



ASSOCIATED
ENVIRONMENTAL
GROUP, LLC

September 26, 2011

Mr. Marv Coleman
Department of Ecology
SWRO Toxics Cleanup Program
P.O. Box 47775
Olympia, Washington 98504-7775

RE: FINAL Cleanup Action Plan

Former Brumfield – Twidwell Site (Ecology Agreed Order AE DE2953)
301 East Pioneer Avenue
Montesano, WA 98563

Dear Mr. Coleman:

Associated Environmental Group, LLC (AEG) has prepared this Proposed Cleanup Action Plan (CAP) for your consideration of remedial action at the former Brumfield-Twidwell facility, located at 301 East Pioneer Avenue in Montesano, Grays Harbor County, Washington (herein referred to as the Site). The scope of work (SOW) section of this CAP describes the property, environmental conditions, remedial action objectives, and the appropriate cleanup action standards selected under the Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA). It also describes the Performance Groundwater Monitoring/Sampling Events that will be conducted at the Site.

AEG plans to submit the Final Remedial Investigation/Feasibility Study (RI/FS) report to Ecology in September 2011 as part of the Agreed Order mandate for this Site. A review of this document in conjunction with this proposed CAP is recommended for full details on the Site's background. A description of previous environmental investigations and interim remedial action completed at the Site is provided in the Draft Final RI/FS report.

CONCEPTUAL SITE MODEL

The conceptual site model reflects the findings of previous environmental investigations and presents an exposure assessment for the Site. The exposure assessment involved evaluating the distribution of the dissolved and adsorbed phases of gasoline range petroleum hydrocarbons in soil and groundwater onsite and at adjacent downgradient locales, potential pathways, and potential receptors. The conceptual site model is used to support an evaluation of feasible remediation technology for the cleanup of petroleum contaminated soil (PCS) and impacted groundwater at the Site and impacted areas off-property.

The primary conceptual release model for the Site consists of gasoline fuel leakage from the leaking underground storage tanks associated with the operation of the former Brumfield-Twidwell

facility and subsequent incorporation of spilled gasoline fuel into the subsurface soils and groundwater.

In addition, groundwater analytical results, groundwater potentiometric maps, and subsurface investigations conducted at the Pick-Rite Thriftway property (located directly west and downgradient of the Site) by AEG indicate that the lateral western extent of dissolved phase gasoline petroleum hydrocarbons impact extends from the central-southwest area of the Site (in the vicinity of the previous underground storage tanks) to off-property areas west-southwest of the property including areas on Sylvia Street, and near the eastern property boundary of the Pick-Rite Thriftway property (near the eastern entrance to the grocery store).

Contaminant distribution and groundwater elevations (based on surveyed groundwater elevation data measured at the Site and off-property areas) indicate the direction of groundwater migration is generally to the south-southwest at the Site and nearby vicinity area. Presence of cohesionless soils at the Site including silty sand to sandy gravel enabled the vertical migration of dissolved phase gasoline range petroleum hydrocarbons to where groundwater was encountered (at approximately 11 feet to 13 feet bgs) and beyond the vadose zone. Contaminants may also spread laterally to the west and south-southwest area of the Site due to the gradient of groundwater flow in the area and due potentially to the presence of utility corridors on Sylvia Street.

Petroleum hydrocarbons impact is also present at the eastern property boundary of the Pick-Rite Thriftway property (directly west-southwest of the Site) at well PRMW-9. The eastern area of the Pick-Rite property, as represented by monitoring well PRMW-9 will represent the western distal end of the plume associated with the Site (refer to Figure 1, *Site Plan Former Brumfield-Twidwell & Off-Property Areas*).

The constituents of concern (COCs) at the Site and associated offsite areas downgradient to the west-southwest include the following:

- Gasoline range TPH – associated with gasoline fuel leaked from the Site’s previous leaking USTs (associated with the former Brumfield-Twidwell facility);
- Gasoline fuel associated VOC as per Ecology MTCA Cleanup Regulation Table 830–1, *Required Testing for Petroleum Releases*:
 - ❖ Specific aromatic hydrocarbons including benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tertiary-butyl ether (MTBE), total naphthalenes, 1-2 dibromoethane (EDB), and 1-2 dichloroethane (EDC); and
- Total lead.

