

RESTOVER TRUCK STOP GROUND WATER MONITORING JANUARY AND APRIL 1994

Summary

This document is one in a series describing the results of ground water sampling at Restover Truck Stop. Ecology has conducted ground water sampling at the site from 1987 to the present. To remediate soil and ground water contamination a vapor extraction system (VES) was constructed in the summer of 1993. The VES has been operating steadily since February 1994. To determine the effectiveness of the cleanup, ground water monitoring was expanded from semiannual to quarterly sampling in the fall of 1993. This technical document describes the results of samples collected in January and April, 1994.

In January, water levels, which are used to determine ground water flow direction, were measured in ten wells and samples were collected from four wells. In April, six wells were sampled (Figure 1). All samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), and total petroleum hydrocarbons as gasoline (TPH-G).

Overall, BTEX concentrations in the upper aquifer have decreased substantially since 1989. Concentration decreases are probably due to a combination of plume spreading, dispersion, biodegradation and reduction of source loading. Since August 1991 concentrations have been relatively stable. The VES has only been operating steadily since February 1994. The monitoring period had been too short to determine whether the VES has improved the ground water quality. BTEX concentrations continue to be elevated in well WDOE-6A. In January, Model Toxic Control Act (MTCA) cleanup levels were exceeded in WDOE-6A for BTEX compounds and TPH. In April, BTEX and TPH cleanup levels were exceeded in MW-9A, MW-20A, MW-30 and WDOE-6A. Laboratory reporting sheets are presented in Appendix B.

Results

Field Observations

Depth-to-water measurements, water level elevations, and stabilized pH, specific conductance, and temperature results for both sample events are listed in Table 1. In January static water level measurements were obtained from 10 onsite wells. Wells MW-9A, MW-27A and MW-30 were dry. Depth to water ranged from 13.55 to 20.59 feet with a water table elevation ranging from 186.86 to 181.68 mean sea level (MSL). The ground water flow direction in the upper aquifer was toward the west and northwest, which was consistent with flow patterns observed during previous sample events (Figure 2).

In January, MW-20A was purged dry the first day of sampling. This well was slow to recover; there was only enough water on the following day to collect a BTEX sample. In both sampling events water purged from monitoring wells MW-8A, MW-30 and WDOE-6A continued to have a hydrocarbon odor and cloudy appearance.

Analytical Results

Analytical results for BTEX and TPH-G, and MTCA ground water cleanup levels are shown in Table 2 for both sample events.

In January, samples were collected from four wells: three monitoring wells; MW-8A, MW-20A and WDOE-6A, and the Restover water supply well. Wells MW-9A and MW-30 were not sampled because they were dry. MW-20A was purged dry the first day of sampling. A sample was collected for BTEX on the following day. All four BTEX compounds were detected in wells MW-8A and WDOE-6A with total concentrations of 36 $\mu\text{g/L}$ and 6360 $\mu\text{g/L}$, respectively. The BTEX concentrations for MW-8A is the average of duplicate samples. The relative percent difference (RPD) for the duplicate samples is 150%. Due to the high RPD, these results should be considered qualified as estimates. Well WDOE-6A continues to have the highest concentration of the wells sampled. BTEX concentrations in WDOE-6A for this sample round were the highest they have been since August 1990. The cause is unknown. TPH-G concentrations in wells MW-8A and WDOE-6A were 5800 $\mu\text{g/L}$ and 28000 $\mu\text{g/L}$, respectively.

In April samples were collected from monitoring wells: MW-8A, MW-9A, MW-18A, MW-20A, MW-30 and WDOE-6A. All four BTEX compounds were detected in all wells except for MW-18A. BTEX concentrations in wells MW-8A, MW-20A and WDOE-6A were approximately 4 $\mu\text{g/L}$, 59 $\mu\text{g/L}$ and 5242 $\mu\text{g/L}$, respectively. Wells MW-9A and MW-30, which were added to the monitoring network in April, had BTEX concentrations of 366 $\mu\text{g/L}$ and 2400 $\mu\text{g/L}$, respectively. TPH-G concentrations were highest in wells at the truckstop (WDOE-6A, 26,000 $\mu\text{g/L}$ and MW-30, 12,000 $\mu\text{g/L}$) and decreased toward the north (MW-9A, 2500 $\mu\text{g/L}$ and MW-20A, 2100 $\mu\text{g/L}$) downgradient of the site.

