SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

PHONE 285-2400
CABLE ADDRESS: TIMOIL
(FAX) 206-283-8036

TIME OIL CO.

2737 WEST COMMODORE WAY
P.O. BOX 24447

SEATTLE, WA 98199-1233
SEATTLE, WA 98124-0447

January 23, 1996

Mr. Don Abbott
Washington Department of Ecology
Central Region
15 West Yakima Avenue
Yakima, WA 98902-3387

RE: Transmittal of:
Hydrology Study, Limited Qualitative Risk Assessment and Groundwater Monitoring and Status Report

Time Oil Co. Property 01-056; Jackpot Food Mart
500 George Washington Way; Richland, Washington

Dear Mr. Abbott,

Please find enclosed herewith copies of the above referenced documents produced for Time Oil Co. by AGRA Earth & Environmental, Inc. The following paragraphs present a brief history of the site, and synopses of the goals and findings of the Hydrology Study and Limited Qualitative Risk Assessment (Exposure Assessment). The groundwater monitoring report contains a description of our most recent monitoring event in which groundwater conditions were very similar to those documented during previous groundwater monitoring events. Please refer to the enclosed reports for more detailed descriptions of each study's findings.

Site History:

The subject property was operated as a bus depot and gasoline service station prior to being purchased by Time Oil Co. in the late 1950's. The bus depot has since been demolished, and a Jackpot Food Mart convenience store has been constructed in the central area of the site.

Four carbon steel USTs were previously located near the southeastern corner of the site. Three of these tanks and their associated product piping and dispenser islands were removed in 1990 and replaced with a new tank system located in another portion of the site. Analytical testing of soil samples recovered during UST removal determined that gasoline concentrations exceeding MTCA Method A Cleanup Levels - Soil (Soil Cleanup Levels) were present in soils within the UST cavity. The new dispenser complex was constructed in the same location as the original complex, and the new underground tanks are located slightly northeast of the dispenser islands (the current site layout is presented on Figure 2 of the enclosed groundwater monitoring and status report). The former UST cavity was roughly centered around the location of monitoring well MW-1.

There are no closure records for the fourth steel tank; however, this tank was believed to have been located immediately adjacent to the three that were removed. The fourth tank was searched for and not encountered during removal of the other tanks; thus, we believe this tank was either not installed, or may

have been removed at some point prior to 1990. In addition to the former vehicle fueling tanks, a 750-gallon heating oil tank is believed to have been located along the western wall of the former bus depot. It is not known whether this tank was removed during demolition of the depot.

An initial site assessment consisting of the performance of a soil vapor survey, installation of six groundwater monitoring/vapor extraction wells, and vapor extraction testing was completed in 1993. Results of this assessment determined that soils impacted by gasoline were present beneath the former UST cavity, gasoline impacted soils were likely present beneath the dispenser islands, and weathered gasoline affected groundwater was present beneath both the former UST and dispenser areas. The extent of affected groundwater was not delineated, and affected groundwater appeared to be flowing off-site to the east. Results of vapor extraction testing determined that vapor extraction would be a suitable cleanup technology for impacted soils.

An expanded hydrocarbon assessment was conducted during the late spring and early summer of 1995 in an attempt to define the full extent of the groundwater impact and perform remedial testing for the design of a groundwater remediation system. An extensive area of groundwater contamination extending both up and downgradient from the Time Oil Co. site was discovered during the expanded assessment. The sidegradient limits of affected groundwater were defined during the expanded assessment; however, the plume's extensive nature and the need to negotiate access to additional drilling locations precluded definition of the up and downgradient limits of the groundwater impact. Remedial testing conducted as a portion of the expanded assessment determined that air sparging and vapor extraction could be used in tandem to effectively address hydrocarbon affected groundwater beneath the site.

Following discovery of the extensive groundwater impact, we authorized AGRA to conduct Columbia River bank sampling to check for the possibility of an impact to the river, perform a hydrology study to unravel some of the site's peculiar hydrogeologic characteristics, perform an exposure assessment to ensure that the plume does not present a health threat to users of nearby Howard Amon Park, install additional wells to define the remainder of the plume, and design and install the subsurface portions of an interim remediation system to begin cleaning up the most heavily impacted portion of the site. A report on the Columbia River bank sampling was submitted to your office in October 1995. The current status of each additional task is discussed below.

Summaries of Recently Completed Work:

* Hydrology Study: The hydrology study was primarily conducted to determine how a submerged zone of heavily contaminated soil was placed 5 to 10 feet below the current groundwater table, why groundwater contamination appears to have migrated a significant distance upgradient from the Time Oil Co. property, and if the hydrogeologic conditions which caused these peculiar contaminant characteristics are likely to return.

  Findings of the Hydrology Study indicate that the submerged soil contamination was likely caused by a release which occurred prior to the completion of McNary Dam (1953) when groundwater elevations near the Columbia River were probably five to ten feet lower than present groundwater elevations. Prior to completion of the dam, the currently submerged soil contamination was likely emplaced as groundwater contaminants and/or free product were transported upwards into the soil layer directly overlying the contaminated groundwater surface (capillary fringe zone) through capillary action. As McNary dam was completed, and Lake Wallula filled behind the dam, groundwater elevations beneath the site likely rose as a result of the increasing river/lake elevation, thus submerging the former capillary fringe zone and the contaminants located within.

  The hydrology study's findings also indicate that past pumping from currently inactive City of Richland municipal supply wells located within the Wellsian Way well field may have caused upgradient contaminant migration. Results of the hydrology study will be discussed with City of Richland officials such that the effect of potential future pumping from these wells may be factored into groundwater monitoring and remedial efforts at the Time Oil Co. site. It is possible that additional remedial actions may be necessary upgradient

from the Time Oil Co. site should future pumping from the Wellsian Way well field be conducted. The Hydrology Study report is enclosed with this letter.

* Limited Qualitative Risk Assessment for Users of Howard Amon Park: A limited qualitative risk assessment (Exposure Assessment) was conducted to determine whether the presence of a gasoline plume beneath Howard Amon Park might present a health risk to recreational users of the park. The Exposure Assessment report cites the methods and findings of the study in a detailed manner; however, the most significant finding of the study can be summarized by the following quote from the report's executive summary "no site related health-based exposure risks currently exist to recreational users of the park, including users of the ball field, picnic grounds, and Columbia River in the vicinity of the park." The Exposure Assessment report is enclosed with this letter.

* Additional Well Installation: One upgradient and several downgradient monitoring wells were installed in November 1995 in an attempt to fully define the groundwater impact. Results of two sampling events on the new wells have determined that although contaminated groundwater is present beneath Howard Amon Park's picnic area (between the ball field and the river), contaminant concentrations beneath the picnic area are either below, or only slightly above, MTCA Method A Groundwater Cleanup Levels. Two additional monitoring wells will be installed within and near the park's picnic area on January 25, 1996 in an attempt to completely define the area of affected groundwater which exceeds MTCA Method A Groundwater Cleanup Levels.

  The new upgradient well (designated MW-21 and located approximately 350 feet to the west of the Time Oil Co. property) installed in November 1995 also contains contaminant concentrations exceeding groundwater cleanup levels. Analytical results from MW-21 suggest the possibility of an impact from another site; thus, additional upgradient exploration is not currently planned. Analytical results from samples collected from MW-21 will be closely watched during quarterly groundwater monitoring in order to further evaluate the potential for an impact from another site.

  A report on conditions encountered during additional well installation and sampling is in production, and will be completed after the two wells discussed above have been installed and sampled. This report will be submitted to your office upon completion.

* Interim/Pilot Remediation System: Subsurface portions of an interim remediation system were designed in the late summer and early fall of 1995 and the subsurface components of an air sparging/vapor extraction cut-off gallery were installed at the eastern (downgradient) edge of the Time Oil Co. property in November 1995. The installed utilities include air sparging injection wells, vapor extraction wells, well vaults, air sparging and vapor extraction conveyance piping, and a concrete slab to accommodate a treatment compound. An as-built report describing the subsurface equipment installation is in production and will be submitted to you in draft form upon completion. The as-built report will be finalized once the above-ground injection and recovery system has been installed. We plan to design the above-ground injection and recovery system, choose treatment system components, complete air discharge permitting, install the treatment equipment, and initiate system operation during 1996.

Future Work:

Remedial Design and Installation:

In order to begin restoration of groundwater quality upon, and downgradient from, the Time Oil Co. property, a suitable above-ground injection, recovery, and treatment system must be designed and installed. Conceptually, the remediation system will operate by injecting air through the sparging wells to volatilize groundwater contaminants and stimulate natural contaminant biodegradation as the injected air migrates upwards through affected groundwater. The system will then recover the hydrocarbon laden air with vapor extraction wells as it emerges from the groundwater surface, and remove hydrocarbons from the extracted air stream with a suitable treatment system prior to discharging the cleaned air to the atmosphere. As noted above, the injection wells, recovery wells, horizontal conveyance piping, and equipment compound pad have been installed; however, the equipment which will inject, recover, and cleanse the air must be designed, selected, and installed.

AGRA has developed a scope of work and cost estimate to complete the necessary design work, conduct air discharge permitting, install the system, conduct the first six months of system operation & maintenance, and evaluate the system's effectiveness during a six-month "pilot" operation period. AGRA's scope of work and cost estimate are currently undergoing Time Oil Co. internal review, and we expect to authorize AGRA to conduct the necessary additional work within two weeks. Timing for the commencement of active remediation is somewhat uncertain due to the inherent difficulties in predicting the time frames necessary to complete the necessary tasks; however, we hope to initiate operation of the interim system during the late summer of 1996.

Quarterly Groundwater Monitoring:
Quarterly groundwater monitoring will continue in order to provide an early warning system for potential plume migration. The monitoring will also be utilized to track remedial progress once active remediation has commenced. In an effort to reduce overall project costs, we intend to conduct an abbreviated monitoring program during the January, April, and October monitoring events. We propose to sample 14 wells located around the plume's boundaries and within its central axis to check for plume migration and track remedial progress during the January, April, and October monitoring events. All of the site's wells would be sampled once per year during the July monitoring event. We believe that sampling of wells MW-1, MW-4, MW-7, MW-8, MW-10, MW-13, MW-15, MW-16, MW-17, MW-18, MW-21A, MW-21B, MW-22, and at least one future downgradient well (likely to be designated MW-23), will be sufficient to check for plume migration and track remedial progress during the January, April, and October monitoring events.

Our surveyor will produce a map of the entire site once installation of additional wells has been conducted on January 25, 1996. A copy of this map will be transmitted to your office upon completion such that you may review the map and assess our choice of monitoring wells to be sampled during the abbreviated monitoring program proposed for the January, April, and October monitoring events.

If you have any questions or comments concerning this letter, the reports, or the information contained within either, please call me at (206) 286-6457. I would also be happy to visit your office on my next trip to Richland to review any aspect of the project you might wish to discuss.

