RESULTS OF A SITE ASSESSMENT INVESTIGATION AT MAID O'CLOVER FACILITY 1802 E. NOB HILL BOULEVARD YAKIMA, WASHINGTON

FOR:

MAID O'CLOVER CORPORATION
202 SOUTH FIFTH AVENUE
YAKIMA, WA 98902

PREPARED BY:

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RESULTS OF A SITE ASSESSMENT INVESTIGATION AT MAID O'CLOVER FACILITY YAKIMA, WASHINGTON

1.0 INTRODUCTION

This report summarizes the results of a Site Assessment Investigation conducted by Environmental Science & Engineering, Inc. (ESE) at a Maid O'Clover facility in Yakima, Washington. The purpose of the investigation was to assess the lateral and vertical extent of soil and/or ground water impacted with petroleum hydrocarbons beneath the subject site. The scope of work for this investigation included the drilling of three soil borings, convertion of each of the borings to ground water monitoring wells and the collection and chemical analysis of soil and ground water samples.

This report presents information concerning the local geology and hydrogeology, and the results of on-site data collection. The data collection procedures employed during this investigation are documented in this report as are the methods and rationale for chemical analyses of soil samples. The physical and chemical findings of the program are presented and discussed herein, and are the basis for ESE's conclusions and recommendations concerning shallow subsurface soil and ground water at the subject site.

2.0 BACKGROUND INFORMATION

2.1 SITE DESCRIPTION AND HISTORY

The subject site is located at 1802 E. Nob Hill Boulevard, on the southeast corner of the intersection of 18th Street and E. Nob Hill Boulevard, in Yakima Washington (Figure 1). Two 6,000-gallon capacity gasoline underground storage tanks (USTs), and two 10,000-gallon capacity gasoline USTs are currently located on the property (Figure 2).

Convienience stores and service stations operating USTs containing petroleum hydrocarbon products for retail sale are present immediately north, northwest, and west of the subject facility. In addition, the facility is located approximately one quarter mile to the east of an Exxon service station at which a documented petroleum hydrocarbon release has occured.

The Site Assessment was initiated by the Washington State Department of Ecology (DOE). The DOE received reports of gasoline odors in residential basements to the south of the Maid O'Clover facility. In response, the DOE issued letters ordering nearby UST operators to conduct tank integrity tests. The test results indicated that leakage may have occurred from a turbine pump associated with the western-most 10,000-gallon capacity gasoline UST at the Maid O' Clover facility.

2.2 SITE GEOLOGY AND HYDROGEOLOGY

The local geology consists predominantly of four formations. These formations are the Yakima Basalt, the Ellensburg Formation, an extensive body of cemented basalt gravel, and a relatively thin mantle of unconsolidated and semi-consolidated stream deposits of recent age. (U.S. Geological Survey, 1962).

Ground water in the unconsolidated alluvium in the area is freely interconnected with the streams. Water may alternately rise to or percolate below the land surface several times during its course eastward through the Ahtanum Valley. During most of the year, stream flow is maintained largely by ground water discharge; conversely, much of the recharge to both shallow and deep ground water bodies occurs by direct infiltration from stream channels and by infiltration of irrigation water derived from streams.

First ground water was identified beneath the site at a depth of approximately 16 to 17 feet below ground surface (bgs). The direction of ground water flow beneath the site is uncertain. However, according to DOE personnel, ground water flow in the site area is believed to be to the southeast.

3.0 SITE ASSESSMENT PROGRAM

The objective of the Site Assessment Program was to assess the lateral and vertical extent of soil and/or ground water impacted with petroleum hydrocarbons beneath the subject site. The program consisted of drilling three soil borings and converting each of these borings to ground water monitoring wells (MW-1, MW-2, and MW-3). Soil and ground water samples were collected from each boring/well and submitted for laboratory analyses. The Site Assessment program is described in detail in the following sections.

3.1 DRILLING AND SOIL SAMPLING

Three soil borings were drilled using a truck-mounted O-DEX drilling system. The depths of the borings ranged from 53 to 55 feet bgs. Soil sample collection was attempted at 5-foot intervals during the drilling process for lithologic description and laboratory analyses. Soil samples were not collected at depths in excess of the static ground water level. A detailed description of the drilling and soil sampling procedures are included in Appendix A. Soil boring logs are presented in Appendix B.

3.2 GROUND-WATER MONITORING WELL INSTALLATION

Each of the three soil borings were converted to ground water monitoring wells (MW-1, MW-2, and MW-3) to assess the ground water quality beneath the site (Figure 2). The ground water monitoring wells were constructed of 2-inch inside diameter (ID) PVC blank and perforated casing. Appendix A contains a diagram of the typical monitoring well, and a description of the proceedures and construction specifications used during well installation.

3.3 GROUND-WATER SAMPLING

Ground water monitoring Wells MW-1, MW-2, and MW-3 were developed and sampled to assess the ground water quality beneath the site. These wells were developed by removing approximately four casing volumes of fluid with a small water pump. Once the wells were developed, ground water samples were collected from each well. Samples were placed in 40 milliliter (ml) glass vials having threaded septum lids and immediately capped to minimize the loss of volatile constituents. Samples were labeled with the sample identification number, date and time of sampling, and analyses required. Samples were placed on ice in a cooler for preservation of sample integrity during field work and transport. A detailed description of the ground water sampling procedures are included in Appendix A.

3.4 WELL SURVEYING AND GROUND WATER DEPTH MEASUREMENTS

The top of each ground water monitoring well casing was surveyed to establish vertical control. On February 14, 1991, after the elevations were recorded, the depths to ground water and floating product were measured using an electronic tape. Details of well leveling and ground water depth measurement procedures are included in Appendix A.