BTEX concentrations for select monitoring wells from May 1987 to April 1994 are listed in Table 3. Figure 3 shows BTEX concentrations for wells WDOE-6A and MW-8A for the same time period. BTEX concentrations in both wells decreased substantially from January 1989 to August 1991. Since August 1991 concentrations have been relatively stable. BTEX concentrations continue to be elevated in well WDOE-6A.

Conclusions

1. Results for January and April are consistent with results from previous sampling events.
2. MTCA cleanup levels were exceeded in WDOE-6A in January for BTEX compounds and TPH. In April, BTEX and TPH cleanup levels were exceeded in MW-9A, MW-20A, MW-30 and WDOE-6A.
3. TPH-G appears to be a good indicator for ground water contamination at the site. High concentrations of TPH-G were detected in wells in which BTEX were present.
4. The vapor extraction system VES has only been operating steadily since February 1994. The monitoring period has been too short to determine whether the VES has improved the ground water quality.

Recommendations

1. Routine monitoring should continue to determine the effectiveness of contaminant removal by vapor extraction. Monitoring wells WDOE-6A, MW-8A, MW-9A, MW-20A, MW-30, the Spencer well, and the Restover supply well should continue to be sampled for BTEX.
2. I will continue to try and remove the obstruction in well MW-12. If this is accomplished, MW-12 should be included in the routine monitoring to determine if the lower aquifer is contaminated. If the obstruction can't be removed, the well should be properly decommissioned.
3. Continue to collect samples for total petroleum hydrocarbon as gasoline (TPH-G) analyses. Elevated concentrations of TPH-G were detected in most of the wells sampled in January and April 1994.
4. Monitoring wells MW-7A, MW-22 and WDOE-2 should be located and properly decommissioned.

Methods

Ground Water Sampling

Ground water samples were collected from both an upper and lower aquifer. The upper and lower aquifers consist of recessional outwash and advance outwash, respectively. These units are separated by the Vashon Till which is a regional aquitard. In January, static water level measurements were obtained from 10 onsite wells to determine ground water flow direction in the upper aquifer. Samples for benzene, toluene, ethylbenzene, and xylene (BTEX) and total petroleum hydrocarbons as gasoline (TPH-G) were also collected from two water supply wells and three shallow monitoring wells. April samples were collected from six shallow monitoring wells. Most of the wells were near the vapor extraction system to determine the effectiveness of the cleanup.

Prior to sampling, static water level measurements were obtained from monitoring wells using an electronic water level indicator (Figure 1). The meter was rinsed with deionized water and wiped clean between measurements. Well purge volumes were small due to low water levels. Therefore, most of the monitoring wells for both sample rounds were purged and sampled using decontaminated teflon bailers. In April MW-30 was purged with a submersible pump and sampled with a teflon bailer. Wells were purged until pH, temperature, and specific conductance readings stabilized, and a minimum of three well volumes had been removed. Purge water was discharged onto the ground near each well, except for wells MW-30 and WDOE-6A. Purge water from these wells was collected in a 30 gallon barrel and stored with other vapor extraction system (VES) waste in the enclosed tank area. This waste will be transported and disposed of in accordance with State of Washington regulations.

Monitoring well samples were collected using decontaminated, bottom-emptying teflon bailers. Bailers were pre-cleaned with sequential washes of Liquinox[®], hot tap water, 10% nitric acid, distilled-deionized water and pesticide-grade acetone. After cleaning, bailers were air-dried and wrapped in aluminum foil. Supply wells were sampled at the tap nearest the pump. Samples for BTEX and TPH-G analysis were collected free of headspace and preserved with 1:1 hydrochloric acid.

Chain-of-custody procedures were followed in accordance with Manchester Laboratory protocol (Ecology, 1994). All samples were analyzed by the Ecology/EPA Laboratory in Manchester.

Quality Assurance

In general the quality of the data is acceptable for use for both sample rounds, except as qualified.

Quality control samples collected in the field consisted of a transport blank, transfer blank, and blind field duplicates. A transport blank was carried unopened during the January sample event. A transfer blank for BTEX was obtained by running organic-free water through a decontaminated bailer and collecting the rinsate in a sample container. Analytical results for the April transfer blank showed low levels of toluene. Duplicate samples for BTEX and TPH-G were obtained from monitoring well MW-8A. The relative percent differences (RPD's) for the January duplicate samples were 127% for benzene, 181% for toluene, 146% for ethylbenzene and 149% for total xylenes and 10% for TPH-G. Due to the high RPD for the January BTEX analyses, results for MW-8A and MW-8B are qualified as estimates. The relative percent differences for the April duplicate samples were 11% for benzene, 22% for ethylbenzene, 16% for total xylenes, and 30% for TPH-G.