Sincerely,

Scott B. Sloan, R.G.
Geologist

Encls: "Hydrology Study"
"Limited Qualitative Risk Assessment"
"Groundwater Monitoring and Status Report"

cc: Mr. Bruce Williams - AGRA Earth & Environmental, Inc. (w/o enclosures)
Mr. Roger Wright - City of Richland

M:\DOCS\RICHLAND\RCHMEHSB.DOC

LIMITED QUALITATIVE RISK ASSESSMENT
RICHLAND JACKPOT (TIME OIL CO. PROPERTY 01-056)
500 GEORGE WASHINGTON WAY
RICHLAND, WASHINGTON

Prepared for:

Time Oil Co.
2737 West Commodore Way
Seattle, Washington 98199-1233

Prepared By:

AGRA Earth and Environmental, Inc.
520 North Foothills Drive, Suite 600
Spokane, Washington

13 October 1995

LIMITED QUALITATIVE RISK ASSESSMENT
RICHLAND JACKPOT
TIME OIL CO. PROPERTY 01-056
500 GEORGE WASHINGTON WAY
RICHLAND, WASHINGTON

TABLE OF CONTENTS
12-1238-03

LIMITED QUALITATIVE RISK ASSESSMENT
RICHLAND JACKPOT (TIME OIL CO. PROPERTY 01-056)
500 GEORGE WASHINGTON WAY, RICHLAND, WASHINGTON

AGRA Earth & Environmental, Inc. (AEE) has completed a Limited Qualitative Risk Assessment for the Howard Amon Park area (herein referred to as the park) located east of the Richland Jackpot Foodmart (Time Oil Co. property 01-056) located at 500 George Washington Way in Richland, Washington. This risk assessment is limited to possible site-related impacts to the park and the Columbia River (Lake Wallula) shoreline adjacent to the park.

Chemicals of concern (COCs) investigated at the Jackpot Foodmart site are benzene, toluene, ethylbenzene, and total xylenes (BTEX) compounds and gasoline range petroleum hydrocarbons (GRPH). These compounds have been detected in groundwater samples collected from two wells located in the park (MW-7 and MW-10), and a low toluene concentration was detected in one seep sample collected along the bank of the Columbia River.

Groundwater beneath the park exists between approximately eight and ten feet below grade. Due to the depth of the affected medium (groundwater), there is no potential for human contact with the contaminants of concern. (This groundwater is not the source of drinking water in the park.) The seep sample contained a toluene concentration of 0.66 parts per billion (ppb), which is orders of magnitude below the established cleanup level of 40.0 ppb as set forth in the Model Toxics Control Act. Although there is a potential for human contact with groundwater emanating from seeps along the bank of the river, the toluene concentration is so minimal that a health-based exposure risk does not exist. Therefore, no site related health-based exposure risks currently exist to recreational users of the park, including users of the ball field, picnic grounds, and Columbia River in the vicinity of the park.

1.0 INTRODUCTION

AEE performed a limited, qualitative risk assessment for the park area adjacent to the Richland Jackpot Foodmart site located at 500 George Washington Way, Richland, Washington (Figure 1, Site Location Map and Figure 2, Site and Exploration Plan). This limited risk assessment is provided as an adjunct to AEE's completed subsurface petroleum hydrocarbon assessment and remedial investigation for this site, documented in a report dated 19 June 1995.

The risk assessment is limited as its scope encompasses only potential risk to recreational users of the park. The risk assessment is qualitative because constituent concentrations detected in seep and soil samples taken from the park are compared to risk-based levels provided in the Washington State Department of Ecology's (Ecology's) Model Toxics Control Act (MTCA) Cleanup Regulation, Chapter 173-340 WAC, amended December 1993. This approach emulates a screening level risk assessment, which is by definition qualitative. Screening level risk assessments make a simple comparison between site concentrations of COCs and their respective published risk-based concentrations (RBCs). Those COCs not exceeding their respective RBCs are screened out of further risk assessment. Those COCs exceeding their respective RBCs are discussed in qualitative terms.

Information obtained from the completed subsurface assessment and remedial investigation was used as the basis of analytical information for this risk assessment, coupled with the more recent analytical results obtained from the two seep samples and five soil samples collected from the bank of the Columbia River inside the park boundaries.

2.0 SITE INFORMATION

All site information was obtained from AEE's report entitled *Subsurface Petroleum Hydrocarbon Assessment and Remedial Investigation, Richland Jackpot Foodmart, Time Oil Co. Property 01-056, 500 George Washington Way, Richland, Washington*, 19 June 1995; from city maps; from a Sensitive Receptor Survey conducted by AEE in August 1995 (presented in Appendix A); and from a letter report to Time Oil dated 17 August 1995 regarding results of bank/seep sampling on the Columbia River (presented in Appendix B).

2.1 Site Description

The Jackpot Foodmart site is located in a primarily commercial area, with some residences to the south along George Washington Way. Site features include one retail building, three underground storage tanks (USTs), and two pump islands. The Columbia River, which is also known as Lake Wallula near the site, is located approximately 800 feet east-northeast of the site. Howard Amon Park is located between the site and the Columbia River. The park contains a baseball field and several picnic areas.

The subject site was operated as a bus depot and gasoline service station prior to being purchased by Time Oil Co. in 1968. The bus depot was demolished and a retail store constructed in the central area of the subject site. Three USTs and their associated product piping and dispenser islands were removed from the southwestern area of the site in 1990 and replaced with a new tank system. The new dispenser complex was constructed in the same location as the original complex, and the new USTs were relocated slightly east of the dispenser islands. A 750-gallon heating oil tank is also believed to have been located along the western wall of the former bus depot. However, it is not known whether this heating oil tank was removed during demolition of the bus depot.

2.2 Site Geology/Hydrogeology

Soils located beneath the site consist of coarse gravels with some cobbles in a sandy matrix. In general, subsurface soils beneath the site typically consist of a thin (approximately 3 feet) gravelly sand (fill) layer above sandy silt and/or silty sand with gravel to a depth of approximately 8 to 10.5 feet. The sand and silt overlie a sandy gravel with cobbles which grades into a gravelly coarse sand with traces of silt to the full depths explored, approximately 45 feet below ground surface (bgs). The borings completed in the vicinity of the park (MW-6, MW-7, MW-8, and MW-10) encountered medium dense, damp, brown gravelly sand (fill) over the native sandy gravel and gravelly sand with interbedded medium to coarse sand.

The Columbia River is presently dammed by the McNary Dam (approximately 36 river miles downstream), which forms Lake Wallula in the portion of the river east of the park. Shallow groundwater beneath the site appears associated with the current lake water table and fluctuates seasonally with river/lake levels. Groundwater flow direction may also be directly affected by river levels and discharge of the Yakima River which confluences with the Columbia River approximately two miles southeast of the site. The Yakima River course flows southerly approximately 6,500 feet west of the site.

The Columbia River Basalt Group hosts the area's regional aquifer system. These basalt flows compose a multilayered aquifer system with major aquifers located within the basalt interbeds. General regional groundwater flow is to the southeast. Some aquifers are connected hydraulically

through vertical fractures or columnar jointing within the thinner basalt flows. These deep aquifers are the predominant water source for some municipal, industrial, domestic, and agricultural needs. Locally, shallow perched aquifers may exist. The shallow aquifer beneath the site occurs at a depth of approximately 28 feet bgs at the subject site and approximately 8 to 10 feet bgs in the park, and appears to be part of the Lake Wallula water system. Drinking and industrial water for the City of Richland is also derived directly from the Columbia River. The City also maintains 18 deep wells (approximately 120 to 150 feet deep) used to access drinking water and placed in five separate well field locations around the city. These wells are screened within the unconsolidated flood deposits, except for one well which is located south of Richland and is screened within a basalt interflow at a depth of approximately 1,200 feet. The closest well field to the site is the Wellsian Way well field located approximately 4,000 feet west-southwest of the site. This well field was shut down in October 1991 due to the presence of chlorinated solvents detected within the groundwater supply.

Groundwater was encountered at 27.2 to 28.5 feet bgs in the elevated grade associated with the site and 9.6 to 11.7 feet bgs in the park's lower grade during the assessment/investigation in the spring of 1995. Groundwater migration direction is apparently towards the north-northeast and exhibits a hydraulic gradient of 0.0016 ft/ft, as determined by groundwater elevation measurements.

It is apparent that groundwater elevations and migration directions have fluctuated beneath the site as indicated by the orientation of a soil smear zone identified beneath the site and the park. This petroleum hydrocarbon containing smear zone, identified during drilling activities, is present between five and ten feet below static groundwater levels and oriented in an approximately east-west direction between MW-10 and MW-11. This would indicate that if the source of the smear zone emanated from the site, groundwater flow directions were towards the east during the migration time of the contaminant plume. Since the impacted soil zone was also identified in exploration MW-11 located west of the site across George Washington Way, it appears that either the groundwater direction was reversed due to operation of the Wellsian Way well field or that another possible source area was (is) present west of the site. Furthermore, the presence of the smear zone approximately five to ten feet below the groundwater interface indicates that a rise in groundwater has occurred since migration of the plume.

3.0 SUMMARY OF PAST ENVIRONMENTAL WORK AND ANALYTICAL TESTING

A soil and groundwater site assessment was performed in 1993 by Environmental Science & Engineering, Inc. Five groundwater monitoring wells (MW-1 through MW-5) and one vapor extraction well (VW-1) were installed on site. Soil contamination was detected beneath the former UST cavity during this assessment. Petroleum hydrocarbon impacted groundwater was also identified, emanating from both the former UST cavity and the existing pump island complex. Groundwater flow direction and hydraulic gradient were found to be to the east, with a calculated hydraulic gradient of 0.01 ft/ft.

A subsurface petroleum hydrocarbon assessment/remedial investigation was performed in April 1995, and is documented in detail in the AEE report entitled *Subsurface Petroleum Hydrocarbon Assessment and Remedial Investigation, Richland Jackpot Foodmart, Time Oil Co. Property 01-056, 500 George Washington Way, Richland, Washington* dated 19 June 1995.

During this investigation, a number of tasks were performed:

1. Sampling groundwater from five existing site wells prior to initiation of investigation.
2. Drilling and sampling seven borings followed by installation of seven groundwater monitoring wells.
3. Sampling groundwater from all wells following the investigation.
4. Installing one deep in-situ sparging well.
5. Conducting a 24-hour in-situ air sparging pilot test.
6. Conducting vapor extraction tests.