REMEDIAL ACTION OBJECTIVE

The objective of the remedial action/CAP is to remediate and restore the groundwater quality at the northwest corner of the Site (well BTMW-2) and associated off-property downgradient areas (as represented by wells BTMW-5, BTMW-6, and PRMW-9) to concentrations below Ecology MTCA Method A groundwater cleanup levels and minimize the potential for exposure to humans and the environment. Table 1, *Summary of Groundwater Analytical Results – Former Brumfield-Twidwell & Pick Rite*, presents analytical results for all monitoring wells at the Site and the two offsite wells at the Pick Rite Property (PRMW-9 and PRMW-10). Elevated concentrations of gasoline range TPH and selected VOC constituents are above Ecology MTCA Method A groundwater cleanup levels at only BTMW-2 and PRMW-9 as of 2011. These constituents of concern were above cleanup levels at BTMW-5 and BTMW-6 in 2008 and 2009, respectively.

PROPOSED REMEDIAL ACTION

Ecology MTCA Method A cleanup levels are designed for facilities undergoing routine cleanup actions that involve relatively few hazardous substances (WAC 173-340-700(5)(a)). The conditions for using Ecology MTCA Method A cleanup levels are met at this Site because numerical standards are available for all indicator hazardous substances in all media of concern (WAC 173-340-704(1)(b)). In addition, Method A cleanup levels are appropriate because only two hazardous analytes, gasoline range TPHs and its volatile constituents, primarily benzene, have been identified at concentrations above cleanup levels (WAC 173-340-700(2)). Therefore, Ecology MTCA Method A groundwater cleanup levels will be used at the Site and off-property areas since the conditions for using this Method are met.

Table 1. Selected MTCA Cleanup Levels for Site Remediation

Media	Contaminants	Cleanup Levels	Reference
Groundwater	TPH-Gasoline	800 µg/L	MTCA Method A
	Benzene	5 µg/L	MTCA Method A

Based on the conceptual site model, the selected remediation technologies for the cleanup action at the Site will involve a staged approach to in-situ bioremediation comprising of chemical oxidation and aerobic biodegradation of petroleum hydrocarbon. The primary components of this remedial action are as follows:

- In-Situ chemical oxidation using Regenesis RegenOx to reduce sorbed and soil-matrix bound petroleum hydrocarbon in the vadose zone and saturated zone, as well as the dissolved phase in groundwater.
- Regenesis Oxygen Releasing Compound² (ORC) will be used to accelerate the microbial degradation of remaining petroleum hydrocarbon impacted vadose zone and groundwater.

RegenOx chemical oxidation involves injecting an oxidizer and activator directly into the source area, impacted soil areas, and the petroleum hydrocarbon plume onsite. The oxidants in the RegenOx are a mixture of sodium percarbonate, sodium carbonate, sodium silicate and silica gel. The oxidant chemicals react with the contaminants producing innocuous substances such as carbon dioxide (CO₂), water (H₂O), and inorganic chloride.

RegenOx directly oxidizes contaminants and generates a range of highly oxidizing free radicals that remediates the constituents of concern - gasoline range petroleum hydrocarbon and its associated volatile organic compounds. These reactions can be propagated in the presence of RegenOx for periods of up to 30 days on a single injection.

ORC will also be applied by direct injection into the source zone and the petroleum hydrocarbon plume onsite. ORC is a phosphate-intercalated magnesium peroxide, that when hydrated, produces a controlled release of oxygen for periods of up to 12 months on a single application. This controlled release of oxygen assists in accelerating the naturally occurring aerobic contaminant biodegradation in groundwater and saturated soils.

RegenOx/ORC Rationale

Following preliminary screening of other feasible remedial technologies, RegenOx followed by an injection of ORC was selected because additional soil excavation was deemed impractical at the Site. In addition, RegenOx/ORC are more tailored for remediation at properties where the relative permeability of soils ranges from semi-pervious to pervious with hydraulic conductivity values ranging from 10⁻⁵ to 1 cm/s and presence of high groundwater table, as compared to other remedial technologies such as soil vapor extraction/air sparging (SVE/AS) and groundwater extraction for hydrocarbon remediation.

Furthermore, the selection of this remedial action approach for the Site was undertaken based on the following considerations: remedial action objectives for the Site, feasibility analyses, regulatory requirements, and the Site and Pick-Rite's commercial operations. Enhanced bioremediation via ORC was selected as a secondary remedial technology to address the remaining petroleum hydrocarbon impacts to achieve the required regulatory cleanup levels for groundwater.

