-14 (b)	1588.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-2	1588.92	1582.22	1581.39	1582.42	1582.04	1581.74	1583.23	1583.13	1582.73	1582.37	1582.34	1581.22	1581.86	1581.69	1581.74
MW-3	1591.43	1583.35	1583.01	1583.78	1583.42	1583.26	1584.72	1583.93	1584.01	1583.92	1583.77	1583.63	1583.15	1583.02	1583.14
MW-4	1589.50	---	1581.66	1582.33	1582.07	1581.83	1583.08	1582.93	1582.60	1582.49	1582.36	1582.29	1581.88	1581.82	1581.90
MW-4R (c)	1588.76	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-5	1587.75	---	1579.52	1580.60	1580.30	1579.79	1581.51	1581.41	1581.10	1580.59	1580.46	1580.34	1579.81	1580.23	1580.43
MW-6	1587.72	---	1578.02	1579.05	1578.59	1578.26	1579.58	1579.51	1579.06	1578.85	1578.71	1578.67	1578.21	1579.12	1579.36
MW-12	1585.41	---	---	---	---	---	---	---	---	---	---	---	---	1578.50	1578.77
MW-13	1582.45	---	---	---	---	---	---	---	---	---	---	---	---	1577.03	1577.12
MW-15	1588.39	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Table 4 - Groundwater Elevation Data

Measured Depth to Groundwater in Feet

Well No.	14-Jun-00	12-Sep-00	30-Jan-01	26-Apr-01	29-Jul-01	27-Oct-01	15-Nov-02	9-May-03	30-Sep-03	11-Dec-03	31-Mar-04	2-Jun-04	30-Sep-04	14-Dec-04
MW-1	7.08	7.85	---	---	---	---	---	---	---	---	---	---	---	---
MW-14 (b)	---	---	8.55	8.35	7.01	9.02	8.90	6.23	8.05	8.58	8.32	6.28	7.79	8.45
MW-2	6.10	6.70	7.54	7.11	6.23	7.64	7.61	5.95	6.81	7.03	7.05	5.94	6.69	7.07
MW-3	7.42	7.92	8.70	7.67	7.28	8.66	8.63	6.89	8.06	8.48	8.30	6.98	7.92	8.64
MW-4	6.80	7.23	8.08	7.85	6.93	8.09	8.04	6.71	7.65	7.81	7.70	6.62	7.44	7.86
MW-4R (c)	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-5	6.25	6.87	na	7.98	6.29	7.97	8.05	6.19	7.55	7.83	7.59	6.14	---	9.21
MW-6	7.70	8.07	na	9.28	8.09	9.44	9.37	7.91	8.90	9.19	9.00	7.82	8.88	9.49
MW-12	6.05	6.36	na	7.30	6.38	7.13	7.52	6.50	7.25	7.38	7.18	6.40	7.31	7.81
MW-13	4.70	4.98	na	5.74	4.67	5.78	---	---	5.32	5.73	5.49	4.63	5.18	5.81
MW-15	---	---	9.23	8.83	7.59	9.30	9.08	7.38	8.55	8.67	8.85	7.31	8.33	9.20

Groundwater Elevation in Feet

Well No.	TOC Elev. (a)	14-Jun-00	12-Sep-00	30-Jan-01	26-Apr-01	29-Jul-01	27-Oct-01	15-Nov-02	9-May-03	30-Sep-03	11-Dec-03	31-Mar-04	2-Jun-04	30-Sep-04	14-Dec-04
MW-1	1588.38	1581.30	1580.53	---	---	---	---	---	---	---	---	---	---	---	---
MW-14 (b)	1588.4	---	---	1579.85	1580.05	1581.39	1579.38	1579.50	1582.17	1580.35	1579.82	1580.08	1582.12	1580.61	1579.95
MW-2	1588.92	1582.82	1582.22	1581.38	1581.81	1582.69	1581.28	1581.31	1582.97	1582.11	1581.89	1581.87	1582.98	1582.23	1581.85
MW-3	1591.43	1584.01	1583.51	1582.73	1583.76	1584.15	1582.77	1582.80	1584.54	1583.37	1582.95	1583.13	1584.45	1583.51	1582.79
MW-4	1589.50	1582.70	1582.27	1581.42	1581.65	1582.57	1581.41	1581.46	1582.79	1581.85	1581.69	1581.80	1582.88	1582.06	1581.64
MW-4R (c)	1588.76	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-5	1587.75	1581.50	1580.88	na	1579.77	1581.46	1579.78	1579.70	1581.56	1580.20	1579.92	1580.16	1581.61	---	1578.54
MW-6	1587.72	1580.02	1579.65	na	1578.44	1579.63	1578.28	1578.35	1579.81	1578.82	1578.53	1578.72	1579.90	1578.84	1578.23
MW-12	1585.41	1579.36	1579.05	na	1578.11	1579.03	1578.28	1577.89	1578.91	1578.16	1578.03	1578.23	1579.01	1578.10	1577.60
MW-13	1582.45	1577.75	1577.47	na	1576.71	1577.78	1576.67	---	---	1577.13	1576.72	1576.96	1577.82	1577.27	1576.64
MW-15	1588.39	---	---	1579.16	1579.56	1580.80	1579.09	1579.31	1581.01	1579.84	1579.72	1579.54	1581.08	1580.06	1579.19

Table 4 - Groundwater Elevation Data

Measured Depth to Groundwater in Feet

Well No.	4-Apr-05	6-Oct-05	28-Jun-06	13-Nov-06	25-May-07	8-Nov-07	4-Jun-08	21-Oct-08	14-Oct-09	15-Nov-10	2-May-11	27-Jul-11	2-Nov-11	13-Feb-12
MW-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-14 (b)	8.63	7.83	6.15	7.57	5.23	8.04	5.20	7.57	7.20	8.11	5.88	6.57	7.91	7.35
MW-2	7.57	7.21	nm	7.01	5.56	7.18	5.46	6.80	6.77	7.23	nm	nm	7.20	nm
MW-3	8.80	8.37	nm	8.13	6.72	8.52	6.52	8.17	8.00	8.64	6.75	7.45	8.75	8.29
MW-4	8.02	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-4R (c)	---	7.78	6.01	6.23	5.45	6.92	5.39	6.60	6.51	6.94	5.84	6.00	6.88	6.71
MW-5	8.32	7.73	6.38	7.32	5.83	7.97	5.82	7.40	7.12	7.99	nm	nm	7.79	nm
MW-6	9.78	9.14	nm	8.79	7.56	9.22	7.43	8.84	8.58	9.20	7.90	8.16	9.36	9.13
MW-12	7.89	7.51	6.90	7.20	6.41	7.62	6.30	7.30	7.16	7.63	nm	nm	7.61	nm
MW-13	5.16	5.56	nm	5.91	4.46	5.68	4.43	5.40	5.11	5.60	4.85	4.88	5.64	5.45
MW-15	9.40	8.02	nm	8.49	6.98	8.96	6.90	8.57	8.22	9.04	nm	nm	9.04	nm

Groundwater Elevation in Feet

Well No.	TOC Elev. (a)	4-Apr-05	6-Oct-05	28-Jun-06	13-Nov-06	25-May-07	8-Nov-07	4-Jun-08	21-Oct-08	14-Oct-09	15-Nov-10	2-May-11	27-Jul-11	2-Nov-11	13-Feb-12
MW-1	1588.38	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-14 (b)	1588.4	1579.77	1580.57	1582.25	1580.83	1583.17	1580.36	1583.20	1580.83	1581.20	1580.29	1582.52	1581.83	1580.49	1581.05
MW-2	1588.92	1581.35	1581.71	nm	1581.91	1583.36	1581.74	1583.46	1582.12	1582.15	1581.69	nm	nm	1581.72	nm
MW-3	1591.43	1582.63	1583.06	nm	1583.30	1584.71	1582.91	1584.91	1583.26	1583.43	1582.79	1584.68	1583.98	1582.68	1583.14
MW-4	1589.50	1581.48	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-4R (c)	1588.76	---	1580.98	1582.75	1582.53	1583.31	1581.84	1583.37	1582.16	1582.25	1581.82	1582.92	1582.76	1581.88	1582.05
MW-5	1587.75	1579.43	1580.02	1581.37	1580.43	1581.92	1579.78	1581.93	1580.35	1580.63	1579.76	nm	nm	1579.96	nm
MW-6	1587.72	1577.94	1578.58	nm	1578.93	1580.16	1578.50	1580.29	1578.88	1579.14	1578.52	1579.82	1579.56	1578.36	1578.59
MW-12	1585.41	1577.52	1577.90	1578.51	1578.21	1579.00	1577.79	1579.11	1578.11	1578.25	1577.78	nm	nm	1577.80	nm
MW-13	1582.45	1577.29	1576.89	nm	1576.54	1577.99	1576.77	1578.02	1577.05	1577.34	1576.85	1577.60	1577.57	1576.81	1577.00
MW-15	1588.39	1578.99	1580.37	nm	1579.90	1581.41	1579.43	1581.49	1579.82	1580.17	1579.35	nm	nm	1579.35	nm

Notes:

(a) TOC Elevation = top of casing elevations are surveyed relative to Mean Sea Level by Sage Environmental. MW-12 and MW-13 were surveyed relative to existing well MW-1, and existing wells MW-5 and MW-6 were re-surveyed and corrected slightly.

(b) Well MW-1 replaced as well MW-14 by Hart Crowser and resurveyed following remediation work in November 2000.

(c) Well MW-4 was replaced as well MW-4R by Hart Crowser in October 2005 and resurveyed, following removal of the well during UST removal activities in April 2005.

--- Well not installed or not available as of date indicated.

nm Indicates well was not measured.

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-1	4/8/1996	**160,000**	**2,500**	**19,000**	**3,000**	**21,000**	**65**	--
	1/5/1998	--	--	--	--	--	--	--
	4/6/1998	**100,000**	**180**	260	**940**	**9,800**	**180**	--
	7/6/1998	**93,000**	**110**	200	**760**	**8,800**	**220**	--
	10/5/1998	--	--	--	--	--	--	--
	12/29/1999	**21,600**	**87.4**	47.7	657	**3,900**	--	**21.3**
	3/21/2000	**19,800**	**94.1**	59.6	479	**2,710**	--	**16.5**
	6/14/2000	**18,800**	**94.9**	26.4	471	**2,870**	--	8
	9/12/2000	**21,400**	**111**	35.1	496	**2,930**	--	6.54
MW-14	1/30/2001	**7,450**	**19.3**	14	424	673	--	--
(Replaces MW-1)	4/26/2001	**26,100**	**37.2**	29.7	580	**2,680**	--	--
	7/29/2001	**14,200**	**10.3**	14.2	318	**1,480**	--	--
	10/27/2001	**9,970**	**46.4**	4.55	187	707	--	--
	11/15/2002	**8,380**	**11**	2.5 U	122	357	--	--
	5/9/2003	**4,520**	2.62	0.5 U	0.775	172	5.33	--
	9/30/2003	**6,230** J	**11.7** J	1.61 J	151 J	369 J	4.56	--
	12/11/2003	**5,890**	**12.6**	5.0 U	5.0 U	271	12.4	--
	3/31/2004	**6,270**	**12.6**	5 U	80.4	168.4	4.85	--
	6/2/2004	**3,790** J	2.36 J	0.5 U	26.9 J	88.1 J	4.12	--
	9/30/2004	**5,700** J	**5.52**	2.5 U	82.1	256	4.29	--
	12/14/2004	**5,500** J	4.36	0.643	66.1	178	--	--
	4/4/2005	**8,100** J	**6.89**	0.746	75.8	221	--	--
	10/6/2005	**4,070** J	**7.85**	0.5 U	43.1	62.8	3.7	--
	6/28/2006	533	0.545	0.5 U	0.593	5.34	3.41	--
	11/13/2006	496	0.933	0.5 U	6.89	5.99	3.03	--
	5/25/2007	54	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	**3,050**	**7.6**	2.58	28.1	20	2.31	--
	6/4/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	**2,040**	4.76	0.5 U	16.6	15.1	1.85	--
	10/14/2009	**2,030**	12.2 U	0.844 U	18.9	33.8	2 U	--
	11/15/2010	**2,500**	0.25 U	1.0 UJ	7.6	10.7	1	--
	5/2/2011	**3,100**	1.0 U	1.7	1.4	1.3	--	--
	7/27/2011	**3,700**	1.0 U	1.2	3.0	2.8	--	--
	11/2/2011	**1,200**	0.25 U	0.3 U	3.4	1.8	2.0	--
	2/13/2012	**2,200**	0.25 U	0.25 U	1.8	8.6	--	--

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline		Benzene		Toluene		Ethyl-benzene		Total Xylenes		Total Lead		Diss. Lead	
MW-2	4/8/1996	50	U	1	U	1	U	1	U	1	U	5	U	--	
	1/5/1998	50	U	1	U	1	U	1	U	1	U	15		5	U
	4/6/1998	50	U	1	U	1	U	1	U	1	U	5	U	--	
	7/6/1998	50	U	1	U	1	U	1	U	1	U	**21**		--	
	10/5/1998	50	U	1	U	1	U	1	U	1	U	**34**		--	
	12/29/1999	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	3/21/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	6/14/2000	50	U	0.5	U	0.5	U	0.55		3.41		--		1	U
	9/12/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	1/30/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/26/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	7/29/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/27/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/15/2002	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	5/9/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	2.61		--	
	12/11/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	3/31/2004	**13,000**		10	U	119		180		**2,541**	J	1	U	--	
	6/2/2004	**1,480**		2.10		0.5	U	0.5	U	11.0		1	U	--	
	9/30/2004	**1,290**	J	2.40		0.5	U	0.859		5.11		1	U	--	
	12/14/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/4/2005	101		0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/6/2005	160		0.741		0.5	U	0.5	U	1	U	1	U	--	
	6/28/2006	--		--		--		--		--		--		--	
	11/13/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	5/25/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/7/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/4/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/21/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	**20.8**		--	
	10/14/2009	80	U	0.5	U	0.5	U	0.5	U	1	U	2	U	--	
	11/15/2010	100	U	0.25	U	0.5	U	0.25	U	0.75	U	1	U	--	
	11/2/2011	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.3		--	

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-3	4/8/1996	50 U	1 U	1 U	1 U	1 U	5 U	--
	1/5/1998	50 U	1 U	1 U	1 U	1 U	5 U	--
	4/6/1998	50 U	1 U	1 U	1 U	1 U	5 U	--
	7/6/1998	50 U	1 U	1 U	1 U	1 U	5 U	--
	10/5/1998	50 U	1 U	1 U	1 U	1 U	3.8	--
	12/29/1999	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	3/21/2000	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	6/14/2000	50 U	0.5 U	0.85	0.5 U	1 U	--	1 U
	9/12/2000	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	1/30/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/26/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	7/29/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/27/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/15/2002	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	5/9/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/11/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	3/31/2004	50 U	0.2 U	0.2 U	0.2 U	0.5 U	1 U	--
	6/2/2004	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2004	50 UJ	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/14/2004	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/6/2005	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	--	--	--	--	--	--	--
	11/13/2006	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/8/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/4/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/14/2009	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
	11/15/2010	100 U	0.25 U	0.5 U	0.25 U	0.75 U	1 U	--
	5/2/2011	250 U	1.0 U	1.0 U	1.0 U	2.0 U	--	--
	7/27/2011	250 U	1.0 U	1.0 U	1.0 U	2.0 U	--	--
	11/2/2011	100 U	0.25 U	0.25 U	0.25 U	0.75 U	0.1 U	--
	2/13/2012	100 U	0.25 U	0.25 U	0.25 U	0.75 U	--	--

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-4	1/5/1998	200	1 U	27	1	3	10	5 U
	4/6/1998	400	3	14	1	6	5 U	--
	7/6/1998	50 U	1 U	3	1 U	1 U	5 U	--
	10/5/1998	150	1 U	7	1 U	1 U	2	--
	12/29/1999	301	**51.4**	32.5	0.5 U	6.08	--	1 U
	3/21/2000	414	**44.8**	28.2	1.92	3.2 U	--	1 U
	6/14/2000	439	**69.7**	4.91	2.01	6.8	--	1 U
	9/12/2000	101	4.49	0.5 U	0.5 U	0.5 U	--	1 U
	1/31/2001	182	2.22	1.17 U	0.5 U	1.33 U	--	--
	4/26/2001	673	**8.79**	4.73	4.28	28.6	--	--
	7/29/2001	402	**24.3**	16.3	2.84	14.8	--	--
	10/27/2001	200	**24.9**	2.62	1.15	6.57	--	--
	11/15/2002	75.6	0.858	0.5 U	0.5 U	1 U	--	--
	5/9/2003	61.8	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	161	0.730	0.5 U	2.59	2.59	1 U	--
	12/11/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	3.22	--
	3/31/2004	267	**29.0**	1.43	1 U	2.94	1 U	--
	6/2/2004	140	**46.4**	4.2	0.5 U	1 U	1 U	--
	9/30/2004	88.7 J	0.5 U	0.5 U	1.83	1 U	1 U	--
	12/14/2004	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
MW-4R	4/4/2005	112	1.93	0.5 U	0.5 U	1 U	--	--
(Replaces MW-4)	10/6/2005	744	0.929	0.5 U	9.31	3.57	19	--
	6/28/2006	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	11/13/2006	107	0.5 U	0.5 U	0.5 U	1 U	5.82	--
	5/25/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	75.2	0.5 U	0.5 U	0.5 U	1 U	0.325	--
	6/4/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	6.98	--
	10/14/2009	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
	11/15/2010	100 U	0.25 U	0.5 U	0.25 U	0.75 U	1 U	--
	5/2/2011	250 U	1.0 U	1.6	1.0 U	2.0 U	--	--
	7/27/2011	980	1.0 U	250	1.0 U	2.0 U	--	--
	11/2/2011	100 U	0.25 U	14	0.25 U	0.75 U	0.1	--
	2/13/2012	100 U	0.25 U	0.25 U	0.25 U	0.75 U	--	--

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-5	1/5/1998	**6200**	1	57	3	160	5 U	--
	4/6/1998	**2800**	2	30	2	27	5 U	--
	7/6/1998	50 U	1 U	1 U	1 U	1 U	10	--
	10/5/1998	**4700**	2	39	16	94	7.4	--
	12/29/1999	779	2.96	0.69	9.03	27.4	--	1 U
	3/21/2000	519	0.5 U	13.9	4.95	3.6	--	1 U
	6/14/2000	708	3.45 U	1.17 U	1.08	1 U	--	1 U
	9/12/2000	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	4/26/2001	**831**	**7.35**	0.516	15.3	1 U	--	--
	7/29/2001	53.8	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/27/2001	552	3.29	0.5 U	1.28	1.58	--	--
	11/15/2002	108	0.5 U	0.5 U	0.5 U	0.5 U	--	--
	5/9/2003	78.7	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	229	0.5 U	0.5 U	0.5 U	1.61	1 U	--
	12/11/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	3/31/2004	53	0.2 U	0.2 U	0.2 U	0.5 U	1 U	--
	6/2/2004	92.8	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/14/2004	308	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	620	1.45	0.5 U	0.5 U	1.07	--	--
	10/6/2005	114	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	11/13/2006	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/4/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/22/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/15/2009	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
	11/15/2010	170	0.25 U	0.5 U	0.25 U	0.75 U	1 U	--
	11/2/2011	100 U	0.25 U	0.25 U	0.25 U	0.75 U	2.1	--

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-6	1/5/1998	**2,200**	**53**	17	9	93	5 U	--
	4/6/1998	**4,200**	**51**	16	25	110	5 U	--
	7/6/1998	**6,900**	**11**	19	1	510	11	--
	10/5/1998	**5,800**	**43**	22	48	240	12	--
	12/29/1999	**2,090**	**11.5**	2	35.1	65.1	--	1 U
	3/21/2000	**1,580**	0.75 U	14.3	28.7	61	--	1 U
	6/14/2000	**2,170**	**9.78**	1.03 U	33.1	101	--	1 U
	9/12/2000	**1,630**	**12.8**	1.2 U	27.9	75.7	--	1 U
	4/26/2001	**1,320**	**11.3**	0.906	1.41	3.37	--	--
	7/29/2001	**5,050**	**8.71**	4.99	189	536	--	--
	10/27/2001	**1,910**	**15.3**	0.786	1.67	5.49	--	--
	11/15/2002	**1,270**	**9.01**	0.5 U	0.594	1.85	--	--
	5/9/2003	**1,710**	1.79	0.5 U	1.29	21.2	1.29	--
	9/30/2003	**1,610**	**16.7**	2.50 U	2.91	7.96	1 U	--
	12/11/2003	624	**5.67**	0.50 U	0.737 J	2.19 J	1 U	--
	3/31/2004	**1,160**	0.520	0.2 U	0.350	0.5 U	1 U	--
	6/2/2004	**2,300** J	4.78 J	0.5 U	54.0 J	75.5 J	1.29	--
	9/30/2004	**1,150** J	**8.34** J	0.5 J	0.553 J	2.92 J	1 U	--
	12/14/2004	672	3.57	0.5 U	0.5 U	1.42	--	--
	4/4/2005 [b]	**1,010**	**5.91**	0.5 U	0.5 U	1.86 [c]	--	--
	10/6/2005	**1,380** J	**8.10**	0.5 U	0.632	1.94	1 U	--
	6/28/2006	--	--	--	--	--	--	--
	11/13/2006	**826**	3.3	0.5 U	0.5 U	1.89	1 U	--
	5/25/2007	**1,460**	0.5 U	0.5 U	25.6	1.22	--	--
	11/7/2007	729	3.53	0.5 U	0.5 U	1.69	1 U	--
	6/4/2008	**1,550**	1.93	0.5 U	30.8	2.78	1 U	--
	10/22/2008	**855**	3.1	0.5 U	0.933	3.37	1 U	--
	10/14/2009	501	7.59 U	0.5 U	1.18 U	1 U	2 U	--
	11/15/2010	450	0.25 U	0.49	0.25 U	0.75 U	1 U	--
	5/2/2011	490	1.0 U	1.0 U	1.0 U	2.0 U	--	--
	7/27/2011	610	1.0 U	1.0 U	1.0 U	2.0 U	--	--
	11/2/2011	590	0.25 U	0.25 U	0.25 U	0.75 U	4	--
	2/13/2012	**1,600**	0.25 U	0.25 U	0.25 U	1.5	--	--

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L											
		TPH-Gasoline		Benzene		Toluene		Ethyl-benzene		Total Xylenes		Total Lead		Diss. Lead	
MW-12	12/29/1999	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	3/21/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	6/14/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	9/12/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	4/26/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	7/29/2001	50	U	0.5	U	0.5	U	1.74		4.83		--		--	
	10/27/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/15/2002	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	5/9/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/11/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1.47		--	
	3/31/2004	50	U	0.2	U	0.2	U	0.2	U	0.5	U	1	U	--	
	6/2/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2004	50	UJ	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/14/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/4/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/12/2005	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/28/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	2.98		--	
	11/13/2006	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	5/25/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/8/2007	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/4/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/22/2008	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/14/2009	80	U	0.5	U	0.5	U	0.5	U	1	U	2	U	--	
	11/15/2010	100	U	0.25	U	0.5	U	0.25	U	0.75	U	1	U	--	
	11/2/2011	100	U	0.25	U	0.25	U	0.25	U	0.75	U	0.1	U	--	
MW-13	12/29/99	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	3/21/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	6/14/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	9/12/2000	50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	4/26/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	7/29/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/27/2001	50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	9/30/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/11/2003	50	U	0.5	U	0.5	U	0.5	U	1	U	1.56		--	
	3/31/2004	50	U	0.2	U	0.2	U	0.2	U	0.5	U	1	U	--	
	6/2/2004	50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2004	50	UJ	0.5	U	0.5	U	0.5	U	1	U	1	U	--	

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
	12/14/2004	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/6/2005	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	--	--	--	--	--	--	--
	11/13/2006	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/8/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/4/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/22/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/15/2009	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
	11/15/2010	100 U	0.25 U	0.5 U	0.25 U	0.75 U	1 U	--
	11/2/2011	100 U	0.25 U	0.25 U	0.25 U	0.75 U	0.2	--
MW-15	1/30/2001	161	1.53	0.5 U	0.5 U	1.18 U	--	--
	4/26/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	7/29/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/27/2001	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/15/2002	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	5/9/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/11/2003	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	3/31/2004	50 U	0.2 U	0.2 U	0.2 U	0.5 U	1 U	--
	6/2/2004	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2004	50 UJ	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/14/2004	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/6/2005	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	--	--	--	--	--	--	--
	11/13/2006	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/5/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/22/2008	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/14/2009	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
	11/15/2010	100 U	0.25 U	0.5 U	0.25 U	0.75 U	1 U	--
	11/2/2011	100 U	0.25 U	0.25 U	0.25 U	0.75 U	0.1 U	--
MTCA Method A Groundwater Cleanup Level		800/1,000 [a]	5	1000	700	1000	15	15

Table 5 - Summary of Groundwater Chemistry Data - TPH-G, BTEX, and Lead

Well ID	Date Sampled	Concentration in µg/L TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead

Notes:
Gasoline-range TPH analyzed by EPA Method 8015 prior to 1999. After that, analyzed by NWTPH-G; BTEX Analyzed by EPA Method 8021B
BTEX analyzed by EPA Method 8260B in March 2004.
Total and Dissolved Lead analyzed by EPA Method 6010 or 6020.
-- Not analyzed.
U = Not detected at specified reporting limit.
J = Estimated concentration.
Bolded concentrations exceed MTCA Method A cleanup levels.
Access to well MW-13 obstructed in November 2002 and May 2003.
Access to well MW-5 obstructed in September 2004.
Data from 1996 and 1998 collected by Sage Environmental.
Well MW-1 was removed during the October 2000 excavation. Wells MW-14 and MW-15 were installed in January 2001 after the excavation.
Well MW-4 was replaced as well MW-4R by Hart Crowser in October 2005, following removal of the well during UST removal activities in April 2005.
First dashed line indicates soil was excavated in November 2000.
Second dashed line indicates bioremediation amendments were injected in January 2011.
a) Cleanup level for TPH-G with/without detectable benzene
b) Values shown are the average of the results for the sample and its field duplicate.
c) The value is the result for the field duplicate. The result for the sample was ND (not detected at the detection limit of 1.0 µg/L).

