

Environmental Management Services, Inc.

42809 236th Avenue SE, Enumclaw, Washington 98022
Telephone (360) 825-8560 / Fax (360) 825-8640

September 9, 2002

Mr. Todd Connelly
American Golf Corporation
Bear Creek Country Club
13737 202nd Avenue NE
Woodinville, WA 98072

RE: Groundwater Monitoring Results – August 2002
Former UST Location
Bear Creek Country Club, Woodinville, WA

Dear Ms. Doran:

Environmental Management Services, Inc. (EMS) has conducted monitoring and sampling of six groundwater monitoring wells in the vicinity of two former underground storage tanks (USTs) at the above-referenced location (the site). This letter report presents the results of the groundwater monitoring event.

Site Description

The site is located at the Bear Creek Country Club in Woodinville, Washington (Figure 1). Bear Creek Country Club is a private golf course, located in an area of residential land use. The nearest surface water is Bear Creek, located approximately 1,500 feet west of the site.

The site is located west of the maintenance building along the southern edge of the country club. The site is bounded by an access road to the south, the maintenance building to the east, and the golf course to the north and west (Figure 2). An aboveground fuel storage tank (AST) is located west of the maintenance building, in the approximate location of the former dispenser island. The area between the AST and the building is paved with asphalt and concrete. The area west of the AST is covered with grass and other vegetation. The site slopes toward the west and drainage swales are located northwest of the AST and along the access road.

Background

In March 1997, two 1,000-gallon USTs, used to store gasoline and diesel fuel, along with product piping and dispensers, were removed by PSCI Environmental, of Bothell, Washington. Soil samples collected following removal indicated that one sample from the UST excavation slightly exceeded Model Toxics Control Act (MTCA) Method A Soil Cleanup Levels. However, a sample collected from beneath the dispenser contained 4,200 parts per million (ppm) of diesel (TPH-D). Further soil sampling was conducted toward the west and TPH-D was identified in 11 additional samples extending approximately 130 feet southwest of the former dispensers. The samples were collected at depths ranging from 5 to 9 feet below ground surface (bgs). No groundwater was apparently encountered during the UST removal or subsequent soil sampling.

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SEP 10 2002

DEPT OF ECOLOGY

In May 1997, Global Environmental, of Seattle, Washington (Global), excavated approximately 35 tons of contaminated soil from the area of the former dispenser for off-site treatment and disposal. A monitoring point (MP-1) was installed during backfilling of the excavation. Three groundwater monitoring wells (MW-1 through MW-3) were also installed downgradient of the former dispenser to facilitate testing of cleanup alternatives. Groundwater was encountered at depths of approximately three to four feet bgs.

Global installed and operated a soil remediation system consisting of bio-venting with extensive de-watering to increase the amount of soil exposed to treatment. Subsequent groundwater monitoring, conducted in April 1998, indicated that diesel-range hydrocarbons are present in samples from MW-2 and MW-3 at concentrations exceeding MTCA Method A Groundwater Cleanup Levels.

EMS conducted initial groundwater monitoring during May 1998. Monitoring results indicated that diesel-range hydrocarbons were present at concentrations above MTCA Method A Cleanup Levels in wells MW-1, MW-2, MW-3 and monitoring point MP-1. During October 1998, EMS installed and sampled three additional monitoring wells at the site (MW-4 through MW-6) to delineate the extent of groundwater impacts at the site. None of the additional wells contained hydrocarbon concentrations above Method A Cleanup Levels. Periodic groundwater monitoring has been conducted since October 1998.

Purpose and Scope of Work

The purpose of this investigation was to characterize the magnitude and extent of diesel-range hydrocarbon impacts to groundwater at the site. To meet this objective the following scope of work was performed:

- Measured groundwater depth in each of the six monitoring wells and one monitoring point,
- Collected groundwater samples from each of the six monitoring wells,
- Submitted the samples for laboratory analysis for diesel and oil-range hydrocarbons, and
- Prepared this report.

