ASSOCIATED
ENVIRONMENTAL
GROUP, LLC

May 1, 2013

Mr. Norman Hepner, P.E.
Environmental Engineer
Toxics Cleanup Program - Central Region Office
15 W. Yakima Ave, Suite 200
Yakima, WA 98902
Email: nhep461@ecy.wa.gov

RE: Proposed Limited In-Situ Bioremediation Work Plan
Gateway 76 Nob Hill Facility
1802 East Nob Hill Boulevard
Yakima, Washington 98901

Dear Mr. Hepner:

Associated Environmental Group, LLC (AEG) has prepared the enclosed *Proposed Limited In-Situ Bioremediation Work Plan* on behalf of R.H. Smith Distributing, owner of the Gateway 76 Nob Hill Property, located at the above referenced address in Yakima, Washington (herein referred to as the Site). The proposed scope of work is based on a discussion and meeting between the Property owner, AEG, and the Washington State Department of Ecology (Ecology) Toxics Cleanup Program Site Manager.

AEG requests that Ecology provides a formal opinion on the proposed *Work Plan*.

SITE DESCRIPTION AND LOCATION

The subject Site is used as a retail gasoline station and as a convenience store. The fueling facilities and convenience store are currently active.

The Site is located at 1802 East Nob Hill Boulevard, within the City of Yakima, Yakima County, Washington State. The facility is located at the southeast corner of the intersection of East Nob Hill Boulevard and South 18th Street. The Site is physically located within the NW ¼ of the SE ¼ of Section 29. Township 13 N and Range 19 E of the Willamette Meridian. The Yakima County Parcel Number for the Property is 19132942431. The Site is listed in the Ecology database as Facility Site No. 506. The Site is generally level and is located in mixed residential/industrial/commercial area.

The Site was first developed in the early 1900s when the Property was used as a residence and possibly linked to larger orchard land or farmland. The Property was used as a residence for approximately 60 years until it was commercialized. In the late 1980s, the Property became a Maid O'Clover gas station. Four underground storage tanks (USTs) are present at the Site including two

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10,000-gallon gasoline USTs, one 6,000-gallon gasoline UST, and one 6,000-gallon diesel tank. The USTs were installed in 1987.

The Site is included on the Ecology Leaking Underground Storage Tank (LUST) Confirmed and Suspected Contaminated Sites List (CSCSL), and UST List. The Site received a Washington Ranking Method (WARM) ranking of 2 in 1992 and was placed on the Hazardous Sites List. The basis of the ranking was related to human health concerns from contaminated groundwater containing benzene, toluene, ethylbenzene, and total xylenes (BTEX). In the early 1990s, adjacent residences were using drinking water from domestic wells.

Initial characterization was performed in 1991 and 1992. A release was reported associated with the turbine pump for the westernmost 10,000-gallon gasoline UST. The release was estimated to be between 50 and 2,000 gallons. In 1991, three wells were installed and BTEX and gasoline total petroleum hydrocarbon (TPH) were detected above Ecology Model Toxics Control Act (MTCA) Method A groundwater cleanup levels. About 0.2 feet of free product was detected in monitoring well MW-3. Groundwater flow direction has been determined to be to the east-southeast of the Site. Six additional wells were installed in 1992. About 650 gallons of free product was removed from MW-3 using a skimming pump. Pumps were installed in various other wells to remove additional product. Up to 7,000 gallons of product and water was removed per day and treated during 1992.

In 1991 and 1992, petroleum contaminated groundwater in the general vicinity of the Gateway 76 Nob Hill Site was the subject of residence complaints and newspaper articles. Some of the contamination present in the Site vicinity was attributed to upgradient facilities such as the Exxon/Tiger Oil bulk fuel facility located approximately 400 feet west of the Property. The presence of groundwater contamination in a well along the southwestern boundary of the Property (MOC3) was attributed to unnamed offsite sources in the 1992 report. Three other service stations (Citgo/7-11, Time Oil, and ARCO AM/PM) are present at the intersection of East Nob Hill Boulevard and South 18th Street and represent potential sources of offsite groundwater contamination.

In 2002, Ecology sent a letter regarding the status of LUST remedial activities at Maid O'Clover and stated that there was a need for further action at the Site based on the presence of petroleum hydrocarbons at the Site above MTCA Method A cleanup levels. The 2002 Ecology letter concluded that there were inconsistencies in past reports regarding the levels of contaminants at the Site, and that the Site should remain in "Cleanup Started" status.