In addition to field quality assurance samples, a matrix spike, a matrix spike duplicate and surrogate compound recoveries were performed in the laboratory. Matrix spike and surrogate recoveries for BTEX and TPH-G were all within acceptable limits. Julia Ratmeyer Folkerts and Dickey Huntamer of the Manchester Laboratory conducted the quality assurance review, which has been included in Appendix A.

References

Enviros, Inc. 1993. Groundwater Sampling and Analysis Restover Truck Stop Thurston County, Washington. E1/921205.06.

Washington State Department of Ecology, 1994. Manchester Environmental Laboratory - Laboratory Users Manual.

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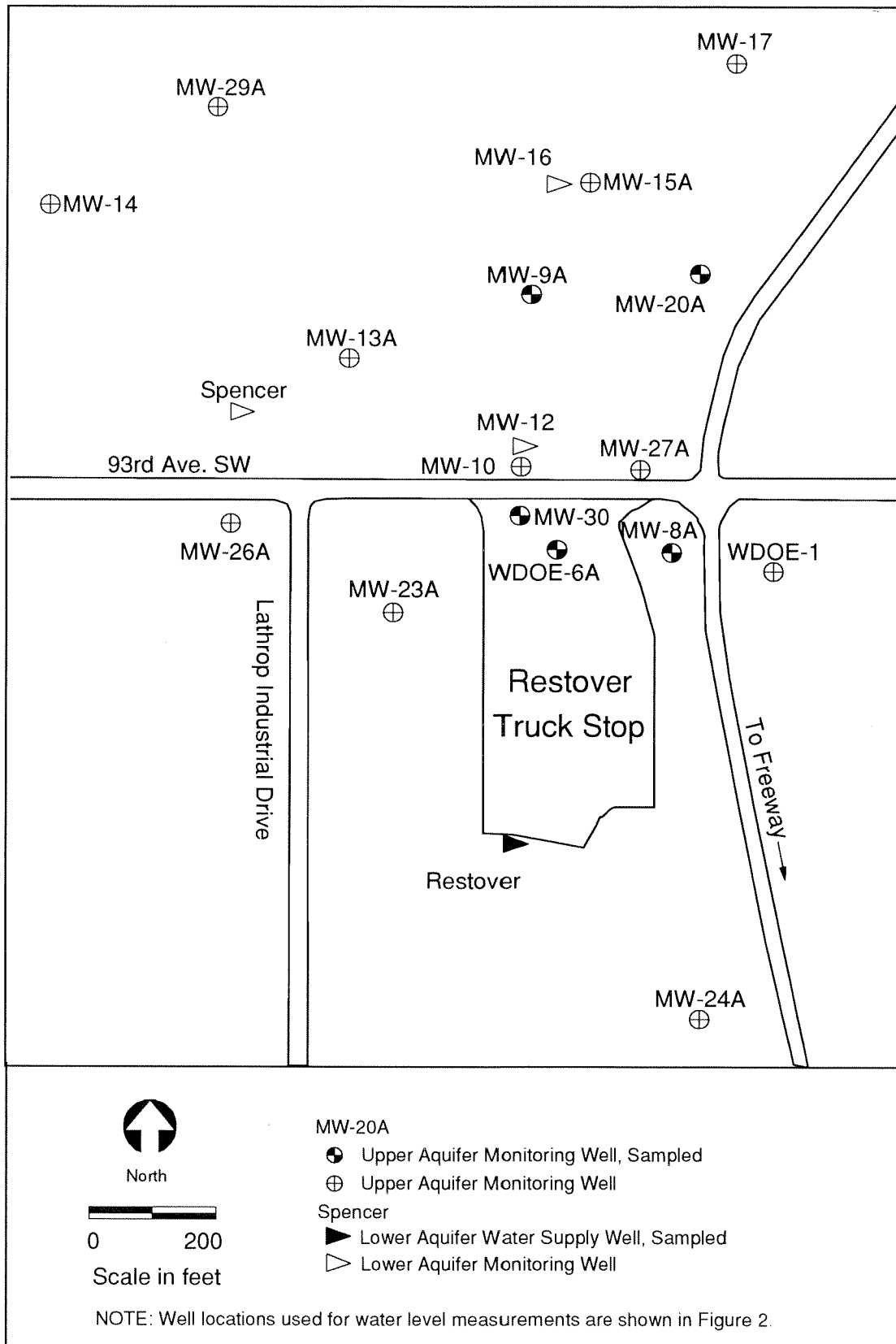