Groundwater Monitoring

Groundwater levels were measured in each of the wells on August 12, 2002. Prior to sampling, depth to water was measured from the measuring points at the top of each PVC well casing using a Solinst water level indicator. The water level indicator was decontaminated prior to each use. Depth to water ranged from 2.02 to 6.01 feet. Consistent with the surface topography, the groundwater elevations slope toward the west. The depth to water measurements and groundwater elevations are presented on Table 1. Historic groundwater monitoring data is presented on Table 2.

Groundwater Sampling and Analysis

Prior to sampling, the selected wells were purged by hand bailing or pumping with a peristaltic pump. Each of the wells pumped dry before three well casing volumes could be removed. The purge water was contained in a drum for off-site disposal. Following recharge, samples were collected using a peristaltic pump and disposable tubing. Due to the limited purging, the samples were very silty. The samples were contained in laboratory-supplied glass jars and were properly labeled, sealed, and placed in a cooler with ice. The samples were

Mr. Todd Connelly
Page 3
September 8, 2002

transported under standard chain-of-custody protocol to ESN Northwest of Bellevue, Washington for laboratory analysis.

The samples were analyzed for diesel and oil-range hydrocarbons (TPH-D and TPH-O) by Northwest Method NWTPH-Dx. The laboratory results indicated that TPH-D was present in the samples from MW-1, MW-2, and MW-3 at concentrations ranging from 5 to 23 mg/L. The remaining wells did not contain detectable concentrations of hydrocarbon compounds. The groundwater analytical results are presented on Table 3. The historical analytical results are presented on Table 4. The laboratory results are attached.

Summary

Groundwater monitoring and sampling was conducted at six monitoring wells at the site. Depth to water ranged from 2.02 to 6.01 feet with an overall groundwater flow direction toward the west. Groundwater samples from wells MW-1, MW-2 and MW-3 contained diesel-range hydrocarbons at concentrations exceeding MTCA Method A Groundwater Cleanup Levels. The concentrations identified were somewhat higher than previous results. This is likely related to higher levels of silt in the samples that could not be removed during purging because of the lower water elevations and limited water recovery. The results of the perimeter wells confirm that the plume still appears to be stable.

Limitations

Services provided by EMS have been conducted in a manner consistent with the care and skill ordinarily exercised by members of the consulting industry in this area. No other representation, expressed or implied, is intended in this report.

EMS appreciates the opportunity to provide American Golf Corporation with consulting services. If you have any questions or require additional information, please do not hesitate to call me at (360) 825-8560.