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-1/MW-14	3/21/2000	0.6	--	--	--	--	--	--	--	--	--	--
	6/14/2000	1	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.4	--	--	--	--	--	--	--	--	--	--
	1/30/2001	2.4	--	--	--	--	--	--	--	--	--	--
	4/26/2001	--	--	--	--	--	--	--	--	--	--	--
	7/29/2001	2.3	--	--	--	--	--	--	--	--	--	--
	10/27/2001	0.8	--	--	--	--	--	--	--	--	--	--
	11/15/2002	--	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.2	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.29	--	--	--	--	0.349	0.400 U	--	--	0.200 U	1.6
	12/11/2003	3.2	--	--	--	--	0.200 U	1.14	--	--	0.200 U	4
	3/31/2004	0.12	--	--	--	--	0.200 U	1.08	--	--	0.200 U	5.2
	6/2/2004	0.02	--	--	--	--	0.200 U	4.24	--	--	0.200 U	7.2
	9/30/2004	0.11	--	--	--	--	0.200 U	0.635	--	--	0.200 U	5.6
	12/14/2004	0.07	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	6.3
	4/4/2005	--	--	--	--	--	0.200 U	0.464	--	--	0.200 U	4.82 J
	10/6/2005	--	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	9.74
	6/28/2006	0.6	--	--	--	--	0.556	13.4	--	--	0.400 U	0.25 U
	11/13/2006	0.39	3.5-3.75	--	--	--	0.200 U	1.4	--	--	0.200 U	2.16
	5/25/2007	3.47	ND	--	--	--	3.120	12.200	--	--	0.200 U	0.25 U
	11/7/2007	4.84	5.2	--	--	--	0.010 U	0.900	--	--	0.010 U	--
	6/4/2008	6.01	ND	--	--	--	1.870	9.970	--	--	0.200 U	--
	10/21/2008	5.09	2.9	--	--	--	0.200 U	0.680	--	--	0.200 U	--
	10/14/2009	0	3.6	--	--	--	0.90 UJ	1.2 U	--	--	1.6 J	--
	11/15/2010	0	5	--	--	--	0.1 U	0.4	--	--	--	--
	5/2/2011	0	0.8	4	100	6	63.2	541	35.1	0.2	--	--
	7/27/2011	0.16	1.9	0	10	6	0.1 U	550	40.2	1.0 U	--	--
	11/2/2011	0.86	2	ND	ND	0.75	0.1 U	63.6	17.2	0.8	--	--
	2/13/2012	2.41	2	5	160	2	99.0	671	208	0.2	--	--

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-2	3/21/2000	2.6	--	--	--	--	--	--	--	--	--	--
	6/14/2000	2.8	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.8	--	--	--	--	--	--	--	--	--	--
	1/30/2001	1.5	--	--	--	--	--	--	--	--	--	--
	4/26/2001	4.5	--	--	--	--	--	--	--	--	--	--
	7/29/2001	3.3	--	--	--	--	--	--	--	--	--	--
	10/27/2001	2	--	--	--	--	--	--	--	--	--	--
	11/15/2002	1.5	--	--	--	--	--	--	--	--	--	--
	5/9/2003	2.3	--	--	--	--	--	--	--	--	--	--
	9/30/2003	1.51	--	--	--	--	0.489	3.38	--	--	0.200 U	1.2
	12/11/2003	3.90	--	--	--	--	1.08	3.79	--	--	0.200 U	0.0
	3/31/2004	0.82	--	--	--	--	0.912	4.60	--	--	0.200 U	0.0
	6/2/2004	1.63	--	--	--	--	0.467	3.23	--	--	0.200 U	0.0
	9/30/2004	0.52	--	--	--	--	0.443	2.93	--	--	0.200 U	0.2
	12/14/2004	6.05	--	--	--	--	0.922	3.05	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.719	3.52	--	--	0.200 U	0.25 R
	10/6/2005	--	--	--	--	--	0.219	3.75	--	--	0.200 U	0.25 U
	6/28/2006	--	--	--	--	--	--	--	--	--	--	--
	11/13/2006	0.64	ND	--	--	--	0.410	5.26	--	--	0.200 U	0.25 U
	5/25/2007	7.11	ND	--	--	--	2.740	8.57	--	--	0.200 U	0.25 U
	11/7/2007	4.95	ND	--	--	--	0.275	4.32	--	--	0.010 U	--
	6/4/2008	4.6	ND	--	--	--	1.440	6.14	--	--	0.200 U	--
	10/21/2008	--	ND	--	--	--	0.200 U	3.21	--	--	0.200 U	--
	10/14/2009	0	ND	--	--	--	0.90 U	6.5	--	--	1.3 J	--
	11/15/2010	0.33	ND	--	--	--	0.3	3.9	--	--	--	--
	11/2/2011	1.08	ND	--	--	--	0.6	9.1	5.8	0.1 U	--	--

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-3	3/21/2000	2	--	--	--	--	--	--	--	--	--	--
	6/14/2000	2.1	--	--	--	--	--	--	--	--	--	--
	9/12/2000	1.4	--	--	--	--	--	--	--	--	--	--
	1/30/2001	2.7	--	--	--	--	--	--	--	--	--	--
	4/26/2001	1.8	--	--	--	--	--	--	--	--	--	--
	7/29/2001	4.4	--	--	--	--	--	--	--	--	--	--
	10/27/2001	2.3	--	--	--	--	--	--	--	--	--	--
	11/15/2002	2.1	--	--	--	--	--	--	--	--	--	--
	5/9/2003	2.7	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.44	--	--	--	--	0.228	4.39	--	--	0.200 U	0.0
	12/11/2003	3.20	--	--	--	--	0.200 U	4.79	--	--	0.200 U	0.0
	3/31/2004	1.59	--	--	--	--	0.812	5.53	--	--	0.200 U	0.0
	6/2/2004	0.89	--	--	--	--	0.816	5.61	--	--	0.200 U	0.0
	9/30/2004	0.54	--	--	--	--	0.253	4.43	--	--	0.200 U	0.0
	12/14/2004	2.10	--	--	--	--	0.206	4.69	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.358	4.23	--	--	0.200 U	0.25 R
	10/6/2005	--	--	--	--	--	0.200 U	3.67	--	--	0.200 U	0.25 U
	6/28/2006	--	--	--	--	--	--	--	--	--	--	--
	11/13/2006	1.19	ND	--	--	--	0.370	6.1	--	--	0.200 U	0.25 U
	5/25/2007	8.13	ND	--	--	--	1.520	6.43	--	--	0.200 U	0.25 U
	11/8/2007	5.15	ND	--	--	--	0.168	4.13	--	--	0.010 U	--
	6/4/2008	5.51	ND	--	--	--	0.920	4.59	--	--	0.200 U	--
	10/21/2008	8.29	ND	--	--	--	0.250	3.84	--	--	0.200 U	--
	10/14/2009	0.81	ND	--	--	--	0.90 UJ	3.2	--	--	1.3 J	--
	11/15/2010	1.86	ND	--	--	--	0.2	4.1	--	--	--	--
	5/2/2011	0	ND	2	10	1	3.4	12.4	36.0	0.1 U	--	--
	7/27/2011	0.06	0.6	2	10	1.5	1.8	21.6	12.6	0.1 U	--	--
	11/2/2011	0.9	1.5	ND	ND	1	0.1 U	24.0	9.5	0.1	--	--
	2/13/2012	2.14	ND	0.25	10	0.5	6.8	8.9	12.3	0.1 U	--	--

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-4	3/21/2000	0.6	--	--	--	--	--	--	--	--	--	--
	6/14/2000	1	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.4	--	--	--	--	--	--	--	--	--	--
	1/30/2001	2.4	--	--	--	--	--	--	--	--	--	--
	4/26/2001	--	--	--	--	--	--	--	--	--	--	--
	7/29/2001	2.3	--	--	--	--	--	--	--	--	--	--
	10/27/2001	0.8	--	--	--	--	--	--	--	--	--	--
	11/15/2002	--	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.2	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.12	--	--	--	--	0.200 U	4.57	--	--	0.200 U	1.4
	12/11/2003	1.40	--	--	--	--	1.05	15.3	--	--	0.200 U	0.5
	3/31/2004	0.11	--	--	--	--	0.200 U	7.41	--	--	0.200 U	5.4
	6/2/2004	0.03	--	--	--	--	0.200 U	8.32	--	--	0.200 U	5.2
	9/30/2004	0.06	--	--	--	--	0.200 U	4.91	--	--	0.200 U	3.8
	12/14/2004	0.12	--	--	--	--	0.200 U	5.13	--	--	0.200 U	2.0
	4/4/2005	--	--	--	--	--	0.200 U	5.79	--	--	0.200 U	3.47 J
MW-4R	10/6/2005	--	--	--	--	--	0.200 U	8.07	--	--	0.200 U	1.39
	6/28/2006	0.6	--	--	--	--	0.200 U	16	--	--	0.400 U	0.25 U
	11/13/2006	0.24	2.9-3.0	--	--	--	0.200 U	16.2	--	--	0.200 U	0.25 U
	5/25/2007	2.63	ND	--	--	--	2.290	17.6	--	--	0.200 U	0.25 U
	11/7/2007	4.78	3.7	--	--	--	0.031	10.3	--	--	0.010 U	--
	6/4/2008	3.87	ND	--	--	--	2.030	14.1	--	--	0.200 U	--
	10/21/2008	8.98	1.4	--	--	--	0.200 U	6.52	--	--	0.200 U	--
	10/14/2009	4.83	ND	--	--	--	0.90 UJ	5.9	--	--	1.7 J	--
	11/15/2010	0	2.2	--	--	--	0.1 U	7.3	--	--	--	--
	5/2/2011	0	2.4	5	20	2	18.7	78.9	30.8	8.6	--	--
	7/27/2011	0.14	2	ND	10	4	4.2	12.4	24.7	0.9	--	--
	11/2/2011	0.76	1.9	ND	ND	5	0.2	13.1	14.3	1.0	--	--
	2/13/2012	2.95	1.3	3	120	2	74.9	174	20.2	0.5	--	--

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-5	3/21/2000	0.6	--	--	--	--	--	--	--	--	--	--
	6/14/2000	0.7	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.6	--	--	--	--	--	--	--	--	--	--
	4/26/2001	0.8	--	--	--	--	--	--	--	--	--	--
	7/29/2001	3	--	--	--	--	--	--	--	--	--	--
	10/27/2001	0.9	--	--	--	--	--	--	--	--	--	--
	11/15/2002	0.7	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.2	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.30	--	--	--	--	0.200 U	8.61	--	--	0.200 U	1.8
	12/11/2003	1.30	--	--	--	--	0.200 U	6.85	--	--	0.200 U	0.0
	3/31/2004	0.42	--	--	--	--	1.32	16.1	--	--	0.200 U	0.0
	6/2/2004	0.20	--	--	--	--	1.36	11.7	--	--	0.200 U	0.0
	12/14/2004	0.49	--	--	--	--	0.200 U	7.57	--	--	0.200 U	2.95
	4/4/2005	--	--	--	--	--	0.200 U	9.92	--	--	0.200 U	3.06 J
	10/6/2005	--	--	--	--	--	0.200 U	9.50	--	--	0.200 U	0.25 U
	6/28/2006	2.4	--	--	--	--	2.59	16	--	--	0.400 U	0.25 U
	11/13/2006	3.6	ND	--	--	--	2.99	11.7	--	--	0.200 U	0.25 U
	5/25/2007	6.6	ND	--	--	--	3.400	19.9	--	--	0.200 U	0.25 U
	11/7/2007	5.18	ND	--	--	--	0.110	7.75	--	--	0.010 U	--
	6/4/2008	5.44	ND	--	--	--	1.730	11.8	--	--	0.200 U	--
	10/22/2008	6.75	ND	--	--	--	0.220	6.35	--	--	0.200 U	--
	10/15/2009	1.13	ND	--	--	--	0.90 U	5.2	--	--	1.5 J	--
	11/15/2010	0	ND	--	--	--	0.1	6.6	--	--	--	--
	11/2/2011	0.87	2	--	--	--	0.4	21.7	16.7	0.1	--	--

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-6	3/21/2000	1.8	--	--	--	--	--	--	--	--	--	--
	6/14/2000	0.5	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.5	--	--	--	--	--	--	--	--	--	--
	4/26/2001	--	--	--	--	--	--	--	--	--	--	--
	7/29/2001	2.6	--	--	--	--	--	--	--	--	--	--
	10/27/2001	0.7	--	--	--	--	--	--	--	--	--	--
	11/15/2002	0.6	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.8	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.12	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	2.2
	12/11/2003	1.50	--	--	--	--	0.200 U	0.685	--	--	0.200 U	3.8
	3/31/2004	0.15	--	--	--	--	0.200 U	3.02	--	--	0.200 U	3.4
	6/2/2004	0.09	--	--	--	--	0.200 U	0.557	--	--	0.200 U	5.2
	9/30/2004	0.12	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	6.4
	12/14/2004	0.42	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	3.2
	4/4/2005 [a]	--	--	--	--	--	0.200 U	3.19	--	--	0.200 U	9.33 J
	10/6/2005	--	--	--	--	--	0.200 U	0.400 U	--	--	0.200 U	9.33
	4/4/2005	--	--	--	--	--	0.200 U	3.20	--	--	0.200 U	9.53
Dup	4/4/2005	--	--	--	--	--	0.200 U	3.17	--	--	0.200 U	14.4
	6/28/2006	--	--	--	--	--	2.6	18.6	--	--	0.400 U	--
	11/13/2006	0.48	0.9-1.0	--	--	--	0.200 U	1.11	--	--	0.200 U	6.95
	5/25/2007	1.11	4.2	--	--	--	0.200 U	2.67	--	--	0.200 U	0.5 U
	11/7/2007	5.18	5.4	--	--	--	0.010 U	2.24	--	--	0.010 U	--
	6/4/2008	5.76	5.2	--	--	--	0.200 U	3.68	--	--	0.200 U	--
	10/22/2008	4.15	5.4	--	--	--	0.200 U	0.40 U	--	--	0.200 U	--
	10/14/2009	0	6.0	--	--	--	0.90 UJ	1.2 U			1.7 J	--
	11/15/2010	0	3.4	--	--	--	0.1 U	1.5			--	--
	5/2/2011	0	1	ND	10	0.5	2.6	79.6	83.0	0.3	--	--
	7/27/2011	0.48	2	ND	5	6	2.0 U	879	97.8	2.0 U	--	--
	11/2/2011	1.01	ND	ND	ND	5	0.1	14.8	25.1	0.2	--	--
	2/13/2012	2.62	1.6	3	15	2	3.1	68.0	25.7	0.1	--	--

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-12	3/21/2000	5	--	--	--	--	--	--	--	--	--	--
	6/14/2000	4.9	--	--	--	--	--	--	--	--	--	--
	9/12/2000	0.6	--	--	--	--	--	--	--	--	--	--
	4/26/2001	4	--	--	--	--	--	--	--	--	--	--
	7/29/2001	3	--	--	--	--	--	--	--	--	--	--
	10/27/2001	5.2	--	--	--	--	--	--	--	--	--	--
	11/15/2002	2.7	--	--	--	--	--	--	--	--	--	--
	5/9/2003	6	--	--	--	--	--	--	--	--	--	--
	9/30/2003	1.66	--	--	--	--	0.452	5.32	--	--	0.200 U	0.8
	12/11/2003	2.70	--	--	--	--	0.200 U	2.77	--	--	0.200 U	0.0
	3/31/2004	3.91	--	--	--	--	3.88	8.45	--	--	0.200 U	0.0
	6/2/2004	5.20	--	--	--	--	3.64	11.7	--	--	0.200 U	0.0
	9/30/2004	6	--	--	--	--	0.573	5.66	--	--	0.200 U	0.0
	12/14/2004	1.32	--	--	--	--	0.200 U	2.95	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.200 U	3.32	--	--	0.200 U	0.25 R
	10/12/2005	--	--	--	--	--	0.200 U	3.37	--	--	0.200 U	0.25 U
	6/28/2006	0.42	--	--	--	--	2.57	11.5	--	--	0.400 U	0.25 U
	11/13/2006	2.61	ND	--	--	--	0.590	6.89	--	--	0.200 U	0.25 U
	5/25/2007	6.71	ND	--	--	--	7.140	18.4	--	--	0.200 U	0.25 U
	11/8/2007	6.33	ND	--	--	--	0.121	11.5	--	--	0.010 U	--
	6/4/2008	9.5	ND	--	--	--	6.020	16.4	--	--	0.200 U	--
	10/22/2008	8.88	ND	--	--	--	0.330	10.1	--	--	0.200 U	--
	10/14/2009	2.23	ND	--	--	--	0.90 UJ	5.2	--	--	1.4 J	--
	11/15/2010	2.73	ND	--	--	--	0.2	13.4	--	--	--	--
	11/2/2011	3.01	ND	--	--	--	0.7	60.3	493	0.3	--	--

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-13	3/21/2000	4.6	--	--	--	--	--	--	--	--	--	--
	6/14/2000	1.5	--	--	--	--	--	--	--	--	--	--
	9/12/2000	3.3	--	--	--	--	--	--	--	--	--	--
	4/26/2001	5	--	--	--	--	--	--	--	--	--	--
	7/29/2001	3.8	--	--	--	--	--	--	--	--	--	--
	10/27/2001	3.4	--	--	--	--	--	--	--	--	--	--
	9/30/2003	3.04	--	--	--	--	0.455	4.91	--	--	0.200 U	--
	12/11/2003	6.70	--	--	--	--	0.477	5.56	--	--	0.200 U	0.0
	3/31/2004	4.87	--	--	--	--	1.60	8.04	--	--	0.200 U	0.0
	6/2/2004	1.85	--	--	--	--	1.05	6.52	--	--	0.200 U	0.0
	9/30/2004	2.69	--	--	--	--	0.496	4.49	--	--	0.200 U	0.0
	12/14/2004	5.57	--	--	--	--	0.412	5.10	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.582	4.99	--	--	0.200 U	0.547 J
	10/6/2005	--	--	--	--	--	0.348	3.68	--	--	0.200 U	0.25 U
	6/28/2006	--	--	--	--	--	--	--	--	--	--	--
	11/13/2006	3.49	ND	--	--	--	0.940	6.18	--	--	0.200 U	0.25 U
	5/25/2007	4.14	ND	--	--	--	1.670	7.57	--	--	0.200 U	0.25 U
	11/8/2007	6.93	ND	--	--	--	0.490	4.09	--	--	0.010 U	--
	6/4/2008	6.9	ND	--	--	--	1.280	5.51	--	--	0.200 U	--
	10/22/2008	9.35	ND	--	--	--	0.440	3.56	--	--	0.200 U	--
	10/15/2009	4.61	ND	--	--	--	0.90 U	3.3	--	--	1.2 J	--
	11/15/2010	4.38	ND	--	--	--	0.4	3.7	--	--	--	--
	5/2/2011	4.87	ND	ND	5	ND	2.4	7.3	20.7	0.1 U	--	--
	7/27/2011	1.47	ND	ND	10	0.25	1.3	5.8	9.4	0.1 U	--	--
	11/2/2011	5.11	ND	0.5	ND	ND	0.4	4.7	6.3	0.1	--	--
	2/13/2012	4.58	ND	ND	ND	ND	0.9	5.6	21.7	0.1 U	--	--

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron
MW-15	1/30/2001	1.3	--	--	--	--	--	--	--	--	--	--
	4/26/2001	--	--	--	--	--	--	--	--	--	--	--
	7/29/2001	2.6	--	--	--	--	--	--	--	--	--	--
	10/27/2001	1.4	--	--	--	--	--	--	--	--	--	--
	11/15/2002	0.8	--	--	--	--	--	--	--	--	--	--
	5/9/2003	1.5	--	--	--	--	--	--	--	--	--	--
	9/30/2003	0.56	--	--	--	--	0.282	5.02	--	--	0.200 U	2.6
	12/11/2003	2.80	--	--	--	--	0.415	8.52	--	--	0.200 U	0.0
	3/31/2004	0.88	--	--	--	--	0.200 U	8.42	--	--	0.200 U	0.0
	6/2/2004	0.40	--	--	--	--	1.67	8.32	--	--	0.200 U	0.0
	9/30/2004	0.33	--	--	--	--	0.429	4.56	--	--	0.200 U	0.0
	12/14/2004	1.40	--	--	--	--	0.200 U	6.68	--	--	0.200 U	0.0
	4/4/2005	--	--	--	--	--	0.200 U	7.45	--	--	0.200 U	0.254 J
	10/6/2005	--	--	--	--	--	0.340	4.14	--	--	0.200 U	0.25 U
	6/28/2006	--	--	--	--	--	--	--	--	--	--	--
	11/13/2006	1.06	ND	--	--	--	0.450	6.48	--	--	0.200 U	0.25 U
	5/25/2007	2.63	ND	--	--	--	3.070	10.4	--	--	0.200 U	0.25 U
	11/7/2007	5.66	ND	--	--	--	0.220	5.21	--	--	0.010 U	--
	6/5/2008	6.5	ND	--	--	--	2.010	8.02	--	--	0.200 U	--
	10/22/2008	5.61	ND	--	--	--	0.280	3.81	--	--	0.200 U	--
	10/14/2009	0	ND	--	--	--	0.90 UJ	3.1	--	--	1.2 J	--
	11/15/2010	0.67	ND	--	--	--	0.2	4.1	--	--	--	--
	11/2/2011	1.3	ND	--	--	--	0.4	6.0	8.7	0.1 U	--	--
MTCA Method A Cleanup Level							na	na	na	na	na	na

Notes:

Nitrate, sulfate, chloride, bromide, and nitrite analyzed by EPA Method 300.0.

MTBE, EDB, and EDC analyzed by EPA Method 8260B.

-- Not analyzed.

U = Not detected above specified reporting limit.

J = Estimated concentration.

R = Rejected concentration.

ND = Analyte not detected.

Bolded concentrations exceed MTCA Method A cleanup levels.

Table 6 - Summary of Groundwater Chemistry Data - Other Compounds

		Field Test Results - Concentrations in mg/L					Concentration in mg/L					
Exploration	Date Sampled	Dissolved Oxygen	Ferrous Iron	Nitrite	Nitrate	Ammonia	Nitrate	Sulfate	Chloride	Bromide	Nitrite	Ferrous Iron

a) Values shown are the average of the results for the sample and its field duplicate.

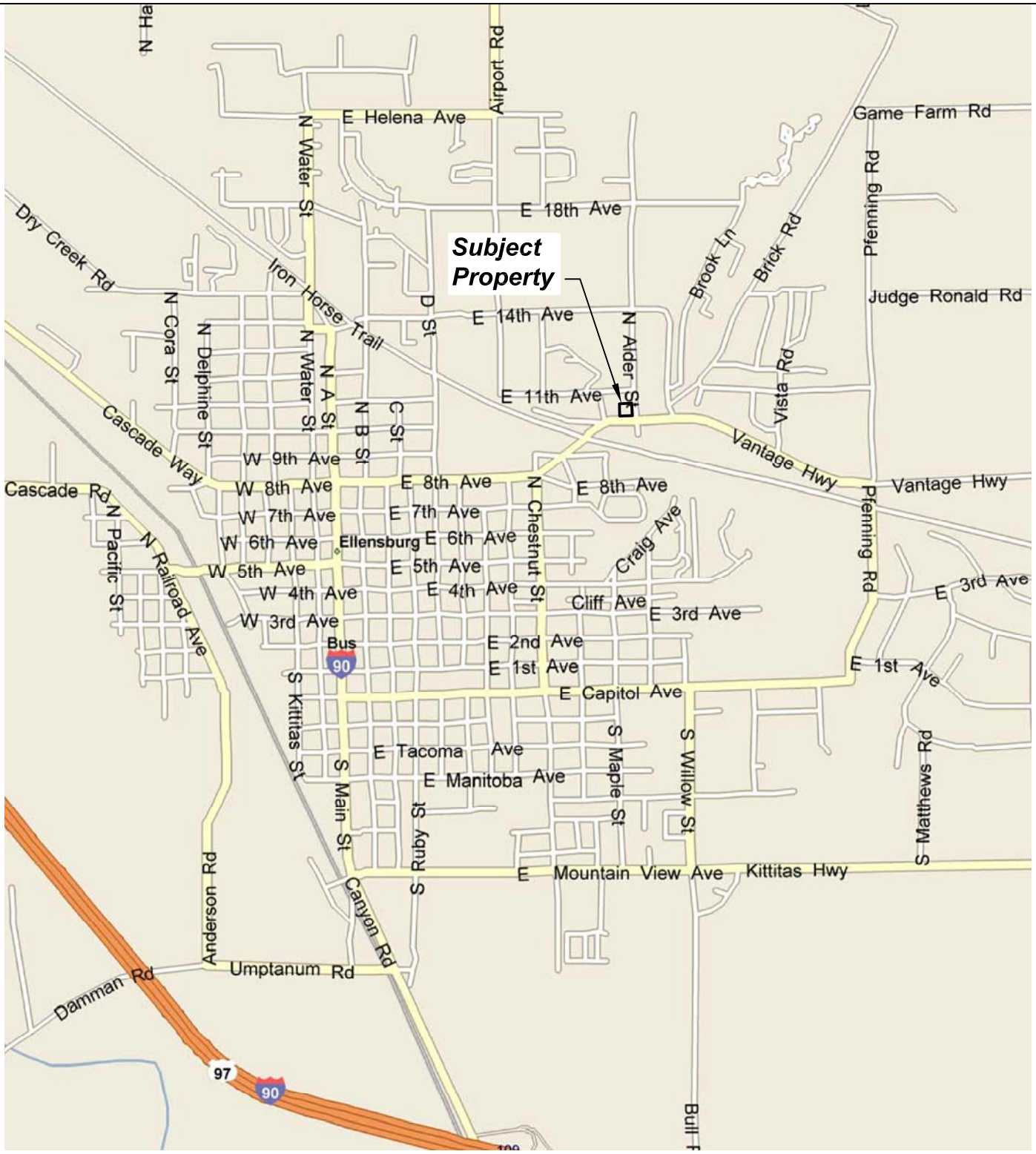
na = No MTCA Method A or B value available.

First dashed line indicates soil was excavated in November 2000.