Figure 1: Well Locations, Restover Truck Stop

Table 1: Field Parameter Results for January and April, 1994

Well ID	Total Depth From Top of PVC Casing	Aquifer	Depth to Water	Elevation (MSL)	pH (st. units)	Specific Conductance (umhos/cm)	Temperature (°C)	Purge Volume (gallons)
January 1994								
Restover	60	Lower	++					
MW-8A	21.10*	Upper	17.72	183.62	5.9	82	13.7	100
MW-9A	16.23*	Upper	DRY		5.9	255	11.9	2.5
MW-17	27.0	Upper	14.67	182.98				
MW-18A	23.22*	Upper	15.88	182.86				
MW-20A	13.95*	Upper	13.55	184.52	NM	NM	NM	0.1
MW-23A	23.7	Upper	16.06	183.24				
MW-24A	14.5	Upper	13.91	186.86				
MW-26A	25.7	Upper	16.41	182.80				
MW-27A	16.7	Upper	DRY					
MW-29A	23.8	Upper	14.8	181.68				
MW-30	17.6*	Upper	DRY					
WDOE-1	25.5	Upper	20.59	183.12				
WDOE-6A	21.68*	Upper	18.17	183.64	5.6	240	12.0	3
April 1994								
MW-8A	21.10*	Upper	13.72	187.62	5.7	110	11.8	5.5
MW-9A	16.23*	Upper	12.26	187.30	5.6	122	10.5	4
MW-18A	23.22*	Upper	11.87	186.87	5.9	35	9.0	7
MW-20A	13.95*	Upper	10.78	187.29	5.6	70	--	3
MW-30	17.6*	Upper	12.55	187.46	6.1	360	--	9
WDOE-6A	21.68*	Upper	14.25	187.56	6.2	170	--	4

* = Total depth of well from top of casing as measured.

++ = Private well, no water-level measurement collected.

NM = Not Measured. Insufficient water to collect field parameters.

-- = Not measured due to probe malfunction.