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In 2004, a Phase II Environmental Site Assessment (ESA) was performed at the Site. The Phase II ESA discovered tetrachloroethylene (PCE) in groundwater above Ecology MTCA cleanup levels at two borehole locations at concentrations of 16.7 micrograms per liter (ug/L) and 38.2 ug/L. BTEX, gasoline TPH, and diesel TPH were not detected in any of the water and soil samples that were collected near the UST. In 2005, Ecology sent a response to the Phase II investigation and stated that additional further actions are needed to address the PCE in the groundwater.

This Site is located within the Yakima Railroad Area PCE plume. This is a large co-mingled plume that is present over a large area of downtown Yakima. Based on the draft *Revised Draft Remedial Investigation Report, Yakima Railroad Area, Yakima, Washington,* and dated December 1998, shallow groundwater flow is to the southeast in the vicinity of the Site. In 1998, PCE concentrations in wells located north (upgradient) of the Site ranged from about 10 to 100 ug/L. The closest wells sampled in the 1998 investigation were approximately 2,000 feet from the Site. In June 1992, a grant application was submitted to Ecology by the Cities of Yakima and Union Gap to connect approximately 1200 residences in the Yakima Railroad Area to the cities' water systems. Ecology provided 100% funding of $6.4 million to the cities. Construction began in 1993 to connect these homes to the municipal water supplies.

According to the CSCSL, three applications to enter the Voluntary Cleanup Program (VCP) have been received by Ecology (in February 2005, March 2007, and in March 2013). The first two applications were terminated for various reasons in August 2005 and in October 2012. AEG is presently working under the last application. AEG began groundwater sampling from five previously drilled monitoring wells located on the Site beginning on December 11, 2011. Initial samples included analyses for BTEX, TPH-gasoline, TPH-diesel, 1,2-dichloroethane (EDC), ethylene dibromide (EDB), total naphthalenes, methyl tertiary-butyl ether (MTBE), and total lead. Three wells (MW-1, MW-2, and MW-5) were sampled for TPH-heavy oil and mineral oil, as well. Three of the wells (MW-1, MW-2, and MW-4) were sampled for halogenated volatile organic compounds (VOCs), including PCE, trichloroethylene (TCE), 1,2-dichloroethylene (1,2-DCE), vinyl chloride, and carcinogenic polynuclear aromatic hydrocarbons (cPAHs). No constituents were detected above MTCA Method A groundwater cleanup levels except benzene in monitoring well MW-1 (9.9 ug/L). It was suspected that the benzene detected in this well was coming from off-Site sources other than the Site itself. The MTCA Method A groundwater cleanup level for benzene is 5 ug/L.

CONCEPTUAL MODEL

A conceptual model has been developed for the Site. Much of the model is based on resulting investigations from the Yakima Railroad Area as reported in the draft report. The shallower soils (shallower than 200 or 300 feet below ground surface [bgs]) consist of fill material, Yakima Valley

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Alluvium, and the Yakima Valley Terrace Deposits. The Site is mostly located within the alluvium materials and to some extent, the terrace deposits. The surface soil and fill consists of discontinuous layers of silty gravel, gravely sands, and organic soils. Significant modifications of the surface over the historic development of Yakima have affected the extent, depth, and permeability of the surface soils. The Yakima Valley Alluvium consists of unconsolidated silts, sands, gravels, and cobbles deposited by rivers and streams. This unit occurs at or near the ground surface near the Site and extends to no more than 30 feet bgs. The alluvium is highly permeable and acts as an unconfined shallow water-bearing zone, which is directly recharged by precipitation and/or irrigation. The water level is typically eight to 12 feet bgs with a two to five-foot seasonal fluctuation. The Yakima Valley Terrace Deposits consist of gravels with minor clay, silt, and sand deposited by high energy streams associated with glacial retreats and advances. The gravels can be stratified and indurated to a conglomerate with discontinuous layers of permeable cemented gravels, caliche, and clay/silt. The terrace deposits can extend to 300 feet bgs. The deposits act as an unconfined water-bearing zone which is used for domestic, public, irrigation, and industrial water supply wells. The gravels are recharged by precipitation, irrigation, and upward leakage from the underlying Upper Ellensburg Formation.