The specific RegenOx/ORC injection/application was designed using typical parameters based on the type of soil identified during the previous Site work. The in-situ hydraulic conductivity was estimated at 10⁻⁵ to 1 cm/s. The injection spacing was then chosen based on specific criteria considered for the minimum effective area. A conservative injection spacing recommendation of approximately 20 feet for RegenOx and 10 feet for ORC was determined based on site specific characteristics, the nature of the constituents of concern, and the estimated area for applying

RegenOx and ORC into the vadose zone and saturated zone of the impacted area and nearby vicinity.

RegenOx product will be injected by a direct push probe drilling rig and a pump hopper using the “bottom up” injection method where the probe will be driven down and RegenOx will be injected at pre-determined intervals as the probe is slowly brought up toward ground surface. RegenOx is a chemical oxidation technology developed by Regenesis and consists of two parts that, when mixed cause controlled chemical reactions in the subsurface that can effectively remediate petroleum hydrocarbons in soil and groundwater.

Regenesis’ ORC Advanced product will also be injected by a direct push probe drilling rig and a pump hopper using the “bottom up” injection method where the probe will be driven down and ORC Advanced will be injected in pre-determined intervals as the probe is slowly brought up toward ground surface. ORC Advanced is an oxygen release technology developed by Regenesis that produces a sustained oxygen release when combined with water and remediates the contamination through biological means. The sustained biological reaction created in the subsurface by the injection of ORC Advanced can last up to 12 months on a single application (Regenesis).

The proposed in-situ bioremediation will focus on the following areas: 1) around well BTMW-2, located at the northwest corner of the Site; 2) around well BTMW-6, located on the western side of Sylvia Street; and 3) around well PRMW-9, located at the eastern entrance to Pick Rite grocery store. RegenOx/ORC injection points will be set in these areas at depths of 2 feet to 10 feet and at lateral intervals of approximately 7 to 10 feet (depending on the bioremediation product).

Case studies of similar impacted facilities engaged in bioremediation via RegenOx have shown that this remedial action technology is effective in gross reduction of the contaminant mass by oxidizing the sorbed contamination and changing the contaminant mass equilibrium (by increasing its solubility) which result in a shift from a sorbed phase to a dissolved phase. Application of ORC Advanced to the more soluble partially oxidized contaminants (as a result of RegenOx) would expedite the rate of aerobic biodegradation. Due to the changes in the contaminants and soil matrix chemistry, a *“temporary increase in the soluble fractions may occur post-application”* (Regenesis, 2009).

As per the agreement with the Ecology Site Manager, four Performance Monitoring Groundwater Sampling events are proposed after the completion of in-situ bioremediation activities. The completion of the fourth groundwater monitoring and sampling event will represent the final

activities for the proposed remedial action and also as the final environmental investigation activities conducted for the Site and for associated off-property areas.

The proposed cleanup actions and further groundwater investigations will be conducted as part of the Agreed Order to meet the MTCA requirements for remedial action at the Site and associated off-property areas and to obtain a Satisfaction Determination from Ecology. The MTCA requirements for substantial equivalence under Section 515 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-515) will be met, including providing Ecology with information on the Site cleanup action.

COMPLIANCE MONITORING OF GROUNDWATER

The MTCA regulations, WAC 173-340-720(8), require that groundwater cleanup levels be attained in all groundwater monitoring locales from the point of compliance to the outer boundary of the contamination plume. The point of compliance for groundwater that will meet the MTCA groundwater cleanup level is throughout the plume and will be measured in groundwater monitoring wells specifically at selected wells onsite.

Compliance with groundwater cleanup levels at the western boundary of the Site and off-property areas will be measured at wells PRMW-9 and MW-6. Monitoring well PRMW-10 will serve as the southern boundary compliance well with well BTMW-2 as the northern compliance point. Monitoring wells BTMW-5 and BTMW-6 will represent the central off-property areas of concern. By measuring the compliance monitoring wells at these locales, AEG will be able to confirm that the proposed remediation of combined in-situ bioremediation processes of RegenOx chemical oxidation and ORC Advanced aerobic biodegradation in addition to natural attenuation will achieve MTCA groundwater cleanup levels.