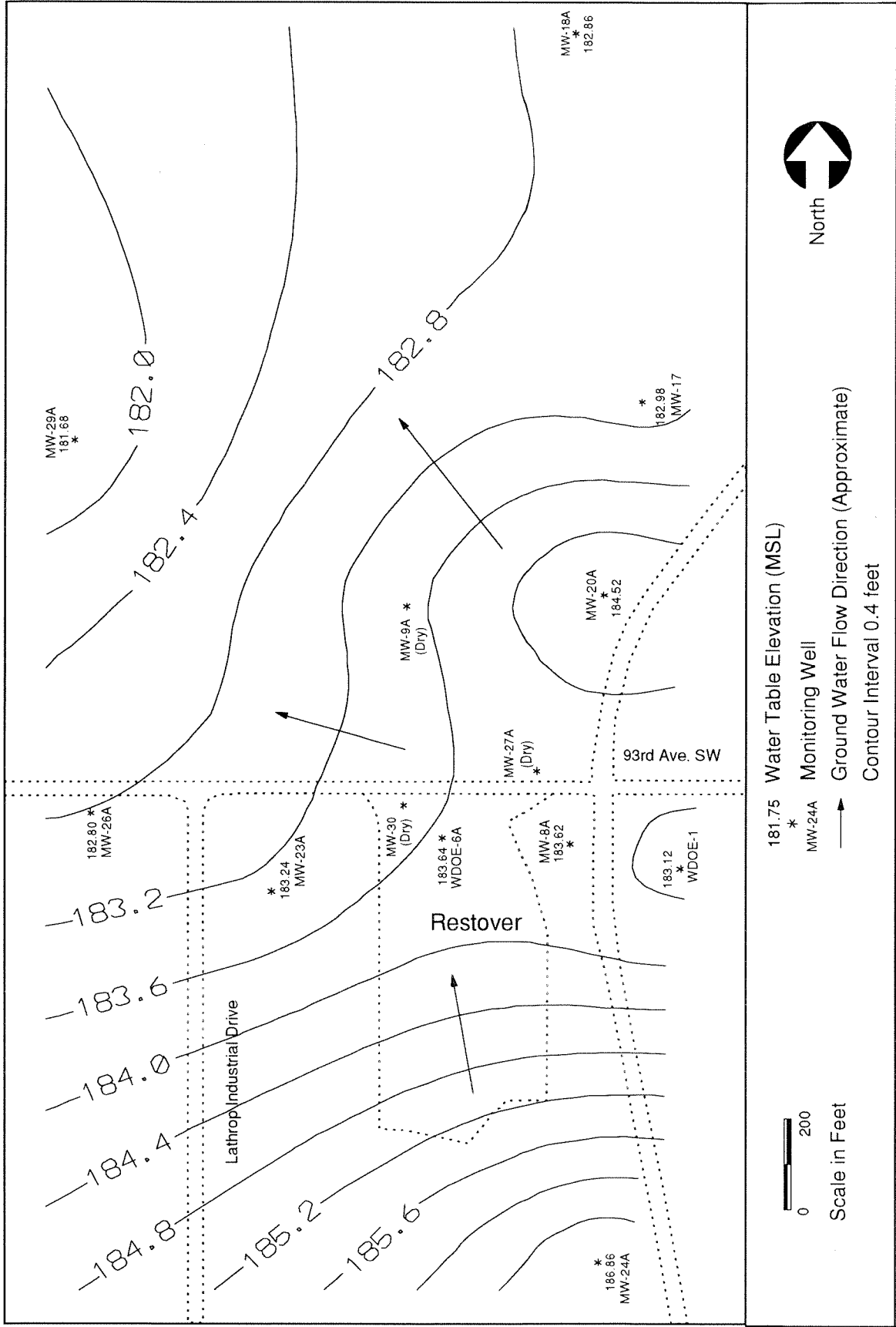


Figure 2: Restover Truck Stop - Water Table Map, January 1994

Table 2: Analytical Results (ug/L) for Jan 31–Feb 1, 1994 and April 11–12, 1994

Well Number	Benzene	Toluene	Ethylbenzene	Total Xylene	Total BTEX	TPH-G (Total TPH) 1000.0
MTCA Cleanup Levels	5.0	40.0	30.0	20.0		
Jan/Feb 1994						
Restover	0.2 U	0.2 U	0.2 U	0.6 U	ND	24 U
MW-8A	9.0 J	10.0 J	9.0 J	36.0 J	64	6100
MW-8B(dup)*	2.0 J	0.5 J	1.4 J	5.2 J	9.1	5500
MW-20A	0.2 U	0.2 U	0.2 U	0.6 U	ND	NA
WDOE-6A	710	2015	540	3095	6360	28000
Transfer	0.2 U	0.2 U	0.2 U	0.6 U	ND	24 U
Transport	0.2 U	0.2 U	0.2 U	0.6 U	ND	24 U
April 1994						
MW-9A	72.8	12.4	66.6	213.8	365.6	2500
MW-18A	0.2 U	0.2 U	0.2 U	0.6 U	ND	0.2 U
MW-8A	1.7	0.2 U	0.4	1.1	3.2	1400
MW-8B(dup)*	1.9	1.8	0.5	1.3	5.5	1900 J
MW-20A	1.2	2.3	13.0	42.1	58.6	2100 J
MW-30	688	206	488	1018	2400	12000
WDOE-6A	386	1542	570	2744	5242	26000
Transfer	0.2 U	0.3	0.2 U	0.6 U	ND	NA

U : Not detected at detection limit shown.

J : The analyte was positively identified. The associated numerical value is an estimate.

NA: Not analyzed.

ND: Compounds Not Detected

* : MW-8B is a duplicate sample of MW-8A.

Table 3: Historical Restover Truck Stop BTEX Concentrations (ug/L)

Well Number	May 1987	September 1987	October 1988	January 1989	July 1989	January 1990	August 1990	February 1991	August 1991	February 1992	July 1992	January 1993
Upper Aquifer												
WDOE-6A	6950	1180	5300	28000	7490	9870	5190	3460	2840	3830	2990	4784
MW-8A	230 ¹	388 ¹	479 ¹	334 ¹	64 ²	20 ²	178 ²	19 ²	20 ²	9 ²	53 ²	47 ²
MW-15A	1433	NT	NT	ND	218	NT	285	122	NT	NT	NT	NT
MW-17	ND	ND	ND	ND	ND	NT	NT	ND	ND	NT	2.7	ND
MW-20A	126	NT	NT	NT	NT	20	1400	5	293	11	452	NT(Dry)
Lower Aquifer												
Restover	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Spencer	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-12	53	5	8	ND	4	ND	6	ND	NT	NT	NT	NT