3.5 LABORATORY ANALYSES

Chemical analyses of all soil and ground water samples were conducted by North Creek Analytical located in Bothell, Washington. Selected depth-specific soil samples collected from on-site wells were analyzed for purgeable total petroleum hydrocarbons (TPH) using EPA Method 8015 and for Benzene, Toluene, Ethylbenzene, and Total Xylene (BTEX) using EPA Method 8020. Ground water samples collected from Wells MW-1, MW-2, and MW-3 were analyzed for purgeable TPH using EPA method 8015 and for BTEX using EPA Method 8020.

4.0 FINDINGS

4.1 PHYSICAL RESULTS

4.1.1 Soil

Soil beneath the site consists predominantly of sandy gravel to a depth of approximately 55 feet bgs.

Slight gasoline odors were detected in the soil sample collected from a depth of 15 feet bgs in Well MW-3. (Figure 2). For a more detailed description of the lithology at the site, refer to the boring logs included in Appendix B.

4.1.2 Ground Water

Ground water was identified at depths ranging from 16 to 17 feet bgs during this investigation.

The presence of approximately 0.2 feet of floating hydrocarbon product in Well MW-3 prevented an accurate determination of the ground water gradient and flow direction beneath the site. Refer to Appendix C for the actual depth to ground water and floating hydrocarbon thickness measurements.

4.2 CHEMICAL RESULTS

4.2.1 Soil

Laboratory results of soil sample analyses are summarized in Table 1. Copies of the laboratory reports and chain-of custody documentation are included in Appendix D.

Laboratory results of EPA Method 8015 analysis indicate that none of the soil samples collected from Wells MW-1, MW-2, and MW-3 contained TPH concentrations above the laboratory detection limit.

EPA Method 8020 results indicate that Benzene, Toluene, Ethylbenzene, and Total Xylenes were not detected above their respective limits of detection in any of the soil samples collected from Wells MW-1, MW-2, and MW-3.

4.2.2 Ground Water

Laboratory results of ground water sample analyses are summarized in Table 2. Copies of the laboratory reports and chain-of custody documentation are included in Appendix D.

Ground water samples analyzed for purgeable TPH using EPA Method 8015 contained concentrations ranging from less than 30 micrograms per liter (ug/l) or parts per billion (ppb) to 45,000 ppb.

Ground water samples analyzed for Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX) using EPA Method 8020 contained concentrations ranging from less than 0.30 ppb to 3,200, 6,200, 280, and 11,000 ppb, respectively.

TABLE 1. RESULTS OF SOIL SAMPLE ANALYSES;
EPA METHODS 8015 AND 8020

		EPA METHOD 8015 (ppm)	EPA METHOD 8020 (ppm)			
SAMPLE NUMBER	DEPTH	TPH	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES
MW-1	5	ND	ND	ND	ND	ND
MW-1	10	ND	ND	ND	ND	ND
MW-1	15	ND	ND	ND	ND	ND
MW-2	10	ND	ND	ND	ND	ND
MW-2	15	ND	ND	ND	ND	ND
MW-3	5	ND	ND	ND	ND	ND
MW-3	10	ND	ND	ND	ND	ND
MW-3	15	ND	ND	ND	ND	ND

ppm - Parts per million or milligrams per kilogram (mg/kg)
TPH - Total Petroleum Hydrocarbons
ND - Not Detected
EPA - Environmental Protection Agency

TABLE 2. RESULTS OF GROUND WATER SAMPLE ANALYSES;
EPA METHODS 8015 AND 8020

	EPA METHOD 8015(ppb)	EPA METHOD 8020 (ppb)			
SAMPLE NUMBER	TPH	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES
MW-11	ND	ND	ND	ND	ND
MW-21	34	ND	ND	ND	ND
MW-31	45,000	3,200	6,200	280	11,000

ppb - Parts per billion or micrograms per liter (ug/l)
TPH - Total Petroleum Hydrocarbons
ND - Not Detected
EPA - Environmental Protection Agency

5.0 CONCLUSIONS

Environmental Science & Engineering, Inc. has conducted a Site Assessment Investigation at the Maid O' Clover facility in Yakima, Washington to evaluate the lateral and vertical extent of petroleum hydrocarbon concentrations in site soil and ground water. The conclusions of this investigation are discussed in the following sections.

5.1 CLEAN-UP LEVEL GUIDELINE

The State of Washington, Department of Ecology (DOE) has adopted the Model Toxics Control Act (MTCA) Clean-up Regulation, Chapter 173-340 WAC. The regulation specifies clean-up level guidelines for various substances in soil and ground water. The following table outlines the clean-up levels in soil for the constituents analyzed in this investigation. The soil clean-up levels listed below are for industrial or commercial facilities.

STATE CLEAN-UP LEVEL GUIDELINES (SCLGs)

CONSTITUENT	SOIL (ppm)	GROUND WATER (ppb)
TPH (gasoline)	100	1,000
Benzene	0.5	5
Toluene	40	40
Ethylbenzene	20	20
Total Xylenes	20	20

5.2 SOIL

- Results of TPH analyses using EPA Method 8015 indicate that none of the soil samples collected contained petroleum hydrocarbon concentrations above the laboratory limit of detection.

- Results of BTEX analyses using EPA Method 8020 indicate that none of the soil samples collected contained BTEX constituent concentrations above the laboratory limits of detection.

5.3 GROUND WATER

- Results of TPH analyses using EPA Method 8015 indicate that the ground water sample collected from Well MW-3 contained a TPH concentration above the current MTCA clean-up level guideline. TPH concentrations were not detected above laboratory detection limits in Well MW-1, and were detected below the current MTCA clean-up level guideline in Well MW-2.

- Results of BTEX analyses using EPA Method 8020 indicate that the ground water sample collected from Well MW-3 contained Benzene, Toluene, Ethylbenzene, and Total Xylene concentrations above the current MTCA clean-up level guidelines. BTEX constituents were not detected above laboratory detection limits in Wells MW-1 and MW-2.