AEG will also monitor the natural attenuation of constituents of concern through ongoing assessment of field parameters. Natural attenuation is the reduction in concentration of compounds in soil or groundwater over time or distance from the source due to naturally occurring physical, chemical, and biological processes, such as biodegradation, dispersion, dilution, adsorption, and volatilization. Therefore, field parameters such as dissolved oxygen and oxygen-reduction-potential will be monitored at the selected monitoring wells.

The five core wells (BTMW-2, BTMW-5, BTMW-6, PRMW-9, and PRMW-10) will be monitored and sampled for four compliance groundwater monitoring/sampling events after the completion of bioremediation.

The tasks for the four Compliance Monitoring/Sampling Events are as follows:

- Groundwater samples will be analyzed for gasoline range organics as per MTCA Cleanup Regulation Table 830-1, *Required Testing for Petroleum Releases*. The analyses would include:
 - ❖ Gasoline range TPHs by Northwest Method NWTPH-Gx;
 - ❖ VOCs including BTEX, methyl tertiary-butyl ether (MTBE), total naphthalenes, 1-2 dibromoethane (EDB), and 1-2 dichloroethane (EDC) via EPA Method 8260B; and
 - ❖ Total lead via EPA Method 7421.
- Prepare and submit a report documenting the depth-to-water, groundwater migration direction, and summarizing analytical results of the compliance groundwater monitoring/sampling activities after each monitoring event. A total of four reports will be generated. All reports generated by AEG will be reviewed by a WA State licensed hydrogeologist.
- All data generated will be submitted to Ecology in accordance with WAC 173-340-840(5) in both written and electronic format.

CLOSING

Before proceeding with the proposed Cleanup Action Plan, AEG requests your approval, on behalf of Mr. Bryan Kolb, of the proposed remedial action for the Site and associated off-property areas. Please contact the undersigned at (360) 352-9835 with questions, comments, and/or your approval.

Sincerely,
Associated Environmental Group, LLC



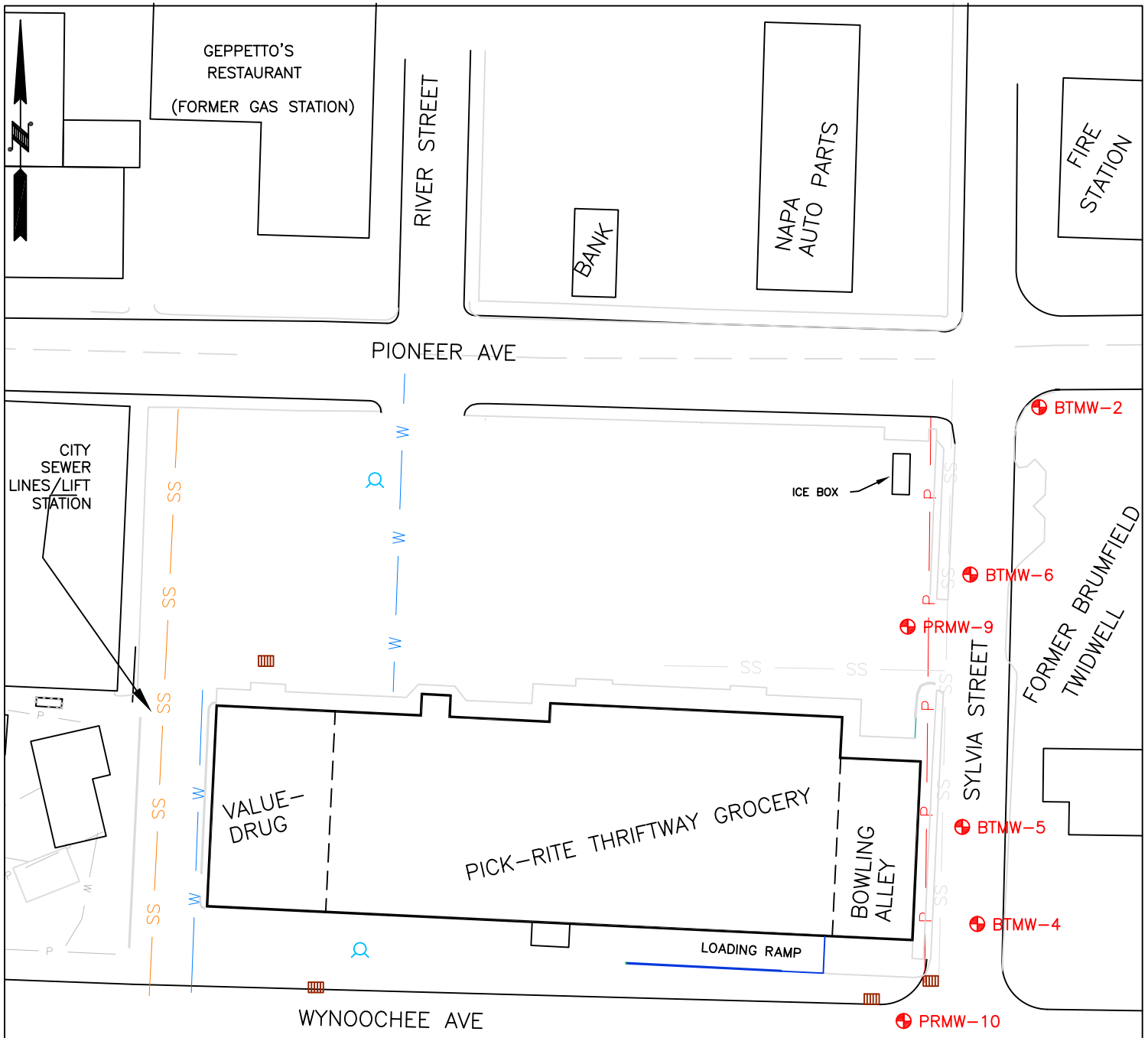
Yen-Vy Van, P.G., P. H.G.
Principal Hydrogeologist