The characterization of groundwater conditions for the Yakima Railroad Area Remedial Investigation (RI) involved interpretation of groundwater level data and other information from 28 RI monitoring wells and selected monitoring wells at 13 subfacilities. Regional hydrogeologic information and data from these wells were used to generate a conceptual model of groundwater flow in the water-bearing zones investigated. Four quarters of monitoring were reported in the draft RI document. The potentiometric surface maps for the shallow water-bearing zone indicate that the gradient and estimated direction of groundwater flow is consistently to the southeast across the Yakima Railroad Area and toward the Site during all four quarters of monitoring. The seasonal variations of groundwater levels ranged from 0.39 to 11.76 feet and averaged less than five feet for wells screened in the shallow water-bearing zone. Irrigation recharge is likely the primary factor responsible for the larger fluctuations at the monitoring wells. Annual precipitation in the Yakima River Valley is approximately eight inches, with more than half occurring during the winter months as snow. Potential evapotranspiration determined using a modified Blaney-Criddle calculation from the U.S. Department of Agriculture is approximately 38 inches annually. Basically, this means that little or no recharge is coming from precipitation in this area. Consequently, crops require extensive irrigation. Irrigation canals are located throughout the Yakima Railroad Area. The irrigation canals are typically constructed of concrete-lined channels; however, leakage from the channels is common. Application of irrigation water occurs during the summer and early fall months (generally from May to October) and affects the regional surface water flow and groundwater levels within the Yakima area.

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Seasonal irrigation in the Yakima Valley is interpreted to be responsible for the higher groundwater levels that were typically recorded during the June and September monitoring rounds as compared to the December and March monitoring rounds. Groundwater levels measured in the Yakima Railroad Area suggest that recharge from irrigation is primarily a regional phenomenon, and is not caused by localized point sources. Point sources would result in localized mounding of groundwater, which would be reflected in the groundwater contour maps generated by the RI. Runoff in the spring would also contribute recharge to groundwater along reaches of streams and rivers in the Yakima Valley that lose water to the subsurface, resulting in higher groundwater levels in the late spring to early summer period.

SCOPE OF WORK

The objective of the *Limited In-Situ Bioremediation* is to expedite the biodegradation of residual dissolved phase gasoline range petroleum hydrocarbons and associated VOCs in groundwater at monitoring well MW-1 (located at the southwest area of the property). Regenesis Oxygen Releasing Compound Advanced (ORCa) Filter Socks will be installed into the well. Regenesis ORCa has been successfully employed for remediation of petroleum fuel contamination due to its ability to produce controlled-release, molecular oxygen for periods of up to 12 months on a single application. The abundant oxygen is then readily available to facilitate the proven and cost-effective, enhanced aerobic biodegradation process.

The ORC Filter Socks are permeable, fabric sleeves filled with pure ORC or ORC Advanced® material. Each filter sock is inserted into a colored, Naltex™ Flex-Guard for maximum durability. Filter socks are designed to deliver controlled release oxygen into a specific well or treatment area with the purpose of creating a very localized but effective oxygenated zone where accelerated aerobic biodegradation can occur. Upon exhaustion of their oxygen supply (anywhere from 9-12 months) the socks can be removed and/or replaced.

Two monitoring events have been conducted to date by AEG to determine initial concentrations. Three wells have been sampled onsite to determine possible halogenated VOCs present. Five wells have been sampled for BTEX, TPH, and associated constituents. Four of the wells demonstrated non-detect for the sampled constituents for the two monitoring events. AEG proposes to conduct an additional two quarters in the four wells (MW-2, MW-4, MW-5, and MW-6) that have been below MTCA Method A groundwater cleanup levels for TPH, BTEX, and associated petroleum constituents. Three sampling events will be conducted on the three wells (MW-1, MW-2, and MW-4) that have been sampled for halogenated VOCs. Should these monitoring events demonstrate all of the constituents below groundwater cleanup levels; AEG will request that these wells no longer be sampled. AEG will conduct at least 10 consecutive monthly groundwater monitoring and sampling events beginning in the month of May 2013 to assess the efficacy of the

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ORCa and groundwater quality at monitoring well MW-1 and compare the results statistically with Ecology MTCA Method A groundwater cleanup levels. The Ecology three-part statistical method will be used as described in WAC 173-340-720(9). The monthly frequency is suggested to overlap the irrigation cycle (May to October/October to May), rather than a quarterly frequency oriented around precipitation events. The cycle is based on the periods of canal flow as the canals are filled and subsequently leak to groundwater (approximately May to October) to when they are emptied (approximately October to May) and the groundwater table drops to its maximum depth bgs.