- Ground water was encountered at depths between 16 and 17 feet bgs during this investigation.

- The ground water flow direction could not be accurately evaluated during this investigation due to the presence of approximately 0.2 feet of floating hydrocarbon product in Well MW-3.

Based on the physical and analytical results of this investigation, petroleum hydrocarbons, possibly released from a faulty turbine pump, have impacted ground water beneath the USTs at the site.

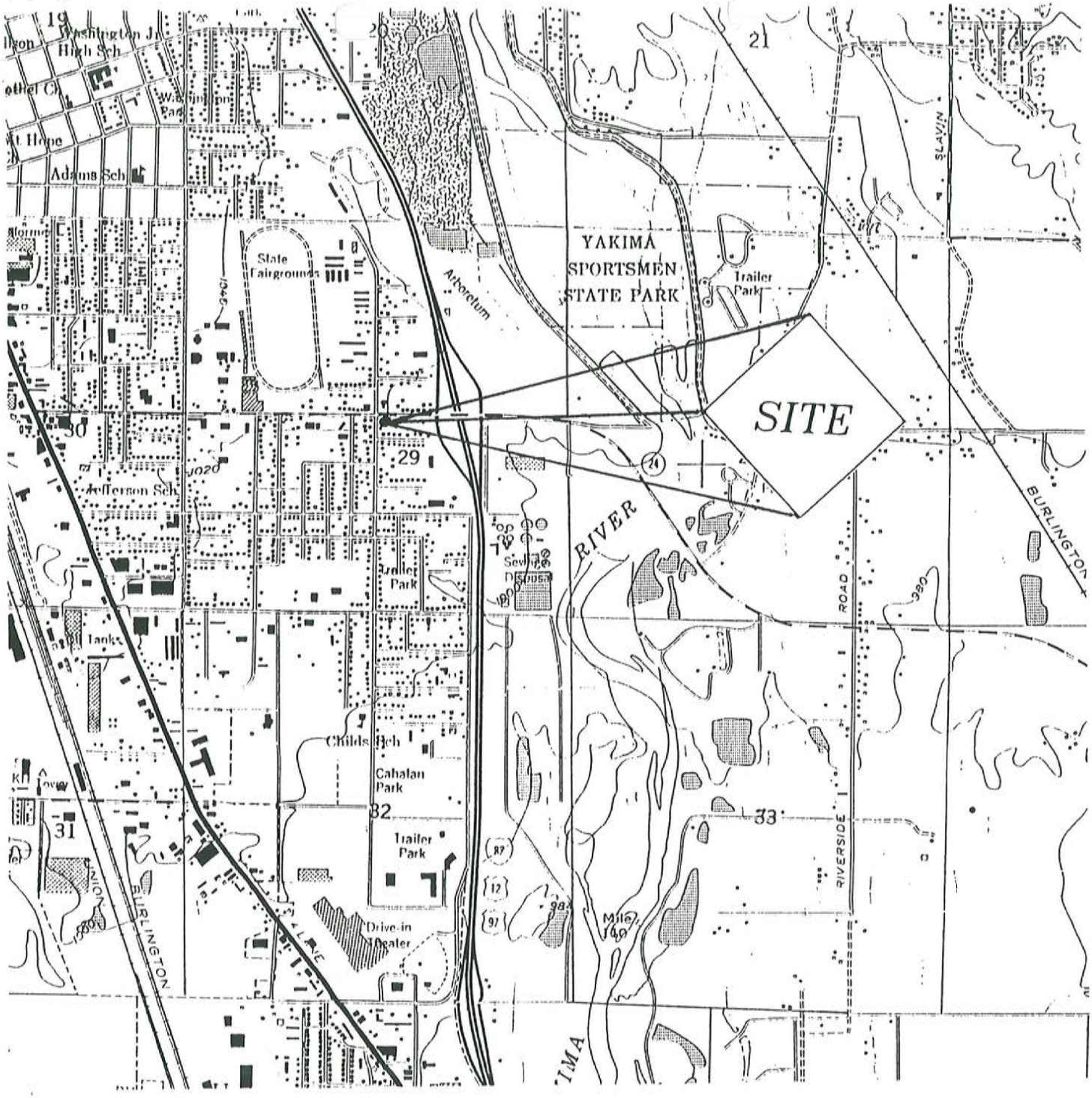
The lateral extent of the free-floating petroleum hydrocarbon plume and dissolved gasoline constituent plume could not be evaluated given the limited scope of this investigation. The lateral extent of soil impacted with petroleum hydrocarbon concentrations above the MTCA clean-up level guidelines, with the exception of soil currently in contact with free-floating petroleum hydrocarbons, appears to be limited to a radius of approximately 15 to 20 feet from the release source at the time of this writing.

REFERENCES

U.S. Geological Survey, 1985, Yakima East, Washington 7.5-minute Topographic Quadrangle, Yakima County, Washington: U.S. Geological Survey, scale 1:24,000, 1 sheet.

State of Washington, Department of Ecology, 1990, The Model Toxics Control Act Clean-up Regulation (Chapter 173-340 WAC).