In February 1995, the five existing groundwater monitoring wells (MW-1 through MW-5) and the vapor extraction well (VW-1) were sampled and analyzed for BTEX, GRPH, and diesel range petroleum hydrocarbons (DRPH). Benzene concentrations which exceeded the MTCA cleanup levels were found in groundwater samples from MW-1, MW-3, MW-4 and VW-1, with the highest concentration found in MW-1 (39 ug/L). Toluene concentrations exceeding cleanup levels were found in MW-1 (890 ug/L) and MW-2. Ethylbenzene concentrations exceeding cleanup levels were found in MW-1 (430 ug/L), MW-2, MW-3, MW-4, and VW-1. Xylene concentrations exceeding cleanup levels were found in MW-1 (37,000 ug/L), MW-2, MW-4, and VW-1. GRPH concentrations exceeding the cleanup level of 1,000 ug/L were found in MW-1 (30,000 ug/L), MW-2, MW-4 and VW-1. DRPH concentrations which exceeded the cleanup level of 1,000 ug/L were found in MW-1 (1,800 ug/L) only. Tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in MW-2, and in MW-3 and MW-5, respectively, during this sampling event; however, none of the concentrations exceeded the cleanup level of 5 ug/L.

The seven exploratory borings were drilled on the site property and the adjacent park at depths ranging from 18.9 to 44.5 bgs, with collection of soil samples at five-foot depth intervals. One boring was completed as a 4-inch diameter groundwater recovery/monitoring/vapor extraction well (RW-1). One boring, from which no soils samples were collected, was completed to a depth of 50.3 feet bgs in order to install a 2-inch diameter in-situ sparging well (SW-1). The other six borings were completed as groundwater monitoring/vapor extraction wells (MW-6, MW-7, MW-8, MW-9, MW-10, and MW-11). A petroleum hydrocarbon impacted smear zone was identified in soil borings MW-7, MW-10, MW-11, SW-1, and RW-1. The smear zone is located approximately five to ten feet below the groundwater interface.

Twelve soil samples were analyzed for BTEX, GRPH, and DRPH. Only one of the twelve samples, RW-1 S-2, contained concentrations of analytes above the MTCA Method A soil cleanup levels. This sample from RW-1 was collected approximately 5 feet below the groundwater interface, in the heavily impacted soil smear zone mentioned above. This sample exhibited concentrations of 2,900 mg/kg GRPH, 220 mg/kg DRPH, 27.0 mg/kg ethylbenzene, and 110 mg/kg xylene. Because of matrix interference, the detection limits for benzene and toluene in this sample were high, at 22 mg/kg for each compound. No BTEX, GRPH, or DRPH were detected in the remaining eleven soil samples submitted from analysis.

Following well development, all twelve groundwater monitoring wells (MW-1 through MW-11 and RW-1) were sampled in April 1995. A single groundwater sample was also collected from SW-1, which is screened from 17 to 22 feet below the groundwater interface. All groundwater samples were analyzed for BTEX, GRPH, DRPH, PCE, and TCE. Analytical results indicated eight of the

thirteen wells sampled contained concentrations of BTEX/GRPH and DRPH above MTCA Method A groundwater cleanup levels (MW-1, MW-2, MW-3, MW-4, MW-7, MW-10, MW-11, and RW-1). The highest reported benzene concentration reported for this event was 72 ug/L in MW-7; highest concentration of toluene was 850 ug/L in MW-1; highest concentration of ethylbenzene was 1,400 ug/L in MW-7; highest concentration of xylenes was 6,400 in MW-7; highest concentration of GRPH was 44,000 ug/L in RW-1; and the highest concentration of DRPH was 2,700 ug/L in RW-1.

Detectable levels of PCE were identified in groundwater samples collected from MW-6 (2.5 ug/L), MW-8 (2.7 ug/L), MW-9 (3.7 ug/L) and MW-11 (2.5 ug/L). Only the groundwater sample collected from MW-3 had a detectable concentration of TCE (1.2 ug/L). Detection limits for groundwater collected from MW-1, MW-2, MW-4, MW-5, MW-7, MW-10 and RW-1 were 5.0 ug/L for both PCE and TCE due to high interference with the other hydrocarbon compounds.

The analytical laboratory reviewed the gas chromatographs for soil and groundwater samples and interpreted the diesel range concentrations present in several samples to be the presence of a weathered gasoline eluting in the diesel range (C_{12} to C_{24}), as promulgated in the WTPH-D methodology. Therefore, since diesel fuel did not appear to be a contaminant of concern, analysis of DRPH was discontinued following the second groundwater sampling event.

Two seep samples and five bank samples were collected on 3 August 1995 along the Columbia River shoreline within the boundaries of the park, and analyzed for BTEX and GRPH. All samples demonstrated non-detectable levels of BTEX and GRPH, with the exception of seep sample SEEP-01, which contained 0.66 ug/L toluene. The MTCA Method A Cleanup Level for toluene in groundwater is 40 ug/L.

4.0 LIMITED QUALITATIVE RISK ASSESSMENT

The risk assessment performed by AEE is limited since its scope encompasses only potential risk to recreational users of the park. The risk assessment is qualitative because constituent concentrations detected (or analytical method detection limits where constituents were not detected) in seep, soil, and groundwater samples taken from the park are compared to risk-based levels provided in MTCA (Chapter 173-340 WAC, amended December 1993). This approach emulates a screening level risk assessment, which is by definition qualitative. Screening level risk assessments make a simple comparison between site concentrations of COCs and their respective published RBCs.

4.1 Preliminary Information

The data used in this risk assessment was obtained from the AEE June 1995 report mentioned previously, and from analytical data obtained from the seep/bank sampling event which occurred adjacent to the west bank of the Columbia River/Lake Wallula in the park.

4.1.2 Analytical Data

Analytical data from the seep and bank sampling event will be discussed on an individual location basis. Analytical results have not been statistically combined. Analytical data obtained from groundwater sampling will be discussed in broadly qualitative terms in relation to its possible effect on the chemical composition of the bank seeps.

During the February and April 1995 groundwater sampling events, GRPH was analyzed by Ecology Method WTPH-G; BTEX was analyzed by EPA Method 8020 for soil samples and EPA Method 602 for groundwater samples; DRPH was analyzed by Ecology Method WTPH-D, including Ecology Method WTPH-D Extended for carbon chain lengths C_{25}-C_{36}; and PCE and TCE were analyzed by EPA Method 8260. Seep and bank samples collected along the Columbia River shoreline within park boundaries were analyzed for BTEX by EPA Method 8020 and for GRPH by Ecology Method WTPH-G.

4.1.3 Chemicals of Concern

Chemicals of concern at the site and adjacent park area are gasoline range petroleum hydrocarbons, including the constituents benzene, toluene, ethylbenzene, and xylene.

4.1.4 Nature of Site Releases

Three service station USTs and their associated product piping and dispenser islands were removed from the southwestern area of the site in 1990 and replaced with a new tank system. The new dispenser complex was constructed in the same location as the original complex, and the new USTs were relocated slightly east of the dispenser islands.

According to the soil and groundwater site assessment performed by Environmental Science and Engineering in 1993, contaminated soil was detected beneath the former UST cavity, and hydrocarbon impacted groundwater appeared to be emanating from both the former UST cavity and the existing pump island complex, although other sources of petroleum hydrocarbon impact may exist. Impacted groundwater appeared to be flowing east under the park towards the Columbia River, at a gradient of 0.0016 ft/ft, although recent data suggests a different groundwater flow currently exists (towards the north-northeast). Despite the fact that inconclusive data exists for the source(s) of the release(s) and the groundwater flow during the release(s), for the purpose of this risk assessment, the source is assumed to be the Jackpot site and the groundwater flow is assumed to be east, which was the apparent flow direction at the time of initial release.

4.1.5 Applicable or Relevant and Appropriate Requirements (ARARs)

Applicable or relevant and appropriate requirements are those federal, state, or program-related allowable concentrations of chemicals which are either directly applicable to the site, or if not directly applicable, are relevant and appropriate for the specific site situation in question.

For the sampling of seep groundwater and bank soils along the Columbia River adjacent to the park, MTCA Method A Cleanup Levels for Groundwater and MTCA Method A Cleanup Levels for Soil, respectively, were considered legally applicable requirements. Federal Maximum Contaminant Levels (MCLs) for drinking water, although potentially relevant and appropriate to use in assessing groundwater contamination, will not be used here because Ecology's MTCA Method A Cleanup Levels for BTEX in groundwater are more stringent than the corresponding MCLs.

MTCA Method A Cleanup Levels for both soil and groundwater are legally applicable in this instance because WAC 173-340-704 states that :

"Method A may be used to establish cleanup levels at the following types of sites:

(a) Sites undergoing routine cleanup actions as defined in WAC 173-340-130; or
(b) Sites where numerical cleanup standards are available in this chapter or applicable state and federal laws for all indicator hazardous substances in all media of concern."

The area examined in this risk assessment falls under part (b) above. Routine cleanup actions generally do not encompass impacted groundwater. MTCA Method A cleanup levels for the chemicals of concern are presented below in Table 1.0.

TABLE 1.0

MTCA Method A Cleanup Levels for Soil and Groundwater		
Compounds	Soil Cleanup Levels (mg/kg)	Groundwater Cleanup Levels (ug/L)
Benzene	0.5	5.0
Toluene	40.0	40.0
Ethylbenzene	20.0	30.0
Xylene	20.0	20.0
GRPH	100.0	1,000.0

All cleanup values were obtained from Tables 1 and 2 of WAC 173-340-720 and 173-340-740, respectively.

4.2 Exposure Assessment

Humans and the environment can be exposed to chemical releases through a number of different routes, or exposure pathways. Only complete pathways provide a route of exposure to humans. Complete pathways are defined by four components. If any one of the components is missing, the pathway is not considered complete, and therefore no risk can be associated with that pathway. These components are:

1) A source and mechanism of chemical release, e.g., spills.

2) A retention or transport medium, e.g., contaminated soil.

3) A point of potential human contact with the contaminated medium, referred to as the exposure point, e.g, a site worker getting contaminated soils on his/her skin.

4) An exposure route, e.g, skin absorption of the soil contaminants, at the contact point.

Analytical results from the seep and bank samples indicated that no chemicals of concern were detected in these media, with the exception of sample SEEP-01, which had a detected concentration of toluene (0.66 ug/L) which was orders of magnitude lower than the corresponding health-based

Method A cleanup level for toluene of 40 ug/L. Potential human receptors, such as current recreational users, will not come into contact with levels of contaminants which exceed the State of Washington health-based action levels for groundwater.

4.2.1 Impacted Media and Related Potential Exposure Pathways

Neither the seep groundwater nor the bank soils sampled contained concentrations of COCs which exceeded MTCA Method A cleanup levels, which are health-based. Nonetheless, potential exposure pathways for users of the park will be discussed.

Although impacted groundwater exists beneath the park, recreational users of the park cannot come into contact with it, due to its depth below the ground surface. Drinking fountain water in the park is supplied by the municipality, and does not come from the shallow groundwater aquifer beneath the park.