Second dashed line indicates bioremediation amendments were injected in January 2011.

Table 7 - Measured Free Product Thickness in Well MW-1/MW-14

Date Measured	Product Thickness in Well in Inches	
4/8/1996	0	
4/6/1998	6	
10/5/1998	6	
12/29/1999	0.2	
3/21/2000	5	
6/14/2000	1	
9/12/2000	1	Hotspot Excavation
1/30/2001	0	
4/26/2001	0	
7/29/2001	0	
10/27/2001	4	
11/15/2002	3	
5/9/2003	0	
9/30/2003	0	
12/12/2003	1	
3/31/2004	1.80	
6/2/2004	0	
9/30/2004	0	
12/14/2004	0.18	UST Removal
4/4/2005	0	
10/6/2005	0	
6/28/2006	0	
5/25/2007	0	
11/7/2007	0	
6/4/2008	0	
10/21/2008	0	
10/14/2009	0	
11/15/2010	0	Bioremediation Injections
5/2/2011	0	
7/27/2011	0	
11/2/2011	0	
2/13/2012	0	



Note: Base map prepared from Microsoft Streets and Trips 2005.

0 2000 4000

Scale in Feet

WASHINGTON

N

Ken's Auto Wash
Ellensburg, Washington

Vicinity Map

7168-09 4/12

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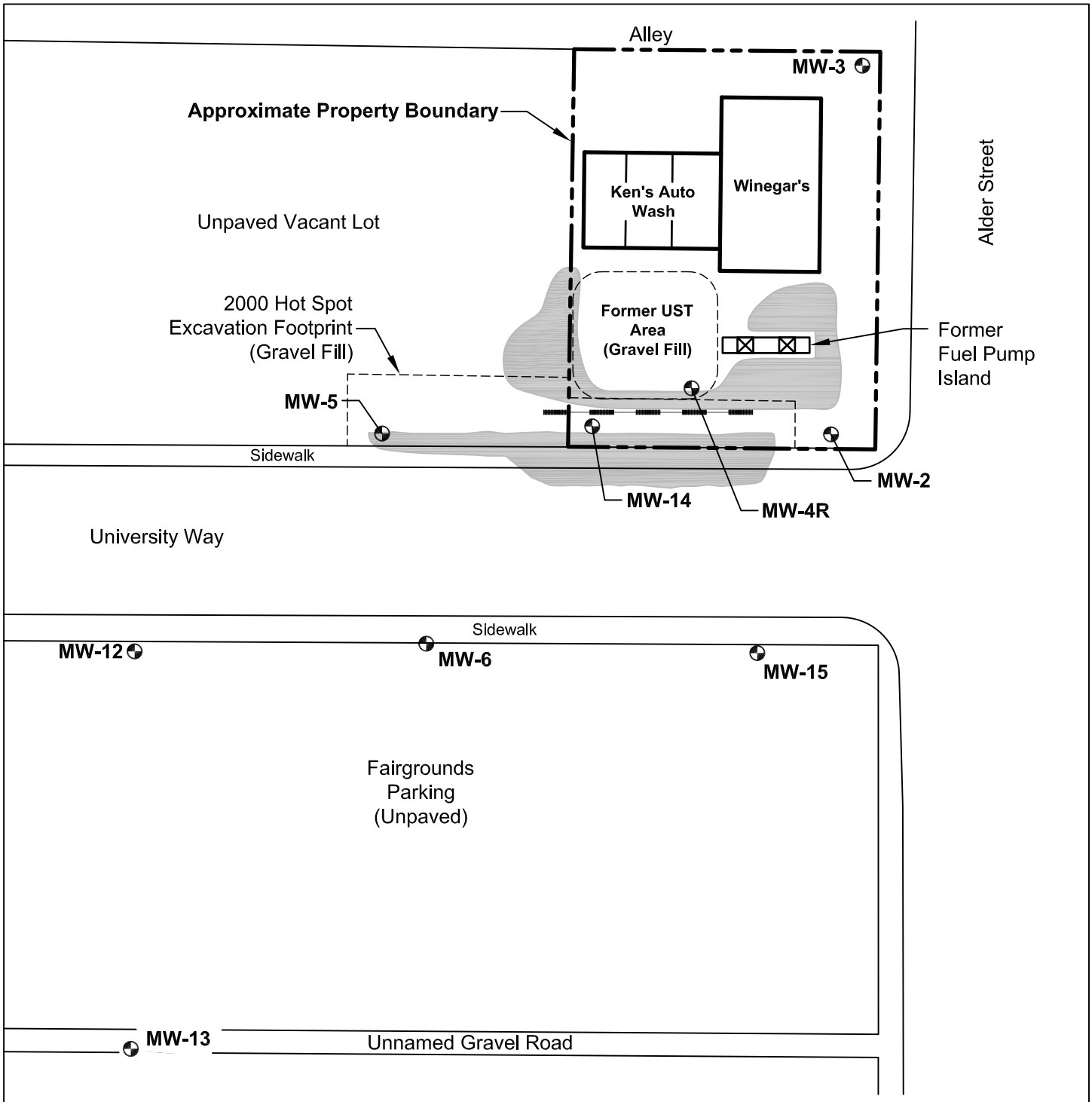
Figure 1

EAL 04/2/12 716809-001.dwg



Note: Base map prepared from drawing provided by Sage Earth Sciences titled "Proposed Addtional Monitoring Well and ORC Injections Locations," dated January 1998.

0 50 100
Scale in Feet

MW-6 Hart Crowser Monitoring Well Location and Number

Estimated Remaining Area with TPH-G and/or BTEX Concentrations above MTCA Method A Soil Cleanup Levels

Air Sparging Pipe (Not Located)

N

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Site and Well Location Plan

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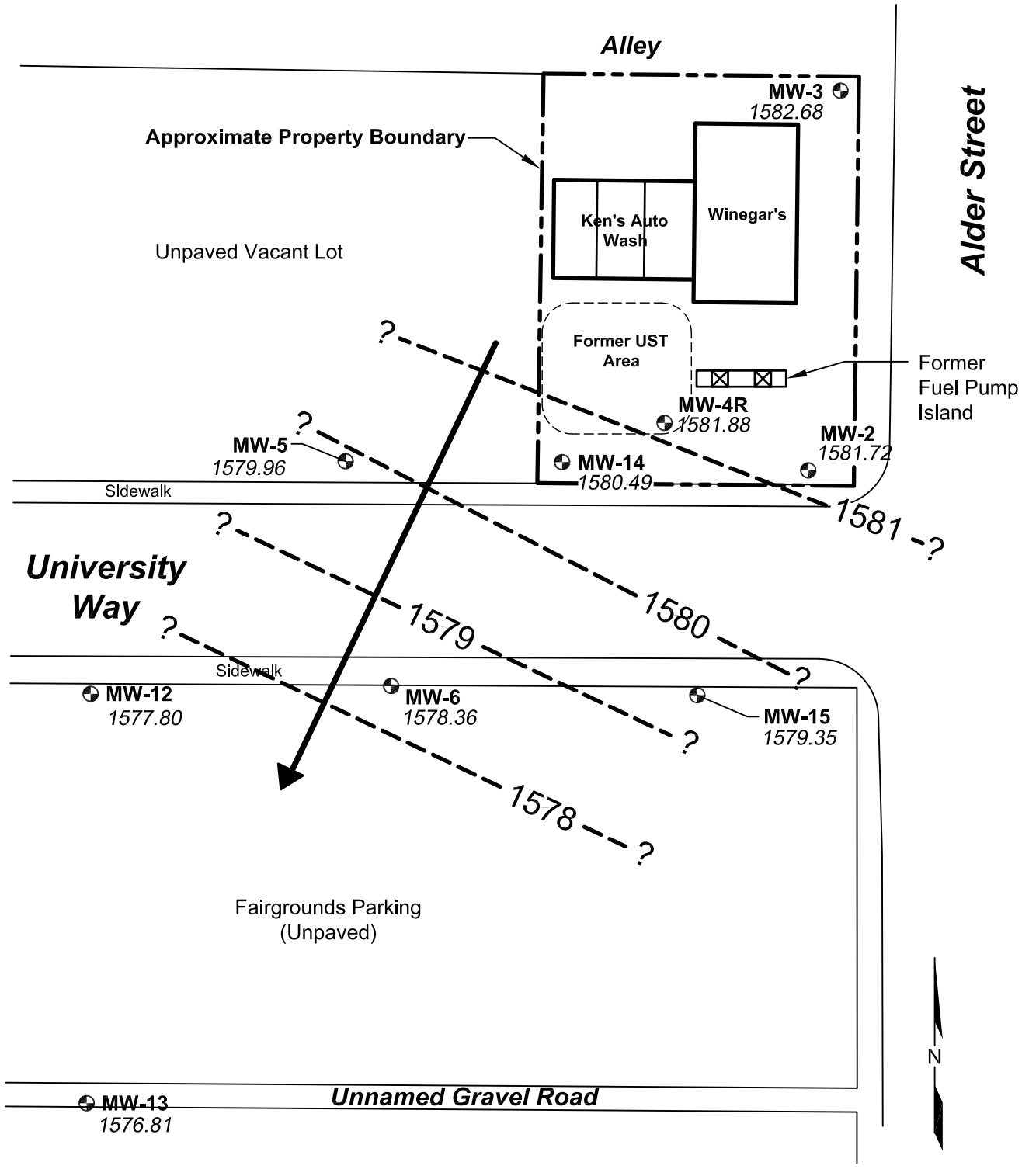
Figure
2

JAB 04/2/12 716809-002.dwg



Note: Elevation shown are in feet above Mean Sea Level.

0 50 100
Scale in Feet

MW-6	Monitoring Well Location and Number
1578.36	Groundwater Elevation in Feet
1580	Groundwater Elevation Contour in Feet
	Inferred Groundwater Flow Direction

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Groundwater Elevation Contour Map
November 2011

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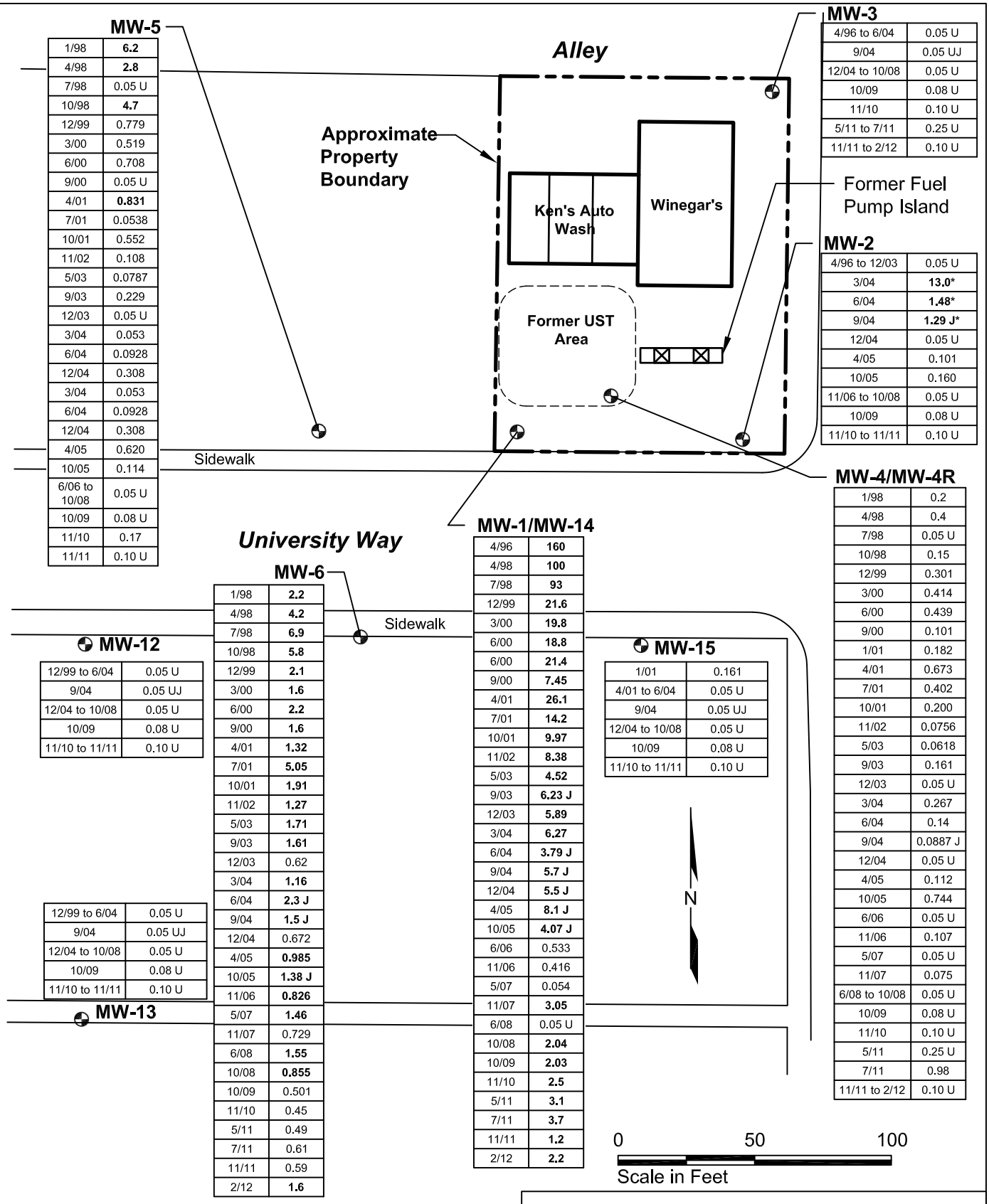
Figure
3

EAL 04/2/12 716809-003.dwg



MW-5

1/98	**6.2**
4/98	**2.8**
7/98	0.05 U
10/98	**4.7**
12/99	0.779
3/00	0.519
6/00	0.708
9/00	0.05 U
4/01	**0.831**
7/01	0.0538
10/01	0.552
11/02	0.108
5/03	0.0787
9/03	0.229
12/03	0.05 U
3/04	0.053
6/04	0.0928
12/04	0.308
3/04	0.053
6/04	0.0928
12/04	0.308
4/05	0.620
10/05	0.114
6/06 to 10/08	0.05 U
10/09	0.08 U
11/10	0.17
11/11	0.10 U

MW-3

4/96 to 6/04	0.05 U
9/04	0.05 UJ
12/04 to 10/08	0.05 U
10/09	0.08 U
11/10	0.10 U
5/11 to 7/11	0.25 U
11/11 to 2/12	0.10 U

MW-2

4/96 to 12/03	0.05 U
3/04	**13.0***
6/04	**1.48***
9/04	**1.29 J***
12/04	0.05 U
4/05	0.101
10/05	0.160
11/06 to 10/08	0.05 U
10/09	0.08 U
11/10 to 11/11	0.10 U

MW-4/MW-4R

1/98	0.2
4/98	0.4
7/98	0.05 U
10/98	0.15
12/99	0.301
3/00	0.414
6/00	0.439
9/00	0.101
1/01	0.182
4/01	0.673
7/01	0.402
10/01	0.200
11/02	0.0756
5/03	0.0618
9/03	0.161
12/03	0.05 U
3/04	0.267
6/04	0.14
9/04	0.0887 J
12/04	0.05 U
4/05	0.112
10/05	0.744
6/06	0.05 U
11/06	0.107
5/07	0.05 U
11/07	0.075
6/08 to 10/08	0.05 U
10/09	0.08 U
11/10	0.10 U
5/11	0.25 U
7/11	0.98
11/11 to 2/12	0.10 U

MW-6

1/98	**2.2**
4/98	**4.2**
7/98	**6.9**
10/98	**5.8**
12/99	**2.1**
3/00	**1.6**
6/00	**2.2**
9/00	**1.6**
4/01	**1.32**
7/01	**5.05**
10/01	**1.91**
11/02	**1.27**
5/03	**1.71**
9/03	**1.61**
12/03	0.62
3/04	**1.16**
6/04	**2.3 J**
9/04	**1.5 J**
12/04	0.672
4/05	**0.985**
10/05	**1.38 J**
11/06	**0.826**
5/07	**1.46**
11/07	0.729
6/08	**1.55**
10/08	**0.855**
10/09	0.501
11/10	0.45
5/11	0.49
7/11	0.61
11/11	0.59
2/12	**1.6**

MW-1/MW-14

4/96	**160**
4/98	**100**
7/98	**93**
12/99	**21.6**
3/00	**19.8**
6/00	**18.8**
6/00	**21.4**
9/00	**7.45**
4/01	**26.1**
7/01	**14.2**
10/01	**9.97**
11/02	**8.38**
5/03	**4.52**
9/03	**6.23 J**
12/03	**5.89**
3/04	**6.27**
6/04	**3.79 J**
9/04	**5.7 J**
12/04	**5.5 J**
4/05	**8.1 J**
10/05	**4.07 J**
6/06	0.533
11/06	0.416
5/07	0.054
11/07	**3.05**
6/08	0.05 U
10/08	**2.04**
10/09	**2.03**
11/10	**2.5**
5/11	**3.1**
7/11	**3.7**
11/11	**1.2**
2/12	**2.2**

MW-12

12/99 to 6/04	0.05 U
9/04	0.05 UJ
12/04 to 10/08	0.05 U
10/09	0.08 U
11/10 to 11/11	0.10 U

MW-15

1/01	0.161
4/01 to 6/04	0.05 U
9/04	0.05 UJ
12/04 to 10/08	0.05 U
10/09	0.08 U
11/10 to 11/11	0.10 U

MW-13

12/99 to 6/04	0.05 U
9/04	0.05 UJ
12/04 to 10/08	0.05 U
10/09	0.08 U
11/10 to 11/11	0.10 U

MW-6 Monitoring Well Location and Number

3/04	0.05 U

Month/Year of Sample Collection

Groundwater TPH-G Concentration in mg/L

Notes: Concentrations exceeding the cleanup level are shown in bold.
U = Not detected at specified detection limit
J = Estimated concentration
* = Previous inflow of minor TPH-contaminated water through MW-2 top of well casing suspected

Ken's Auto Wash
Ellensburg, Washington

TPH-G Occurrences in Groundwater

7168-09 4/12

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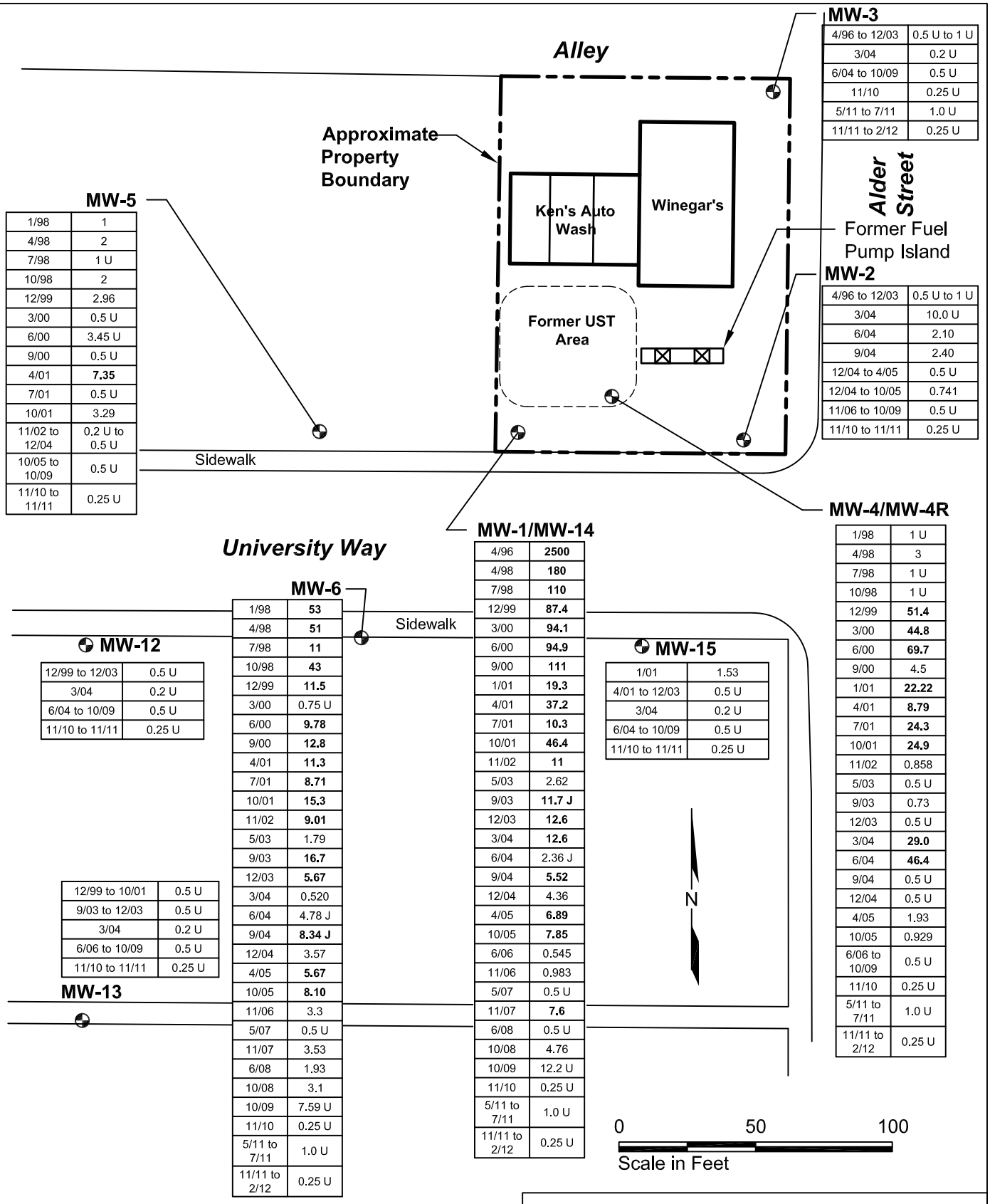
Figure **4**

EAL 04/2/12 716809-004.dwg



MW-3

4/96 to 12/03	0.5 U to 1 U
3/04	0.2 U
6/04 to 10/09	0.5 U
11/10	0.25 U
5/11 to 7/11	1.0 U
11/11 to 2/12	0.25 U

MW-2

4/96 to 12/03	0.5 U to 1 U
3/04	10.0 U
6/04	2.10
9/04	2.40
12/04 to 4/05	0.5 U
12/04 to 10/05	0.741
11/06 to 10/09	0.5 U
11/10 to 11/11	0.25 U

MW-5

1/98	1
4/98	2
7/98	1 U
10/98	2
12/99	2.96
3/00	0.5 U
6/00	3.45 U
9/00	0.5 U
4/01	**7.35**
7/01	0.5 U
10/01	3.29
11/02 to 12/04	0.2 U to 0.5 U
10/05 to 10/09	0.5 U
11/10 to 11/11	0.25 U

MW-4/MW-4R

1/98	1 U
4/98	3
7/98	1 U
10/98	1 U
12/99	**51.4**
3/00	**44.8**
6/00	**69.7**
9/00	4.5
1/01	**22.22**
4/01	**8.79**
7/01	**24.3**
10/01	**24.9**
11/02	0.858
5/03	0.5 U
9/03	0.73
12/03	0.5 U
3/04	**29.0**
6/04	**46.4**
9/04	0.5 U
12/04	0.5 U
4/05	1.93
10/05	0.929
6/06 to 10/09	0.5 U
11/10	0.25 U
5/11 to 7/11	1.0 U
11/11 to 2/12	0.25 U

MW-1/MW-14

4/96	**2500**
4/98	**180**
7/98	**110**
12/99	**87.4**
3/00	**94.1**
6/00	**94.9**
9/00	**111**
1/01	**19.3**
4/01	**37.2**
7/01	**10.3**
10/01	**46.4**
11/02	**11**
5/03	2.62
9/03	**11.7 J**
12/03	**12.6**
3/04	**12.6**
6/04	2.36 J
9/04	**5.52**
12/04	4.36
4/05	**6.89**
10/05	**7.85**
6/06	0.545
11/06	0.983
5/07	0.5 U
11/07	**7.6**
6/08	0.5 U
10/08	4.76
10/09	12.2 U
11/10	0.25 U
5/11 to 7/11	1.0 U
11/11 to 2/12	0.25 U

MW-6

1/98	**53**
4/98	**51**
7/98	**11**
10/98	**43**
12/99	**11.5**
3/00	0.75 U
6/00	**9.78**
9/00	**12.8**
4/01	**11.3**
7/01	**8.71**
10/01	**15.3**
11/02	**9.01**
5/03	1.79
9/03	**16.7**
12/03	**5.67**
3/04	0.520
6/04	4.78 J
9/04	**8.34 J**
12/04	3.57
4/05	**5.67**
10/05	**8.10**
11/06	3.3
5/07	0.5 U
11/07	3.53
6/08	1.93
10/08	3.1
10/09	7.59 U
11/10	0.25 U
5/11 to 7/11	1.0 U
11/11 to 2/12	0.25 U

MW-12

12/99 to 12/03	0.5 U
3/04	0.2 U
6/04 to 10/09	0.5 U
11/10 to 11/11	0.25 U

MW-15

1/01	1.53
4/01 to 12/03	0.5 U
3/04	0.2 U
6/04 to 10/09	0.5 U
11/10 to 11/11	0.25 U

12/99 to 10/01	0.5 U
9/03 to 12/03	0.5 U
3/04	0.2 U
6/06 to 10/09	0.5 U
11/10 to 11/11	0.25 U

MW-13

MW-6 Monitoring Well Location and Number

3/04	0.5 U

Month/Year of Sample Collection

Groundwater Benzene Concentration in µg/L

Notes: Concentrations exceeding the cleanup level are shown in bold.
U = Not detected at specified detection limit.
J = Estimated concentration