FIGURES



0 2000 Feet

N

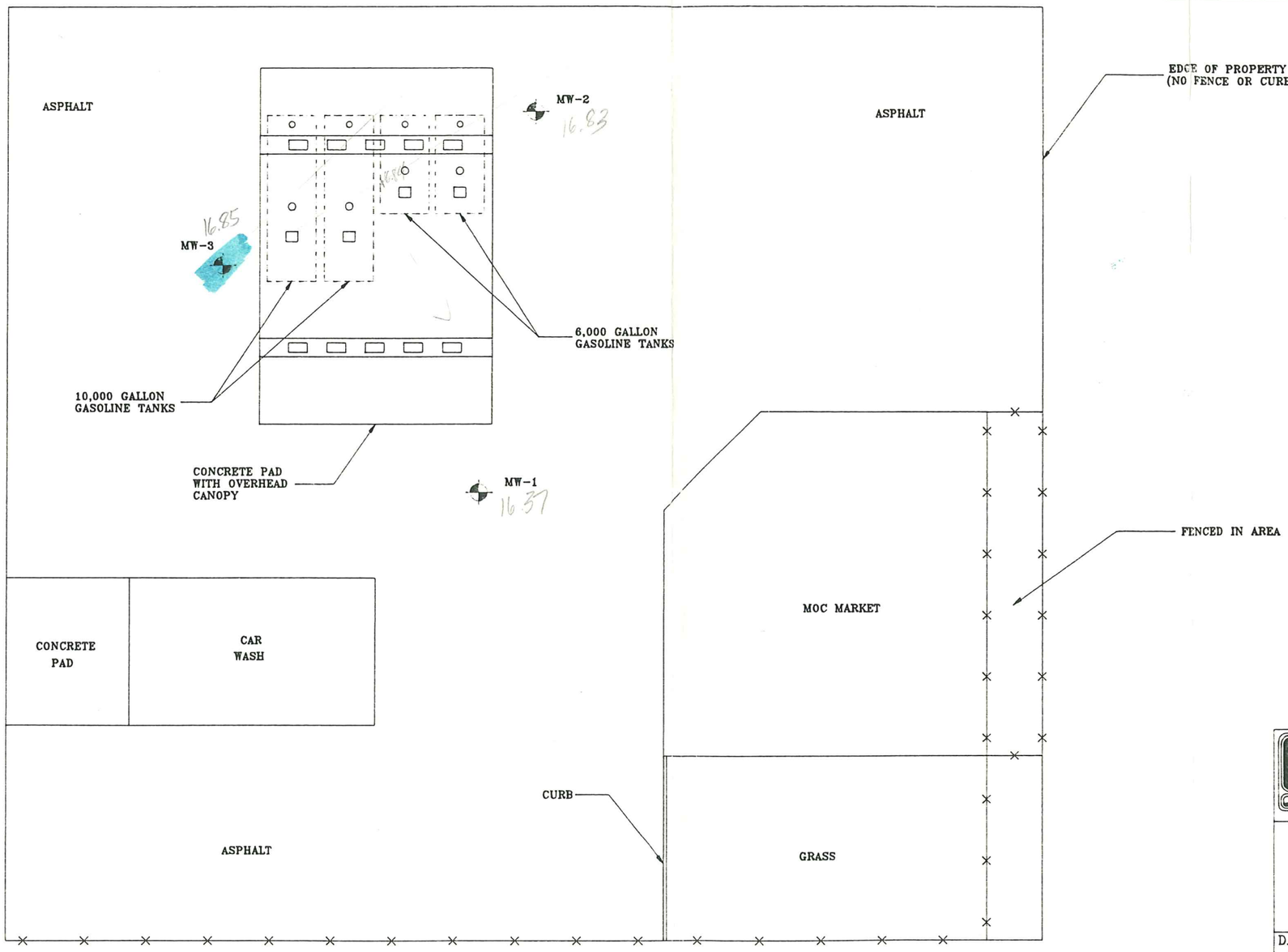
ESE
A CILCORP COMPANY

MAID O'CLOVER CORP.
1802 E. NOB HILL BLVD.
YAKIMA, WASH.

LOCATION MAP

DATE: 3-12-91	PROJECT NO. 6-91-7096	FIG# 1
SCALE: 1"=2000'	DWG NO.: MOC01A--	SIZE: A
DRAWN BY: M. ARMSTRONG	APPROVED BY: D. ALFORD	REV: -

E. NOB HILL BLVD.



LEGEND

EXPLANATION:

MW-1 PHASE I GROUND WATER MONITORING WELL LOCATION

0 20 FEET
SCALE

N

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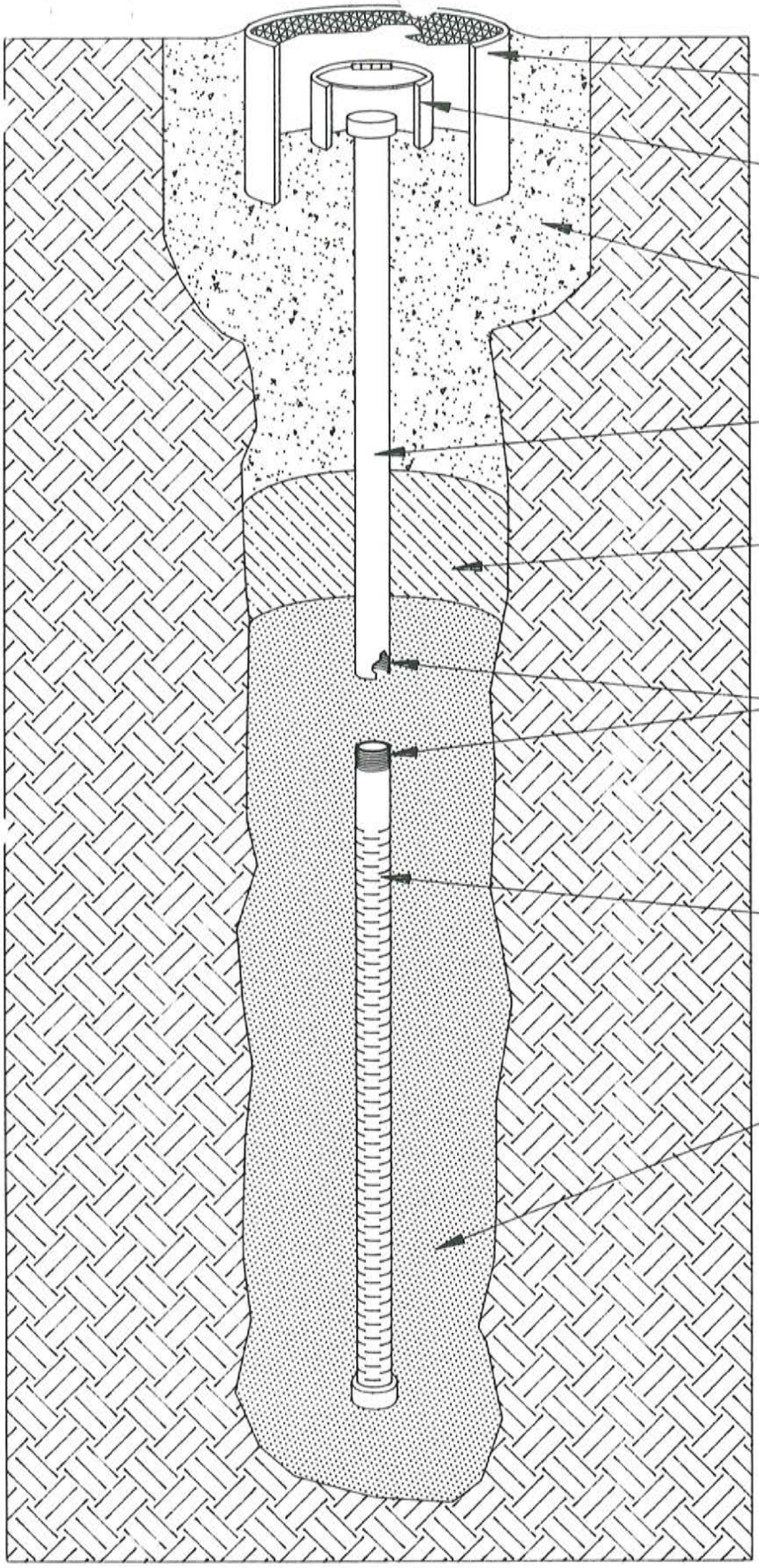
MAID O'CLOVER CORP.
1802 E. NOB HILL BLVD.
YAKIMA, WASH.

SITE MAP

DATE: 02-25-91	PROJECT NO. 6-91-7096	FIG# 2
SCALE: 1"=20'	DWG NO.: MOC01C--	SIZE: B
DRAWN BY: M. ARMSTRONG	APPROVED BY: D. ALFORD	REV: -

APPENDIX A

FIELD INVESTIGATION METHODOLOGY



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REDMOND, WASH.

TYPICAL MONITORING WELL CONSTRUCTION

DATE: 3-25-91	PROJECT NO. N/A	FIG# 1
SCALE:	DWG NO.: MW-1	SIZE: A
DRAWN BY: M. ARMSTRONG	APPROVED BY: D. ALFORD	REV: -

FIELD INVESTIGATION METHODOLOGY

Drilling Procedures

A truck-mounted Mobile Drilling Company Model B-80 equipped with an O-DEX drilling system was used to drill the soil borings and install the ground water monitoring wells. The drill pipe and outer casing are constructed in 5 and 10-foot lengths. The outer casing has an inside diameter (ID) of approximately five and one half inches and an outside diameter (OD), of approximately six inches. The drill bit, which is positioned just slightly beneath the outer casing during the drilling process, has an O.D. of approximately six and one half inches. The retractable nature of the drill bit prevents soil from entering into the outer casing during the drilling process.

Soil Sampling Procedures

During the drilling process, relatively undisturbed soil samples were collected from the borings for chemical analysis, organic vapor monitoring, and visual description. Soil samples were collected at 5-foot intervals from each boring. The soil samples were collected using a Modified California Sampler.

The Modified California Sampler consists of an outer sampler barrel lined with a set of 6-inch long (2.50 inches OD) brass rings. The sampler is attached to the end of the drive hammer, lowered through the hollow-stem auger flights, and is driven 12 inches by raising and dropping the 140-pound drive hammer. A soil sample is thereby collected in the two rings placed end to end inside the sampler.

Before the Modified California Sampler and rings were assembled and placed in the boring, they were cleaned to avoid cross-contamination of samples. The equipment was washed with Liqui-Nox detergent solution, rinsed with tap water and then allowed to air dry. The auger flights were steam cleaned prior to arrival at the site.

After the sampler was driven to the desired depth, the rings were removed. Each end of the lower ring were sealed with a Teflon sheet, capped with plastic end caps, and secured with duct tape. The sample was then labeled and placed in an ice chest for cold storage during field work and transport. These procedures are in accordance with acceptable practices set by Federal, State, and local agencies.

The soil in the upper ring was examined in the field for olfactory indications of petroleum hydrocarbons and used for lithologic description. The grain size, color, odor, moisture, and other pertinent Unified Soil Classification System (USCS) properties were described on field boring logs by a hydrogeologist or engineer from Environmental Science & Engineering, Inc. (ESE).

Organic Vapor Monitoring

The organic vapor of each soil sample collected was monitored in the field according to procedures outlined in "Retail Real Estate Transactions - Environmental Procedures" provided by Shell Oil Company, using a HNU Model 101 Photoionization Detector. The upper 2 inches of soil collected from the top sample ring were removed and the remaining portion was placed in a glass jar until it was approximately half full. The glass jar was then sealed with aluminum foil and fitted with an air-tight lid. The soil sample was exposed to direct sunlight for approximately 10 minutes. The lid was removed and the organic vapor content of the soil was monitored by inserting the HNU probe through the foil and into the vapor head space. The readings were recorded on the soil boring logs in the field.