Michael S. Chun, RSA
General Manager/Principal

Enclosures: Figure 1, *Site Plan Former Brumfield-Twidwell & Off-Property Areas*
Table 1, *Summary of Groundwater Analytical Results – Former Brumfield-Twidwell & Pick Rite*

cc: Bryan Kolb



DRAWING SCALE: 1" = 80'

LEGEND

- ⊕ BTMW-2 Monitoring Well on B-Twidwell Site
- ⊕ PRMW-9 Monitoring Well on Pick Rite Site
- P — POWER (UNDERGROUND)
- W — WATER LINE
- SS — SEWER LINE

Notes:

- (1) The locations of all features shown are approximate.
- (2) This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document.

Reference: Drawing created from surveyor's drawing by PACIFIC GEOMATIC SERVICES, Inc and notes provided by AEG, LLC.



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FIGURE 1 – SITE PLAN
 FORMER BRUMFIELD-TWIDWELL
 & OFF-PROPERTY AREAS

FORMER BRUMFIELD-TWIDWELL
 301 E PIONEER AVE
 MONTESANO, WA

Project# 05-200
 File:

Date: 7/20/2011
 Sheet 2 OF 3

**Table 1 Summary of Groundwater Analytical Results - Former Brumfield-Twidwell & Pick-Rite
Former Brumfield-Twidwell Property & Off-Property Monitoring Wells
Montesano, WA**