Groundwater from the vicinity of the site has been observed discharging into the Columbia River at two minor seeps along the river bank. Sample results indicate the groundwater sample from SEEP-01 contained toluene levels 0.66 ug/L, which is below the MTCA Method A cleanup level of 40 ug/L. Neither the other seep sample nor the five bank soil samples contained detectable levels of any contaminants of concern. This indicates that soils along this bank of the Columbia River/Lake Wallula have not been impacted by site releases. Furthermore, recreational users of the river shoreline in the park, such as boaters, waders, and swimmers would probably not be exposed through seep groundwater or bank soils to concentrations of COCs exceeding health-based cleanup action levels. In addition, these sample results indicate that site-related groundwater COCs exceeding action levels apparently have not reached the Columbia River via seep groundwater or through erosion of bank soils.

4.3 Toxicity Assessment

The purpose of a toxicity assessment is to provide current toxicological information on site-related chemicals of concern. Although none of the COCs were detected in seep groundwater or bank soils at concentrations exceeding MTCA Method A cleanup levels, the toxicity of each chemical will be discussed for informational purposes. In a quantitative baseline risk assessment format, non-carcinogenic and carcinogenic toxicity factors are obtained from the Integrated Risk Information System (IRIS) database or its companion document, the Health Effects Assessment Summary Tables (HEAST) and used in equations to calculate risk values. In this screening-level qualitative risk assessment, the toxicity values will be presented along with other information mainly as a vehicle for comparison purposes.

Toxicological effects of each compound are, from a regulatory perspective, the dominating health-based effects of that chemical as determined by EPA-approved studies and documented in the Integrated Risk Information System (IRIS) Database. For example, benzene is a carcinogen, while ethylbenzene, toluene, and xylene have health effects that may damage organs or organ systems, but do not cause cancer. Carcinogenic toxicity factors are called slope factors (SFs).

Non-carcinogenic toxicity factors are called reference doses (RfDs). In most cases, toxicity factors are based on oral toxicity, although many inhalation-based toxicity factors are available. Increasing carcinogenic potencies of various chemicals are represented by increasing SF values. However, as a non-carcinogenic RfD value decreases, the potency of the non-carcinogenic effect increases.

U.S. EPA's weight-of-evidence classification system for carcinogenicity is comprised of five different groups, all related to a compound's potential to cause cancer in humans:

CANCER CLASS	DEFINITION
A	Human carcinogen
B1	Probable human carcinogen with limited human data
B2	Probable human carcinogen with sufficient evidence in animals and inadequate or no evidence in humans
C	Possible human carcinogen
D	Not classifiable as to human carcinogenicity

All of the following non-referenced information was collected from the IRIS database and from the Hazardous Substances Database (HSDB). Both databases are contained in an "evergreen" Tomes database, 1994 and 1995. Physio-chemical characteristics of compounds determine to a large extent their longevity in the environment, their mobilities in various media, what form they exist in, and their eventual fate in the environment, all of which affect the toxicity of a particular compound.

4.3.1 Aromatic Volatile Organic Compounds (BTEX)

BTEX compounds are associated with gasoline, diesel, and TPH mixtures. At the Richland site, BTEX compounds are associated with weathered gasoline. Note that toluene, ethylbenzene, and xylene are non-carcinogenic compounds with relatively low toxicities.

BENZENE - Benzene is a class A carcinogen, i.e., a known human carcinogen. The oral SF for benzene is 2.9E-02 (mg/kg)/day. Benzene has a high mobility in soil and can leach to groundwater. It is subject to rapid volatilization near the soil surface and from surface water. It biodegrades fairly rapidly in soil. The main exposure routes are inhalation and ingestion. Benzene does not exhibit significant bioconcentration.

TOLUENE - Toluene is a non-carcinogen. The oral RfD for toluene is 2E-01 mg/kg/day, with the liver and kidney as the main target organs. Toluene has moderate to high mobility in soil and can leach to groundwater. It biodegrades in soil and water environments. The main exposure routes for toluene are through inhalation and ingestion. It absorbs dermally to a slight degree. Bioconcentration factors for this chemical are low.

ETHYLBENZENE - Ethylbenzene is a non-carcinogen. The oral RfD for ethylbenzene is 1E-01 mg/kg/day. Ethylbenzene displays a moderate adsorption to soil, and can leach to groundwater. Ethylbenzene volatilizes rapidly from the soil surface and from surface waters. It biodegrades rapidly in soil and water, and does not bioconcentrate significantly. The main exposure routes are through inhalation, ingestion, and dermal absorption.

XYLENE - Xylene is a non-carcinogen. Xylene, although generally reported as a single compound, is actually a combination of ortho, meta, and para-xylene, all with slightly differing physio-chemical parameters. The oral RfD for the xylene mixture is 2E+0 mg/kg/day, with the liver, gastrointestinal tract, and central nervous system as the target organs. Xylene has a low to moderate adsorption to soil. When spilled on land, xylene volatilizes and leaches through soil. It also volatilizes from surface water. The main exposure routes are ingestion and dermal absorption. Xylene, when ingested, is readily absorbed by the human system, as has been shown in accidental ingestions. Absorption through intact and broken skin occurs readily. Xylene is absorbed mainly through mucous membranes and the pulmonary system. Absorbed xylene is translocated through the vascular system.

4.3.2 Total Petroleum Hydrocarbons (TPH)

Total petroleum hydrocarbons (TPH) are a group of chemicals comprised of short carbon chains (C_4-C_{12}), which include the BTEX compounds and other gasoline range petroleum hydrocarbons; intermediate length carbon chain PAHs (C_9-C_{20}), which include diesel range petroleum hydrocarbons; and longer chain heavy oils, including fuel oils like Bunker C, kerosene, jet fuel, and crankcase oil (C_9-C_{50}). Because risk assessment formats require evaluation of individual chemicals, TPH as a group is not specifically evaluated for exposure risks to humans or the environment. Its varied chemical makeup makes quantification of its toxicity nearly impossible. So far, only the individual BTEX and PAH compounds have been assessed for health effects and assigned toxicity values. Nevertheless, TPH as a whole needs to be discussed in terms of its effects on human health.

A recent publication recommended by EPA's Environmental Criteria and Assessment Office in Cincinnati discusses the application of health-based criteria to TPH as a group. The document is available from the Massachusetts Department of Environmental Protection, and is entitled *Interim Final Petroleum Report: Development of Health-Based Alternative to the Total Petroleum Hydrocarbon (TPH) Parameter* (August 1994). In this document, subgroups of TPH are discussed: gasoline, diesel, light weight fuel oils and jet fuel; and No. 6 fuel.

It should be acknowledged that the group of chemicals known as TPH is a varied, complex mixture of hundreds of chemicals, with each TPH subgroup adding its own set of toxic effects. While health information is available for the pure products, released product changes in composition due to weathering processes like volatilization, biodegradation, etc. The environment that the mixture is released to presents another confounding set of parameters. It is difficult to draw any encompassing conclusions about the overall toxicity of TPH.

4.4 Risk Characterization

Generally, risk characterization combines the information from the exposure assessment and toxicity assessment in order to present an integrated picture of health risks associated with a particular site. In this case, however, because COCs were not detected at concentrations exceeding MTCA Method A cleanup levels in the media of concern, i.e., seep groundwater and bank soils, only the absence of human health exposure risk can be discussed.

Current recreational users of the park are not exposed to site-related impacts in groundwater or soil at concentrations which pose a health-based risk. This includes ball players and children playing on the park grounds as well as boaters, swimmers, and fishermen utilizing the Columbia River shore area of the park.

4.5 Final Conclusions

Although the Jackpot Foodmart site has documented impacts to site soils and groundwater, none of these impacts have been shown to affect recreational users of Howard Amon Park or the shoreline of the Columbia River/Lake Wallula in that area. Although impacted groundwater has been identified beneath the park, no COCs have been detected at concentrations above health-based levels in either seep groundwater samples or bank soil samples.

Possible future effects of impacted groundwater on the river shoreline within the park will be limited or prevented by ongoing remedial actions at the Foodmart site.

5.0 CLOSURE

This report has been prepared for the exclusive use of Time Oil Co. and their agents, in accordance with generally accepted professional consulting practices. No other warranty, express or implied, is made. The findings contained herein are relevant to the data available at the tie of this report. in the event that changes in the nature, usage or layout of the property or nearby properties are made, the conclusions and recommendations contained in this report may not be valid. If additional information becomes available, it should be provided to AEE so that the original conclusions and recommendations can be modified as necessary.

The purpose of a risk assessment is to reasonably evaluate the risks to human health and the environment from exposure to chemicals of concern. In performing a risk assessment, it is understood that the evaluation is based on specific site related information, limited to available analytical data obtained during prior investigations of the site. This data, collected from discrete sampling locations, may not represent conditions at unsampled locations.

We appreciate this opportunity to be of continued service to Time Oil Co. Should you have any questions regarding this limited risk assessment or this project in general, please do not hesitate to contact us at your earliest convenience.

Respectfully submitted,
AGRA Earth and Environmental, Inc.

(FOR)
Susan MacMillan
Risk Assessment Specialist

Bruce Williams
Senior Project Scientist

Jon N. Sondergaard, P.G., R.E.A.
Associate

Enclosures: Figure 1 - Site Vicinity Map
Figure 2 - Site and Exploration Plan
Appendix A - Sensitive Receptors Survey
Appendix B - Letter Report Entitled *Results of Bank/Seep Sampling on the Columbia River*, AEE, 17 August 1995