MTCA Cleanup Levels for Gateway Nob Hill, Yakima

Media	Contaminants	Cleanup Levels	Reference
Groundwater	**TPH-gasoline**	**800 ug/L**	**MTCA Method A**
	Benzene	**5 ug/L**	**MTCA Method A**
	Toluene	**1,000 ug/L**	**MTCA Method A**
	Ethylbenzene	**700 ug/L**	**MTCA Method A**
	Total Xylenes	**1,000 ug/L**	**MTCA Method A**
	PCE	**5 ug/L**	**MTCA Method A**
	TCE	**5 ug/L**	**MTCA Method A**
	1,2-DCE	**72 ug/L**	**MTCA Method B**
	Vinyl Chloride	**0.2 ug/L**	**MTCA Method A**

AEG's scope of work for the *Limited In-Situ Bioremediation* is as follows:

- Custodian of any and all permits, notifications, and approvals applicable to the project including all local, state and federal requirements.
- Provide a Washington State Registered Site Assessor (RSA) and Washington State Licensed Hydrogeologist for the project.
- Connect ORCa Filter Socks, hydrate, and form lenticular shapes for installation.
- Install ORCa Filter Socks within the zone of environmental impact and residual contamination from a depth of approximately 10 feet to 25 feet below ground surface (bgs) at MW-1.
- Document Bioremediation activities.
- Prepare a *Limited In-Situ Bioremediation Project Summary* documenting the field activities and methodologies.

Groundwater Monitoring/Sampling Events

- AEG proposes to conduct at least 10 consecutive monthly groundwater monitoring/sampling events at monitoring well MW-1, beginning in May 2013 to evaluate the groundwater quality at the well.
- Prior to groundwater monitoring and sampling activities, the monitoring well will be purged until field parameters such as pH, conductivity, and temperature have stabilized.

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Groundwater samples will be collected via an EPA approved micropurge technique with a submersible pump. The samples will be placed in a chilled cooler until delivery to the analytical laboratory.

- Submit groundwater samples for laboratory analyses of gasoline and associated VOCs. Analyses shall include BTEX and gasoline range TPH for the entire monitoring period for monitoring well MW-1. Halogenated VOCs, including PCE and its breakdown products, will be sampled to determine that PCE and its breakdown products are not present on Site. Four additional quarterly samples will be collected including the samples collected in the three wells (MW-1, MW-2, and MW-4) on March 9, 2012. Four wells (MW-2, MW-4, MW-5, and MW-6) sampled for petroleum constituents on December 11, 2011 and March 9, 2012 will be sampled for another two quarters to determine that petroleum constituents are not present in these wells. If these wells do not detect constituents above MTCA Method A (or B) groundwater cleanup levels, AEG will petition Ecology to remove these wells from the monitoring program.
- Prepare and submit Semi-Annual Quarterly Groundwater Events Report.
- All reports generated by AEG will be prepared and reviewed by a Washington State licensed hydrogeologist.

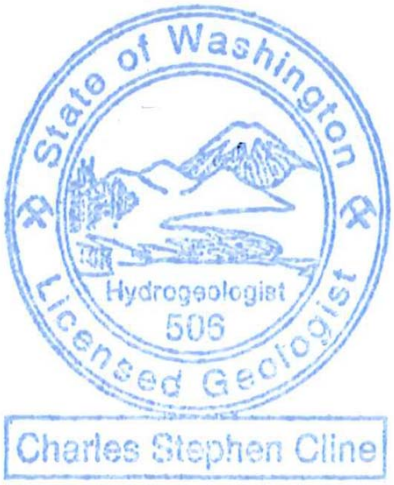
CLOSING

Before proceeding with the proposed scope of work, AEG requests Ecology prepare an Opinion Letter for the Site indicating approval of the proposed SOW for *Limited In-Situ Bioremediation*. Please contact us at (360) 352-9835 with questions, comments, and/or your approval.