Ken's Auto Wash
Ellensburg, Washington

Benzene Occurrences in Groundwater

7168-09 4/12

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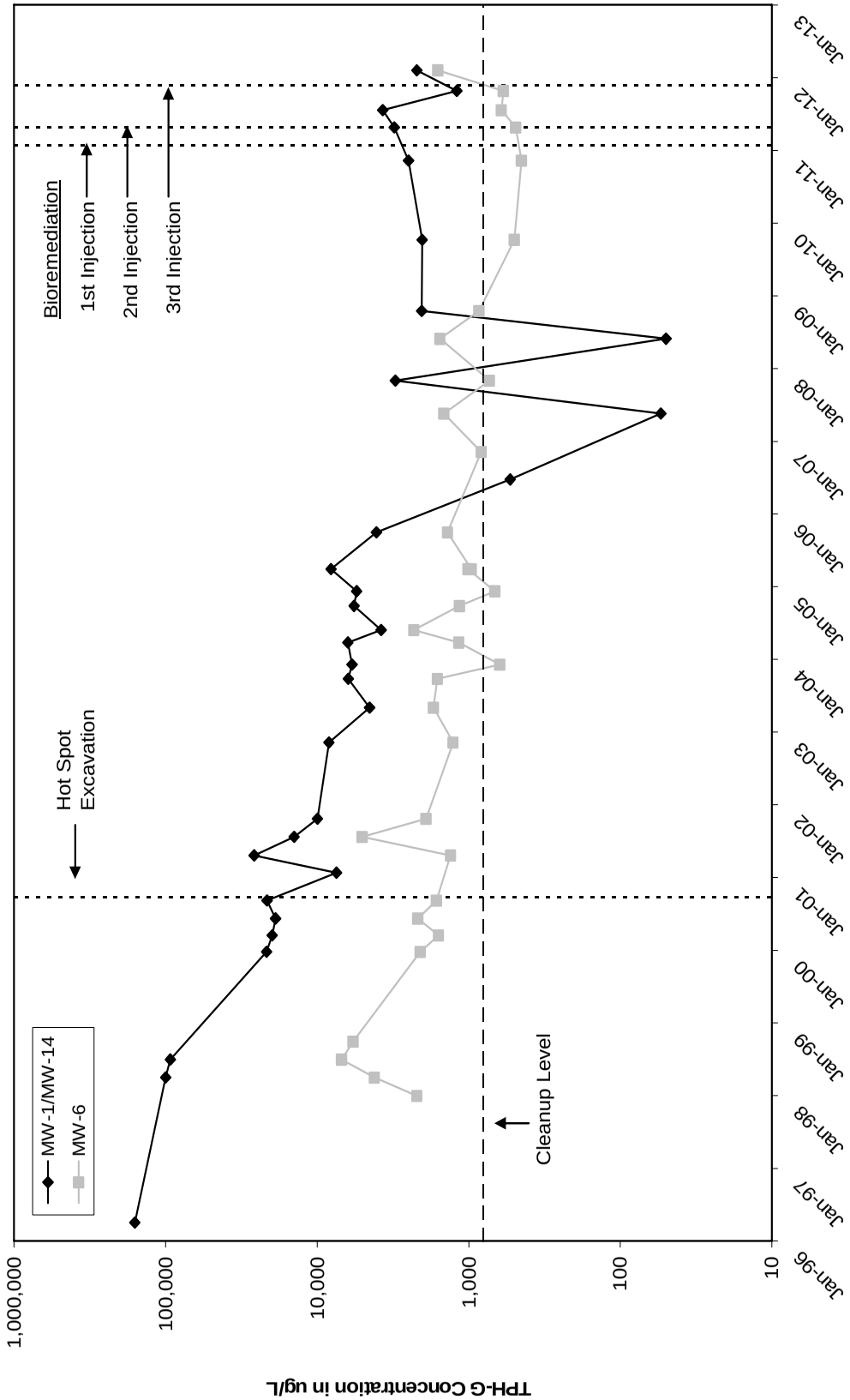
Figure 5

EAL 04/2/12 716809-005.dwg



Ken's Auto Wash
Ellensburg, Washington

Long-Term Trends in TPH-G Concentrations in Groundwater

7168-09 4/12

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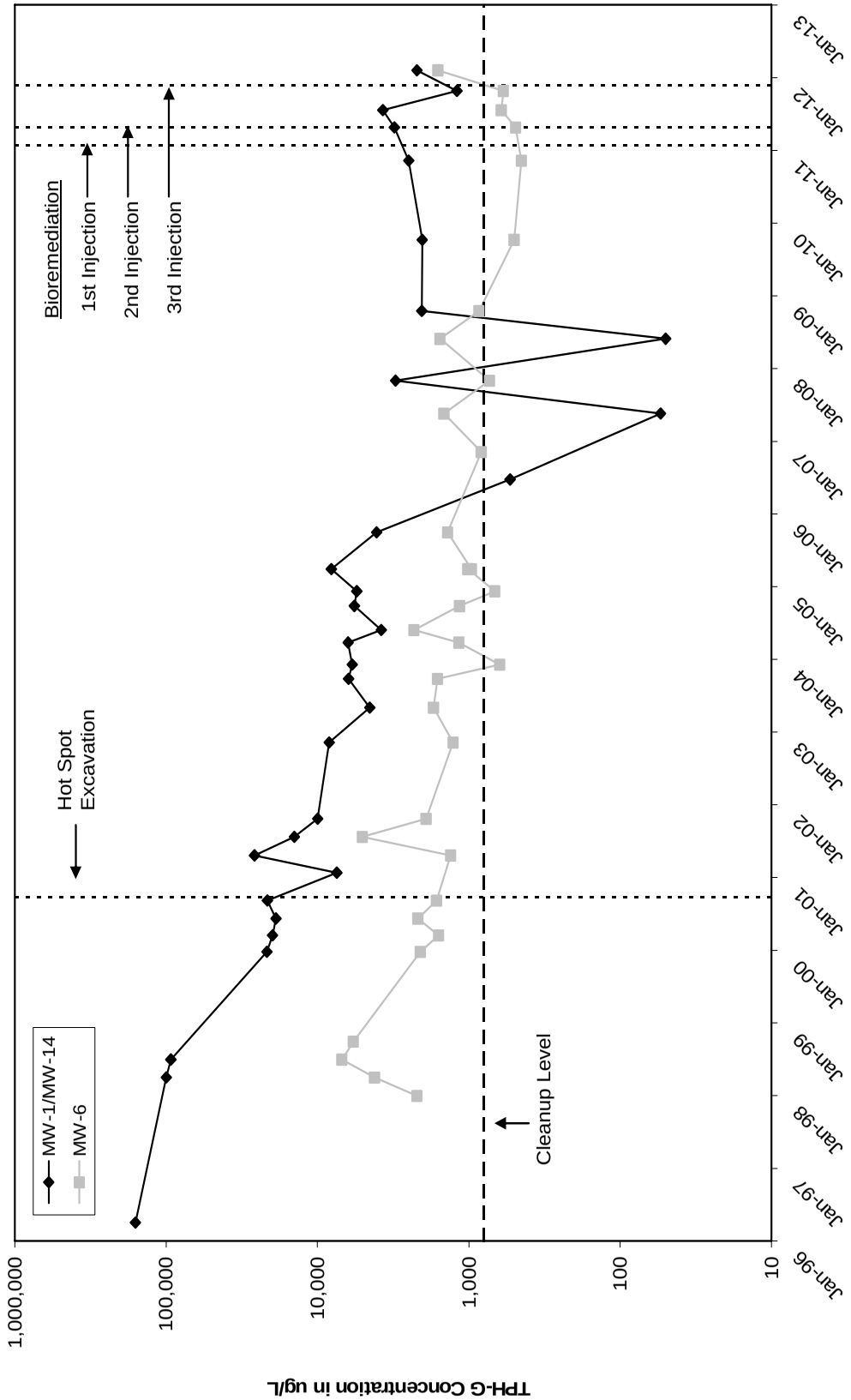
Figure

6

AJG 4/2/12 J:\Jobs\716809\Bioremediation Report\Figure 6-9.xls



Ken's Auto Wash
Ellensburg, Washington

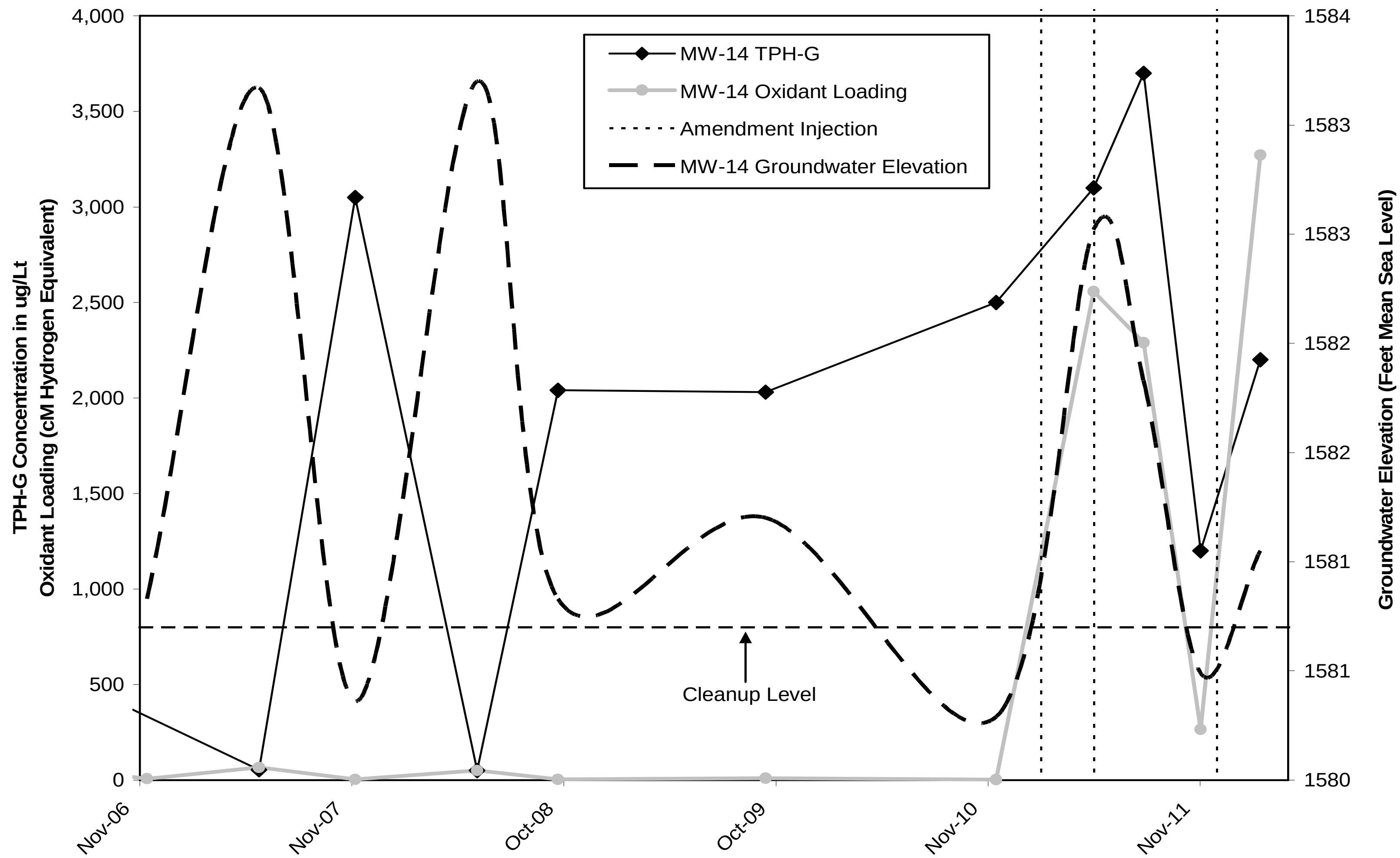
Long-Term Trends in Benzene Concentrations in Groundwater

7168-09 4/12

HARTCROWSER

Figure 7

AJG 4/2/12 J:\Jobs\716809\Bioremediation Report\Figure 6-9.xls



Ken's Auto Wash
Ellensburg, Washington

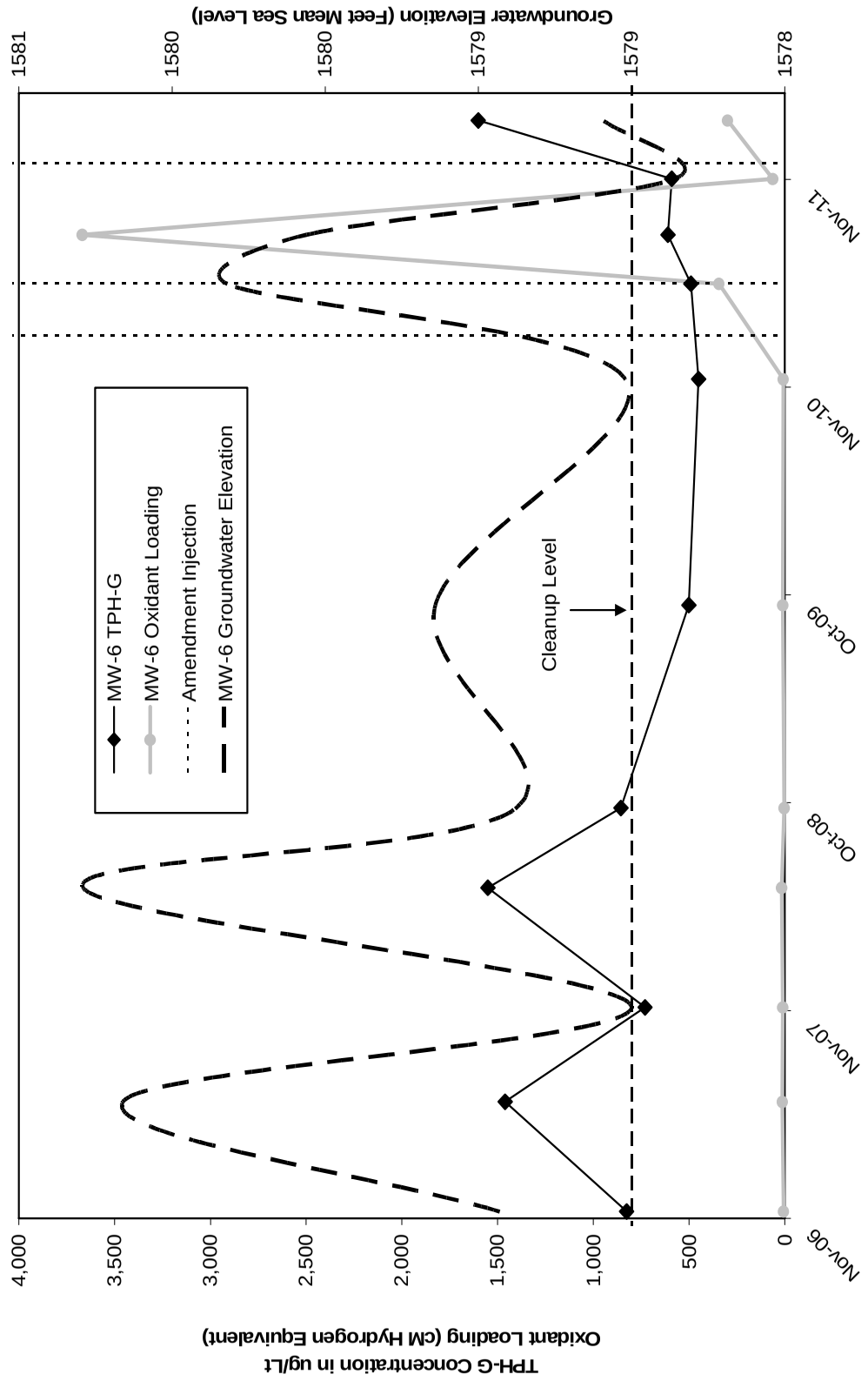
MW-14 Bioremediation Performance Profile

7168-09

4/12

Figure

8



Ken's Auto Wash
Ellensburg, Washington

MW-6 Bioremediation Performance Profile

7168-09 4/12

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Figure 9

AJG 4/2/12 J:\Jobs\716809\Bioremediation Report\Figure 6-9.xls

APPENDIX A
BIOREMEDIATION AMENDMENT DESCRIPTION AND FIELD METHODS

APPENDIX A
BIOREMEDIATION AMENDMENT DESCRIPTION AND FIELD METHODS

This appendix describes the field methods used during the enhanced bioremediation program and includes the amendment descriptions, injection field methods, and groundwater sampling methods.

AMENDMENT DESCRIPTIONS

A total of five amendments was introduced into the groundwater as part of the remedial approach: (1) sodium bromide groundwater tracer; (2) sodium chloride groundwater tracer; (3) PetroBac™, which is a combination of petroleum-degrading bacteria and surface-active agents designed to improve oxidant usage; (4) OxEA-aq™, which is a blend of natural microbial oxidants with macro- and micronutrients to enhance petroleum destruction; and (5) Ivey-sol® 103, which is a nonionic surfactant designed to improve bioremediation of TPH-G. The five amendments are summarized below.

Tracers. Conservative groundwater tracers were used to track groundwater flow, velocity, and effective amendment distribution. The tracers used include sodium bromide and sodium chloride salts.

PetroBac. ETEC, LLC of Portland, Oregon, manufactures and supplies the PetroBac amendment. PetroBac is a liquid containing multiple strains of proven hydrocarbon-degrading bacteria and a biodegradable surface-active agent. PetroBac was freshly batched by ETEC with a guaranteed active plate count of 10^8 colony-forming units per milliliter prior to injection. Fresh batching and plate count verification allows optimal activity. The biodegradable surface-active agent in PetroBac encourages the slow desorption of residual TPH-G from the soil matrix to improve petroleum degradation rates and overall oxidant consumption.

OxEA-aq. Bioremediation Specialists of Portland, Oregon, supplied the OxEA-aq amendment. OxEA-aq is a powder consisting of a highly soluble blend of nitrogen- and sulfur-based oxidants designed to enhance natural attenuation of petroleum by providing the same electron acceptors that existing site microbes are accustomed to using. The amendment also provides a diverse blend of both macro- and micronutrients to support the rapid development of these native bacteria to further enhance hydrocarbon destruction.

Ivey-sol 103. Ivey International Inc. manufacturers Ivey-sol 103 and was available through EnviroSupply & Service of Irvine, California. Ivey-sol 103 is a

liquid consisting of a patented, biodegradable, nonionic surfactant blend that selectively desorbs gasoline-range petroleum hydrocarbons to improve bioavailability and overall oxidant consumption.

INJECTION PROTOCOL

All injections were under pressure using municipal water pressure or a transfer pump. Pressures were monitored in-line near the wellhead and were limited to 15 pounds per square inch. This pressure preserves well seal integrity while pushing amendment into less-accessible pore spaces. Amendment was conveyed to each injection location using a flexible garden hose and a secured high-pressure Furnco compression fitting. In-line valves located up-flow of the pressure gauge was used to control flow rates and injection pressures. A flow meter was used to monitor overall injection volumes at each location.

During the injection events, groundwater levels were measured in selected wells to evaluate amendment distribution, overall rise in groundwater levels, and to indicate potential short circuiting of the injected amendments.

GROUNDWATER SAMPLING

Groundwater samples were collected from monitoring wells during the bioremediation program for chemical analysis (Table 3). One duplicate sample was collected for each analyte during the annual sampling event in November 2011.

Sampling Equipment

Equipment used for the collection of groundwater samples included:

- pH, specific conductivity, redox potential, and temperature meters;
- Solinst or equivalent water level indicator;
- Peristaltic pump with disposable polyethylene tubing;
- Laboratory-supplied pre-cleaned and preserved sample containers;
- Coolers with blue ice;
- Hach color disk and colorimetric strips for field testing; and
- Hart Crowser Sample Custody Record and Groundwater Sampling Data forms.

Sampling Procedures

After measuring the depth to groundwater, samples were collected from the wells using standard low-flow sampling techniques. Each well was purged until the field parameters of pH, temperature, and specific conductivity met the stability criteria (i.e., specific conductivity ±10 percent, pH ±0.1 pH units, and temperature ±0.1° C).

Following stabilization, field testing for ferrous iron, nitrate, nitrite, and ammonia was performed. Groundwater samples were collected for laboratory testing by directly filling pre-cleaned sample containers provided by the laboratory with disposable polyethylene tubing. The labeled sample containers were placed in coolers with ice.

Samples were transferred under chain of custody protocol to Analytical Resources, Inc. (ARI) in Tukwila, Washington, for laboratory analysis (Appendix B). We contracted with ARI in an effort to improve the previous laboratory's elevated reporting limits in October 2009.

INVESTIGATION-DERIVED WASTE (IDW) STORAGE AND DISPOSAL

The purge water produced from groundwater sampling was drummed on site pending receipt of chemical analysis results from the analytical laboratory and determination of appropriate disposal procedures. Drum disposition forms were filled out to record the number, contents, and location of the drums generated.

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APPENDIX B
CHEMICAL DATA QUALITY REVIEW AND LABORATORY REPORTS

APPENDIX B
CHEMICAL DATA QUALITY REVIEW AND LABORATORY REPORTS

CHEMICAL DATA QUALITY REVIEW

Groundwater samples were analyzed for the following:

- Gasoline-range hydrocarbons (Ecology method NWTPH-G);
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX) (EPA Method 8021B); and
- Nitrate, sulfate, bromide, and chloride (EPA Method 300.0).

The November 2011 groundwater monitoring event also included the following analysis:

- Total lead (EPA Method 200.8)

The reported results and the associated quality assurance sample results were reviewed. The following criteria were evaluated in the standard data validation process:

- Holding times;
- Method blanks;
- Surrogate recoveries;
- Standard reference material (SRM) recovery (where applicable);
- Matrix spike and matrix spike duplicate recovery (MS/MSD);
- Laboratory control samples and laboratory control sample duplicate recovery (LCS/LCSD); and
- Laboratory duplicate, MS/MSD, and LCS/LCSD relative percent differences (RPDs).

May 2011 Samples

Five groundwater samples were collected on May 2, 2011. The samples were submitted to Analytical Resources, Inc. (ARI) in Tukwila, Washington, for chemical analysis.

The required holding times were met. No method blank contamination was detected. Surrogate, SRM, MS/MSD, and LCS/LCSD recoveries were within control limits. Laboratory duplicate, MS/MSD, and LCS/LCSD RPDs were acceptable.

The data are acceptable for use as reported.

July 2011 Samples

Five groundwater samples were collected on July 27, 2011. The samples were submitted to Analytical Resources, Inc. (ARI) in Tukwila, Washington, for chemical analysis.

The required holding times were met. No method blank or trip blank contamination was detected. Surrogate, SRM, MS/MSD, and LCS/LCSD recoveries were within control limits. Laboratory duplicate, MS/MSD, and LCS/LCSD RPDs were acceptable.

Sample Receiving Discrepancies: The chain of custody did not include the time when the samples were relinquished to the laboratory. The trip blank was not listed on the chain of custody. Sample results were not qualified due to these discrepancies.

The data are acceptable for use as reported.

November 2011 Samples

Nine groundwater samples, one field duplicate, and one trip blank were collected on November 2, 2011. These samples were submitted to Analytical Resources, Inc. (ARI) in Tukwila, Washington, for chemical analysis.

The required holding times were met for the analyses. No method blank or trip blank contamination was detected. Surrogate, MS/MSD, and LCS/LCSD recoveries were within laboratory control limits. Laboratory duplicate, field duplicate, MS/MSD, and LCS/LCSD RPDs were acceptable.

The data are acceptable for use as reported.

February 2012 Samples

Five groundwater samples and two trip blanks were collected on February 13, 2012. These samples were submitted to Analytical Resources, Inc. (ARI) in Tukwila, Washington, for chemical analysis.

The required holding times were met for the analyses. No method blank or trip blank contamination was detected. Surrogate, MS/MSD, and LCS/LCSD recoveries were within laboratory control limits. Laboratory duplicate, MS/MSD, and LCS/LCSD RPDs were acceptable.

One continuing calibration blank for chloride had a detection slightly above the reporting limit. The associated sample results for chloride were greater than ten times the amount in the blank, and no sample results were qualified.

The data are acceptable for use as reported.

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LABORATORY REPORTS

Analytical Resources, Incorporated
Analytical Chemists and Consultants

May 12, 2011

Angie Goodwin
Hart Crowser, Inc.
1700 Westlake Avenue N. Suite 200
Seattle, WA 98109-3256

RE: Client Project: 7168-09
ARI Job No.: SV27

Dear Angie;

Please find enclosed the original Chain-of-Custody (COC) records, sample receipt documentation, and the final data for samples from the project referenced above. Analytical Resources, Inc. (ARI) received five water samples on May 3, 2011. The samples were received in good condition with a cooler temperature of 3.9 °C.

The samples were analyzed for NWTPH-Gx plus BTEX and Anions, as requested on the COC.

There were no anomalies associated with the analyses of this sample.