Ground Water Monitoring Well Installation

The ground water monitoring wells were constructed of 4-inch ID Schedule 40 perforated and blank PVC pipe. The perforated pipe, with openings of 0.02 inch, was fitted with a threaded cap and positioned at the bottom of each well. Blank pipe was connected to the perforated pipe and extended to approximately 6-inches below the ground surface. All lengths of pipe, both perforated and blank, were connected by threaded joints, no glues or adhesives were used. In general, perforated pipe was positioned from approximately 20 feet below and 10 feet above the static ground water surface. For specific well installation data refer to the soil boring logs.

The annulus of each well was filled with a clean silica sand pack (Colorado 8/12 sand) to a minimum of one foot above the top of the perforated pipe (see boring logs). A two to three foot layer of granular bentonite was placed above the sand pack to form an impermeable barrier in the annulus. The annulus was then filled to approximately 2 feet below the ground surface with concrete and/or bentonite. The ground water monitoring wells were protected at the surface with a cast-iron, traffic-rated well box cemented in place. The PVC casing was fitted with a locking well cover and secured.

Survey of Ground Water Monitoring Wells

The relative elevations of the ground water monitoring wells were determined by establishing a level line for vertical control from the top of the PVC casing in each well. This was accomplished using an engineer's level and a Philadelphia rod. The error of closure for the level line was maintained at no more than 0.01 feet. The relative elevation used was based on information obtained from a U.S. Geological Survey 7.5 Minute topographic map or other reliable references. This information was used to establish the ground water elevations above mean sea level (msl) in each well and in the construction of a ground water table contour map.

Depth to Ground Water Measurements

Depth to ground water surface measurements were recorded for each ground water monitoring well by ESE personnel. The ground water surface measurements were made by lowering an Oil Recovery Systems (ORS) interface probe into each well. The tape on the instrument, which is graduated in one hundredths of a foot increments, was lowered into the well until the electronic sounder is triggered. The depth to the ground water surface is then recorded relative to the top of the PVC casing.

Ground Water Monitoring Well Development and Sampling

Following the installation of the ground water monitoring wells, the wells were developed using a small surface water pump equipped with a dedicated one inch diameter intake hose. Typically, the development consisted of removing approximately four casing volumes of liquid. Prior to being lowered into the well, the dedicated intake hose was washed with a Liqui-Nox detergent solution, rinsed with tap water, and allowed to air dry.

Ground water samples were collected from each well using a disposable Teflon bailer attached to a nylon cord. The ground water samples were transferred from the bailer to 40-milliliter (ml) glass vials with Teflon septum lids, labeled , and placed in an ice chest for cold storage and transport. To prevent cross contamination of the ground water samples, the Teflon bailer and cord was disposed of following sample collection in each well.

APPENDIX B

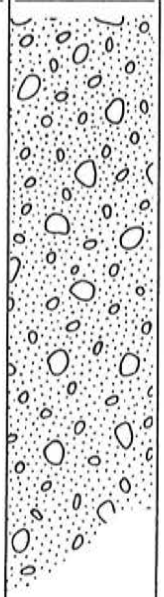
LITHOLOGIC LOGS

LOG OF
EXPLORATORY BORING

Field location of boring:

Project No: 6-91-7096
Client: Maid O'Clover
Location: Yakima, WA
Logged By: J. Martin
Installation Data: 2" Dia. PVC, screen 55' to 5', blank 5' to grade.

Boring No: MW-1
Date: 2/11/91
Driller: Environmental West
Drilling Method: O-DEX B-80
Hole Diameter: 6"
Page No: 1 of 1

Depth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Comments:
0						Asphalt
5		68	BGL	Grab @ 5'	GW	No soil sample retained, graels fine to coarse, no odor.
10		75	BGL	Grab @ 10'	GW	No soil sample retained, gravels, fine to coarse, no odor.
15		80	BGL	Grab @ 15'	GW	Sandy gravel, fine to coarse, sand fine to medium, slightly moist, no odor. Groundwater present approximately 16.5' below grade.
20				Ring @ 20'	GW	Sandy gravel, similar to above, no odor.
25						
30						
35						
40						
45						
50						
55						TD=55'

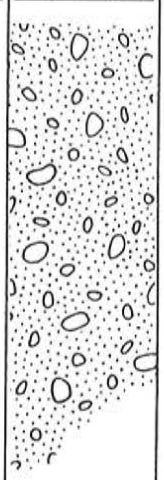
Water Level	Time	Date	Comments:

LOG OF
EXPLORATORY BORING

Field location of boring:

Project No: 6-91-7096
Client: Maid O'Clover
Location: Yakima, WA
Logged By: J. Martin
Installation Data: 2" Dia. PVC, screen 55' to 5', blank 5' to grade.

Boring No: MW-2
Date: 2/12/91
Driller: Environmental West
Drilling Method: O-DEX B-80
Hole Diameter: 6"
Page No: 1 of 1

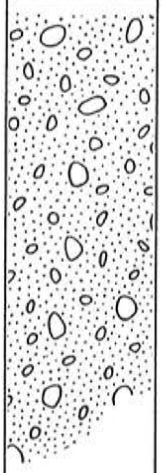
Depth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0									Asphalt
5									Pea gravel fill, no sample retained.
10		52	BGL	Ring @ 10'	GW				Sandy gravel, fine to coarse, slightly moist, brown to gray, no odor.
15		105	BGL	Ring @ 15'	GW				Similar to above, no odor.
									Groundwater 16-17' during drilling, no additional sample collection.
20									
25									
30									
35									
40									
45									
50									
55									TD=55'

LOG OF
EXPLORATORY BORING

Field location of boring:

Project No: 6-91-7096
Client: Maid O'Clover
Location: Yakima, WA
Logged By: J. Martin
Installation Data: 2" Dia. PVC, screen 55' to 5', blank 5' to grade.