Sincerely,

Associated Environmental Group, LLC

Charles S. Cline, L.G., L.Hg.
Senior Hydrogeologist



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Enclosures:

Figure 1	*Site Vicinity Map*
Figure 2	*Site Plan*
Figure 3	*Yakima Railroad Area & Groundwater Contours*
Table 1	*Summary of Groundwater Analytical Results –GRO*
Table 2	*Summary of Groundwater Analytical Results – HVOCs & cPAHs*

cc: Ms. Sue Smith, R.H. Distributing

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FIGURE 1

SITE VICINITY MAP

Gateway 76

1802 East Nob Hill Blvd.
Yakima, WA

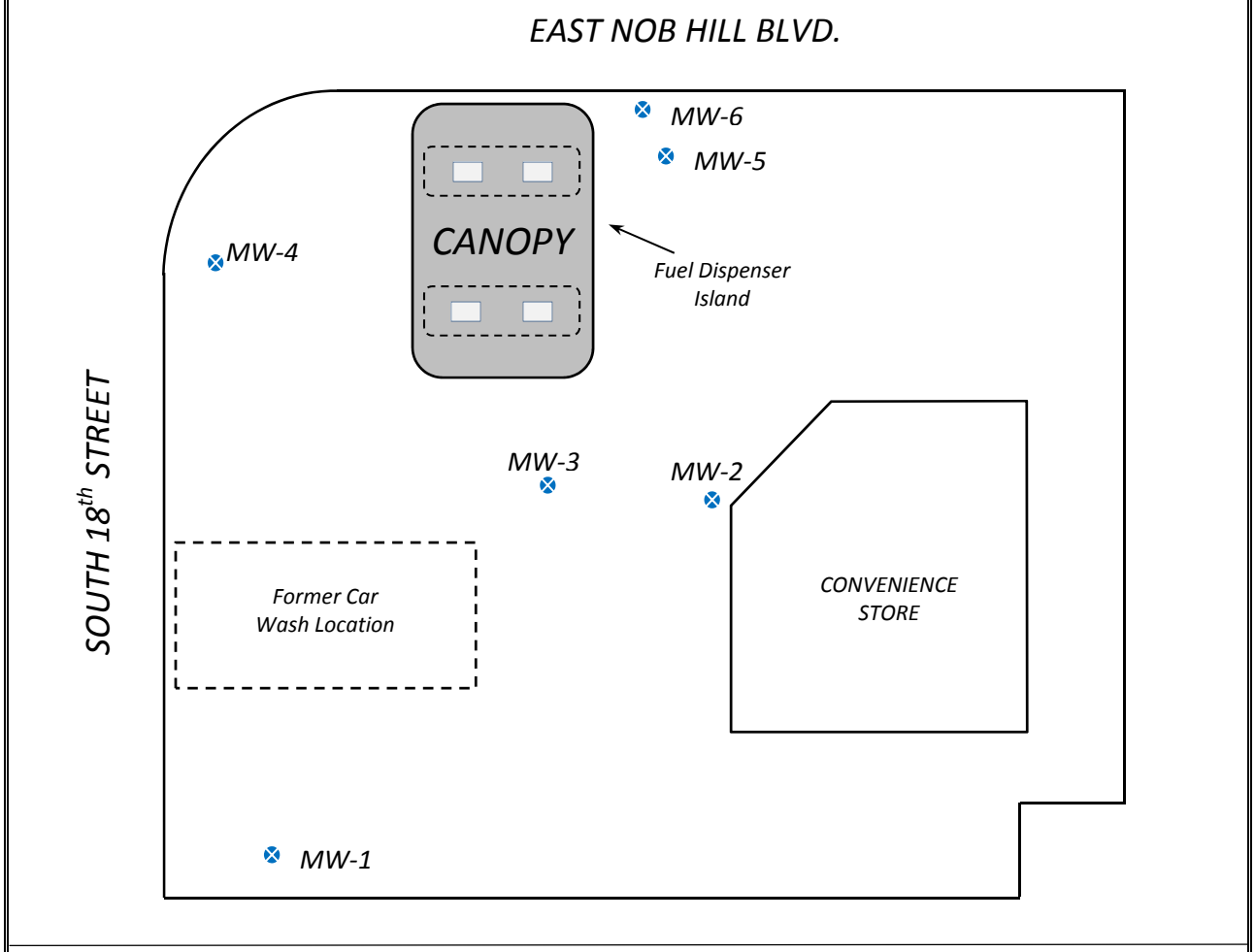

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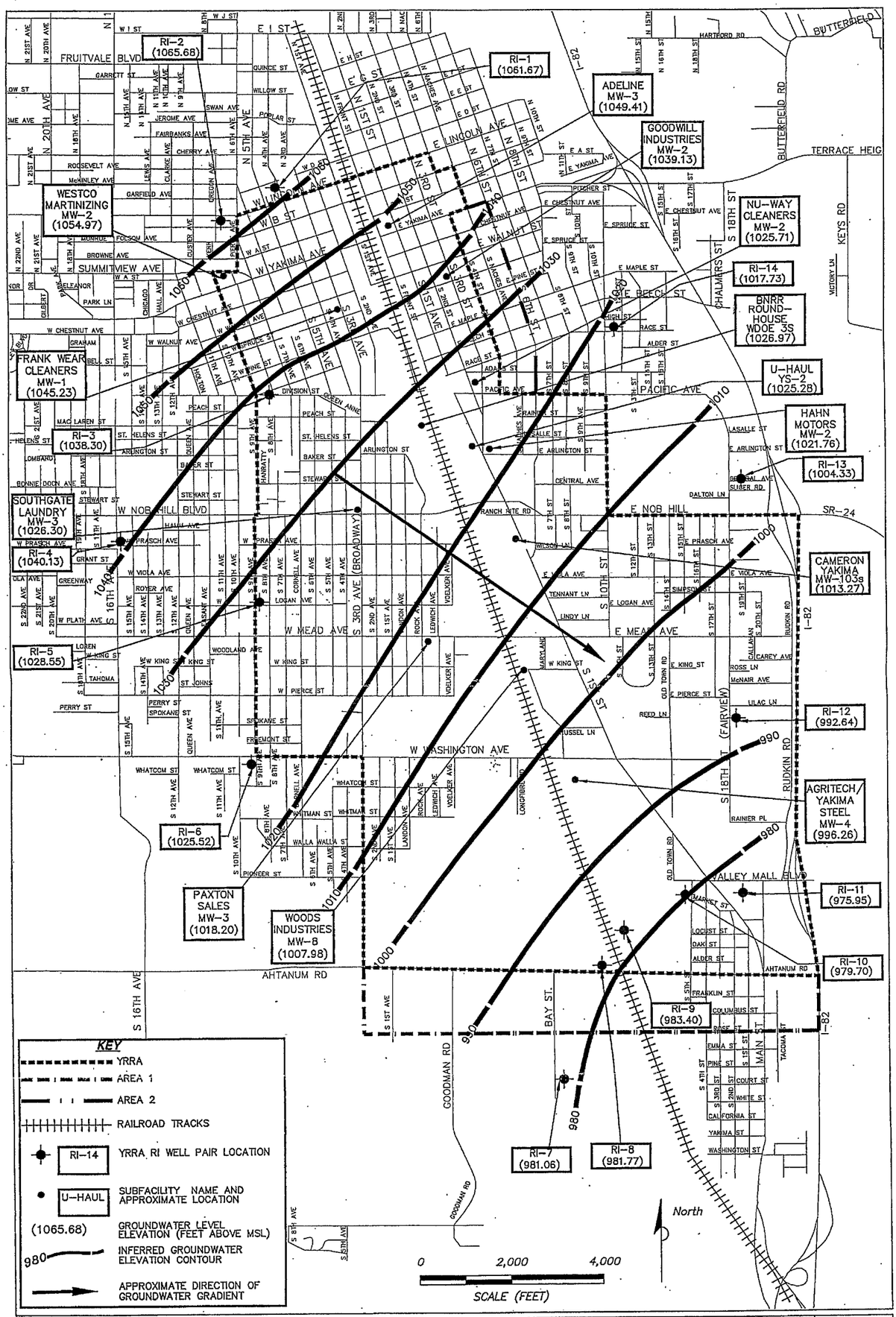
FIGURE 2

SITE PLAN

Gateway 76

1802 East Nob Hill Blvd.
Yakima, WA



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International Incorporated

POTENTIOMETRIC SURFACE MAP
SHALLOW WATER-BEARING ZONE - DECEMBER 1997
YAKIMA RAILROAD AREA
REMEDIAL INVESTIGATION
YAKIMA, WASHINGTON

FIGURE: 11

JOB#: 00378-001-02 APPR: DWN: QDD DATE: 12/11/98

DWG: YAKMAP5.DWG

Table 1 Summary of Groundwater Analytical Results - GRO
Gateway Knob Hill 76 Gas Station
Yakima, WA