Sample Number ¹	Date	BTEX ² (µg/L)				Gasoline ³ (µg/L)	Table 830-1 Constituents ² (µg/L)				
		Benzene	Toluene	Ethylbenzene	Total Xylenes		1,2-Dichloroethane (EDC)	1,2-Dibromoethane (EDB)	Total Naphthalenes	MTBE	Total Lead ⁴
BTMW-1*	2/8/2006	<1.0	<1.0	<1.0	<1.0	<100	--	--	--	--	--
	8/17/2006	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<0.01	<5.0	<5.0	<1.0
	1/9/2007	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<0.01	<5.0	<5.0	<1.0
	3/15/2007	<1.0	<1.0	<1.0	<1.0	<100	--	--	--	--	--
BTMW-2	2/8/2006	550	810	1,280	10,100	58,000	--	--	--	--	--
	8/17/2006	136	176	323	1,570	1,970	<1.0	<0.01	101	<5.0	21
	1/9/2007	357	482	1,430	9,400	7,820	<1.0	<0.01	88.5	<5.0	9
	3/15/2007	355	495	828	4,970	24,600	--	--	--	--	--
	4/1/2008	12.8	211	503	4,040	7,730	<1.0	<0.01	73.5	<5.0	7.3
	4/9/2009	LNAPL present									
	5/12/2010	<1.0	<1.0	<1.0	6.4	160	<1.0	<0.01	<5.0	<5.0	<5.0
	5/12/2011	1.1	5.8	36.5	477	2,650	<1.0	<0.01	11.6	<5.0	<5.0
BTMW-3*	2/8/2006	<1.0	<1.0	2.7	24	120	--	--	--	--	--
	8/17/2006	<1.0	<1.0	4.4	17	175	<1.0	<0.01	<5.0	<5.0	<1.0
	1/9/2007	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<0.01	<5.0	<5.0	<1.0
	3/15/2007	<1.0	<1.0	<1.0	<1.0	<100	--	--	--	--	--
BTMW-4*	2/8/2006	<1.0	<1.0	<1.0	<1.0	<100	--	--	--	--	--
	8/17/2006	<1.0	<1.0	2.1	12	100	<1.0	<0.01	<5.0	<5.0	10
	1/9/2007	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<0.01	<5.0	<5.0	<1.0
	3/15/2007	<1.0	<1.0	<1.0	<1.0	<100	--	--	--	--	--
BTMW-5	4/26/2006	4.0	10.2	5.3	25	1,100	--	--	--	--	--
	8/17/2006	<1.0	<1.0	1.3	20	101	<1.0	<0.01	<5.0	<5.0	<1.0
	1/9/2007	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<0.01	<5.0	<5.0	<1.0
	3/15/2007	<1.0	<1.0	<1.0	<1.0	<100	--	--	--	--	--
	4/1/2008	1.2	12.3	33.2	284	1,040	<1.0	<0.01	<5.0	<5.0	6.0
	4/8/2009	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<0.01	<5.0	<5.0	<5.0
	5/12/2010	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<0.01	<5.0	<5.0	<5.0
	5/12/2011	<1.0	<1.0	<1.0	<1.0	<100	<1.0	<0.01	<5.0	<5.0	<5.0
BTMW-6	4/26/2006	45	41	170	365	3,390	--	--	--	--	--
	8/17/2006	7.1	7.9	1.5	116	611	<1.0	<0.01	8.0	<5.0	13
	1/9/2007	4.0	3.9	37	107	380	<1.0	<0.01	<5.0	<5.0	<1.0
	3/15/2007	4.99	7.3	33	70	450	--	--	--	--	--
	4/1/2008	1.8	8.5	143	211	1,500	<1.0	<0.01	8.2	<5.0	<1.0
	4/8/2009	1.3	4.1	168	120	2,060	<1.0	<0.01	55.5	<5.0	<5.0
	5/12/2010	<1.0	<1.0	11.5	16.3	320	<1.0	<0.01	16.3	<5.0	<5.0
	5/12/2011	<1.0	<1.0	<1.0	1.8	498	<1.0	<0.01	14	<5.0	<5.0
PRMW-9 ⁶	12/1/2010	43.6	75.8	232	413	4,133	--	--	--	--	--
	3/8/2011	35.8	63.2	500	13,300	5,180	--	--	--	--	--
	6/9/2011	<1	34.4	450	1,460	9,240	--	--	--	--	--
PRMW-10 ⁶	12/1/2010	<1	<2	<1	<3	<100	--	--	--	--	--
	3/8/2011	<1	<2	<1	<3	<100	--	--	--	--	--
	6/9/2011	<1	<2	<1	<3	<100	--	--	--	--	--
PQL		1.0	1.0	1.0	1.0	100	1.0	0.01	5.0	5.0	1.0 or 5.0
Method A Cleanup Levels		5	1,000	700	1,000	800 ⁵	5	0.01	160	20	15

Notes:

¹ Approximate monitoring well locations are shown in Figure 5

² Analyzed by EPA Method 8021B.

³ Analyzed by Northwest Method NWTPH-Gx

⁴ Analyzed by EPA Method 7421

⁵ Cleanup level with presence of benzene

⁶ PRMW-9 & PRMW-10: monitoring wells on Pick-Rite Thriftway and Wynoochee Ave. ROW

µg/L = micrograms per liter

"<" not detected above laboratory detection limits.

MTBE = methyl tertiary-butyl ether

-- = not analyzed for this constituent

Bold indicates the detected concentration exceeds MTCA Method A cleanup levels

* = ceased groundwater monitoring/sampling activities at this well