Boring No: MW-3
Date: 2/13/91
Driller: Environmental West
Drilling Method: O-DEX
Hole Diameter: 6"
Page No: 1 of 1

Depth (ft)	Graphic Log	Blow/ft	Vapor Concentration (ppm)	Sample type and Depth	Soil Group Symbol (U.S.C.S.)	Water Level	Time	Date	Comments:
0									Asphalt
5		61	BGL	Grab @ 5'	GW				Sandy gravel, fine to coarse, slightly moist, brown, no odor, no ring sample retained.
10		96	BGL	Ring @ 10'	GW				Similar to above, no odor.
15		100+	6ppm	Ring @ 15'	GW				Similar to above, slight gas odor. Very bottom of sample (approximately 16.5') saturated or very close to saturated.
20									
25									
30									
35									
40									
45									
50									
55									TD=53'

APPENDIX C

FIELD MEASUREMENTS

PROJECT NAME: MAID O' CLOVER PROJECT NO.: 691 7096

LOCATION: 1802 E. NOB HILL YAKIMA, WA. DATE: 2/14/91

VERTICAL CONTROL DATA SHEET

STATION	BACKSITE (KNOWN)	FORESITE (UNKNOWN)	Δ H.I. (+)	Δ H.I. (−)	ELEVATION	ERROR OF CLOSURE +/−
A	+5.84 (MW-2)	-5.96 (MW-3)		.12	MW-3 = 999.88	
B	+4.98 (MW-3)	-5.35 (MW-1)		.37	MW-1 = 999.51	
C	+5.59 (MW-1)	-5.10 (MW-2)	.49		* MW-2 = 1000.00	
CHECK	+16.41	-16.41	+.49	-.49		

REMARKS: * DATUM ESTABLISHED AT TOP OF WELL MW-2 CASING. ELEVATION AT THAT LOCATION ASSUMED = 1000.00' ABOVE MSL.

CREW:

SIGNATURE [signature] DATE: 2/14/91

SIGNATURE _____ DATE: _____

CHECKED BY: _____ DATE: _____

INTERFACE PROBE
WATER/HYDROCARBON LEVEL DATA

Project Location MAID O' CLOVER YAKIMA WA.

Recorded By J. MARTIN

Date 2/14/91

Well No.	(A) Casing Rim Elevation (Feet)	(B) Depth to Hydro-carbon	(C) Depth to Water (Feet)	(A)-(B) Hydro-carbon Surface Elevation (Feet)	(A)-(C) Water Surface Elevation (Feet)	(C)-(B) Hydro-carbon Thickness (Feet)	See Note Potentiometric Surface Elevation (Feet)	Comments
MW-1	999.51	—	16.37	—	983.14	—		
MW-2	ASSUME 1000' DATUM	—	16.83	—	983.17	—		
MW-3	999.88	16.65	16.85	983.23	983.03	0.20		

Water/Hydrocarbon level measurements should be recorded to 0.01 foot accuracy

Specific gravity of Hydrocarbon (S.G.) _____

Note: Potentiometric Surface Elevation = (A)-(C) + S.G. ((C)-(B))

APPENDIX D

LABORATORY REPORTS AND CHAIN OF CUSTODY DOCUMENTS

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-9200 • FAX (206) 485-2992

Environ. Science & Engineering	Client Project ID:	Maid O'Clover	Sampled:	See Below
17411 N.E.Union Hill Rd, Suite 220	Matrix Descript:	Soil	Received:	Feb 14, 1991
Redmond, WA 98052	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Feb 25, 1991
Attention: Jeff Martin	First Sample #:	102-0441	Reported:	Feb 28, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Purgeable Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
102-0441	MW-1, 5' 2/11/91	N.D.	N.D.	N.D.	N.D.	N.D.
102-0442	MW-1, 10' 2/11/91	N.D.	N.D.	N.D.	N.D.	N.D.
102-0443	MW-1, 15' 2/11/91	N.D.	N.D.	N.D.	N.D.	N.D.
102-0444	MW-2, 10' 2/12/91	N.D.	N.D.	N.D.	N.D.	N.D.
102-0445	MW-2, 15' 2/12/91	N.D.	N.D.	N.D.	N.D.	N.D.
102-0446	MW-3, 5' 2/13/91	N.D.	N.D.	N.D.	N.D.	N.D.
102-0447	MW-3, 10' 2/13/91	N.D.	N.D.	N.D.	N.D.	N.D.
102-0448	MW-3, 15' 2/13/91	N.D.	N.D.	N.D.	N.D.	N.D.
Detection Limits:		**1.0**	**0.050**	**0.10**	**0.10**	**0.10**

Purgeable (low to medium boiling point) Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

Scot Cocanour
Laboratory Director

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-9200 • FAX (206) 485-2992

Environ. Science & Engineering	Client Project ID:	Maid O'Clover	Sampled:	Feb 14, 1991
17411 N.E.Union Hill Rd, Suite 220	Matrix Descript:	Water	Received:	Feb 14, 1991
Redmond, WA 98052	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Feb 23, 1991
Attention: Jeff Martin	First Sample #:	102-0449	Reported:	Feb 28, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Purgeable Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
102-0449	MW-11	N.D.	N.D.	N.D.	N.D.	N.D.
102-0450	MW-21	34	N.D.	N.D.	N.D.	N.D.
102-0451	MW-31	45,000	3,200	6,200	280	11,000
Detection Limits:		**30**	**0.30**	**0.30**	**0.30**	**0.30**

Purgeable (low to medium boiling point) Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

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Environ. Science & Engineering
17411 N.E.Union Hill Rd, Suite 220
Redmond, WA 98052
Attention: Jeff Martin

Client Project ID: Maid O'Clover
Sample Matrix: Soil
QC Sample Group: 102-0441 to -0448