Wellsian Way Well Field

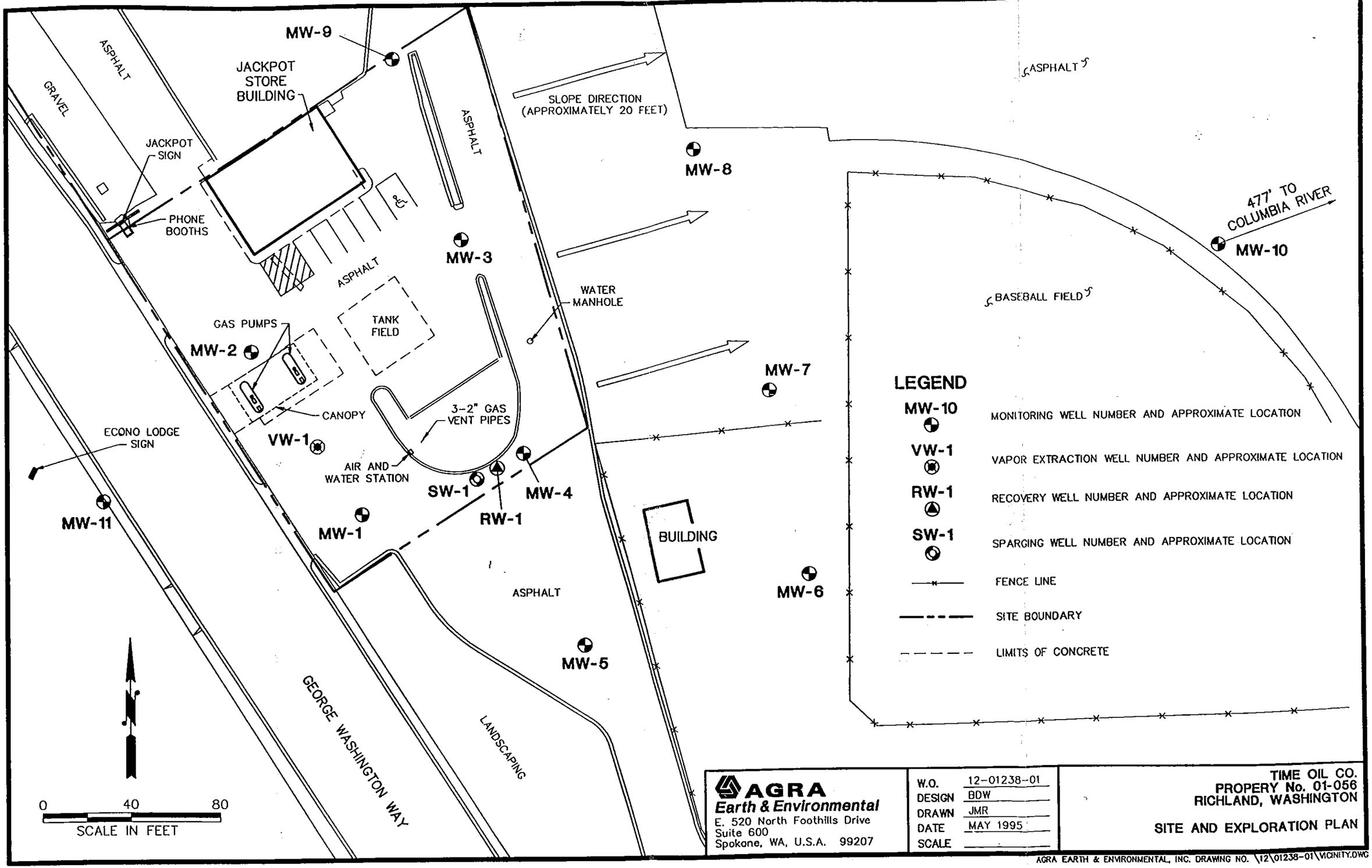
W.O.	12-1238-01
DESIGN	
DRAWN	JNS
DATE	SEPT 1995
SCALE	1"=2,000'

AGRA
Earth & Environmental
E. 520 North Foothills Drive, Suite 600
Spokane, Washington, U.S.A. 99207

SITE LOCATION

FIGURE 1

AGRA Earth & Environmental, Inc.



AGRA
Earth & Environmental
E. 520 North Foothills Drive
Suite 600
Spokane, WA, U.S.A. 99207

W.O.	12-01238-01
DESIGN	BDW
DRAWN	JMR
DATE	MAY 1995
SCALE	

TIME OIL CO.
PROPERY No. 01-056
RICHLAND, WASHINGTON

SITE AND EXPLORATION PLAN

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \12\01238-01\VICINITY.DWG

SENSITIVE RECEPTORS SURVEY

Store No.: 01-056 Time Oil Co.
Location: 500 George Washington Way
City/State: Richland, Washington

I. WATER SUPPLY

A. Is there a public water supply well within 2,500 feet? Y (N)
If yes, distance_____

B. Is there a private water supply well within 1,000 feet? Y (N)
If yes, distance_____

C. Describe type of local water supply. Include supplier's name, source, and distance to site.
City of Richland water supplied by Columbia River after treatment at plant located at 110 Saint St. approximately 2 1/2 miles north of the site.

D. Is the site within an aquifer protection district? If yes, describe.
No

E. Comments

II. SENSITIVE RECEPTORS

A. Are there any sensitive receptors, i.e. bodies of water; schools and daycare facilities; hospitals, convalescent centers, and retirement facilities; basements and subways; and/or others within 1,000 feet of the subject site?

(Y) N

Type of Receptor	Location	Position Relative to Site	Other
Columbia River		800 ft. east	
Private res/basement	509 Geo. Wash. Way	120 ft southwest	
Howard Amon Park	Immediately	eastof site	
Coummunity House	650 Geo. Wash. Way	150 ft northwest	

B. Comments:
Groundwater occurs at a depth of 27 to 28 ft. below the existing ground surface and is not expected to be intersected by site or public utilities.

III. POTENTIAL OFF-SITE SOURCES

A. Are there any potential off-site sources of contamination within 1000 feet of the site?

(Y) N

(i.e. underground storage tanks, leaking underground storage tanks, others)

TriCities Auto/Battery	601 Geo. Wash. Way	200 ft. northwest
Orcon Pest Contral	617 Jadwin Ave.	600 ft. northwest

B. Comments:

The former City of Richland Wellsian Way well field located approximately 3,500 feet west of the site has documented chlorinated volatile organicsin the groundwater. The well field is no longer used as a water supply source.

IV. OBSERVATION WELLS

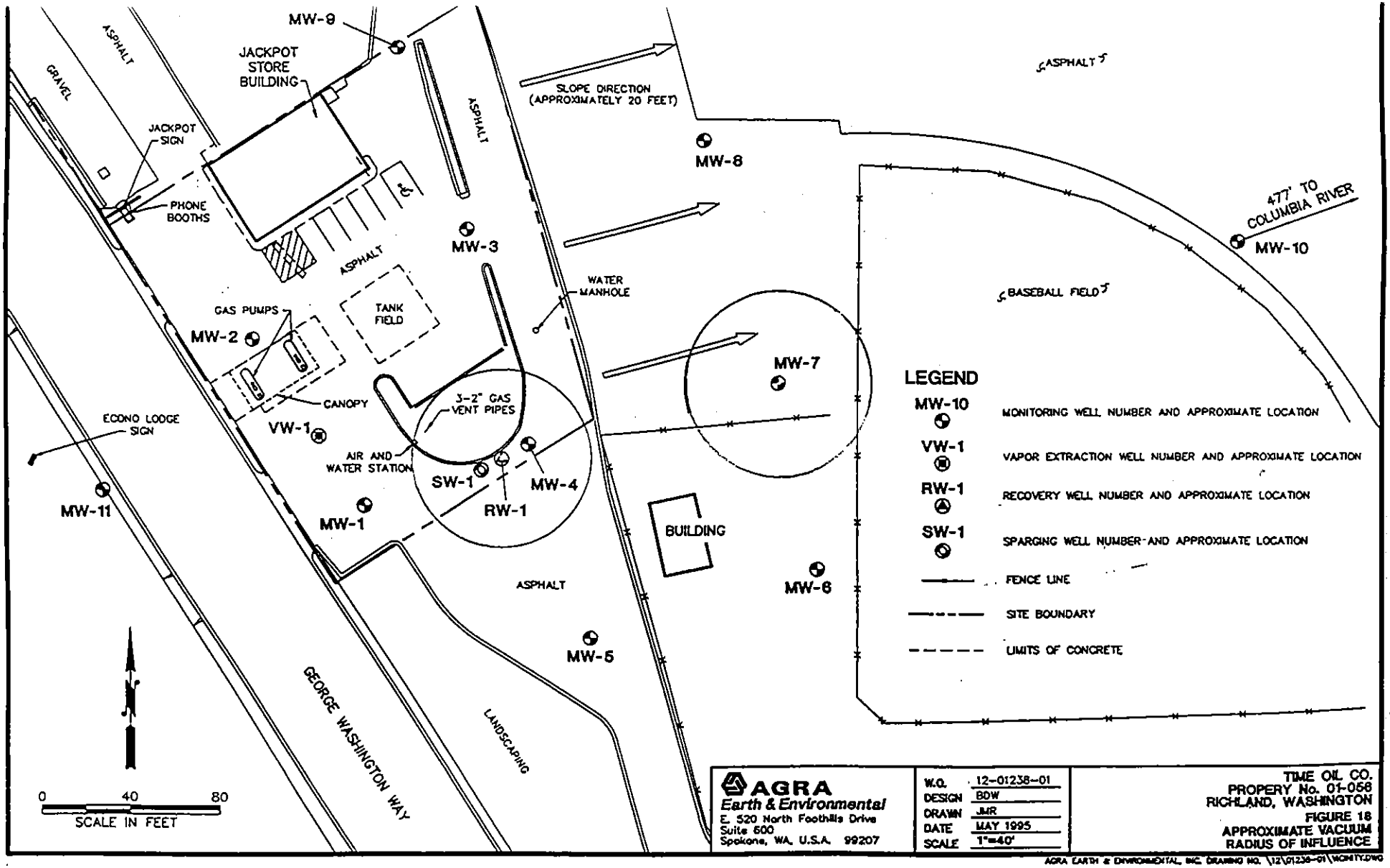
A. Describe observation wells, if any. Include number of wells, presence and amount of free product.

Thirteen wells of various configurations are located on and around the site as shown on the attached figure. No free phase product has been observed.

V. SIGNATURE OF PREPARER

DATE 8/18/95

This Sensitive Receptor Survey is only a limited,non-conclusive document to be used as a general indication of key sensitive receptors in the immediate vicinity of the site. No warranty, express or implied, is made.



AGRA Earth & Environmental
E. 520 North Foothills Drive
Suite 600
Spokane, WA. U.S.A. 99207

W.O.	12-01238-01
DESIGN	BDW
DRAWN	JMR
DATE	MAY 1995
SCALE	1"=40'

TIME OIL CO.
PROPERY No. 01-058
RICHLAND, WASHINGTON
FIGURE 18
APPROXIMATE VACUUM
RADIUS OF INFLUENCE

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \12\01238-01\MONITY.DWG

AGRA
Earth & Environmental
17 August 1995

AGRA Earth &
Environmental, Inc.
E 520 North Foothills Drive
Suite 600
Spokane, Washington
U.S.A. 99207.
Tel (509) 482-0104
Fax (509) 482-0202

Time Oil Company
2737 West Commodore Way
Seattle, Washington 98199-1233

Attention: Mr. Scott Sloan

Regarding: Results of Bank/Seep Sampling on Columbia River
Near Time Oil Property 01-056, Richland, Washington

Dear Mr. Sloan:

AGRA Earth and Environmental, Inc. (AEE) is pleased to submit this letter report presenting results of the bank and seep sampling event conducted along the Columbia River in the vicinity of the subject site (Figure 1 - Site Location Map). The purpose of this sampling event, performed on 3 August 1995 in Howard Amon Park, was to evaluate soil and groundwater conditions with respect to petroleum hydrocarbon impact along the west bank of the Columbia River.