Sincerely

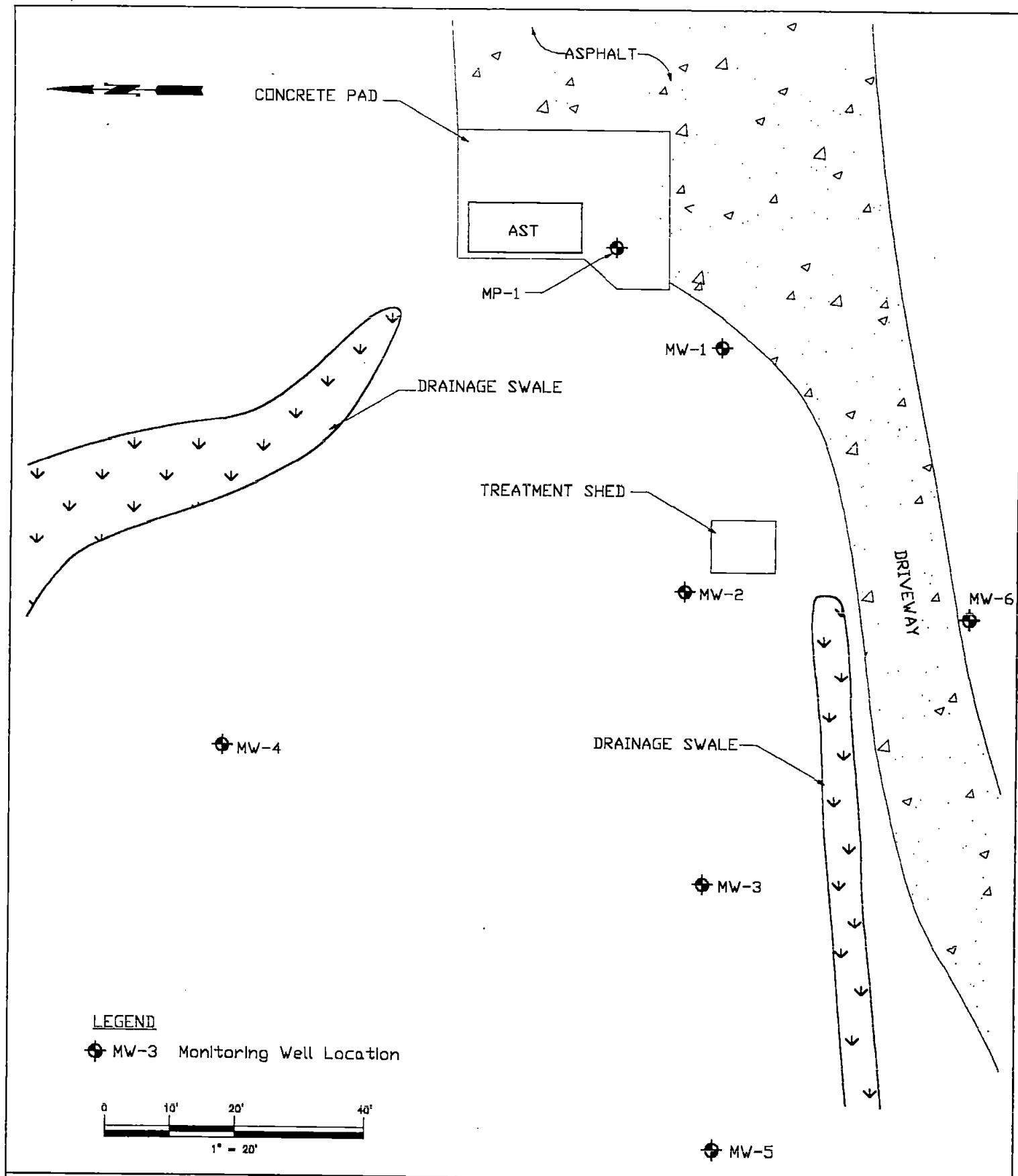


Chris L. Jones
Environmental Management Services, Inc.

Attachments



42809 - 236th Avenue S.E.
Enumclaw, Washington 98022



Environmental Management Services, Inc.

42809 - 236th Avenue S.E.
Enumclaw, Washington 98022

DESIGNED BY: CJ
DRAWN BY: JB
DATE: November 1998
JOB No.:

FIGURE 2
BEAR CREEK COUNTRY CLUB
WOODINVILLE, WA
SITE MAP

Table 1
Groundwater Monitoring Data

Bear Creek Country Club
Woodinville, Washington
August 12, 2002

Well Number	Top of Casing Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)
MP-1	99.18	6.01	93.17
MW-1	97.95	5.78	92.17
MW-2	95.44	3.97	91.47
MW-3	91.13	2.02	89.11
MW-4	95.11	2.71	92.40
MW-5	91.66	3.56	88.10
MW-6	94.21	3.54	90.67

Note:

Top of Casing Elevations relative to a temporary benchmark with an assigned elevation of 100 feet above mean sea level.