Sincerely,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Client Services Manager
kellyb@arilabs.com
206/695-6211
Enclosures

cc: eFile SV27

KFB/kb

Sample Custody Record

1 of 1

Samples Shipped to: ARI

HART CROWSER

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 7168-09 LAB NUMBER

PROJECT NAME KEN'S AUTO

HART CROWSER CONTACT ANGIE GOODWIN
206-826-4495

SAMPLED BY: ASK/BCP

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: TPH-G/BTEX	REQUESTED ANALYSIS: NO3/SO4/Br/Cl	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	MW-3		5/2/11	1110	WATER	2	1	3	
	MW-4R			1250		2	1	3	
	MW-14			1335		2	1	3	
	MW-6			1518		2	1	3	
	MW-13			1625			1	1	

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	5/3/11	SIGNATURE	5/3/11
PRINT NAME ANDREW KAPAROS	TIME	PRINT NAME Angie Goodwin	TIME
COMPANY HART CROWSER	1530	COMPANY HC	1530
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	5/3/11	SIGNATURE	5/3/11
PRINT NAME Angie Goodwin	TIME	PRINT NAME Jennifer Millsap	TIME
COMPANY HC	1655	COMPANY ARI	1655

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

13 TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No.
for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☒ STANDARD
☐ 72 HOURS OTHER

White and Yellow Copies to Lab Pink to Project Manager Lab to Return White Copy to Hart Crowser Gold to Sample Custodian

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Hart Crowser Project Name: Kent Auto

COC No(s): _____ (NA) Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: SV27 Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)..... 3.9 ___ ___ ___ ___ ___

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90941619

Cooler Accepted by: JM Date: 5/3/11 Time: 1655

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ...	(Bubble Wrap) (Wet Ice) Gel Packs Baggies (Foam Block) Paper Other: _____		
Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		YES	(NO)
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	(NO)
Were all VOC vials free of air bubbles?	NA	(YES)	NO
Was sufficient amount of sample sent in each bottle?		(YES)	NO
Date VOC Trip Blank was made at ARI	(NA)		

Was Sample Split by ARI : (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

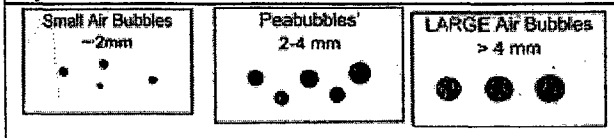
Samples Logged by: JM Date: 5/3/11 Time: 1705

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____ Date: _____



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: SV27
Client: Hart Crowser Inc.
Project Event: 7168-09
Project Name: Ken's Auto

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-3	SV27A	11-9968	Water	05/02/11 11:10	05/03/11 16:55
2.	MW-4R	SV27B	11-9969	Water	05/02/11 12:50	05/03/11 16:55
3.	MW-14	SV27C	11-9970	Water	05/02/11 13:35	05/03/11 16:55
4.	MW-6	SV27D	11-9971	Water	05/02/11 15:18	05/03/11 16:55
5.	MW-13	SV27E	11-9972	Water	05/02/11 16:25	05/03/11 16:55

Printed 05/03/11

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-3**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: SV27A
LIMS ID: 11-9968
Matrix: Water
Data Release Authorized:
Reported: 05/10/11

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Date Analyzed: 05/09/11 09:06
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	1.0	< 1.0 U	
108-88-3	Toluene	1.0	< 1.0 U	
100-41-4	Ethylbenzene	1.0	< 1.0 U	
179601-23-1	m,p-Xylene	1.0	< 1.0 U	
95-47-6	o-Xylene	1.0	< 1.0 U	
	Gasoline Range Hydrocarbons	0.25	< 0.25 U	GAS ID ---

BETX Surrogate Recovery

Trifluorotoluene	94.9%
Bromobenzene	92.9%

Gasoline Surrogate Recovery

Trifluorotoluene	97.9%
Bromobenzene	96.3%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-4R**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: SV27B
LIMS ID: 11-9969
Matrix: Water
Data Release Authorized:
Reported: 05/10/11

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Date Analyzed: 05/09/11 09:35
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	1.0	< 1.0 U	
108-88-3	**Toluene**	**1.0**	**1.6**	
100-41-4	Ethylbenzene	1.0	< 1.0 U	
179601-23-1	m,p-Xylene	1.0	< 1.0 U	
95-47-6	o-Xylene	1.0	< 1.0 U	
	Gasoline Range Hydrocarbons	0.25	< 0.25 U	GAS ID ---

BETX Surrogate Recovery

Trifluorotoluene	94.7%
Bromobenzene	94.7%

Gasoline Surrogate Recovery

Trifluorotoluene	98.2%
Bromobenzene	98.7%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-14**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: SV27C
LIMS ID: 11-9970
Matrix: Water
Data Release Authorized:
Reported: 05/10/11

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Date Analyzed: 05/09/11 10:04
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	1.0	< 1.0 U	
108-88-3	**Toluene**	**1.0**	**1.7**	
100-41-4	**Ethylbenzene**	**1.0**	**1.4**	
179601-23-1	**m,p-Xylene**	**1.0**	**1.3**	
95-47-6	o-Xylene	1.0	< 1.0 U	
				GAS ID
	Gasoline Range Hydrocarbons	**0.25**	**3.1**	**GAS/GRO**

BETX Surrogate Recovery

Trifluorotoluene	95.7%
Bromobenzene	99.7%

Gasoline Surrogate Recovery

Trifluorotoluene	100%
Bromobenzene	106%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-6**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: SV27D
LIMS ID: 11-9971
Matrix: Water
Data Release Authorized:
Reported: 05/10/11

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Date Analyzed: 05/09/11 10:33
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	1.0	< 1.0 U
108-88-3	Toluene	1.0	< 1.0 U
100-41-4	Ethylbenzene	1.0	< 1.0 U
179601-23-1	m,p-Xylene	1.0	< 1.0 U
95-47-6	o-Xylene	1.0	< 1.0 U

			GAS ID
Gasoline Range Hydrocarbons	**0.25**	**0.49**	**GRO**

BETX Surrogate Recovery

Trifluorotoluene	95.0%
Bromobenzene	94.5%

Gasoline Surrogate Recovery

Trifluorotoluene	98.9%
Bromobenzene	97.4%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MB-050911**
TPHG by Method NWTPHG **METHOD BLANK**

Lab Sample ID: MB-050911
LIMS ID: 11-9968
Matrix: Water
Data Release Authorized:
Reported: 05/10/11

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed: 05/09/11 08:17
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	1.0	< 1.0 U	
108-88-3	Toluene	1.0	< 1.0 U	
100-41-4	Ethylbenzene	1.0	< 1.0 U	
179601-23-1	m,p-Xylene	1.0	< 1.0 U	
95-47-6	o-Xylene	1.0	< 1.0 U	
	Gasoline Range Hydrocarbons	0.25	< 0.25 U	---

BETX Surrogate Recovery

Trifluorotoluene	91.9%
Bromobenzene	94.4%

Gasoline Surrogate Recovery

Trifluorotoluene	95.7%
Bromobenzene	98.0%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

BETX WATER SURROGATE RECOVERY SUMMARY

ARI Job: SV27
Matrix: Water

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09

Client ID	TFT	BBZ	TOT OUT
MB-050911	91.9%	94.4%	0
LCS-050911	94.8%	95.1%	0
LCSD-050911	95.7%	96.5%	0
MW-3	94.9%	92.9%	0
MW-4R	94.7%	94.7%	0
MW-14	95.7%	99.7%	0
MW-6	95.0%	94.5%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(79-120)	(80-120)
(BBZ) = Bromobenzene	(79-120)	(80-120)

Log Number Range: 11-9968 to 11-9971

FORM II BETX

ANALYTICAL RESOURCES INCORPORATED

TPHG WATER SURROGATE RECOVERY SUMMARY

ARI Job: SV27
Matrix: Water

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09

Client ID	TFT	BBZ	TOT OUT
MB-050911	95.7%	98.0%	0
LCS-050911	101%	99.3%	0
LCSD-050911	102%	99.8%	0
MW-3	97.9%	96.3%	0
MW-4R	98.2%	98.7%	0
MW-14	100%	106%	0
MW-6	98.9%	97.4%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(80-120)	(80-120)
(BBZ) = Bromobenzene	(80-120)	(80-120)

Log Number Range: 11-9968 to 11-9971

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: LCS-050911
LAB CONTROL SAMPLE

Lab Sample ID: LCS-050911
LIMS ID: 11-9968
Matrix: Water
Data Release Authorized:
Reported: 05/10/11

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 05/09/11 07:18
LCSD: 05/09/11 07:47
Instrument/Analyst LCS: PID1/MH
LCSD: PID1/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Gasoline Range Hydrocarbons	1.07	1.00	107%	1.07	1.00	107%	0.0%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

TPHG Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	101%	102%
Bromobenzene	99.3%	99.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
Page 1 of 1

Sample ID: LCS-050911
LAB CONTROL SAMPLE

Lab Sample ID: LCS-050911
LIMS ID: 11-9968
Matrix: Water
Data Release Authorized:
Reported: 05/10/11

QC Report No: SV27-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 05/09/11 07:18
LCSD: 05/09/11 07:47
Instrument/Analyst LCS: PID1/MH
LCSD: PID1/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Benzene	3.14	3.70	84.9%	3.26	3.70	88.1%	3.8%
Toluene	34.5	36.5	94.5%	36.2	36.5	99.2%	4.8%
Ethylbenzene	10.2	10.7	95.3%	10.7	10.7	100%	4.8%
m,p-Xylene	37.0	40.1	92.3%	38.4	40.1	95.8%	3.7%
o-Xylene	17.0	18.1	93.9%	17.6	18.1	97.2%	3.5%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

BETX Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	94.8%	95.7%
Bromobenzene	95.1%	96.5%

SAMPLE RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Client ID: MW-3
ARI ID: 11-9968 SV27A

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	05/04/11 050411#1	EPA 300.0	mg/L	1.0	36.0
Bromide	05/03/11 050311#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	05/03/11 050311#1	EPA 300.0	mg-N/L	0.1	3.4
Sulfate	05/04/11 050411#1	EPA 300.0	mg/L	1.0	12.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Client ID: MW-4R
ARI ID: 11-9969 SV27B

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	05/04/11 050411#1	EPA 300.0	mg/L	5.0	30.8
Bromide	05/04/11 050411#1	EPA 300.0	mg/L	0.5	8.6
N-Nitrate	05/04/11 050411#1	EPA 300.0	mg-N/L	0.5	18.7
Sulfate	05/04/11 050411#1	EPA 300.0	mg/L	5.0	78.9

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Client ID: MW-14
ARI ID: 11-9970 SV27C

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	05/04/11 050411#1	EPA 300.0	mg/L	2.0	35.1
Bromide	05/03/11 050311#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	05/04/11 050411#1	EPA 300.0	mg-N/L	2.0	63.2
Sulfate	05/04/11 050411#1	EPA 300.0	mg/L	20.0	541

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Client ID: MW-6
ARI ID: 11-9971 SV27D

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	05/04/11 050411#1	EPA 300.0	mg/L	5.0	83.0
Bromide	05/03/11 050311#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	05/03/11 050311#1	EPA 300.0	mg-N/L	0.1	2.6
Sulfate	05/04/11 050411#1	EPA 300.0	mg/L	5.0	79.6

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Client ID: MW-13
ARI ID: 11-9972 SV27E

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	05/04/11 050411#1	EPA 300.0	mg/L	1.0	20.7
Bromide	05/03/11 050311#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	05/03/11 050311#1	EPA 300.0	mg-N/L	0.1	2.4
Sulfate	05/04/11 050411#1	EPA 300.0	mg/L	0.2	7.3

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Chloride	EPA 300.0	05/04/11	mg/L	< 0.1 U	
Bromide	EPA 300.0	05/03/11	mg/L	< 0.1 U	
		05/04/11		< 0.1 U	
N-Nitrate	EPA 300.0	05/03/11	mg-N/L	< 0.1 U	
		05/04/11		< 0.1 U	
Sulfate	EPA 300.0	05/04/11	mg/L	< 0.1 U	

STANDARD REFERENCE RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Chloride	EPA 300.0	05/04/11	mg/L	2.8	3.0	93.3%
ERA #230109						
Bromide	EPA 300.0	05/03/11	mg/L	2.9	3.0	96.7%
ERA #05078		05/04/11		3.0	3.0	100.0%
N-Nitrate	EPA 300.0	05/03/11	mg-N/L	2.9	3.0	96.7%
ERA #09127		05/04/11		2.9	3.0	96.7%
Sulfate	EPA 300.0	05/04/11	mg/L	3.0	3.0	100.0%
ERA #220109						

REPLICATE RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: SV27A Client ID: MW-3						
Chloride	EPA 300.0	05/04/11	mg/L	36.0	35.9	0.3%
Bromide	EPA 300.0	05/03/11	mg/L	< 0.1	< 0.1	NA
N-Nitrate	EPA 300.0	05/03/11	mg-N/L	3.4	3.4	0.0%
Sulfate	EPA 300.0	05/04/11	mg/L	12.4	12.6	1.6%

MS/MSD RESULTS-CONVENTIONALS
SV27-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 05/02/11
Date Received: 05/03/11

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: SV27A Client ID: MW-3							
Bromide	EPA 300.0	05/03/11	mg/L	< 0.1	2.0	2.0	100.0%
N-Nitrate	EPA 300.0	05/03/11	mg-N/L	3.4	5.9	2.0	125.0%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

August 10, 2011

Angie Goodwin
Hart Crowser, Inc.
1700 Westlake Avenue N. Suite 200
Seattle, WA 98109-3256

RE: Client Project: 7168-09
ARI Job No.: TF87

Dear Angie;

Please find enclosed the original Chain-of-Custody (COC) records, sample receipt documentation, and the final data for samples from the project referenced above. Analytical Resources, Inc. (ARI) received five water samples on July 28, 2011. The samples were received in good condition with a cooler temperature of 2.4 °C.

The samples were analyzed for NWTPH-Gx plus BTEX and Anions, as requested on the COC.

There were no anomalies associated with the analyses of this sample.

Sincerely,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Client Services Manager
kellyb@arilabs.com
206/695-6211
Enclosures

cc: eFile TF87

KFB/kb

Sample Custody Record

Samples Shipped to: ARI

HART CROWSER

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 7168-09 LAB NUMBER

PROJECT NAME KEN'S AUTO

HART CROWSER CONTACT ANDREW KAPAROS
206-826-4463

SAMPLED BY: ASK

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	NWTPH-Gx	BTEX by 8021B	IONS by 300.0	NO3 as N, SO4, BROMIDE, AND CHLORIDE	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	MW-14		7/27/11	1045	WATER	X	X	X		3	
	MW-4R			1200		X	X	X		3	
	MW-3			1250		X	X	X		3	
	MW-6			1345		X	X	X		3	
	MW-13			1545				X		1	

REQUESTED ANALYSIS

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE: Andrew Kaparos	7/28/11	SIGNATURE: A. Volgaardsen	7/28/11
PRINT NAME: ANDREW KAPAROS	TIME	PRINT NAME:	TIME
COMPANY: HART CROWSER		COMPANY: ARI	1040
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	TIME	SIGNATURE	TIME
PRINT NAME		PRINT NAME	
COMPANY		COMPANY	

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

13 TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☒ STANDARD
☐ 72 HOURS OTHER

White and Yellow Copies to Lab Pink to Project Manager Lab to Return White Copy to Hart Crowser Gold to Sample Custodian

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Hart Crowser | Project Name: Ken's Auto

COC No(s): _____ (NA) | Delivered by: Fed-Ex UPS (Courier) Hand Delivered Other: Non ARI

Assigned ARI Job No: TF87 | Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	(YES)	NO
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)..... 2.4 ____ ____ ____ ____ ____

If cooler temperature is out of compliance fill out form 00070F | Temp Gun ID#: 90941619

Cooler Accepted by: AV Date: 7/28/11 Time: 1040

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... Bubble Wrap (Wet Ice) Gel Packs (Baggies) (Foam Block) Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		YES	(NO)
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	(NO)
Were all VOC vials free of air bubbles?	NA	YES	(NO)
Was sufficient amount of sample sent in each bottle?		(YES)	NO
Date VOC Trip Blank was made at ARI	NA	~~7/25/11~~ 7/25/11	

Was Sample Split by ARI : (NA) YES Date/Time:_____ Equipment:_____ Split by:_____

Samples Logged by: JM Date: 7/28/11 Time: 1046

*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

MW-3 = sm in 1 of 2

Trip Blank = sm in 2 of 2

By: JM Date: 7/28/11

Small Air Bubbles ~2mm	Peabubbles 2-4 mm	LARGE Air Bubbles >4 mm
• • •	• • •	● ● ●

Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: TF87
Client: Hart Crowser Inc.
Project Event: 7168-09
Project Name: Ken's Auto

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-14	TF87A	11-16110	Water	07/27/11 10:45	07/28/11 10:40
2.	MW-4R	TF87B	11-16111	Water	07/27/11 12:00	07/28/11 10:40
3.	MW-3	TF87C	11-16112	Water	07/27/11 12:50	07/28/11 10:40
4.	MW-6	TF87D	11-16113	Water	07/27/11 13:45	07/28/11 10:40
5.	MW-13	TF87E	11-16114	Water	07/27/11 15:45	07/28/11 10:40
6.	Trip Blank	TF87F	11-16115	Water	07/27/11	07/28/11 10:40

Printed 07/28/11

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-14**
TPHG by Method NWTPHG **SAMPLE**
Page 1 of 1

Lab Sample ID: TF87A
LIMS ID: 11-16110
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Date Analyzed: 08/03/11 08:46
Instrument/Analyst: PIDl/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	1.0	< 1.0 U	
108-88-3	**Toluene**	**1.0**	**1.2**	
100-41-4	**Ethylbenzene**	**1.0**	**3.0**	
179601-23-1	**m,p-Xylene**	**1.0**	**2.8**	
95-47-6	o-Xylene	1.0	< 1.0 U	
				GAS ID
	Gasoline Range Hydrocarbons	**0.25**	**3.7**	**GAS/GRO**

BETX Surrogate Recovery

Trifluorotoluene	108%
Bromobenzene	106%

Gasoline Surrogate Recovery

Trifluorotoluene	108%
Bromobenzene	107%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-4R**
TPHG by Method NWTPHG **SAMPLE**
Page 1 of 1

Lab Sample ID: TF87B
LIMS ID: 11-16111
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Date Analyzed: 08/03/11 09:16
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	1.0	< 1.0 U	
108-88-3	**Toluene**	**1.0**	**250 E**	
100-41-4	Ethylbenzene	1.0	< 1.0 U	
179601-23-1	m,p-Xylene	1.0	< 1.0 U	
95-47-6	o-Xylene	1.0	< 1.0 U	
				GAS ID
	Gasoline Range Hydrocarbons	**0.25**	**0.98**	**GRO**

BETX Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	102%

Gasoline Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	101%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-4R
DILUTION

Lab Sample ID: TF87B
LIMS ID: 11-16111
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Date Analyzed: 08/03/11 11:23
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 10.0

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	10	< 10 U	
108-88-3	**Toluene**	**10**	**250**	
100-41-4	Ethylbenzene	10	< 10 U	
179601-23-1	m,p-Xylene	10	< 10 U	
95-47-6	o-Xylene	10	< 10 U	
	Gasoline Range Hydrocarbons	2.5	< 2.5 U	GAS ID ---

BETX Surrogate Recovery

Trifluorotoluene	99.9%
Bromobenzene	101%

Gasoline Surrogate Recovery

Trifluorotoluene	100%
Bromobenzene	100%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-3
SAMPLE

Lab Sample ID: TF87C
LIMS ID: 11-16112
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Date Analyzed: 08/03/11 09:45
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	1.0	< 1.0 U	
108-88-3	Toluene	1.0	< 1.0 U	
100-41-4	Ethylbenzene	1.0	< 1.0 U	
179601-23-1	m,p-Xylene	1.0	< 1.0 U	
95-47-6	o-Xylene	1.0	< 1.0 U	
	Gasoline Range Hydrocarbons	0.25	< 0.25 U	GAS ID ---

BETX Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	104%

Gasoline Surrogate Recovery

Trifluorotoluene	103%
Bromobenzene	100%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-6
SAMPLE

Lab Sample ID: TF87D
LIMS ID: 11-16113
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Date Analyzed: 08/03/11 10:14
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	1.0	< 1.0 U
108-88-3	Toluene	1.0	< 1.0 U
100-41-4	Ethylbenzene	1.0	< 1.0 U
179601-23-1	m,p-Xylene	1.0	< 1.0 U
95-47-6	o-Xylene	1.0	< 1.0 U

			GAS ID
Gasoline Range Hydrocarbons	**0.25**	**0.61**	**GRO**

BETX Surrogate Recovery

Trifluorotoluene	99.7%
Bromobenzene	104%

Gasoline Surrogate Recovery

Trifluorotoluene	100%
Bromobenzene	105%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: Trip Blank
SAMPLE

Lab Sample ID: TF87F
LIMS ID: 11-16115
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Date Analyzed: 08/03/11 08:17
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	1.0	< 1.0 U
108-88-3	Toluene	1.0	< 1.0 U
100-41-4	Ethylbenzene	1.0	< 1.0 U
179601-23-1	m,p-Xylene	1.0	< 1.0 U
95-47-6	o-Xylene	1.0	< 1.0 U

			GAS ID
Gasoline Range Hydrocarbons	0.25	< 0.25 U	---

BETX Surrogate Recovery

Trifluorotoluene	109%
Bromobenzene	104%

Gasoline Surrogate Recovery

Trifluorotoluene	107%
Bromobenzene	104%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MB-080311
METHOD BLANK

Lab Sample ID: MB-080311
LIMS ID: 11-16110
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed: 08/03/11 07:18
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	1.0	< 1.0 U
108-88-3	Toluene	1.0	< 1.0 U
100-41-4	Ethylbenzene	1.0	< 1.0 U
179601-23-1	m,p-Xylene	1.0	< 1.0 U
95-47-6	o-Xylene	1.0	< 1.0 U

			GAS ID
Gasoline Range Hydrocarbons	0.25	< 0.25 U	---

BETX Surrogate Recovery

Trifluorotoluene	96.3%
Bromobenzene	98.6%

Gasoline Surrogate Recovery

Trifluorotoluene	96.8%
Bromobenzene	98.7%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

BETX WATER SURROGATE RECOVERY SUMMARY

ARI Job: TF87
Matrix: Water

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09

Client ID	TFT	BBZ	TOT OUT
MB-080311	96.3%	98.6%	0
LCS-080311	104%	102%	0
LCSD-080311	105%	104%	0
MW-14	108%	106%	0
MW-4R	102%	102%	0
MW-4R DL	99.9%	101%	0
MW-3	102%	104%	0
MW-6	99.7%	104%	0
Trip Blank	109%	104%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(79-120)	(80-120)
(BBZ) = Bromobenzene	(79-120)	(80-120)

Log Number Range: 11-16110 to 11-16115

ANALYTICAL RESOURCES INCORPORATED

TPHG WATER SURROGATE RECOVERY SUMMARY

ARI Job: TF87
Matrix: Water

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09

Client ID	TFT	BBZ	TOT OUT
MB-080311	96.8%	98.7%	0
LCS-080311	106%	102%	0
LCSD-080311	107%	103%	0
MW-14	108%	107%	0
MW-4R	102%	101%	0
MW-4R DL	100%	100%	0
MW-3	103%	100%	0
MW-6	100%	105%	0
Trip Blank	107%	104%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(80-120)	(80-120)
(BBZ) = Bromobenzene	(80-120)	(80-120)

Log Number Range: 11-16110 to 11-16115

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: LCS-080311
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080311
LIMS ID: 11-16110
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 08/03/11 06:20
LCSD: 08/03/11 06:49
Instrument/Analyst LCS: PID1/MH
LCSD: PID1/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Gasoline Range Hydrocarbons	1.00	1.00	100%	1.00	1.00	100%	0.0%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

TPHG Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	106%	107%
Bromobenzene	102%	103%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
Page 1 of 1

Sample ID: LCS-080311
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080311
LIMS ID: 11-16110
Matrix: Water
Data Release Authorized:
Reported: 08/04/11

QC Report No: TF87-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 08/03/11 06:20
LCSD: 08/03/11 06:49
Instrument/Analyst LCS: PID1/MH
LCSD: PID1/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Benzene	3.56	3.70	96.2%	3.52	3.70	95.1%	1.1%
Toluene	38.7	36.5	106%	38.6	36.5	106%	0.3%
Ethylbenzene	11.4	10.7	107%	11.1	10.7	104%	2.7%
m,p-Xylene	40.4	40.1	101%	40.2	40.1	100%	0.5%
o-Xylene	19.1	18.1	106%	19.0	18.1	105%	0.5%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

BETX Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	104%	105%
Bromobenzene	102%	104%

SAMPLE RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Client ID: MW-14
ARI ID: 11-16110 TF87A

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	07/29/11 072911#1	EPA 300.0	mg/L	1.0	40.2
Bromide	07/29/11 072911#1	EPA 300.0	mg/L	1.0	< 1.0 U
N-Nitrate	07/28/11 072811#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Sulfate	07/29/11 072911#1	EPA 300.0	mg/L	20.0	550

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Client ID: MW-4R
ARI ID: 11-16111 TF87B

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	07/29/11 072911#1	EPA 300.0	mg/L	1.0	24.7
Bromide	07/28/11 072811#1	EPA 300.0	mg/L	0.1	0.9
N-Nitrate	07/28/11 072811#1	EPA 300.0	mg-N/L	0.1	4.2
Sulfate	07/29/11 072911#1	EPA 300.0	mg/L	1.0	12.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Client ID: MW-3
ARI ID: 11-16112 TF87C

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	07/29/11 072911#1	EPA 300.0	mg/L	0.5	12.6
Bromide	07/28/11 072811#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	07/28/11 072811#1	EPA 300.0	mg-N/L	0.1	1.8
Sulfate	07/29/11 072911#1	EPA 300.0	mg/L	0.5	21.6

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Client ID: MW-6
ARI ID: 11-16113 TF87D

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	07/28/11 072811#1	EPA 300.0	mg/L	2.0	97.8
Bromide	07/28/11 072811#1	EPA 300.0	mg/L	2.0	< 2.0 U
N-Nitrate	07/28/11 072811#1	EPA 300.0	mg-N/L	2.0	< 2.0 U
Sulfate	07/29/11 072911#1	EPA 300.0	mg/L	50.0	879

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Client ID: MW-13
ARI ID: 11-16114 TF87E

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	07/29/11 072911#1	EPA 300.0	mg/L	0.5	9.4
Bromide	07/28/11 072811#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	07/28/11 072811#1	EPA 300.0	mg-N/L	0.1	1.3
Sulfate	07/29/11 072911#1	EPA 300.0	mg/L	0.5	5.8

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Chloride	EPA 300.0	07/28/11	mg/L	< 0.1 U	
		07/29/11		< 0.1 U	
Bromide	EPA 300.0	07/28/11	mg/L	< 0.1 U	
		07/29/11		< 0.1 U	
N-Nitrate	EPA 300.0	07/28/11	mg-N/L	< 0.1 U	
Sulfate	EPA 300.0	07/29/11	mg/L	< 0.1 U	

STANDARD REFERENCE RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Chloride	EPA 300.0	07/28/11	mg/L	3.0	3.0	100.0%
ERA #230109		07/29/11		3.0	3.0	100.0%
Bromide	EPA 300.0	07/28/11	mg/L	2.9	3.0	96.7%
ERA #05078		07/29/11		2.9	3.0	96.7%
N-Nitrate	EPA 300.0	07/28/11	mg-N/L	3.1	3.0	103.3%
ERA #09127						
Sulfate	EPA 300.0	07/29/11	mg/L	2.9	3.0	96.7%
ERA #220109						

REPLICATE RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: TF87A Client ID: MW-14						
Chloride	EPA 300.0	07/29/11	mg/L	40.2	40.3	0.2%
Bromide	EPA 300.0	07/29/11	mg/L	< 1.0	< 1.0	NA
N-Nitrate	EPA 300.0	07/28/11	mg-N/L	< 0.1	< 0.1	NA
Sulfate	EPA 300.0	07/29/11	mg/L	550	549	0.2%

MS/MSD RESULTS-CONVENTIONALS
TF87-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/10/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 07/27/11
Date Received: 07/28/11

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: TF87A Client ID: MW-14							
Chloride	EPA 300.0	07/29/11	mg/L	40.2	56.4	20.0	81.0%
Bromide	EPA 300.0	07/29/11	mg/L	< 1.0	16.2	20.0	81.0%
N-Nitrate	EPA 300.0	07/28/11	mg-N/L	< 0.1	1.8	2.0	90.0%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

November 21, 2011

Angie Goodwin
Hart Crowser, Inc.
1700 Westlake Avenue N. Suite 200
Seattle, WA 98109-3256

RE: Client Project: 7168-09
ARI Job No.: TV43

Dear Angie:

Please find enclosed the original Chain-of-Custody (COC) records, sample receipt documentation, and the final data for samples from the project referenced above. Analytical Resources, Inc. (ARI) received ten water samples and one trip blank on November 3, 2011. The samples were received in good condition with a cooler temperature of 2.9°C.