Sampling Procedures
Sampling locations along the river were selected based upon an estimated projection of the down-gradient extent of the submerged hydrocarbon smear zone in soil, which extends to the northwest roughly in a line from monitoring well MW-1 to MW-10. Although recent water level measurements indicate groundwater flow is currently towards the northeast, during the time of the petroleum release at the subject site, groundwater flow was towards the east. Therefore, sampling locations were based upon the down-gradient direction of the plume at the time of the release. Sampling locations are presented in Figure 2.

Five soil samples and two seep samples were collected along the bank of the Columbia River. Each soil sample was collected from a point approximately one foot above the river elevation and less than five feet from the river edge. The bank along the river in this area drops approximately one to two feet in a nearly vertical direction from a grassy park area to the river shore. Soil samples were collected by first removing surficial soil from the bank using a decontaminated stainless steel trowel, then placing soil into two laboratory prepared 8-ounce sample jars. Seep samples were collected by excavating a small hole adjacent to the seep, allowing water to enter the hole, lowering a 40-milliliter unpreserved sample bottle beneath the water surface, opening the cap, allowing the water to fill the bottle, sealing the cap while underwater, then decanting the water into a 40-milliliter sample bottle preserved with hydrochloric acid.

Each sample was placed into an iced cooler, which was transported under AEE chain-of-custody procedures to National Environmental Testing (NET) laboratories of Portland, Oregon. All seven samples was analyzed for gasoline range petroleum hydrocarbons (GRPH) by Washington State

Department of Ecology Method WTPH-G and the aromatic hydrocarbons benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020.

Sampling Results

None of the five soil samples contained detectable concentrations of GRPH or BTEX compounds. Laboratory detection limits for GRPH ranged from 3 to 4 mg/kg or parts per million; laboratory detection limits for the BTEX compounds ranged from 0.3 to 0.4 mg/kg.

Neither of the two seep samples contained detectable concentrations of GRPH, benzene, ethylbenzene, or total xylenes. Sample SEEP-01 contained 0.66 ug/L or parts per billion of toluene, which is less than the cleanup level of 40.0 ug/L. Sample SEEP-02 did not contain detectable concentrations of any target analytes. Laboratory detection limits for GRPH were 50 ug/L; laboratory detection limits for the BTEX compounds were 0.5 ug/L.

Analytical results are summarized in Table 1; laboratory certificates are included in Appendix A.

Conclusions

Analytical results of the bank and seep sampling indicate minimal petroleum hydrocarbon impact along the west bank of the Columbia River in the vicinity of the site. In our opinion, the toluene result observed in the sample collected from SEEP-01 could possibly be a result of gasoline from boat motors (this portion of the Columbia River is heavily used for commercial and recreational boating), which could have been washed onto the beach at this location.

Although the results of this sampling event can be utilized to provide baseline risk assessment data for users of Howard Amon Park and the Columbia River, they should not be used alone to identify the down-gradient extent of petroleum hydrocarbons emanating from the subject site. Based upon the fluctuating hydrogeological characteristics observed at the site to date, the smear zone soils could be found at different depths or locations from those sampled during this event.

We appreciate being of continued service to Time Oil Co. If you have any questions regarding the contents of this letter, please do not hesitate to call us at your earliest convenience.

Respectfully submitted,
AGRA Earth and Environmental, Inc.

Bruce Williams
Senior Project Scientist

Jon N. Sondergaard, P.G., R.E.A.
Associate

Enclosures
Figure 1 - Site Location Map
Figure 2 - Sampling Locations
Table 1 - Summary of Bank/Seep Sample Results
Appendix A - Analytical Laboratory Certificates

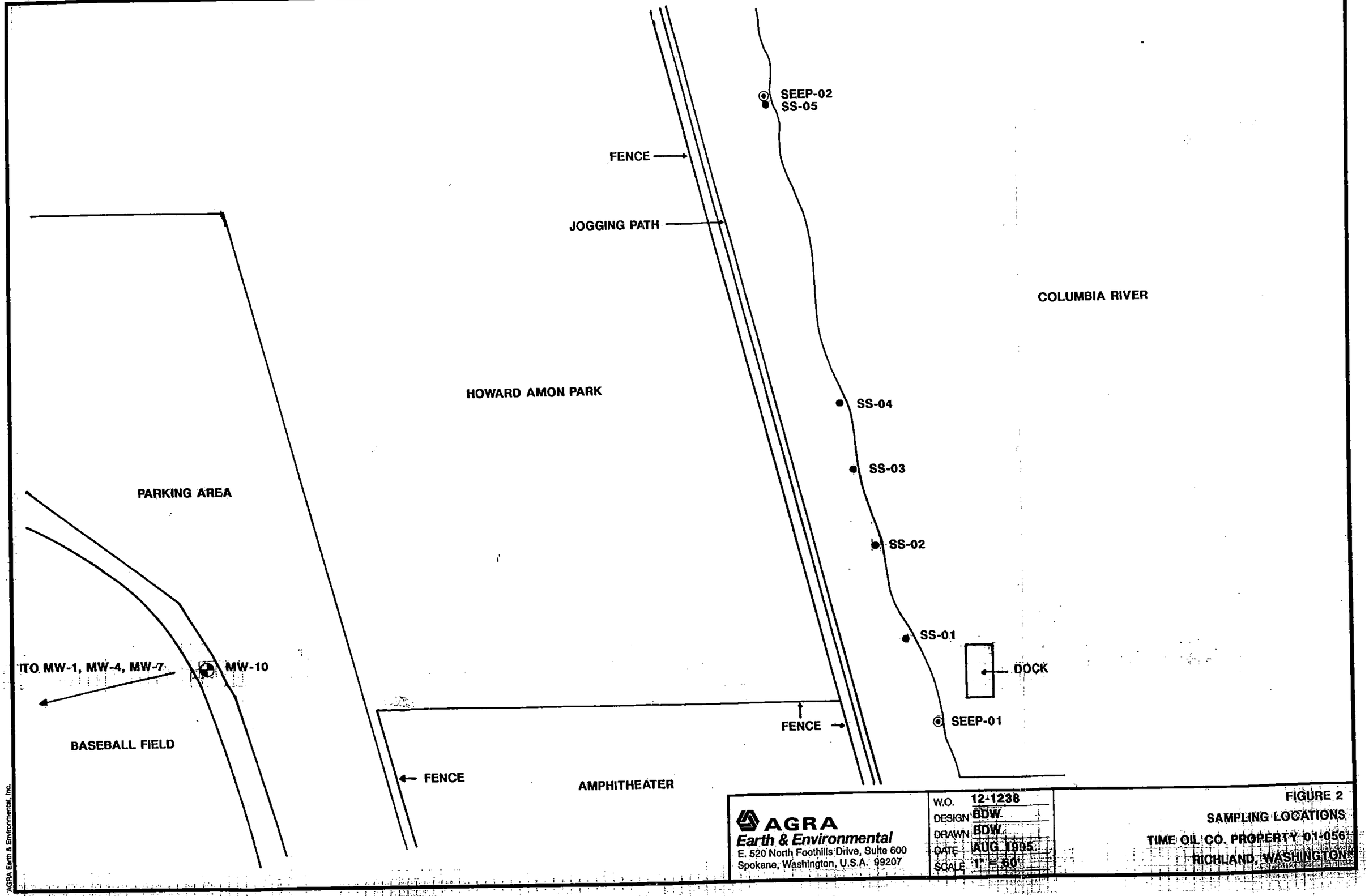
AGRA
Earth & Environmental
E. 520 North Foothills Drive, Suite 600
Spokane, Washington, U.S.A. 99207

W.O.	12-1238-01
DESIGN	
DRAWN	JNS
DATE	SEPT 1995
SCALE	1"=2,000'

SITE LOCATION

FIGURE 1

AGRA Earth & Environmental, Inc.



AGRA Earth & Environmental, Inc.

AGRA
Earth & Environmental
E. 520 North Foothills Drive, Suite 600
Spokane, Washington, U.S.A. 99207

W.O.	12-1238
DESIGN	BDW
DRAWN	BDW
DATE	AUG 1995
SCALE	1" = 50'

FIGURE 2
SAMPLING LOCATIONS
TIME OIL CO. PROPERTY 01-056
RICHLAND, WASHINGTON

TABLE 1 SUMMARY OF BANK/SEEP SAMPLING
TIME OIL PROPERTY 01-056
RICHLAND, WASHINGTON

SAMPLE NUMBER	DATE COLLECTED	UNITS	GRPH	BENZENE	TOLUENE	ETHYL-BENZENE	TOTAL XYLENES
SS-01	3 AUG 95	mg/kg	<4	<0.4	<0.4	<0.4	<0.4
SS-02	3 AUG 95	mg/kg	<4	<0.4	<0.4	<0.4	<0.4
SS-03	3 AUG 95	mg/kg	<4	<0.4	<0.4	<0.4	<0.4
SS-04	3 AUG 95	mg/kg	<3	<0.3	<0.3	<0.3	<0.3
SS-05	3 AUG 95	mg/kg	<4	<0.4	<0.4	<0.4	<0.4
SEEP-01	3 AUG 95	ug/L	<50	<0.5	0.66	<0.5	<0.5
SEEP-02	3 AUG 95	ug/L	<50	<0.5	<0.5	<0.5	<0.5

NATIONAL ENVIRONMENTAL TESTING, INC.

Portland Division
17400 SW Upper Boones Ferry Rd.
Suite #260
Portland, OR 97224
Tel: (503) 624-5449
Fax: (503) 639-6889

Scott Sloan
Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

Date: 08/10/1995
NET Account No.: 60277
NET Job Number: 95.02481

Project: 12-1238-03
Location: Time Oil- Richland, WA

Sample analysis in support of the project referenced above has been completed and results are presented on the following pages. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Sample Number	Sample Description	Matrix Type	Date Taken	Date Received
44568	SS-01	SOIL	08/03/1995	08/04/1995
44569	SS-02	SOIL	08/03/1995	08/04/1995
44570	SS-03	SOIL	08/03/1995	08/04/1995
44571	SS-04	SOIL	08/03/1995	08/04/1995
44572	SS-05	SOIL	08/03/1995	08/04/1995
44573	SEEP-01	GROUND WATER	08/03/1995	08/04/1995
44574	SEEP-02	GROUND WATER	08/03/1995	08/04/1995

Approved by:

Tabatha Brochu
NET, INC. Project Manager

ANALYTICAL REPORT

Scott Sloan
Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

08/10/1995
Job No.: 95.02481

Project Name: 12-1238-03
Date Received: 08/04/1995

Sample Number 44568 — Sample Description SS-01

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
Solids, Total	160.3	82	0.01	%	08/08/1995	
8020 BTEX (S)						
Dilution Factor		1	-		08/08/1995	
Benzene	8020	ND	0.4	mg/kg d	08/08/1995	
Toluene	8020	ND	0.4	mg/kg d	08/08/1995	
Ethylbenzene	8020	ND	0.4	mg/kg d	08/08/1995	
Xylenes, total	8020	ND	0.4	mg/kg d	08/08/1995	
WTPH-GAS (S)						
Dilution Factor		1	-		08/08/1995	
Gasoline	WTPH-G	ND	4.	mg/kg d	08/08/1995	

Sample Number 44569 — Sample Description SS-02

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
Solids, Total	160.3	80	0.01	%	08/08/1995	
8020 BTEX (S)						
Dilution Factor		1	-		08/08/1995	
Benzene	8020	ND	0.4	mg/kg d	08/08/1995	
Toluene	8020	ND	0.4	mg/kg d	08/08/1995	
Ethylbenzene	8020	ND	0.4	mg/kg d	08/08/1995	
Xylenes, total	8020	ND	0.4	mg/kg d	08/08/1995	
WTPH-GAS (S)						
Dilution Factor		1	-		08/08/1995	
Gasoline	WTPH-G	ND	4.	mg/kg d	08/08/1995	

Sample Number 44570 — Sample Description SS-03

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
Solids, Total	160.3	82	0.01	%	08/08/1995	
8020 BTEX (S)						

A sample result of ND indicates the parameter was Not Detected at the reporting limit.