Reported: Feb 28, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
EPA Method:	8020	8020	8020	8020
Analyst:	B. Fletcher	B. Fletcher	B. Fletcher	B. Fletcher
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Feb 23, 1991	Feb 23, 1991	Feb 23, 1991	Feb 23, 1991
QC Sample #:	102-0389	102-0389	102-0389	102-0389
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.50	0.50	0.50	1.50
Conc. Matrix Spike:	0.45	0.48	0.51	1.50
Matrix Spike % Recovery:	90	96	102	100
Conc. Matrix Spike Dup.:	0.43	0.47	0.49	1.45
Matrix Spike Duplicate % Recovery:	86	94	98	97
Relative % Difference:	4.5	2.1	4.0	3.4

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Laboratory Director

$$\text{\% Recovery:} \quad \frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}} \times 100$$

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Environ. Science & Engineering
17411 N.E.Union Hill Rd, Suite 220
Redmond, WA 98052
Attention: Jeff Martin

Client Project ID: Maid O'Clover
Sample Matrix: Water
QC Sample Group: 102-0441 to -0448

Reported: Feb 28, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
EPA Method:	8020	8020	8020	8020
Analyst:	B. Fletcher	B. Fletcher	B. Fletcher	B. Fletcher
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Feb 27, 1991	Feb 27, 1991	Feb 27, 1991	Feb 27, 1991
QC Sample #:	102-0414	102-0414	102-0414	102-0414
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	5.0	5.0	5.0	15.0
Conc. Matrix Spike:	4.4	4.4	4.8	14.2
Matrix Spike % Recovery:	88	88	96	95
Conc. Matrix Spike Dup.:	4.4	4.4	5.0	15.0
Matrix Spike Duplicate % Recovery:	88	88	100	100
Relative % Difference:	0	0	4.1	5.5

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Scot Cocanour
Laboratory Director

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

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CHAIN OF CUSTODY REPORT

CLIENT: ENVIRONMENTAL SCIENCE + ENGINEERING, INC.
ADDRESS: 17411 NE UNION HILL RD. SUITE 220 REDMOND, WA. 98052
PHONE: 206 869 8220
PROJECT NAME: MAID O' CLOVER
PROJECT NUMBER:
SAMPLED BY: Jeff Martin

REPORT TO: JEFF MARTIN
BILLING TO: ESE
P.O. NUMBER:

2-8 HOUR RUSH (+150%)
24 HOUR RUSH (+100%)
2-3 DAY RUSH (+75%)
5 DAY RUSH (+50%)
10 DAY STANDARD (LIST PRICE)

SAMPLE IDENTIFICATION: NUMBER OR DESCRIPTION	MATRIX (W,S,O)	# OF CONT.	SAMPLING DATE / TIME	GAS STANDARD EPA 8015 - 8020	ANALYSIS REQUESTED	REMARKS	LABORATORY NUMBER
1 MW-1 5'	SOIL	1	2/11/91	X		1020441	
2 MW-1 10'	SOIL	1	2/11/91	X			1020442
3 MW-1 15'	SOIL	1	2/11/91	X			1020443
4 MW-1 20'	SOIL	1	2/11/91			HOLD THIS SAMPLE	
5 MW-2 10'	SOIL	1	2/12/91	X			1020444
6 MW-2 15'	SOIL	1	2/12/91	X			1020445
7 MW-3 5'	SOIL	1	2/13/91	X			1020446
8 MW-3 10'	SOIL	1	2/13/91	X			1020447
9 MW-3 15	SOIL	1	2/13/91	X			1020448
10							

RELINQUISHED BY: JEFF MARTIN 2/14/91 DATE:
FIRM: ESE 3:45 pm TIME:
RECEIVED BY: [signature]
FIRM: NCA 2-14-91 3:45 p

RELINQUISHED BY: DATE:
FIRM: TIME:
RECEIVED BY:
FIRM:

SAMPLES KNOWN TO BE HAZARDOUS? NO YES; DESCRIBE ON BACK
SAMPLE RECEIPT CONDITION: GOOD VIOLATED
PRESERVED? YES NO
COOL (4° C)? YES NO
PAGE OF

NORTH CREEK ANALYTICAL

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CHAIN OF CUSTODY REPORT

CLIENT: ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
ADDRESS: 17411 NE UNION HILL RD SUITE 220
REDMOND WA 98052
PHONE: 206 869 8220
PROJECT NAME: MAID O' CLOVER
PROJECT NUMBER:
SAMPLED BY: J. Martin

REPORT TO: JEFF MARTIN
BILLING TO: ESE
P.O. NUMBER:

2-8 HOUR RUSH (+150%)
24 HOUR RUSH (+100%)
2-3 DAY RUSH (+75%)
5 DAY RUSH (+50%)
10 DAY STANDARD (LIST PRICE)

SAMPLE IDENTIFICATION: NUMBER OR DESCRIPTION	MATRIX (W,S,O)	# OF CONT.	SAMPLING DATE / TIME	ANALYSIS REQUESTED: EPA 602	REMARKS	LABORATORY NUMBER
1 MW-11	WATER	2	2/14/91	X		1020449
2 MW-21	WATER	2	2/14/91	X		1020450
3 MW-31	WATER	2	2/14/91	X		1020451
4						
5						
6						
7						
8						
9						
10						

RELINQUISHED BY: JEFF MARTIN 2/14/91 DATE:
FIRM: ESE 3:50 pm TIME:

RECEIVED BY:
FIRM: NCA 2-14-91 3:50 p

RELINQUISHED BY: DATE:
FIRM: TIME:

RECEIVED BY:
FIRM:

SAMPLES KNOWN TO BE HAZARDOUS? NO YES; DESCRIBE ON BACK

SAMPLE RECEIPT CONDITION: GOOD VIOLATED
PRESERVED? YES NO
COOL (4° C)? YES NO

PAGE OF