The samples were analyzed for NWTPH-Gx plus BTEX, Total Metals, and Anions, as requested on the COC.

The continuing calibration blank, an internal quality control measure, for the Chloride analysis had detections just slightly above the reporting limit at 0.102 on 11/3/11 and 0.110 on 11/4/11. All sample detections for Chloride were well over 10x the level of the blank contamination, and no further corrective action was taken.

There were no other anomalies associated with the analyses.

Sincerely,
ANALYTICAL RESOURCES, INC.

Eric Branson
Project Manager
-for-
Kelly Bottem
Client Services Manager
kellyb@arilabs.com
206/695-6211
Enclosures

cc: eFile TV43

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: TV43
Client: Hart Crowser Inc.
Project Event: 7168-09
Project Name: Ken's Auto

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-13	TV43A	11-25596	Water	11/02/11 10:00	11/03/11 15:15
2.	MW-6	TV43B	11-25597	Water	11/02/11 11:05	11/03/11 15:15
3.	MW-15	TV43C	11-25598	Water	11/02/11 11:55	11/03/11 15:15
4.	MW-12	TV43D	11-25599	Water	11/02/11 12:15	11/03/11 15:15
5.	MW-2	TV43E	11-25600	Water	11/02/11 13:10	11/03/11 15:15
6.	MW-14	TV43F	11-25601	Water	11/02/11 13:40	11/03/11 15:15
7.	MW-4R	TV43G	11-25602	Water	11/02/11 14:30	11/03/11 15:15
8.	MW-KA	TV43H	11-25603	Water	11/02/11 14:00	11/03/11 15:15
9.	MW-5	TV43I	11-25604	Water	11/02/11 15:00	11/03/11 15:15
10.	MW-3	TV43J	11-25605	Water	11/02/11 15:30	11/03/11 15:15
11.	Trip Blank	TV43K	11-25606	Water	11/02/11 10:00	11/03/11 15:15

Printed 11/04/11

Sample Custody Record

TV43

Samples Shipped to: ARI

HART CROWSER

Hart Crowser, Inc.
1700 Westlake Avenue North, Suite 200
Seattle, Washington 98109-6212
Office: 206.324.9530 • Fax 206.328.5581

JOB 7168-09 LAB NUMBER

PROJECT NAME KEN'S AUTO

HART CROWSER CONTACT ANGIE GOODWIN

SAMPLED BY: ASK/PHK

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: NWTPH-Gx/BTEX	NO3/SO4/Br/Cl	TOTAL Pb	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	MW-13		11/2/11	1000	WATER	X	X	X	4	
	MW-6			1105		X	X	X	4	
	MW-15			1155		X	X	X	4	
	MW-12			1215		X	X	X	4	
	MW-2			1310		X	X	X	4	
	MW-14			1340		X	X	X	4	
	MW-4R			1430		X	X	X	4	
	MW-KA			1400		X	X	X	4	
	MW-5			1500		X	X	X	4	TOTAL Pb POLY HAS ~1/2 PRESERVATIVE
	MW-3			1530		X	X	X	4	TOTAL Pb POLY HAS ~1/2 PRESERVATIVE

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE: ANDREW KAPAROS	11/3/11	SIGNATURE: Jose Ugas	
PRINT NAME: HC	TIME: 1000	PRINT NAME: ARI	TIME
COMPANY		COMPANY	11/3/11 15:15
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	TIME	SIGNATURE	TIME
PRINT NAME		PRINT NAME	
COMPANY		COMPANY	

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

For gas & benzene, please report to the curve.

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐48 HOURS ☒STANDARD
☐72 HOURS OTHER _____

White and Yellow Copies to Lab Pink to Project Manager Lab to Return White Copy to Hart Crowser Gold to Sample Custodian

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client Hart Crowser Project Name: Kens Auto

COC No(s) _____ (NA) Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No TV43 Tracking No _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? (YES) NO

Were custody papers included with the cooler? (YES) NO

Were custody papers properly filled out (ink, signed, etc) (YES) NO

Temperature of Cooler(s) (°C) (recommended 2.0-6 0 °C for chemistry) 2.9

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID# 90941619

Cooler Accepted by JL Date 11/3/11 Time 15:15

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES (NO)

What kind of packing material was used? Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? NA (YES) NO

Were all bottles sealed in individual plastic bags? YES (NO)

Did all bottles arrive in good condition (unbroken)? (YES) NO

Were all bottle labels complete and legible? (YES) NO

Did the number of containers listed on COC match with the number of containers received? (YES) NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? (YES) NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) NA (YES) NO

Were all VOC vials free of air bubbles? NA (YES) NO

Was sufficient amount of sample sent in each bottle? YES NO

Date VOC Trip Blank was made at ARI NA 10/28/11

Was Sample Split by ARI NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by _____ Date 11/4/11 Time: 1155

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

(1) EXCEPT TRIP BLANK - PEABUBBLES IN 2 OF 2

By EB Date 11/4/11

Small Air Bubbles ~2mm	Peabubbles 2-4 mm	LARGE Air Bubbles > 4 mm
•	• • •	● ● ●

Small → "sm"

Peabubbles → "pb"

Large → "lg"

Headspace → "hs"

PRESERVATION VERIFICATION 11/04/11
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **TV43**

Inquiry Number: NONE
Analysis Requested: 11/04/11
Contact: Goodwin, Angie
Client: Hart Crowser Inc.
Logged by: EB
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

PC: Kelly
VTSR: 11/03/11

Project #: 7168-09
Project: Ken's Auto
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
11-25596 **TV43A**	MW-13						TOT OK															
11-25597 **TV43B**	MW-6						TOT															
11-25598 **TV43C**	MW-15						TOT															
11-25599 **TV43D**	MW-12						TOT															
11-25600 **TV43E**	MW-2						TOT															
11-25601 **TV43F**	MW-14						TOT															
11-25602 **TV43G**	MW-4R						TOT															
11-25603 **TV43H**	MW-KA						TOT															
11-25604 **TV43I**	MW-5						TOT															
11-25605 **TV43J**	MW-3						TOT															

Checked By EB Date 11/4/11

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-13**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: TV43A
LIMS ID: 11-25596
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 19:13
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	97.9%
Bromobenzene	96.9%

Gasoline Surrogate Recovery

Trifluorotoluene	97.0%
Bromobenzene	96.9%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-6**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: TV43B
LIMS ID: 11-25597
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 19:42
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	0.25	< 0.25 U
108-88-3	Toluene	0.25	< 0.25 U
100-41-4	Ethylbenzene	0.25	< 0.25 U
179601-23-1	m,p-Xylene	0.50	< 0.50 U
95-47-6	o-Xylene	0.25	< 0.25 U
	Gasoline Range Hydrocarbons	**0.10**	**0.59**

GAS ID
GAS/GRO

BETX Surrogate Recovery

Trifluorotoluene	97.2%
Bromobenzene	97.9%

Gasoline Surrogate Recovery

Trifluorotoluene	96.7%
Bromobenzene	95.7%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-15
SAMPLE

Lab Sample ID: TV43C
LIMS ID: 11-25598
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 20:11
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	0.25	< 0.25 U
108-88-3	Toluene	0.25	< 0.25 U
100-41-4	Ethylbenzene	0.25	< 0.25 U
179601-23-1	m,p-Xylene	0.50	< 0.50 U
95-47-6	o-Xylene	0.25	< 0.25 U

			GAS ID
	Gasoline Range Hydrocarbons	0.10	< 0.10 U ---

BETX Surrogate Recovery

Trifluorotoluene	98.8%
Bromobenzene	97.8%

Gasoline Surrogate Recovery

Trifluorotoluene	97.2%
Bromobenzene	96.4%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-12
SAMPLE

Lab Sample ID: TV43D
LIMS ID: 11-25599
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 20:40
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	0.25	< 0.25 U
108-88-3	Toluene	0.25	< 0.25 U
100-41-4	Ethylbenzene	0.25	< 0.25 U
179601-23-1	m,p-Xylene	0.50	< 0.50 U
95-47-6	o-Xylene	0.25	< 0.25 U

			GAS ID
	Gasoline Range Hydrocarbons	0.10	< 0.10 U ---

BETX Surrogate Recovery

Trifluorotoluene	97.0%
Bromobenzene	97.3%

Gasoline Surrogate Recovery

Trifluorotoluene	96.1%
Bromobenzene	96.9%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-2
SAMPLE

Lab Sample ID: TV43E
LIMS ID: 11-25600
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 21:10
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	0.25	< 0.25 U
108-88-3	Toluene	0.25	< 0.25 U
100-41-4	Ethylbenzene	0.25	< 0.25 U
179601-23-1	m,p-Xylene	0.50	< 0.50 U
95-47-6	o-Xylene	0.25	< 0.25 U

			GAS ID
	Gasoline Range Hydrocarbons	0.10	< 0.10 U ---

BETX Surrogate Recovery

Trifluorotoluene	97.6%
Bromobenzene	98.3%

Gasoline Surrogate Recovery

Trifluorotoluene	96.4%
Bromobenzene	98.3%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-14
SAMPLE

Lab Sample ID: TV43F
LIMS ID: 11-25601
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 21:39
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	**Ethylbenzene**	**0.25**	**3.4**	
179601-23-1	**m,p-Xylene**	**0.50**	**1.8**	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	**0.10**	**1.2**	GAS ID **GRO**

BETX Surrogate Recovery

Trifluorotoluene	101%
Bromobenzene	101%

Gasoline Surrogate Recovery

Trifluorotoluene	101%
Bromobenzene	98.6%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-4R**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: TV43G
LIMS ID: 11-25602
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 22:08
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	**Toluene**	**0.25**	**14**	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	96.8%
Bromobenzene	96.8%

Gasoline Surrogate Recovery

Trifluorotoluene	95.7%
Bromobenzene	96.0%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MW-KA**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: TV43H
LIMS ID: 11-25603
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 23:36
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	**Ethylbenzene**	**0.25**	**3.3**	
179601-23-1	**m,p-Xylene**	**0.50**	**1.8**	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	**0.10**	**1.2**	**GRO**

GAS ID

BETX Surrogate Recovery

Trifluorotoluene	97.3%
Bromobenzene	98.3%

Gasoline Surrogate Recovery

Trifluorotoluene	96.6%
Bromobenzene	95.5%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: MW-5
SAMPLE

Lab Sample ID: TV43I
LIMS ID: 11-25604
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 00:05
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	0.25	< 0.25 U
108-88-3	Toluene	0.25	< 0.25 U
100-41-4	Ethylbenzene	0.25	< 0.25 U
179601-23-1	m,p-Xylene	0.50	< 0.50 U
95-47-6	o-Xylene	0.25	< 0.25 U

			GAS ID
	Gasoline Range Hydrocarbons	0.10	< 0.10 U ---

BETX Surrogate Recovery

Trifluorotoluene	98.8%
Bromobenzene	98.8%

Gasoline Surrogate Recovery

Trifluorotoluene	96.6%
Bromobenzene	96.9%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-3
SAMPLE

Lab Sample ID: TV43J
LIMS ID: 11-25605
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 00:34
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	96.5%
Bromobenzene	97.2%

Gasoline Surrogate Recovery

Trifluorotoluene	94.8%
Bromobenzene	95.6%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: Trip Blank**
TPHG by Method NWTPHG **SAMPLE**

Lab Sample ID: TV43K
LIMS ID: 11-25606
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Date Analyzed: 11/14/11 18:14
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	100%
Bromobenzene	98.9%

Gasoline Surrogate Recovery

Trifluorotoluene	99.4%
Bromobenzene	97.5%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

BETX WATER SURROGATE RECOVERY SUMMARY

ARI Job: TV43
Matrix: Water

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09

Client ID	TFT	BBZ	TOT OUT
MB-111411	97.4%	97.6%	0
LCS-111411	105%	102%	0
LCSD-111411	103%	100%	0
MW-13	97.9%	96.9%	0
MW-6	97.2%	97.9%	0
MW-15	98.8%	97.8%	0
MW-12	97.0%	97.3%	0
MW-2	97.6%	98.3%	0
MW-14	101%	101%	0
MW-4R	96.8%	96.8%	0
MW-KA	97.3%	98.3%	0
MW-5	98.8%	98.8%	0
MW-3	96.5%	97.2%	0
Trip Blank	100%	98.9%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(79-120)	(80-120)
(BBZ) = Bromobenzene	(79-120)	(80-120)

Log Number Range: 11-25596 to 11-25606

ANALYTICAL RESOURCES INCORPORATED

TPHG WATER SURROGATE RECOVERY SUMMARY

ARI Job: TV43
Matrix: Water

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09

Client ID	TFT	BBZ	TOT OUT
MB-111411	96.2%	96.8%	0
LCS-111411	105%	101%	0
LCSD-111411	102%	98.9%	0
MW-13	97.0%	96.9%	0
MW-6	96.7%	95.7%	0
MW-15	97.2%	96.4%	0
MW-12	96.1%	96.9%	0
MW-2	96.4%	98.3%	0
MW-14	101%	98.6%	0
MW-4R	95.7%	96.0%	0
MW-KA	96.6%	95.5%	0
MW-5	96.6%	96.9%	0
MW-3	94.8%	95.6%	0
Trip Blank	99.4%	97.5%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(80-120)	(80-120)
(BBZ) = Bromobenzene	(80-120)	(80-120)

Log Number Range: 11-25596 to 11-25606

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: LCS-111411
LAB CONTROL SAMPLE

Lab Sample ID: LCS-111411
LIMS ID: 11-25596
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 11/14/11 12:23
LCSD: 11/14/11 12:53
Instrument/Analyst LCS: PID1/MH
LCSD: PID1/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Gasoline Range Hydrocarbons	1.05	1.00	105%	0.99	1.00	99.0%	5.9%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

TPHG Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	105%	102%
Bromobenzene	101%	98.9%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod

Sample ID: LCS-111411
LAB CONTROL SAMPLE

Lab Sample ID: LCS-111411
LIMS ID: 11-25596
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 11/14/11 12:23
LCSD: 11/14/11 12:53
Instrument/Analyst LCS: PID1/MH
LCSD: PID1/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Benzene	3.71	3.70	100%	3.65	3.70	98.6%	1.6%
Toluene	40.6	36.5	111%	40.3	36.5	110%	0.7%
Ethylbenzene	11.3	10.7	106%	11.3	10.7	106%	0.0%
m,p-Xylene	41.7	40.1	104%	41.2	40.1	103%	1.2%
o-Xylene	19.7	18.1	109%	19.6	18.1	108%	0.5%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

BETX Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	105%	103%
Bromobenzene	102%	100%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod **Sample ID: MB-111411**
TPHG by Method NWTPHG **METHOD BLANK**

Lab Sample ID: MB-111411
LIMS ID: 11-25596
Matrix: Water
Data Release Authorized:
Reported: 11/15/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed: 11/14/11 13:22
Instrument/Analyst: PID1/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	97.4%
Bromobenzene	97.6%

Gasoline Surrogate Recovery

Trifluorotoluene	96.2%
Bromobenzene	96.8%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW-13
SAMPLE

Lab Sample ID: TV43A
LIMS ID: 11-25596
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	**7439-92-1**	**Lead**	0.1	**0.2**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW-6
SAMPLE

Lab Sample ID: TV43B
LIMS ID: 11-25597
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	**7439-92-1**	**Lead**	0.1	**4.0**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW-15
SAMPLE

Lab Sample ID: TV43C
LIMS ID: 11-25598
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	7439-92-1	Lead	0.1	0.1	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS **Sample ID: MW-12**
Page 1 of 1 **SAMPLE**

Lab Sample ID: TV43D
LIMS ID: 11-25599
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	7439-92-1	Lead	0.1	0.1	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW-2
SAMPLE

Lab Sample ID: TV43E
LIMS ID: 11-25600
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	**7439-92-1**	**Lead**	0.1	**0.3**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS **Sample ID: MW-14**
Page 1 of 1 **SAMPLE**

Lab Sample ID: TV43F
LIMS ID: 11-25601
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	**7439-92-1**	**Lead**	0.1	**2.0**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS **Sample ID: MW-4R**
Page 1 of 1 **SAMPLE**

Lab Sample ID: TV43G
LIMS ID: 11-25602
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	**7439-92-1**	**Lead**	0.1	**0.1**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW-KA
SAMPLE

Lab Sample ID: TV43H
LIMS ID: 11-25603
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	**7439-92-1**	**Lead**	0.1	**1.7**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW-5
SAMPLE

Lab Sample ID: TV43I
LIMS ID: 11-25604
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	**7439-92-1**	**Lead**	0.1	**2.1**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW-3
SAMPLE

Lab Sample ID: TV43J
LIMS ID: 11-25605
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	7439-92-1	Lead	0.1	0.1	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS **Sample ID: MW-13**
Page 1 of 1 **MATRIX SPIKE**

Lab Sample ID: TV43A
LIMS ID: 11-25596
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Lead	200.8	0.160	25.3	25.0	101%	

Reported in µg/L

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked
NR-Not Recovered

Percent Recovery Limits: 75-125%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW-13
DUPLICATE

Lab Sample ID: TV43A
LIMS ID: 11-25596
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Lead	200.8	0.2	0.2	0.0%	+/- 0.1	L

Reported in µg/L

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS **Sample ID: LAB CONTROL**

Lab Sample ID: TV43LCS
LIMS ID: 11-25597
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Lead	200.8	25.5	25.0	102%	

Reported in µg/L

N-Control limit not met
Control Limits: 80-120%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS **Sample ID: METHOD BLANK**

Lab Sample ID: TV43MB
LIMS ID: 11-25597
Matrix: Water
Data Release Authorized:
Reported: 11/19/11

QC Report No: TV43-Hart Crowser Inc.
Project: Ken's Auto
7168-09
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	11/14/11	200.8	11/18/11	7439-92-1	Lead	0.1	0.1	U

U-Analyte undetected at given RL
RL-Reporting Limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-13
ARI ID: 11-25596 TV43A

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/04/11 110411#1	EPA 300.0	mg/L	0.2	6.3
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	0.1
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	0.4
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	0.1	4.7

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-6
ARI ID: 11-25597 TV43B

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/03/11 110311#1	EPA 300.0	mg/L	1.0	25.1
Bromide	11/04/11 110411#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	11/04/11 110411#1	EPA 300.0	mg-N/L	0.1	0.1
Sulfate	11/03/11 110311#1	EPA 300.0	mg/L	1.0	14.8

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-15
ARI ID: 11-25598 TV43C

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/04/11 110411#1	EPA 300.0	mg/L	0.2	8.7
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	0.4
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	0.2	6.0

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-12
ARI ID: 11-25599 TV43D

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/11/11 111111#1	EPA 300.0	mg/L	20.0	493
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	0.7
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	2.0	60.3

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-2
ARI ID: 11-25600 TV43E

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/04/11 110411#1	EPA 300.0	mg/L	0.2	5.8
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	0.6
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	0.2	9.1

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-14
ARI ID: 11-25601 TV43F

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/04/11 110411#1	EPA 300.0	mg/L	0.5	17.2
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	0.8
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	2.0	63.6

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-4R
ARI ID: 11-25602 TV43G

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/04/11 110411#1	EPA 300.0	mg/L	0.5	14.3
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	1.0
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	0.2
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	0.5	13.1

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-KA
ARI ID: 11-25603 TV43H

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/04/11 110411#1	EPA 300.0	mg/L	0.5	17.4
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	0.9
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	2.0	59.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-5
ARI ID: 11-25604 TV43I

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/04/11 110411#1	EPA 300.0	mg/L	0.5	16.7
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	0.1
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	0.4
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	0.5	21.7

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Client ID: MW-3
ARI ID: 11-25605 TV43J

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	11/04/11 110411#1	EPA 300.0	mg/L	0.2	9.5
Bromide	11/03/11 110311#1	EPA 300.0	mg/L	0.1	0.1
N-Nitrate	11/03/11 110311#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Sulfate	11/04/11 110411#1	EPA 300.0	mg/L	2.0	24.0

RL Analytical reporting limit
U Undetected at reported detection limit

MS/MSD RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: TV43A Client ID: MW-13							
Chloride	EPA 300.0	11/04/11	mg/L	6.3	15.6	10.0	93.0%
Bromide	EPA 300.0	11/03/11	mg/L	0.1	2.1	2.0	100.0%
N-Nitrate	EPA 300.0	11/03/11	mg-N/L	0.4	2.3	2.0	95.0%
Sulfate	EPA 300.0	11/04/11	mg/L	4.7	8.6	4.0	97.5%

REPLICATE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: 11/02/11
Date Received: 11/03/11

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: TV43A Client ID: MW-13						
Chloride	EPA 300.0	11/04/11	mg/L	6.3	6.4	1.6%
Bromide	EPA 300.0	11/03/11	mg/L	0.1	0.1	0.0%
N-Nitrate	EPA 300.0	11/03/11	mg-N/L	0.4	0.4	0.0%
Sulfate	EPA 300.0	11/04/11	mg/L	4.7	4.7	0.0%

METHOD BLANK RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Chloride	EPA 300.0	11/03/11	mg/L	< 0.1 U	
		11/04/11		< 0.1 U	
		11/11/11		< 0.1 U	
Bromide	EPA 300.0	11/03/11	mg/L	< 0.1 U	
		11/04/11		< 0.1 U	
N-Nitrate	EPA 300.0	11/03/11	mg-N/L	< 0.1 U	
		11/04/11		< 0.1 U	
Sulfate	EPA 300.0	11/03/11	mg/L	< 0.1 U	
		11/04/11		< 0.1 U	

STANDARD REFERENCE RESULTS-CONVENTIONALS
TV43-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 11/16/11

Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Chloride	EPA 300.0	11/03/11	mg/L	2.9	3.0	96.7%
ERA #411010		11/04/11		2.9	3.0	96.7%
		11/11/11		2.8	3.0	93.3%
Bromide	EPA 300.0	11/03/11	mg/L	3.0	3.0	100.0%
ERA #111109		11/04/11		3.0	3.0	100.0%
N-Nitrate	EPA 300.0	11/03/11	mg-N/L	2.9	3.0	96.7%
ERA #230511		11/04/11		2.9	3.0	96.7%
Sulfate	EPA 300.0	11/03/11	mg/L	3.0	3.0	100.0%
ERA #160111		11/04/11		3.0	3.0	100.0%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

February 23, 2012

Angie Goodwin
Hart Crowser, Inc.
1700 Westlake Avenue N. Suite 200
Seattle, WA 98109-3256

RE: Client Project: Ken's Auto, 7168-09
ARI Job No.: UI10

Dear Angie:

Please find enclosed the original Chain-of-Custody (COC) record, sample receipt documentation, and the final data for samples from the project referenced above. Analytical Resources, Inc. (ARI) received five water samples and one trip blank on February 14, 2012. The samples were received in good condition with a cooler temperature of 2.3°C. For further details regarding sample receipt, please refer to the enclosed Cooler Receipt Form.

The samples were analyzed for NWTPH-Gx plus BTEX and Anions, as requested on the COC.

The continuing calibration blank, an internal quality control measure, for the Chloride analysis had detections just slightly above the reporting limit at 0.109 on 2/15/12. All associated sample detections for Chloride were greater than ten times the level found in the calibration blank. No further corrective action was taken.

There were no other anomalies associated with the analyses.

Sincerely,
ANALYTICAL RESOURCES, INC.

Cheronne Oreiro
Project Manager
-for-
Kelly Bottem
Client Services Manager
kellyb@arilabs.com
206/695-6211
Enclosures

cc: eFile UI10

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Sample Custody Record

Samples Shipped to: ARI

HARTCROWSER

Hart Crowser, Inc.
1700 Westlake Avenue . th, Suite 200
Seattle, Washington 98109-6212
Office: 206.324.9530 • **Fax** 206.328.5581

JOB 7168-09 LAB NUMBER

PROJECT NAME KEN'S AUTO

HART CROWSER CONTACT ANGIE GOODWIN

SAMPLED BY: ASK

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: TPH-G/BTEX	REQUESTED ANALYSIS: NO_3/SO_4/Br/Cl	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	MW-6		2/13/12	1045	WATER	X	X	3	
	MW-3			1145		X	X	3	
	MW-4R			1230		X	X	3	
	MW-14			1315		X	X	3	
	MW-13			1400			X	1	
	TB1		2/10/12	—				1	
	TB2		2/10/12	—				1	

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE Andrew Kapards	2/14/12	SIGNATURE Taylor street v	2-14-12
PRINT NAME Andrew Kapards	TIME	PRINT NAME ART	TIME
COMPANY Hart Crowser	0845	COMPANY	1155
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	TIME	SIGNATURE	TIME
PRINT NAME		PRINT NAME	
COMPANY		COMPANY	

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

For gas + benzene, please report to the Curve.