ANALYTICAL REPORT

Scott Sloan
Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

08/10/1995
Job No.: 95.02481

Project Name: 12-1238-03
Date Received: 08/04/1995

Sample Number 44570 — Sample Description SS-03

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
Dilution Factor		1	-		08/08/1995	
Benzene	8020	ND	0.4	mg/kg d	08/08/1995	
Toluene	8020	ND	0.4	mg/kg d	08/08/1995	
Ethylbenzene	8020	ND	0.4	mg/kg d	08/08/1995	
Xylenes, total	8020	ND	0.4	mg/kg d	08/08/1995	
WTPH-GAS (S)						
Dilution Factor		1	-		08/08/1995	
Gasoline	WTPH-G	ND	4.	mg/kg d	08/08/1995	

Sample Number 44571 — Sample Description SS-04

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
Solids, Total	160.3	87	0.01	%	08/08/1995	
8020 BTEX (S)						
Dilution Factor		1	-		08/08/1995	
Benzene	8020	ND	0.3	mg/kg d	08/08/1995	
Toluene	8020	ND	0.3	mg/kg d	08/08/1995	
Ethylbenzene	8020	ND	0.3	mg/kg d	08/08/1995	
Xylenes, total	8020	ND	0.3	mg/kg d	08/08/1995	
WTPH-GAS (S)						
Dilution Factor		1	-		08/08/1995	
Gasoline	WTPH-G	ND	3	mg/kg d	08/08/1995	

Sample Number 44572 — Sample Description SS-05

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
Solids, Total	160.3	81	0.01	%	08/08/1995	
8020 BTEX (S)						
Dilution Factor		1	-		08/08/1995	
Benzene	8020	ND	0.4	mg/kg d	08/08/1995	

A sample result of ND indicates the parameter was Not Detected at the reporting limit.

ANALYTICAL REPORT

Scott Sloan
Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

08/10/1995
Job No.: 95.02481

Project Name: 12-1238-03
Date Received: 08/04/1995

Sample Number 44572 — Sample Description SS-05

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
Toluene	8020	ND	0.4	mg/kg d	08/08/1995	
Ethylbenzene	8020	ND	0.4	mg/kg d	08/08/1995	
Xylenes, total	8020	ND	0.4	mg/kg d	08/08/1995	
WTPH-GAS (S)						
Dilution Factor		1	-		08/08/1995	
Gasoline	WTPH-G	ND	4.	mg/kg d	08/08/1995	

Sample Number 44573 — Sample Description SEEP-01

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
BTEX/WTPH-Gasoline (W)						
Dilution Factor		1			08/09/1995	
Benzene	8020	ND	0.5	ug/L	08/09/1995	
Toluene	8020	0.66	0.5	ug/L	08/09/1995	
Ethyl Benzene	8020	ND	0.5	ug/L	08/09/1995	
Xylenes, total	8020	ND	0.5	ug/L	08/09/1995	
WTPH-Gasoline	WTPH-G	ND	50	ug/L	08/09/1995	

Sample Number 44574 — Sample Description SEEP-02

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
BTEX/WTPH-Gasoline (W)						
Dilution Factor		1			08/09/1995	
Benzene	8020	ND	0.5	ug/L	08/09/1995	
Toluene	8020	ND	0.5	ug/L	08/09/1995	
Ethyl Benzene	8020	ND	0.5	ug/L	08/09/1995	
Xylenes, total	8020	ND	0.5	ug/L	08/09/1995	
WTPH-Gasoline	WTPH-G	ND	50	ug/L	08/09/1995	

A sample result of ND indicates the parameter was Not Detected at the reporting limit.

SURROGATE REPORT

Scott Sloan
Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

08/10/1995
Job No.: 95.02481

Project Name: 12-1238-03
Date Received: 08/04/1995

SURROGATES	METHODS	RESULTS		DATE ANALYZED	FLAG
Sample Number	Sample Description				
44568	SS-01				
aaa-Trifluorotoluene (Surr.)	8020	131	%	08/08/1995	
aaa-Trifluorotoluene (Surr.)	WTPH-G	127	%	08/08/1995	
4-Bromofluorobenzene (Surr.)	WTPH-G	88	%	08/08/1995	
Sample Number	Sample Description				
44569	SS-02				
aaa-Trifluorotoluene (Surr.)	8020	102	%	08/08/1995	
aaa-Trifluorotoluene (Surr.)	WTPH-G	100	%	08/08/1995	
4-Bromofluorobenzene (Surr.)	WTPH-G	98	%	08/08/1995	
Sample Number	Sample Description				
44570	SS-03				
aaa-Trifluorotoluene (Surr.)	8020	96	%	08/08/1995	
aaa-Trifluorotoluene (Surr.)	WTPH-G	94	%	08/08/1995	
4-Bromofluorobenzene (Surr.)	WTPH-G	94	%	08/08/1995	
Sample Number	Sample Description				
44571	SS-04				
aaa-Trifluorotoluene (Surr.)	8020	107	%	08/08/1995	
aaa-Trifluorotoluene (Surr.)	WTPH-G	105	%	08/08/1995	
4-Bromofluorobenzene (Surr.)	WTPH-G	94	%	08/08/1995	
Sample Number	Sample Description				
44572	SS-05				
aaa-Trifluorotoluene (Surr.)	8020	126	%	08/08/1995	
aaa-Trifluorotoluene (Surr.)	WTPH-G	124	%	08/08/1995	
4-Bromofluorobenzene (Surr.)	WTPH-G	97	%	08/08/1995	
Sample Number	Sample Description				
44573	SEEP-01				

SURROGATE REPORT

Scott Sloan
Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

08/10/1995
Job No.: 95.02481

Project Name: 12-1238-03
Date Received: 08/04/1995

SURROGATES	METHODS	RESULTS		DATE ANALYZED	FLAG
Sample Number	Sample Description				
44573	SEEP-01				
aaa-TFT (BTEX-Surr.)	8020	101	%	08/09/1995	
aaa-TFT (Gas Surr.)	WTPH-G	98	%	08/09/1995	
Sample Number	Sample Description				
44574	SEEP-02				
aaa-TFT (BTEX-Surr.)	8020	120	%	08/09/1995	
aaa-TFT (Gas Surr.)	WTPH-G	119	%	08/09/1995	

QUALITY CONTROL REPORT
CONTINUING CALIBRATION VERIFICATION

Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

Date: 08/10/1995

NET Job Number: 95.02481

Contact: Scott Sloan
Project: 12-1238-03

Analyte	CCV True Concentration	Concentration Found	Percent Recovery	Date Analyzed
BTEX/WTPH-Gasoline (W)				
Benzene	20.0	21.0	105.0	08/09/1995
Toluene	20.0	20.9	104.5	08/09/1995
WTPH-Gasoline	700	724	103.4	08/09/1995
8020 BTEX (S)				
Benzene	20	21.8	109.0	08/08/1995
Toluene	20	21.7	108.5	08/08/1995
WTPH-GAS (S)				
Gasoline	700	728	104.0	08/08/1995

CCV - Continuing Calibration Verification

Note: Recovery limits for 8240, 8260, 8270, 8010, 8020, 624, 625 specified in method.
Gasoline, Diesel, 418.1, 418.1M limits 80-120%. Metals recovery limits 80-120%.

QUALITY CONTROL REPORT
LABORATORY CONTROL STANDARD

Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

Date: 08/10/1995

NET Job Number: 95.02481

Contact: Scott Sloan
Project: 12-1238-03

Analyte	LCS True Concentration	Concentration Found	LCS % Recovery	Date Analyzed
BTEX/WTPH-Gasoline (W)				
Benzene	12.7	10.6	83.5	08/09/1995
Toluene	38.4	36.6	95.3	08/09/1995
WTPH-Gasoline	350	364	104.0	08/09/1995
BTEX/WTPH-Gasoline (W)				
Benzene	12.7	10.3	81.1	08/09/1995
Toluene	38.4	35.5	92.4	08/09/1995
WTPH-Gasoline	350	356	101.7	08/09/1995
8020 BTEX (S)				
Benzene	12.7	12.5	98.4	08/08/1995
Toluene	38.4	41.1	107.0	08/08/1995
WTPH-GAS (S)				
Gasoline	350	380	108.6	08/08/1995

LCS - Laboratory Control Standard

Note: Recovery limits for fuels 80-120%. 8010, 8020, 8240, 8260, 8270, 624, 625 specified in method. Recovery limits for metals analyses 80-120%. 418.1 limits are 90-140%.

QUALITY CONTROL REPORT
MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

Date: 08/10/1995

Job Number: 95.02481

Contact: Scott Sloan
Project: 12-1238-03

Analyte	Matrix Spike Result	Sample Result	Spike Amount	Units	Percent Recovery	MSD Result	MSD Spike Amount	Units	Percent Recovery	MS/MSD RPD
BTEX/WTPH-Gasoline (W)										
Benzene	1117	ND	1270	ug/L	88.0	1167	1270	ug/L	91.9	4.3
Toluene	3787	ND	3840	ug/L	98.6	3931	3840	ug/L	102.4	3.7
8020 BTEX (S)										
Benzene	2.2	ND	2.4	mg/kg	92.4	2.2	2.4	mg/kg	91.4	1.1
Toluene	7.4	ND	8.3	mg/kg	88.6	7.5	8.3	mg/kg	89.5	1.0
WTPH-GAS (S)										
Gasoline	74.	ND	79.	mg/kg	93.7	76.	79.	mg/kg	96.5	2.9

NOTE: Matrix Spike Samples may not be samples from this job.