Well Number[1]	Date Sampled	Gasoline TPH[2] (ug/L)	Table 830-1 GRO Volatile Organic Constituents[3] (ug/L)								Total Lead[5] (ug/L)	Diesel TPH Extended[4] (ug/L)		
			Benzene	Toluene	Ethylbenzene	Total Xylenes	EDC	EDB	Total Naphthalenes	MTBE		Diesel	Heavy Oil	Mineral Oil
MW-1	12/11/2011	<100	<1.0	<2.0	<1.0	<3.0	--	--	--	--	--	--	--	--
	3/9/2012	<100	**9.9**	<1.0	<1.0	<1.0	<1.0	<0.01	<5.0	<5.0	--	<200	<400	<400
MW-2	12/11/2011	<100	<1.0	<2.0	<1.0	<3.0	--	--	--	--	--	<200	--	--
	3/9/2012	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<0.01	<5.0	<5.0	--	<200	<400	<400
MW-4	12/11/2011	<100	<1.0	<2.0	<1.0	<3.0	--	--	--	--	--	<200	--	--
	3/9/2012	<100	<1.0	<2.0	<1.0	<3.0	--	--	--	--	--	--	--	--
MW-5	12/11/2011	<100	<1.0	<2.0	<1.0	<3.0	--	--	--	--	--	--	--	--
	3/9/2012	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<0.01	<5.0	<5.0	--	<200	<400	<400
MW-6	12/11/2011	<100	<1.0	<2.0	<1.0	<3.0	--	--	--	--	--	<200	--	--
	3/9/2012	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<0.01	<5.0	<5.0	--	--	--	--
PQL		100	1.0	1.0 or 2.0	1.0	1.0 or 3.0	1.0	0.01	5.0	5.0	5.0	200	400	400
Ecology MTCA Method A Clean Up Levels		800 [6]	5	1,000	700	1,000	5	0.010	160	20	15	500	500	500

Notes:
[1]Monitoring well locations are shown in figure 1
[2]Gasoline range total petroleum hydrocarbons (TPH). Analyzed by Northwest Method NWTPH-G
[3]Select Volatile Organic Compounds in gasoline range organics (GRO) per Table 830-1. Analyzed by EPA Method 8260E
[4]Analyzed by Northwest Method NWTPH-Dx/Dx Extended
[5]Analyzed by EPA Method 7421
[6]Cleanup level with presence of benzene
EDC = 1,2-Dichloroethane
EDB = 1,2-Dibromoethane
MTBE = methyl tertiary-butyl ethe
PQL = Practical Quantification Limit
ug/L= micrograms per liter
-- = not analyzed for constituent
< = not detected above laboratory limits
Bold indicates the detected concentration exceeds Ecology MTCA Method A cleanup leve

Table 2 Summary of Groundwater Analytical Results - HVOCs & cPAHs
Gateway Knob Hill 76 Gas Station
Yakima, WA

Well Number[1]	Date Sampled	Select Halogenated Volatile Organic Constituents[2] (ug/L)						cPAH[5] (ug/L)
		PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-Dichloroethene	Vinyl Chloride	
MW-1	3/9/2012	<1.0	<1.0	<1.0	<1.0	<2.0	<0.2	<0.100
MW-2	3/9/2012	<1.0	<1.0	<1.0	<1.0	<2.0	<0.2	<0.100
MW-4	3/9/2012	<1.0	<1.0	<1.0	<1.0	<2.0	<0.2	--
MW-5	3/9/2012	--	--	--	--	--	--	<0.100
PQL		1.0	1.0	1.0	1.0	2.0	0.2	0.100
Ecology MTCA Method A Clean Up Levels		5	5	*	*	*	0.2	0.1

Notes:
[1]Monitoring well locations are shown in figure 1.
[2]Select Halogenated Volatile Organic Compounds. Analyzed by EPA Method 8260B.
[3]Analyzed by EPA Method 8270C.
ug/L= micrograms per liter
-- = not analyzed for constituent
< = not detected above laboratory limits
PCE = tetrachloroethene
TCE = trichloroethene
cis-1,2-DCE = cis-1,2 dichloroethene
trans-1,2-DCE = trans-1,2 dichloroethene
cPAHs = carcinogenic polycyclic aromatic hydrocarbons
PQL = Practical Quantification Limit
Bold indicates the detected concentration exceeds Ecology MTCA Method A cleanup level