Table 2
Historic Groundwater Monitoring Data

Bear Creek Country Club
Woodinville, Washington

Well Number	Top of Casing Elevation (ft)	Date	Depth to Water (ft)	Groundwater Elevation (ft)	Elevation Change
MP-1	99.18	5/14/98	5.17	94.01	-
		3/22/99	4.25	94.93	0.92
		6/29/99	4.82	94.36	-0.57
		10/12/99	NM	-	-
		1/4/00	4.20	94.98	-
		8/12/02	6.01	93.17	-1.81
MW-1	98.58	5/14/98	5.53	93.05	-
		3/22/99	4.21	94.37	1.32
		6/29/99	4.39	94.19	-0.18
		10/12/99	5.14	93.44	-0.75
		1/4/00	4.06	94.52	1.08
		8/12/02	5.78	92.17	-2.35
MW-2	95.74	5/14/98	4.11	91.63	-
		3/22/99	1.64	94.1	2.47
		6/29/99	2.03	93.71	-0.39
		10/12/99	2.91	92.83	-0.88
		1/4/00	2.49	93.25	0.42
		8/12/02	3.97	91.47	-1.78
MW-3	92.32	5/14/98	2.21	90.11	-
		3/22/99	0.86	91.46	1.35
		6/29/99	0.99	91.33	-0.13
		10/12/99	1.44	90.88	-0.45
		1/4/00	0.34	91.98	1.1
		8/12/02	2.02	89.11	-2.87
MW-4	95.11	3/22/99	1.00	94.11	-
		6/29/99	1.37	93.74	-0.37
		10/12/99	2.23	92.88	-0.86
		1/4/00	0.55	94.56	1.68
		8/12/02	2.71	92.40	-2.16
MW-5	91.66	3/22/99	1.62	90.04	-
		6/29/99	2.25	89.41	-0.63
		10/12/99	2.75	88.91	-0.5
		1/4/00	1.18	90.48	1.57
		8/12/02	3.56	88.1	-2.38
MW-6	94.21	3/22/99	1.76	92.45	-
		6/29/99	2.13	92.08	-0.37
		10/12/99	2.86	91.35	-0.73
		1/4/00	1.31	92.90	1.55
		8/12/02	3.54	90.67	-2.23

Note:

Top of Casing Elevations relative to a temporary benchmark with an assigned elevation of 100 feet above mean sea level.

Wellheads for MW-1, MW-2 and MW-3 were modified during June 2000

NM = Not Measured (well dry)

Table 3
Groundwater Analytical Results

Bear Creek Country Club
Woodinville, Washington
August 12, 2002

Well Number	TPH-Diesel	TPH-Oil
MW-1	14	<0.50
MW-2	5	<0.50
MW-3	23	<0.50
MW-4	<0.20	<0.50
MW-5	<0.20	<0.50
MW-6	<0.20	<0.50
MTCA Method "A" Cleanup Level	0.5	0.5

Notes:

Analyses by Method NWTPH-Dx

TPH-Diesel = Diesel-range Total Petroleum Hydrocarbons

TPH-Oil = Oil-range Total Petroleum Hydrocarbons

All results in milligrams per liter (mg/L) or parts per million

< = Not detected at the referenced method reporting limit

Table 4
Historical Groundwater Analytical Results

Bear Creek Country Club
Woodinville, Washington

Well Number	Date	TPH-Diesel	TPH - Oil
MP-1	5/14/98	20.8	<8.25
MW-1	5/14/98	5.33	1.23
	3/22/99	0.402	NA
	6/29/99	<0.250	NA
	10/12/99	1.18	NA
	1/4/00	<0.455	NA
	8/12/02	14	<0.50
MW-2	5/14/98	1.11	<0.750
	3/22/99	1.03	NA
	6/29/99	<0.250	NA
	10/12/99	3.34	NA
	1/4/00	5.01	NA
	8/12/02	5	<0.50
MW-3	5/14/98	4.03	<0.750
	3/22/99	0.613	NA
	6/29/99	0.689	NA
	10/12/99	1.07	NA
	1/4/00	1.18	NA
	8/12/02	23	<0.50
MW-4	10/13/98	<0.250	NA
	3/22/99	<0.250	NA
	10/12/99	<0.250	NA
	8/12/02	<0.20	<0.50
MW-5	10/13/98	<0.250	NA
	3/22/99	<0.250	NA
	10/12/99	0.43	NA
	8/12/02	<0.20	<0.50
MW-6	10/13/98	0.323	NA
	3/22/99	<0.250	NA
	10/12/99	<0.250	NA
	8/12/02	<0.20	<0.50
MTCA Method "A" Cleanup Level		0.5	0.5

Notes:

August 12, 2002 analyses by Method NWTPH-Dx

All other analyses by Ecology Method WTPH-D

TPH-Diesel = Diesel-range Total Petroleum Hydrocarbons

TPH-Oil = Oil-range Total Petroleum Hydrocarbons

All results in milligrams per liter (mg/L) or parts per million

< = Not detected at the referenced method reporting limit

October 13, 1998 samples were grab samples collected during well installation

Bolded values exceed MTCA Method "A" Cleanup Levels

NA = Not Analyzed



Environmental
Services Network

August 22, 2002

Chris Jones
Environmental Management Services, Inc.
42809 236TH Avenue SE
Enumclaw, WA 98022

Dear Mr. Jones:

Please find enclosed an invoice for the Bear Creek Country Club Project site located in Woodinville, Washington. Water samples were analyzed for Diesel by NWTPH-Dx on August 12, 2002.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

ESN Northwest appreciates the opportunity to have provided analytical services to EMS for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

A handwritten signature in cursive script that reads "Michael A. Korosec".