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐48 HOURS ☒STANDARD
☐72 HOURS OTHER

White and Yellow Copies to Lab Pink to Project Manager Lab to Return White Copy to Hart Crowser Gold to Sample Custodian

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Hart Crowser Project Name: Kens Auto

COC No(s): _____ NA Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: UI10 Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES NO

Were custody papers included with the cooler? ..... YES NO

Were custody papers properly filled out (ink, signed, etc.) ..... YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)..... 2.3 ____ ____ ____ ____

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90GL1619

Cooler Accepted by: TS Date: 2-14-12 Time: 1155

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? ..... YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? ..... NA YES NO

Were all bottles sealed in individual plastic bags? ..... YES NO

Did all bottles arrive in good condition (unbroken)? ..... YES NO

Were all bottle labels complete and legible? ..... YES NO

Did the number of containers listed on COC match with the number of containers received? ..... YES NO

Did all bottle labels and tags agree with custody papers? ..... YES NO

Were all bottles used correct for the requested analyses? ..... YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... NA YES NO

Were all VOC vials free of air bubbles? ..... NA YES NO

Was sufficient amount of sample sent in each bottle? ..... YES NO

Date VOC Trip Blank was made at ARI..... NA 2-10-12

Was Sample Split by ARI : NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: TS Date: 2-14-12 Time: 1217

*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions: Trip blanks PB x 2

By: TS Date: 2-14-12

Small → "sm"	
Peabubbles → "pb"	
Large → "lg"	
Headspace → "hs"	

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: UI10
Client: Hart Crowser Inc.
Project Event: 7168-09
Project Name: Ken's Auto

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-6	UI10A	12-2561	Water	02/13/12 10:45	02/14/12 11:55
2.	MW-3	UI10B	12-2562	Water	02/13/12 11:45	02/14/12 11:55
3.	MW-4R	UI10C	12-2563	Water	02/13/12 12:30	02/14/12 11:55
4.	MW-14	UI10D	12-2564	Water	02/13/12 13:15	02/14/12 11:55
5.	MW-13	UI10E	12-2565	Water	02/13/12 14:00	02/14/12 11:55
6.	Trip Blanks	UI10F	12-2566	Water	02/13/12	02/14/12 11:55

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Data Reporting Qualifiers

Effective 2/14/2011

Inorganic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Duplicate RPD is not within established control limits
B	Reported value is less than the CRDL but ≥ the Reporting Limit
N	Matrix Spike recovery not within established control limits
NA	Not Applicable, analyte not spiked
H	The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
L	Analyte concentration is ≤5 times the Reporting Limit and the replicate control limit defaults to ±1 RL instead of the normal 20% RPD

Organic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Flagged value is not within established control limits
B	Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
J	Estimated concentration when the value is less than ARI's established reporting limits
D	The spiked compound was not detected due to sample extract dilution
E	Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF).

S — Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte

NA — The flagged analyte was not analyzed for

NR — Spiked compound recovery is not reported due to chromatographic interference

NS — The flagged analyte was not spiked into the sample

M — Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses

M2 — The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.

N — The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"

Y — The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.

EMPC — Estimated Maximum Possible Concentration (EMPC) defined in EPA Statement of Work DLM02.2 as a value "calculated for 2,3,7,8-substituted isomers for which the quantitation and /or confirmation ion(s) has signal to noise in excess of 2.5, but does not meet identification criteria" **(Dioxin/Furan analysis only)**

C — The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column

P — The analyte was detected on both chromatographic columns but the quantified values differ by ≥40% RPD with no obvious chromatographic interference

X — Analyte signal includes interference from polychlorinated diphenyl ethers. **(Dioxin/Furan analysis only)**

Z — Analyte signal includes interference from the sample matrix or perfluorokerosene ions. **(Dioxin/Furan analysis only)**

Geotechnical Data

A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.

F Samples were frozen prior to particle size determination

SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations

SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis

W Weight of sample in some pipette aliquots was below the level required for accurate weighting

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: MW-6
SAMPLE

Lab Sample ID: UI10A
LIMS ID: 12-2561
Matrix: Water
Data Release Authorized:
Reported: 02/23/12

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Date Analyzed: 02/17/12 11:15
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	**o-Xylene**	**0.25**	**1.5**	
				GAS ID
	Gasoline Range Hydrocarbons	**0.10**	**1.6**	**GRO**

BETX Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	98.6%

Gasoline Surrogate Recovery

Trifluorotoluene	106%
Bromobenzene	103%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: MW-3
SAMPLE

Lab Sample ID: UI10B
LIMS ID: 12-2562
Matrix: Water
Data Release Authorized:
Reported: 02/23/12

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Date Analyzed: 02/17/12 11:43
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	0.25	< 0.25 U
108-88-3	Toluene	0.25	< 0.25 U
100-41-4	Ethylbenzene	0.25	< 0.25 U
179601-23-1	m,p-Xylene	0.50	< 0.50 U
95-47-6	o-Xylene	0.25	< 0.25 U

			GAS ID
	Gasoline Range Hydrocarbons	0.10	< 0.10 U ---

BETX Surrogate Recovery

Trifluorotoluene	101%
Bromobenzene	97.9%

Gasoline Surrogate Recovery

Trifluorotoluene	106%
Bromobenzene	103%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: MW-4R
SAMPLE

Lab Sample ID: UI10C
LIMS ID: 12-2563
Matrix: Water
Data Release Authorized:
Reported: 02/23/12

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Date Analyzed: 02/17/12 12:11
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	0.25	< 0.25 U
108-88-3	Toluene	0.25	< 0.25 U
100-41-4	Ethylbenzene	0.25	< 0.25 U
179601-23-1	m,p-Xylene	0.50	< 0.50 U
95-47-6	o-Xylene	0.25	< 0.25 U

			GAS ID
	Gasoline Range Hydrocarbons	0.10	< 0.10 U ---

BETX Surrogate Recovery

Trifluorotoluene	97.3%
Bromobenzene	95.8%

Gasoline Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	100%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: MW-14
SAMPLE

Lab Sample ID: UI10D
LIMS ID: 12-2564
Matrix: Water
Data Release Authorized:
Reported: 02/23/12

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Date Analyzed: 02/17/12 12:39
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	**Ethylbenzene**	**0.25**	**1.8**	
179601-23-1	**m,p-Xylene**	**0.50**	**7.1**	
95-47-6	**o-Xylene**	**0.25**	**1.5**	
	Gasoline Range Hydrocarbons	**0.10**	**2.2**	GAS ID **GRO**

BETX Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	100%

Gasoline Surrogate Recovery

Trifluorotoluene	106%
Bromobenzene	104%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: Trip Blanks
SAMPLE

Lab Sample ID: UI10F
LIMS ID: 12-2566
Matrix: Water
Data Release Authorized:
Reported: 02/23/12

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Date Analyzed: 02/17/12 10:47
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
				GAS ID
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	101%
Bromobenzene	99.5%

Gasoline Surrogate Recovery

Trifluorotoluene	105%
Bromobenzene	103%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

TPHG WATER SURROGATE RECOVERY SUMMARY

ARI Job: UI10
Matrix: Water

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09

Client ID	TFT	BBZ	TOT OUT
MB-021712	101%	100%	0
LCS-021712	102%	102%	0
LCSD-021712	104%	101%	0
MW-6	106%	103%	0
MW-3	106%	103%	0
MW-4R	102%	100%	0
MW-14	106%	104%	0
Trip Blanks	105%	103%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(80-120)	(80-120)
(BBZ) = Bromobenzene	(80-120)	(80-120)

Log Number Range: 12-2561 to 12-2566

FORM II TPHG

ANALYTICAL RESOURCES INCORPORATED

BETX WATER SURROGATE RECOVERY SUMMARY

ARI Job: UI10
Matrix: Water

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09

Client ID	TFT	BBZ	TOT OUT
MB-021712	97.3%	97.1%	0
LCS-021712	97.8%	98.1%	0
LCSD-021712	99.5%	98.8%	0
MW-6	102%	98.6%	0
MW-3	101%	97.9%	0
MW-4R	97.3%	95.8%	0
MW-14	102%	100%	0
Trip Blanks	101%	99.5%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(79-120)	(80-120)
(BBZ) = Bromobenzene	(79-120)	(80-120)

Log Number Range: 12-2561 to 12-2566

FORM II BETX

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TPHG by Method NWTPHG
Page 1 of 1

Sample ID: LCS-021712
LAB CONTROL SAMPLE

Lab Sample ID: LCS-021712
LIMS ID: 12-2561
Matrix: Water
Data Release Authorized:
Reported: 02/23/12

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 02/17/12 09:23
LCSD: 02/17/12 09:51
Instrument/Analyst LCS: PID2/MH
LCSD: PID2/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Gasoline Range Hydrocarbons	1.04	1.00	104%	0.94	1.00	94.0%	10.1%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

TPHG Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	102%	104%
Bromobenzene	102%	101%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod

Sample ID: LCS-021712
LAB CONTROL SAMPLE

Lab Sample ID: LCS-021712
LIMS ID: 12-2561
Matrix: Water
Data Release Authorized:
Reported: 02/23/12

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 02/17/12 09:23
LCSD: 02/17/12 09:51
Instrument/Analyst LCS: PID2/MH
LCSD: PID2/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Benzene	3.71	3.70	100%	3.44	3.70	93.0%	7.6%
Toluene	38.9	39.6	98.2%	35.6	39.6	89.9%	8.9%
Ethylbenzene	11.0	11.6	94.8%	10.1	11.6	87.1%	8.5%
m,p-Xylene	40.8	42.5	96.0%	37.1	42.5	87.3%	9.5%
o-Xylene	18.6	19.2	96.9%	17.0	19.2	88.5%	9.0%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

BETX Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	97.8%	99.5%
Bromobenzene	98.1%	98.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: MB-021712
METHOD BLANK

Lab Sample ID: MB-021712
LIMS ID: 12-2561
Matrix: Water
Data Release Authorized:
Reported: 02/23/12

QC Report No: UI10-Hart Crowser Inc.
Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Date Analyzed: 02/17/12 10:19
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
71-43-2	Benzene	0.25	< 0.25 U
108-88-3	Toluene	0.25	< 0.25 U
100-41-4	Ethylbenzene	0.25	< 0.25 U
179601-23-1	m,p-Xylene	0.50	< 0.50 U
95-47-6	o-Xylene	0.25	< 0.25 U

			GAS ID
	Gasoline Range Hydrocarbons	0.10	< 0.10 U ---

BETX Surrogate Recovery

Trifluorotoluene	97.3%
Bromobenzene	97.1%

Gasoline Surrogate Recovery

Trifluorotoluene	101%
Bromobenzene	100%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

SAMPLE RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Client ID: MW-6
ARI ID: 12-2561 UI10A

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	02/15/12 021512#1	EPA 300.0	mg/L	1.0	25.7
Bromide	02/14/12 021412#1	EPA 300.0	mg/L	0.1	0.1
N-Nitrate	02/14/12 021412#1	EPA 300.0	mg-N/L	0.1	3.1
Sulfate	02/15/12 021512#1	EPA 300.0	mg/L	2.0	68.0

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Client ID: MW-3
ARI ID: 12-2562 UI10B

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	02/15/12 021512#1	EPA 300.0	mg/L	0.5	12.3
Bromide	02/14/12 021412#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	02/14/12 021412#1	EPA 300.0	mg-N/L	0.2	6.8
Sulfate	02/14/12 021412#1	EPA 300.0	mg/L	0.2	8.9

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Client ID: MW-4R
ARI ID: 12-2563 UI10C

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	02/15/12 021512#1	EPA 300.0	mg/L	0.5	20.2
Bromide	02/14/12 021412#1	EPA 300.0	mg/L	0.1	0.5
N-Nitrate	02/14/12 021412#1	EPA 300.0	mg-N/L	2.0	74.9
Sulfate	02/15/12 021512#1	EPA 300.0	mg/L	5.0	174

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Client ID: MW-14
ARI ID: 12-2564 UI10D

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	02/14/12 021412#1	EPA 300.0	mg/L	5.0	208
Bromide	02/14/12 021412#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/14/12 021412#1	EPA 300.0	mg-N/L	5.0	99.0
Sulfate	02/15/12 021512#1	EPA 300.0	mg/L	20.0	671

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Client ID: MW-13
ARI ID: 12-2565 UI10E

Analyte	Date Batch	Method	Units	RL	Sample
Chloride	02/15/12 021512#1	EPA 300.0	mg/L	1.0	21.7
Bromide	02/14/12 021412#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	02/14/12 021412#1	EPA 300.0	mg-N/L	0.1	0.9
Sulfate	02/15/12 021512#1	EPA 300.0	mg/L	0.2	5.6

RL Analytical reporting limit
U Undetected at reported detection limit

MS/MSD RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: UI10A Client ID: MW-6							
Chloride	EPA 300.0	02/15/12	mg/L	25.7	44.7	20.0	95.0%
Bromide	EPA 300.0	02/14/12	mg/L	0.1	2.1	2.0	100.0%
N-Nitrate	EPA 300.0	02/14/12	mg-N/L	3.1	5.5	2.0	120.0%
Sulfate	EPA 300.0	02/15/12	mg/L	68.0	170	100	102.0%

REPLICATE RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: 02/13/12
Date Received: 02/14/12

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: UI10A Client ID: MW-6						
Chloride	EPA 300.0	02/15/12	mg/L	25.7	25.8	0.4%
Bromide	EPA 300.0	02/14/12	mg/L	0.1	0.1	0.0%
N-Nitrate	EPA 300.0	02/14/12	mg-N/L	3.1	3.1	0.0%
Sulfate	EPA 300.0	02/15/12	mg/L	68.0	67.9	0.1%

METHOD BLANK RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Chloride	EPA 300.0	02/14/12	mg/L	< 0.1 U	
		02/15/12		< 0.1 U	
Bromide	EPA 300.0	02/14/12	mg/L	< 0.1 U	
N-Nitrate	EPA 300.0	02/14/12	mg-N/L	< 0.1 U	
Sulfate	EPA 300.0	02/14/12	mg/L	< 0.1 U	
		02/15/12		< 0.1 U	

STANDARD REFERENCE RESULTS-CONVENTIONALS
UI10-Hart Crowser Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/17/12

Project: Ken's Auto
Event: 7168-09
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Chloride	EPA 300.0	02/14/12	mg/L	3.0	3.0	100.0%
ERA #411010		02/15/12		3.0	3.0	100.0%
Bromide	EPA 300.0	02/14/12	mg/L	3.0	3.0	100.0%
ERA #111109						
N-Nitrate	EPA 300.0	02/14/12	mg-N/L	3.0	3.0	100.0%
ERA #230511						
Sulfate	EPA 300.0	02/14/12	mg/L	3.0	3.0	100.0%
ERA #160111		02/15/12		3.0	3.0	100.0%

Interim Action Plan
In Situ Enhanced Attenuation of Petroleum Hydrocarbons
Ken's Auto Wash
Ellensburg, Washington

Prepared for
Ken's Auto Wash

June 13, 2013
7168-11

HARTCROWSER

Interim Action Plan
In Situ Enhanced Attenuation of Petroleum Hydrocarbons
Ken's Auto Wash
Ellensburg, Washington

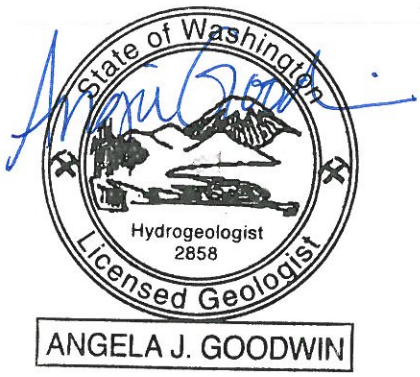
Prepared for
Ken's Auto Wash

June 13, 2013
7168-11

Prepared by
Hart Crowser, Inc.

Troy Fowler
Senior Project
Biochemist

Mike W. Ehlebracht, LG, LHG
Principal



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TABLES

FIGURES

INTERIM ACTION PLAN
***IN SITU* ENHANCED ATTENUATION OF PETROLEUM HYDROCARBONS**
KEN'S AUTO WASH
ELLENSBURG, WASHINGTON

1.0 INTRODUCTION

This Interim Action Plan (IAP) has been prepared to implement an *in situ* bioremediation injection program and groundwater response monitoring at the Ken's Auto Wash site, located at 1013 East University Way in Ellensburg, Washington (Figure 1). The Remedial Investigation/Feasibility Study (dated November 14, 2006) submitted under an Agreed Order with the Washington State Department of Ecology (Ecology) concluded that natural attenuation was the preferred remedy to address residual petroleum contamination. Subsequently, enhanced biodegradation was used to accelerate the cleanup process. In a letter dated June 20, 2012, Ecology requested that this IAP be prepared to document this approach.

The goal of this work is to assess applicability of anaerobic oxidation technologies to accelerate degradation of residual gasoline-range hydrocarbon (TPH-G) currently impacting the site. Results will be used to develop a Cleanup Action Plan for the site and achieve the ultimate goal of reducing contaminant concentrations below Washington State Model Toxics Control Act (MTCA) Method A cleanup levels (Chapter 173-340 WAC).

2.0 PROJECT BACKGROUND

Below is a summary of site information used to select and design this IAP.

2.1 Prior Environmental Work

The site is affected by a petroleum hydrocarbon release discovered during UST tightness testing in 1996 (Figure 2). Corrective actions were taken at that time, and the site USTs were subsequently removed in April 2005, as documented in the June 7, 2005, Gasoline UST Closure Report. Petroleum-impacted soil was removed downgradient of the UST area in October and November 2000, but a small volume of affected soil remained because of utilities and sidewalk at the site.

During the soil removal, oxygen-releasing compound (ORC) was added to the excavation backfill to promote biodegradation of residual petroleum

hydrocarbons. ORC was also injected in the downgradient area of petroleum hydrocarbon-affected groundwater in February 2005, as documented in the April 6, 2005, Supplemental Strataprobe Exploration Report. Although concentrations of TPH in groundwater continued to slowly decrease following UST removal, soil removal, and ORC injection, TPH-G concentrations in groundwater downgradient of the residual source area periodically exceed the MTCA Method A cleanup limit.

2.2 Geology and Hydrogeology

Shallow soils typically encountered at the site are near-surface fill of variable thickness and alluvial deposits consisting of silty, sandy gravel with occasional cobbles. These soils are consistent with shallow soils recorded on well logs and observed in the upper 32 feet of the municipal supply well southeast of the site. A clay aquitard underlies the shallow soils, and municipal supply well logs indicate that several aquitards separate shallow site groundwater from deeper water-bearing units, including units used for water supply.

Shallow site groundwater appears to be perched above the aquitard and is typically present between 4.3 and 9.8 feet below ground surface. Groundwater elevations at the site typically fluctuate 1 to 2 feet seasonally, reaching their peak in late spring and low point in late fall. The groundwater flow direction is toward the southwest. Calculated gradients are typically between 0.015 and 0.025 and do not change significantly with season. Extensive areas of imported gravel fill to depths of 13 feet below ground surface likely influence groundwater flow across the site (Figure 2). Recent groundwater elevation measurements and inferred groundwater flow direction are presented on Figure 3.

2.3 Areas of Residual Contamination

Petroleum-impacted soil remains downgradient of the former USTs beneath the adjacent sidewalk and portions of East University Way (Figure 2). Based on groundwater elevation and TPH-G concentration data, most of the residual contamination is located in two areas: in unexcavated soil between MW-4R and MW-1/MW-14 and near the top of the smear zone under the street and sidewalk north of MW-6. This remaining source material is likely contributing to periodic exceedances of MTCA Method A cleanup criteria for TPH-G in groundwater near wells MW-14 and MW-6. Gasoline-associated aromatics are also present, including toluene, ethyl benzene, and xylene. Benzene has not been detected since October 2008.

Residual contamination appears to be truncated south of University Way (Fairgrounds parking area) and west of the property (MW-5 area) because these

areas are not paved. Unpaved areas permit infiltration of natural oxidants dissolved in precipitation into the aquifer, including dissolved oxygen and nitrate. The rate of oxidant infiltration over time appears to exceed the flux of hydrocarbons and partially-degraded hydrocarbons, which are generically termed volatile fatty acids (VFAs). The resulting shift from reductive to oxidative conditions constitutes a redox-recovery zone and doesn't require any additional treatment.

2.4 Feasibility Study Recommendations

Remedial alternatives were presented and evaluated in the Remedial Investigation and Feasibility Study (RI/FS) completed in November 2006. The RI/FS addressed requirements of an Agreed Order issued by Ecology for site cleanup assessment following an MTCA site hazard ranking of 2. Remedial technologies evaluated in the RI/FS were based on results of site investigation, soil cleanup, and monitoring efforts through 2006.

Monitored natural attenuation (MNA) with free product removal was initially selected as the preferred remedial alternative. MNA is a process where hydrocarbon-degrading microbes that occur naturally in soil degrade petroleum hydrocarbons. Appreciable free product has not been identified at the site since 2004, so current remedial actions have not incorporated sorbent socks to remove free product. Site monitoring continues to be implemented in accordance with the selected FS alternative. Ecology has not required any additional actions besides the monitored natural attenuation.

Due to the slow progress of natural attenuation and the development of new treatment options since 2006, Hart Crowser has been evaluating options for accelerating the cleanup process. Implementation and performance findings from this IAP will be evaluated for possible inclusion and update of the preferred remedial alternative previously identified in the RI/FS.

3.0 REGULATORY AUTHORITY

According to the state cleanup regulation WAC 173-340-430(1), an "interim action" is distinguished from a "cleanup action" in that the interim action only partially addresses the cleanup of a site. The remediation conducted under an interim action may end up constituting the complete cleanup action for a site if the interim action subsequently is shown to meet requirements in the rule for a complete cleanup action.

The interim action proposed for the Ken's Auto site qualifies under WAC 173-340-430(1)(c). Data obtained as part of this IAP will be incorporated into the supplemental feasibility study and may be the basis for cleanup action design.

4.0 INTERIM ACTION ALTERNATIVES

Several new technologies have emerged since 2006 which may provide for a faster, more protective, and lower cost alternative compared to long-term MNA. These alternatives include:

- Direct Chemical/Biological Oxidant Injections – Direct injection of chemical and biological oxidants into areas of residual petroleum hydrocarbons to eliminate the ongoing source of TPH-G in groundwater;

- Closed-Loop Groundwater Recirculation – Groundwater recirculation containing dissolved ozone/oxygen and biological oxidants in areas north of University Way to assess achievable recirculation rates and develop an understanding of groundwater behavior at the highly disturbed site; and

- Enhanced Bioremediation Injections - A series of biological oxidant, surfactant, and bio-augmentation slug injections to more passively accelerate natural attenuation already occurring in site groundwater via anaerobic processes.

While there have been advancements in coupling chemical and biological processes to address TPH-G contamination, the direct injection interim action was eliminated from consideration at this site. As chemical oxidation requires direct contact with the contaminant, more extensive understanding of contaminant and natural soil oxidative demand distribution would have been required to develop a reliable and cost-effective remedy. Groundwater recirculation, while an effective technology for addressing petroleum, would have required substantial up-front capital cost and testing to assess applicability. Therefore, the most cost-effective and easiest to evaluate of the new technologies for this site is to improve existing natural attenuation through enhanced bioremediation injections.

5.0 DESCRIPTION OF THE INTERIM REMEDIAL ACTION

Enhanced bioremediation injections introduce several remediation amendments *in situ* in a series of quarterly injection events to accelerate the natural attenuation that is already occurring at the site. Petroleum is typically being

degraded through a process termed "anaerobic oxidation." As part of this process, native microbes use alternate electron acceptors (oxidants) instead of molecular oxygen for petroleum destruction, including nitrate, manganese, iron, sulfate and carbon dioxide. Residual petroleum is the targeted electron donor, and microbes gain energy for growth by using available oxidants to degrade available petroleum. Enhancing this process is termed Enhanced Anaerobic Oxidation (EAO).

The bioremediation injections were formulated based on site-specific conditions. These conditions include the nature of the contaminant (TPH-G and aromatic hydrocarbons); the estimated mass of residual petroleum; the target soil matrix (silty sand to sandy gravel with large areas of gravel backfill); contaminant distribution (localized to shallow source area); monitoring well locations; estimated groundwater flow direction and velocity, and the relatively short distance between areas of residual contamination on the site and rapid redox recovery occurring south of University Way. Recent groundwater elevation and inferred groundwater flow direction is provided on Figure 3.

5.1 Amendment Details

There are four categories of amendments selected for bioremediation injections. These include supplemental oxidants/nutrients, surfactants, microbes, and conservative tracer. The first two categories augment the bioavailability of electron acceptors and electron donors to control the EAO process based on site-specific conditions. The introduction of microbes is termed bio-augmentation, which helps to quickly populate soil and groundwater in impacted areas with non-pathogenic bacteria specifically selected for their ability to use provided oxidants to degrade petroleum contamination. Added nutrients help to propagate both native and introduced microbes and maximize EAO utilization and performance. Conservative tracers improve understanding of the movement of groundwater at the site.

Supplemental Oxidants/Nutrients. Hart Crowser has chosen to use AnoxEA-aq™ (formerly OxEA-aq™), manufactured by Bioremediation Specialists, LLC, to serve as the source of oxidants and nutrients for EAO at this site. The product contains a patent-pending blend of nitrate and sulfate salts (oxidants), a dose of macro- and micro-nutrients, and pH buffers. AnoxEA-aq is fully water soluble and can be injected as a solution into existing monitoring wells.

Surfactants. To improve bio-availability of petroleum for subsequent oxidation and destruction, surfactants will be injected to promote desorption of soil-bound hydrocarbons. Selected surfactants include EA™ (provided by ETEC, LLC) and Ivey-Sol® 103 (provided by Ivey International, Inc). EA is a blend of

biodegradable rhamnolipids that enhance desorption of weathered and heavy-end petroleum hydrocarbons and is bundled with microbes in ETEC's PetroBac™ product bundle. Ivey Sol is a biodegradable, non-ionic surfactant which promotes desorption of gasoline-range hydrocarbons. Both products are provided as highly concentrated liquids.

Bio-Augmentation. Because of the relatively short distance between contaminated areas and the redox-recovery zone south of University Way, bio-augmentation will be necessary to ensure rapid consumption of injected oxidants and desorbed hydrocarbons. A2™ (provided by ETEC, LLC) was selected and consists of a blend of non-pathogenic, hydrocarbon-degrading bacteria including *Pseudomonas putida*, *Pseudomonas fluorescens*, and *Rhodococcus sp*. A2 is provided in liquid form and is packaged along with EA in ETEC's PetroBac product bundle.