MS = Matrix Spike
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference
dil.= Diluted Out

QUALITY CONTROL REPORT
BLANKS

Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

Date: 08/10/1995

NET Job Number: 95.02481

Contact: Scott Sloan
Project: 12-1238-03
Location: Time Oil- Richland, WA

Analyte	Blank Analysis	MDL	Units	Date Analyzed
BTEX/WTPH-Gasoline (W)				
Dilution Factor	1			08/09/1995
Benzene	ND	0.5	ug/L	08/09/1995
Toluene	ND	0.5	ug/L	08/09/1995
Ethyl Benzene	ND	0.5	ug/L	08/09/1995
Xylenes, total	ND	0.5	ug/L	08/09/1995
WTPH-Gasoline	ND	50	ug/L	08/09/1995
aaa-TFT (Gas Surr.)	117		%	08/09/1995
aaa-TFT (BTEX-Surr.)	117		%	08/09/1995
8020 BTEX (S)				
Benzene	ND	0.5	mg/Kg	08/08/1995
Toluene	ND	0.5	mg/Kg	08/08/1995
Ethylbenzene	ND	0.5	mg/Kg	08/08/1995
Xylenes, total	ND	0.5	mg/Kg	08/08/1995
aaa-Trifluorotoluene (Surr.)	138	-	%	08/08/1995
WTPH-GAS (S)				
Gasoline	ND	10	mg/Kg	08/08/1995
aaa-Trifluorotoluene (Surr.)	140	-	%	08/08/1995

Advisory Control Limits for Blanks:
Metals/Wet Chemistry/ Conventionals/GC - all compounds should be less than the Reporting Limit.
GC/MS - Semi-Volatiles - all compounds should be less than the Reporting Limit except for phthalates which should be less than 5 times the reporting limit.

QUALITY CONTROL REPORT
DUPLICATES

Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199-1233

Date: 08/10/1995

Job Number: 95.02481

Contact: Scott Sloan
Project: 12-1238-03

Analyte	Original Analysis	Duplicate Analysis	Units	RPD	Date Analyzed	Flag
8020 BTEX (S)						
Benzene	ND	ND	mg/kg		08/08/1995	
Toluene	ND	ND	mg/kg		08/08/1995	
WTPH-GAS (S)						
Gasoline	ND	ND	mg/kg		08/08/1995	

NOTE: Duplicates may not be samples from this job.

RPD - Relative Percent Difference

A	This sample does not have a typical gasoline pattern.
B1	This sample does not have a typical diesel pattern.
B	The blank exhibited a positive result greater than the reporting limit for this compound.
C	The sample appears to contain a lighter hydrocarbon than gasoline.
D	The sample appears to extend to a heavier hydrocarbon range than gasoline.
E	The sample appears to extend to a lighter hydrocarbon range than diesel.
F	The sample appears to extend to a heavier hydrocarbon range than diesel.
G	The positive result for gasoline is due to single component comtamination.
H	The gasoline elution pattern for the sample is not typical.
I	The oil pattern for this sample is not typical.
J	The result for this compound is an estimated concentration.
L	The LCS recovery exceeded control limits. See the LCS page of this report.
M	MS and/or MSD percent recovery exceeds control limits.
MR	The MS/MSD RPD is greater than 20%. The sample was re-extracted and re-analyzed with similar results. This is due to a matrix interference, likely a non-homogeneity of the sample.
P	A post digestion spike was analyzed, and recoveries are within control limits.
Q	Detection limits elevated due to sample matrix.
R	The duplicate RPD was greater than 20%. The sample was re-extracted and re-analyzed with similar results. This indicates a matrix interference in the sample, likely a non-homogeneity of the sample.
SR	Surrogate recovery outside control limits. See the surrogate page of the report.
W	The duplicate RPD was greater than 20%. Due to insufficient sample, re-analysis was not possible.
X	Sample was analyzed outside recommended holding times.
Y	The result for this parameter was greater than the TCLP regulatory limit.
Z	The pattern seen for the parameter being analyzed is not typical.

AGRA
Earth & Environmental
E 520 North Foothills Drive, Suite 600
Spokane, Washington, U.S.A. 99207
Tel (509) 482-0104 Fax (509) 482-0202

02387

CHAIN OF CUSTODY

PROJECT: Time - Richland	PROJECT No.: 12-1238-03
CLIENT: AGRA	PHONE No.: (509) 482-0104
PROJECT MANAGER: Bruce Williams	PHONE No.:
SAMPLER'S NAME (please print): Bruce Williams	PHONE No.:
SAMPLER'S SIGNATURE: Bruce Williams	

SAMPLE I.D.	DATE	TIME	MATRIX	PRESERVATIVE	CONTAINERS No.	CONTAINERS VOL.
1. SS-01	8/3/95	0955	S	—	2	8oz
2. SS-02		0920	S	—		
3. SS-03		0930	S	—		
4. SS-04		0940	S	—		
5. SS-05		0945	S	—	↓	↓
6. SEEP-01		1005	W	HCl	3	40ml
7. SEEP-02	↓	1015	W	HCl	↓	↓
8.						
9.						
10.						

ANALYSIS REQUESTED (circle, check box or write preferred method in box)

BTEX by EPA 602 / 8020	WTPH-G	BTEX / WTPH-G	WTPH-HCID	WTPH-D / WTPH-D EXTENDED	TPH by EPA 8015 MODIFIED	WTPH-418.1 MODIFIED	TPH by EPA 418.1	GC / MS EPA 624 / 8240 or EPA 8260 Volatiles	GC / MS EPA 625 / 8270 Semi-volatiles	VOCs EPA 601 / 8010 or EPA 602 / 8020	PCBs EPA 608 / 8080	LEAD EPA 6010 / EPA 7421 Total / Dissolved	TOTAL METALS	TCLP				
		X																
		X																
		X																
		X																
		X																
		X																
		X																
		X																

SAMPLE RECEIPT	LABORATORY: NET	TURNAROUND TIME	SPECIAL INSTRUCTIONS / ADDITIONAL COMMENTS
TOTAL # CONTAINERS	SHIPPING I.D. / AIRBILL #	☐ 8 HOUR	Water samples contain debris. Please pre-filter if possible
CONDITION OF CONTAINERS	CARRIER	☐ 24 HOUR	
CONDITION OF SEALS	DOT DESIGNATION	☒ WEEK	
		☐ 2 WEEK (standard)	
		☐ OTHER _____	

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
1. Bruce Williams	8/3/95	1200	1. NET	8/4/95	0940
2.			2.		
3.			3.		

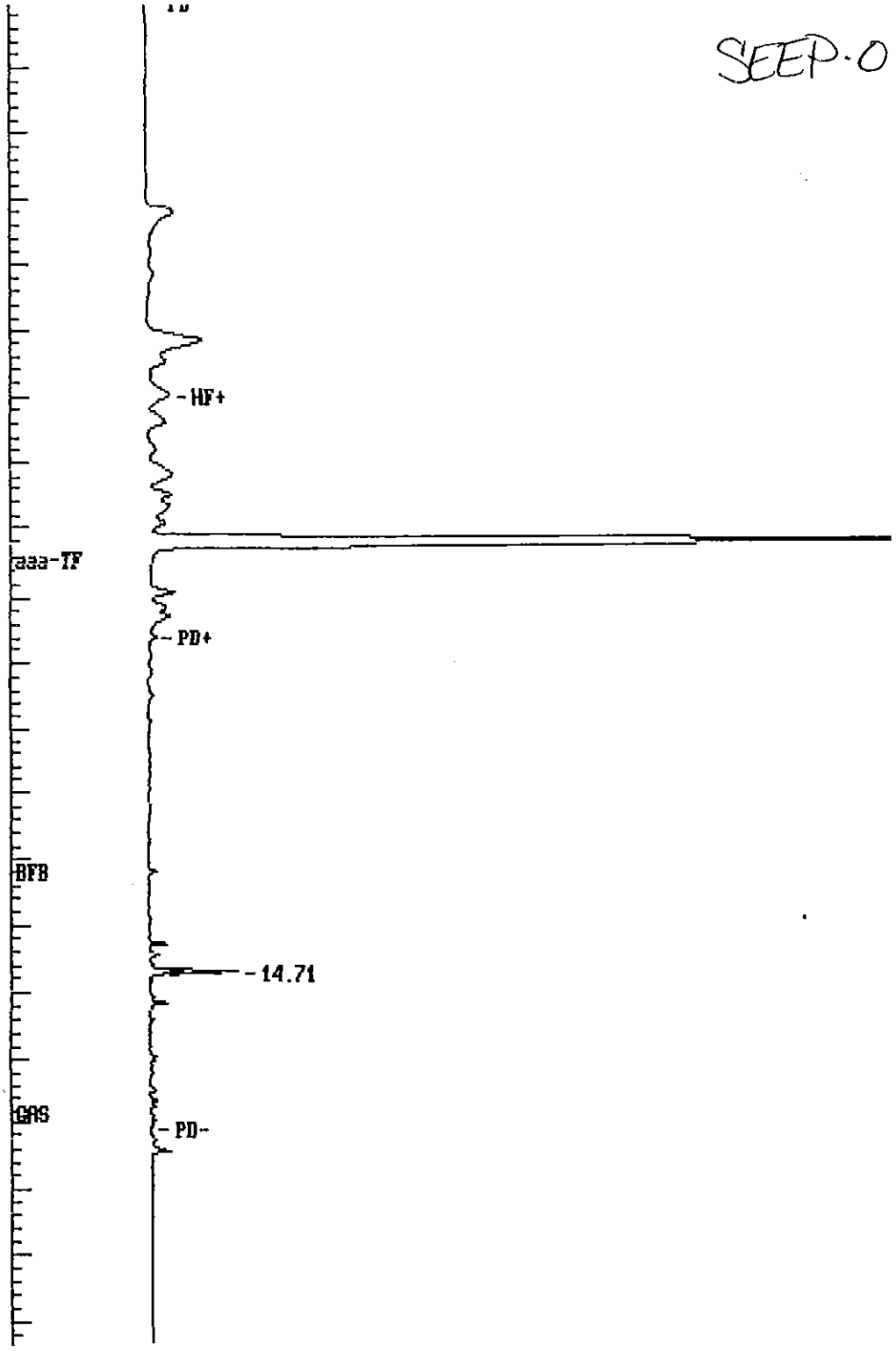
PAGE _____ OF _____

AGRA Earth & Environmental, Inc. (7/94)

DISTRIBUTION: White, Yellow - Laboratory, Pink - Originator

Data File = I:\AU09F26.PTS Printed on 08-10-1995 at 14:04:44
Start time: 0.00 min. Stop time: 20.30 min. Offset: 0 cts
Full Range: 90 K-Counts

SEEP-01



Data File = I:\BU09F26.PTS Printed on 08-10-1995 at 14:07:49
Start time: 0.00 min. Stop time: 19.00 min. Offset: -5 K-cts
Full Range: 90 K-Counts

SEEP-01