Michael A. Korosec
President

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number: S20812-3
Client: EMS, Inc.
Client Job Name: Beer Creek Country Club
Client Job Number: 114001

Analytical Results

NWTPH-Dx, mg/l		MTH BLK	MW-1	MW-2	MW-3	MW-4
Matrix	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	08/12/02	08/12/02	08/12/02	08/12/02	08/12/02
Date analyzed	Limits	08/13/02	08/13/02	08/13/02	08/13/02	08/13/02
Kerosene/Jet fuel	0.20	nd	nd	nd	nd	nd
Diesel/Fuel oil	0.20	nd	14	5.0	23	nd
Heavy oil	0.50	nd	nd	nd	nd	nd

Surrogate recoveries:

Fluorobiphenyl	92%	109%	104%	C	94%
o-Terphenyl	121%	92%	95%	104%	94%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number: S20812-3
Client: EMS, Inc.
Client Job Name: Beer Creek Country Club
Client Job Number: 114001

Analytical Results

DUPL

NWTPH-Dx, mg/l		MW-5	MW-6	MW-6
Matrix	Water	Water	Water	Water
Date extracted	Reporting	08/12/02	08/12/02	08/12/02
Date analyzed	Limits	08/13/02	08/13/02	08/13/02
Kerosene/Jet fuel	0.20	nd	nd	nd
Diesel/Fuel oil	0.20	nd	nd	nd
Heavy oil	0.50	nd	nd	nd

Surrogate recoveries:

Fluorobiphenyl	96%	96%	95%
o-Terphenyl	98%	97%	95%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

520812-3

CHAIN-OF-CUSTODY RECORD

CLIENT: Environmental Management Services, Inc.
 ADDRESS: 42809 236th Ave. SE, Enumclaw, WA 98022
 PHONE: 360-825-8560 FAX: 360-825-8640
 CLIENT PROJECT #: 114001 PROJECT MANAGER: Chris Jones

DATE: 8/12/02 PAGE 1 OF 1
 PROJECT NAME: Bear Creek Country Club
 LOCATION: Woodinville, WA
 COLLECTOR: Chris Jones DATE OF COLLECTION: 8/12/02

Sample Number	Depth	Time	Sample Type	Container Type	ANALYSES																	NOTES	Total Number of Containers	Laboratory Note Number	
					VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	TPH - HClD	TPH 8015 (gasoline)	TPH 8015 (diesel)	PAH 8100	PAH 8270	PCBs 8082	Pesticides 8081	EPH	VPH	Melhamphetamine	Pb	Hex Chrome					
1. MW-1		10:55	W							X															
2. MW-2		11:05	W							X															
3. MW-3		11:15	W							X															
4. MW-4		11:25	W							X															
5. MW-5		10:30	W							X															
6. MW-6		10:45	W							X															
7.																									
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RELINQUISHED BY (Signature) [Signature] DATE/TIME 8/12/02 12:32 RECEIVED BY (Signature) [Signature] DATE/TIME 8/12/02

RELINQUISHED BY (Signature) [Signature] DATE/TIME 8/12/02 RECEIVED BY (Signature) [Signature] DATE/TIME 8/12/02

SAMPLE DISPOSAL INSTRUCTIONS

☐ ESN DISPOSAL @ \$2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS 6
 CHAIN OF CUSTODY SEALS Y/N/NA Y
 SEALS INTACT? Y/N/NA Y
 RECEIVED GOOD COND./COLD Y
 NOTES:

LABORATORY NOTES:

Turn Around Time: 24 HR 48 HR 5 DAY