5.2 UIC Registration

Introduction of bioremediation enhancing materials to the subsurface requires registration under Washington State's Underground Injection Control (UIC) program. The UIC program was created to protect groundwater quality by regulating discharges to wells, including remediation. Remediation wells will be designated "5X26" injection features. Ecology must approve and complete UIC registration before we can initiate the proposed bioremediation injection. The registration seeks approval for injection up to 2,800 pounds of AnoxEA-aq, 25 gallons of PetroBac, 25 pounds each of chloride and bromide tracer, and 9.2 gallons of Ivey-Sol amendments.

5.3 Amendment Injection Summary

Amendment distribution will be achieved by using multiple amendment injections into multiple locations on quarterly basis. Table 1 summarizes the scope of the up to four injection events, which will ultimately be used to assess applicability of the EAO program. Injection locations are within areas of current or recent contamination. In summary, this IAP will inject up to a total of 25 gallons of PetroBac, 2,800 pounds of AnoxEA-aq, and 9.2 gallons of Ivey Sol. Conservative tracers will be introduced into MW-4R (sodium bromide) and MW-3 (sodium chloride) during the first injection to track groundwater movement, flux, and amendment use. Up to 25 pounds of each tracer will be introduced. Actual amendment application may be reduced based on field screening results, as described in Section 6.0 (below). If elevated levels of nitrate are detected in an injection well, less amendment may be added to prevent over-treatment and amendment migration into the redox-recovery zone.

Amendment injections occur in a prescribed sequence to achieve the goals of treatment traceability and amendment contact with residual petroleum contamination. All injections use municipal tap water for dissolving and distributing amendments. Pressures will be monitored in-line near the well head and will be limited to 15 pounds per square inch. This pressure preserves well seal integrity while pushing amendment into less accessible pore spaces. Injectate will be conveyed to each injection location using a flexible hose and secured high-pressure Furnco compression fitting. In-line valving located up-flow of the pressure gauge will be used to control flow rates and injection pressures. A flow meter will be used to monitor overall injection volumes at each location.

Tracers. During the initial injection, conservative tracer solutions are introduced first. Twenty-five pounds of sodium chloride dissolved in tap water will be introduced into MW-3, followed by a 25-gallon tap water chase to flush the tracer out of the well. Up to 25 pounds of sodium bromide dissolved in tap water will be introduced into MW-4R and followed by a tap water chase. These tracer injections will help confirm groundwater flow directions and diffusion time frames over the course of the IAP.

Bio-Augmentation. Following the initial tracer injection, PetroBac will be diluted to a 1:20 ratio in tap water and injected into MW-4R, MW-6, and MW-14.

Oxidants/Nutrients. Wells MW-2, MW-3, MW-4R, MW-5, MW-6, and MW-14, will receive the prescribed AnoxEA-aq mass by dissolving the amendment at a rate of approximately one pound of AnoxEA-aq to 1 gallon of tap water to make a master working solution. Master working solutions are prepared in batches up to 55 gallons. This master solution is then injected into each location and chased with 9 gallons of tap water for each gallon of master working solution.

Subsequent injection events will introduce AnoxEA-aq and Ivey Sol only. The AnoxEA-aq injection methodology for subsequent injection events will follow the same master working solution method. For wells receiving Ivey Sol, the Ivey Sol is added full-strength to the first master working solution batch prepared. Subsequent master working solutions will then be injected (as required) and followed by the same 9 gallons of tap water per gallon of master working solution.

6.0 SAMPLING AND ANALYSIS PLAN

IAP performance groundwater monitoring events will be completed before the first injection (baseline) and during four quarterly events thereafter. The monitoring program is presented in Table 2. The monitoring program is

designed to evaluate oxidant distribution, amendment use, groundwater flow paths and travel times, and petroleum hydrocarbon concentration responses. Groundwater monitoring will include both depth to groundwater measurements and sample collection for subsequent analysis, as described below.

6.1 Monitoring Equipment

Equipment to be used for the collection of groundwater samples include:

- pH, specific conductivity, redox potential, and temperature meters;
- Solinst or equivalent water level indicator;
- Peristaltic pump with disposable polyethylene tubing;
- Laboratory-supplied, pre-cleaned and preserved sample containers;
- Coolers with cubed or "blue" ice;
- Hach color disk and colorimetric strips for field testing; and
- Hart Crowser Sample Custody Record and Groundwater Sampling Data forms.

6.2 Sampling Procedures

Depth to groundwater will be measured in all monitoring wells before each quarterly monitoring and injection event to confirm groundwater flow direction and gradient across the site. After measuring the depth to groundwater, samples will be collected from the wells using standard low-flow sampling techniques. Each well will be purged until the field parameters of pH, temperature, and specific conductivity met the stability criteria (i.e., specific conductivity ±10 percent, pH ±0.1 pH units, and temperature ±0.1° C).

After field parameters stabilize, wells will be field tested for ferrous iron, nitrate, nitrite, and ammonia. Groundwater samples will be collected for laboratory testing by directly filling pre-cleaned sample containers provided by the laboratory with disposable polyethylene tubing. The labeled sample containers will be immediately placed in coolers with ice. Samples will be transferred under chain of custody protocol to Analytical Resources, Inc. (ARI) in Tukwila, Washington, for laboratory analysis.

Monitoring includes sampling groundwater from up to nine monitoring wells (Figure 2) for analysis of one or more of the following:

- TPH-G via Ecology Method NWTPH-G;

- Benzene, toluene, ethylbenzene, and total xylenes (BTEX) via EPA Method 8021B;
- Nitrogen as nitrate, sulfate, bromide, and chloride via EPA Method 300.0; and/or
- Total lead via EPA Method 6020.

In addition, ferrous iron will be measured in the field using a Hach color disc and nitrate, nitrite, and ammonia will be measured in the field using colorimetric strips. These field measurements will be used to evaluate and potentially modify the injection schedule during the bioremediation program.

6.3 Investigation-Derived Waste Storage and Disposal

The purge water produced from groundwater sampling will be drummed on site pending receipt of chemical analysis results from the laboratory to determine appropriate disposal procedures. Drum disposition forms will be filled out to record the number, contents, and location of the drums generated during implementation of the IAP.

6.4 Reporting

Quarterly groundwater sampling results will be summarized in a table and electronically transmitted to the project team. A technical groundwater monitoring report will be prepared after the annual (Fall) event and a draft will be submitted to the project team for review and comments. Following incorporation of review comments and document edits, we will submit a revised report to Ecology.

7.0 LIMITATIONS

Work for this project was performed, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Ken's Auto Wash for specific application to the referenced property. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

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Table 1 - Enhanced Bioremediation IAP Injection Schedule
Ken's Auto Wash
Ellensburg, Washington

Injection Location	Event 1			Event 2		Event 3		Event 4		**AnoxEA-aq Total**
	AnoxEA-aq	PetroBac	Tracer	AnoxEA-aq	Ivey-sol	AnoxEA-aq	Ivey-sol	AnoxEA-aq	Ivey-sol	
MW-2	75 lbs				1.6 gal		0.8 gal		2.0 gal	**75** lbs
MW-3	275 lbs		Cl 25 lbs	250 lbs		150 lbs		300 lbs		**975** lbs
MW-4R	275 lbs	10 gal	Br 25 lbs	175 lbs	1.0 gal	75 lbs	0.2 gal	250 lbs	1.6 gal	**775** lbs
MW-5	75 lbs									**75** lbs
MW-6	100 lbs	5 gal		75 lbs	0.2 gal			100 lbs	0.2 gal	**275** lbs
MW-14	250 lbs	10 gal		150 lbs	0.8 gal	75 lbs	0.2 gal	150 lbs	0.6 gal	**625** lbs
Event Total	1,050 lbs	25 gal	50 lbs	650 lbs	3.6 gal	300 lbs	1.2 gal	800 lbs	4.40 gal	**2,800** lbs

Notes:
Table presents the planned series of up to four quarterly injection events as part of the Interim Action Plan technology evaluation.
PetroBac contains biodegradable surface-active agents and petroleum-degrading microbes to enhance amendment consumption and petroleum destruction.
AnoxEA-aq is a soluble blend of oxidants with macro- and micro-nutrients to enhance petroleum degradation.
Ivey-sol is a biodegradable, non-ionic surfactant formulated to improve bioremediation of petroleum hydrocarbons.
Table presents maximum quarterly injection masses. Actual mass may be modified based on performance and monitoring results.

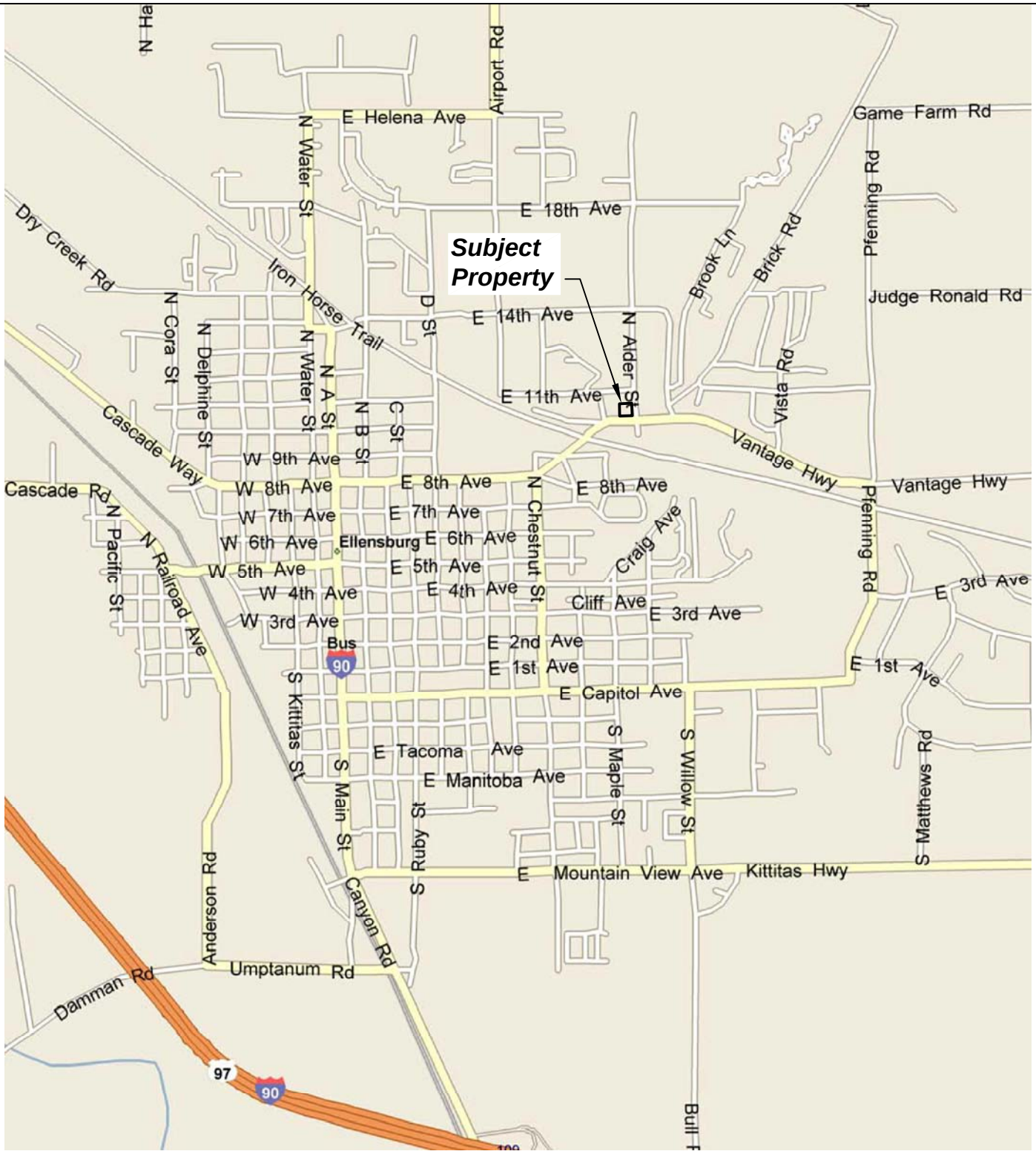
Abreviations:
IAP = Interim Action Plan.
Br = Food-grade sodium bromide salt.
Cl = Food-grade sodium chloride salt.
lbs = pounds.
gal = gallons.

Table 2 - Enhanced Bioremediation IAP Groundwater Monitoring Schedule
Ken's Auto Wash
Ellensburg, Washington

Monitoring Well	Baseline				Event 2				Event 3				Event 4				Non-Injection Event			
	G	V	Ions	F	G	V	Ions	F	G	V	Ions	F	G	V	Ions	F	G	V	Ions	F
Injection Wells																				
MW-2	X	X											X	X						
MW-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-4R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-5	X	X											X	X						
MW-6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Downgradient Wells																				
MW-12	X	X											X	X						
MW-13	X	X	X	X			X	X			X	X	X	X	X	X			X	X
MW-15	X	X											X	X						

Notes:
Quarterly monitoring will be performed before any injection activities.
Water level elevations will be measured quarterly, before well purging and sampling.
Samples will be collected using low-flow techniques and a flow-through cell, consistent with recent monitoring events.

Abreviations:
IAP = Interim Action Plan.
G = Total petroleum hydrocarbons by Ecology Method NWTPH-G.
V = Volatile organic compounds benzene, toluene, ethylbenzene, and xylene by EPA Method 8021B.
Ions = Nitrate as nitrogen, sulfate, bromide, and chloride by EPA Method 300.0.
F = Field kit testing of nitrate, nitrite, ammonium, and ferrous iron.



Note: Base map prepared from Microsoft Streets and Trips 2005.

0 2000 4000

Scale in Feet

N

Ken's Auto Wash
Ellensburg, Washington

Vicinity Map

7168-11 3/13

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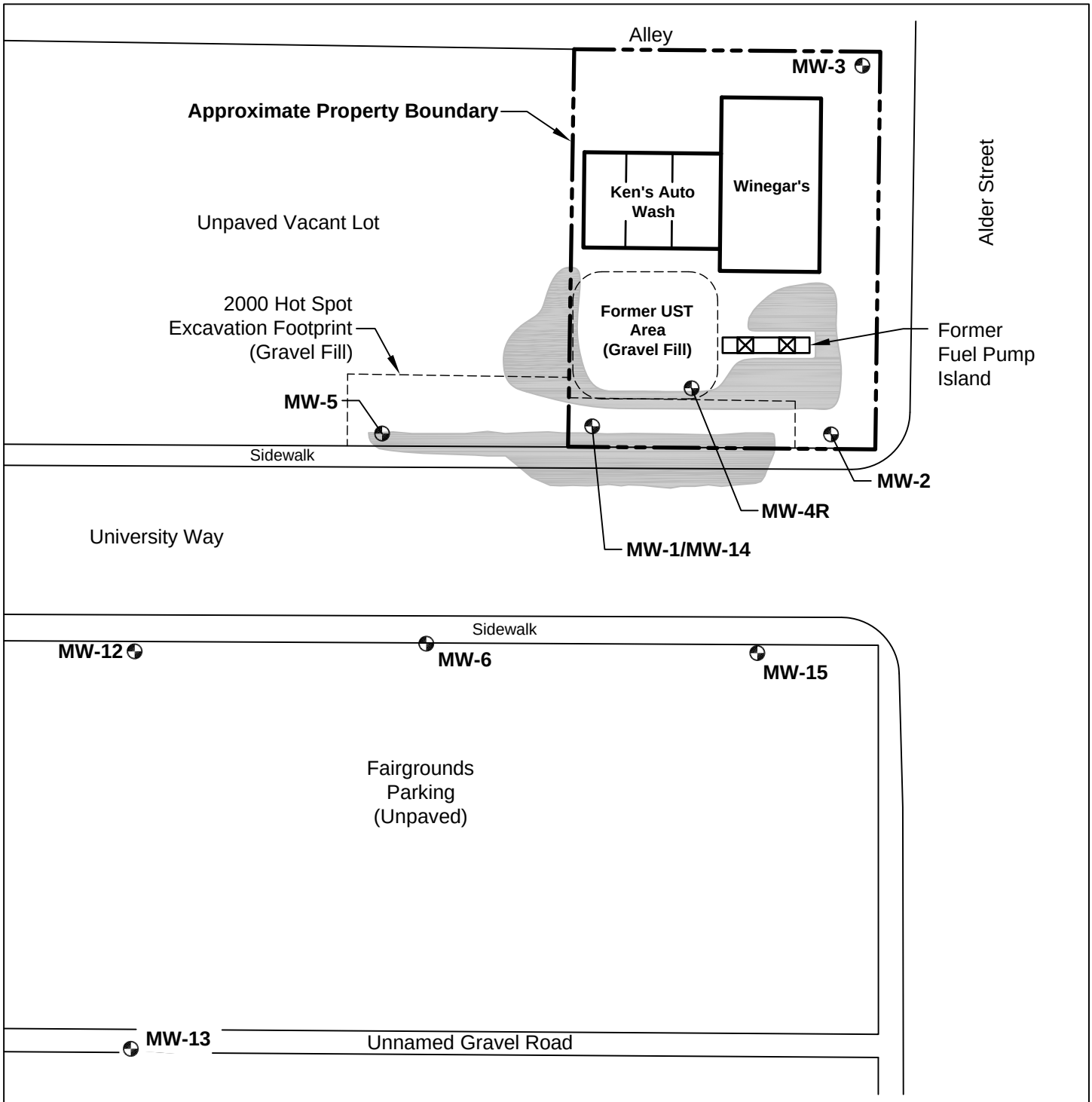
Figure **1**

EAL 03/1/13 716811-001.dwg



Note: Base map prepared from drawing provided by Sage Earth Sciences titled "Proposed Addtional Monitoring Well and ORC Injections Locations," dated January 1998.

0 50 100
Scale in Feet

MW-6 Hart Crowser Monitoring Well Location and Number

Estimated Remaining Area with TPH-G and/or BTEX Concentrations above MTCA Method A Soil Cleanup Levels (2000-2005 Data)

N

Ken's Auto Wash
Ellensburg, Washington

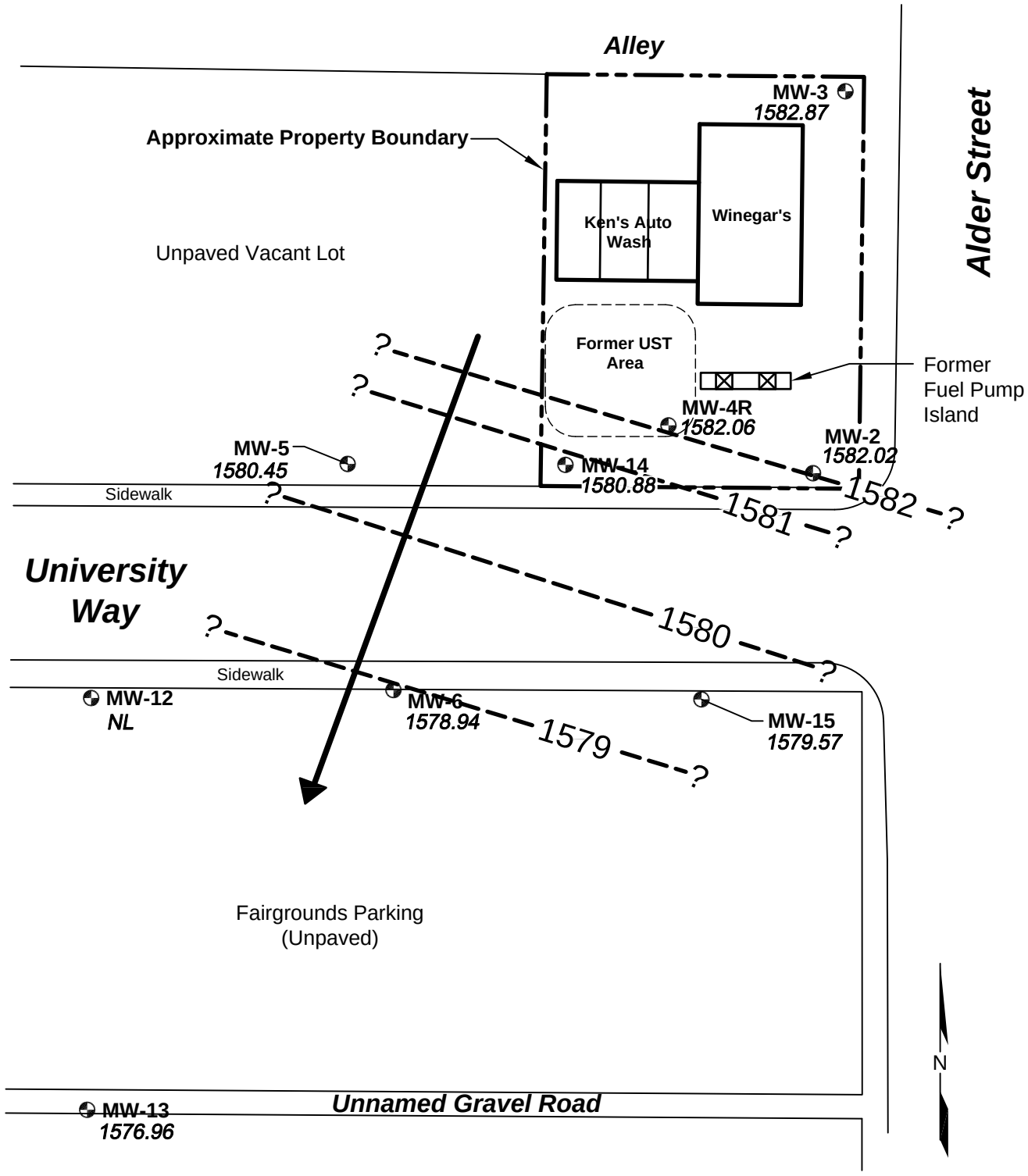
Site and Well Location Plan

7168-11 3/13

HARTCROWSER

Figure
2

EAL 03/1/13 716811-002.dwg



Note: Elevation shown are in feet above Mean Sea Level.

0 50 100

Scale in Feet

MW-6	Monitoring Well Location and Number
1578.94	Groundwater Elevation in Feet
NL	Not Located
1580	Groundwater Elevation Contour in Feet
	Inferred Groundwater Flow Direction

Ken's Auto Wash
Ellensburg, Washington

Groundwater Elevation Contour Map
November 2012

7168-11 3/13

HARTCROWSER

Figure
3

EAL 03/1/13 716811-003.dwg

31210

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

January 24, 2011

Mr. Ken Peterson
Ken's Auto Wash
PO Box 677
Ellensburg, WA 98926

RE: Registration with the Underground Injection (UIC) Program, Ken's Auto Wash, 1013 E. University Way, Ellensburg, WA 98926

Dear Mr. Peterson:

This letter is to acknowledge receipt of your registration form received December 8, 2010 to register the above-mentioned site with the UIC Program. The site project will:

- Include injecting the following amounts of product (diluted with water) over 4 injection events and into six monitoring wells:
  - Sodium bromide and sodium chloride salt tracers, 50 pounds total
  - OxEA-aq, 2800 pounds
  - PetroBac, 25 gallons
  - Ivey-sol, 4.8 gallons
- Begin in January 2011 and can continue through October 2011 if necessary.
- Quarterly ground water monitoring of wells MW-3, MW-4R, MW-6, MW-13, and MW- 14. If any of the product, constituents exceed the criteria of chapter 173-200 Water Quality Standards for Ground Waters of the State of Washington then injection must stop.

Clean up actions/sites that are not approved by WA State Department of Ecology under the Model Toxics Control Act (MTCA), chapter 70.105D RCW or approved by the United States Environmental Protection Agency under the Comprehensive Environmental Response Compensation and Liability Act, 42 U.S.C. 9601 et sew are required to meet the GWQS. The injected compounds are intended to improve ground water quality and meet the Ground Water Quality Standards. There are inherent environmental risks associated with injecting compounds into ground water. The site must be carefully characterized, managed, and monitored to minimize risk and prevent unforeseen degradation of ground water quality. Mobilized metals or other substances, injected chemicals or hazardous bi-products, are not allowed to migrate beyond the plume/property boundary. A thorough discussion of risk and management options is provided in the following document: *Technical and Regulatory Guidance for In Situ Chemical Oxidation of Contaminated Soil and Groundwater,* June 2005, prepared by Interstate Technology and Regulatory Cooperation Work Group. This document is available on the internet at: http://www.itrcweb.org/Documents/ISCO-2.pdf.

The two UIC Program requirements for rule authorization are, registration of UIC wells (prior to use) and the discharge from the well must meet the nonendangerment standard, of WAC 173-218-080. The UIC site is number 31210. The minimum requirements to meet the nonendangerment standard are listed below. Your site is conditionally rule authorized when the following have been met:

- Meet the ground water quality standards, chapter 173-200-WAC;
- Complete a thorough site characterization including: geologic investigation, concentration and extent of contaminant plume, aquifer characteristics, and location of preferential migration pathways (natural and manmade);
- A ground water monitoring program that includes: well location and sampling sufficient to characterize the background water quality, the water quality at the point of compliance, and identify any changes in ground water quality resulting from the injected compounds;
- Develop a conceptual site model that balances the injection rate, concentration, and total mass of injected compound with that of the subsurface oxidizable material. The model should predict the expected changes in ground water chemistry over time, final ground water quality at the point of compliance, and predicted restoration timeframe;
- Hydrologically contain within the site property boundaries, the injected compounds and any regulated substances mobilized by the injected products;
- Prepare a written contingency plan that describes, in detail, the actions to be taken in case of spills, failures, equipment breakdowns and/or unforeseen environmental degradation caused by the cleanup activities; and,
- Retain all plans, modeling, monitoring results, interim and final reports. Upon request, provide these documents to the Department of Ecology.

If ground water quality does not meet the Ground Water Quality Standards at the point of compliance, you must notify the Department of Ecology within 24 hours of discovery.

At any time, the Department of Ecology may require you to apply for and obtain a Waste Discharge Permit for the continued use of these compounds to promote In Situ Chemical Oxidation.

Also, contact us when the UIC wells are no longer in use.

A formal approval for this project may be obtained through the departments' State Waste Discharge Permit Program or the MTCA Program.

Please call me at (360) 407-6143 if you have any questions. Additional information on the UIC Program can also be found at our website
http://www.ecy.wa.gov/programs/wq/grndwtr/uic/index.html

Sincerely,

MSHansen

Mary Shaleen-Hansen
UIC Coordinator
Water Quality Program

Cc: Troy Fowler, Hart Crowser