Well Number	July 1993	November 1993	January 1994	April 1994
Upper Aquifer				
WDOE-6A	2620	3070	6360	5242
MW-8A	30 ²	41 ²	36 ²	4 ²
MW-15A	NT	NT	NT	NT
MW-17	NT	NT	NT	NT
MW-20A	162	NT(Dry)	ND	59
MW-30	NT	NT(Dry)	NT(Dry)	2400
MW-9A	NT	NT	NT(Dry)	366
Lower Aquifer				
Restover	0.4	NT	ND	NT
Spencer	ND	NT	NT	NT
MW-12	1.7	NT	NT	NT

ND: Compound Not Detected

NT: Compound Not Tested

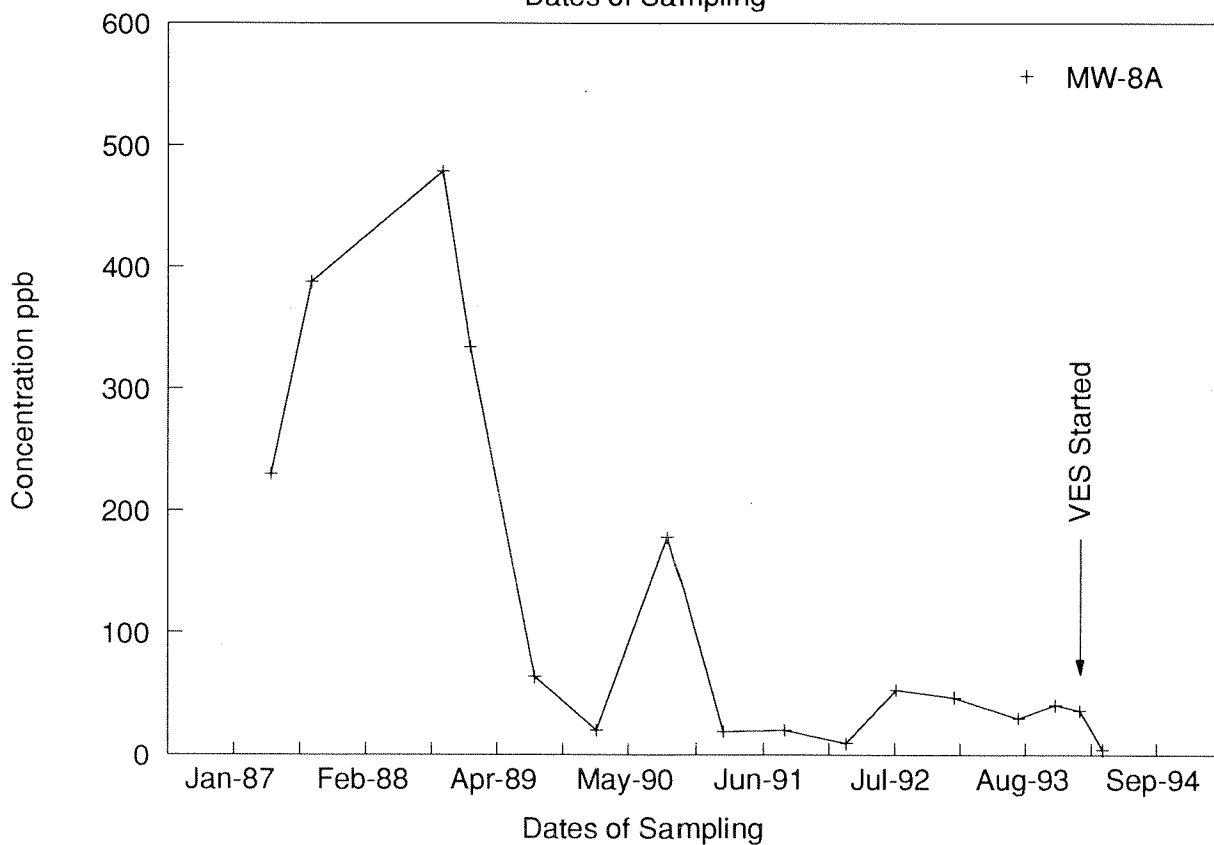
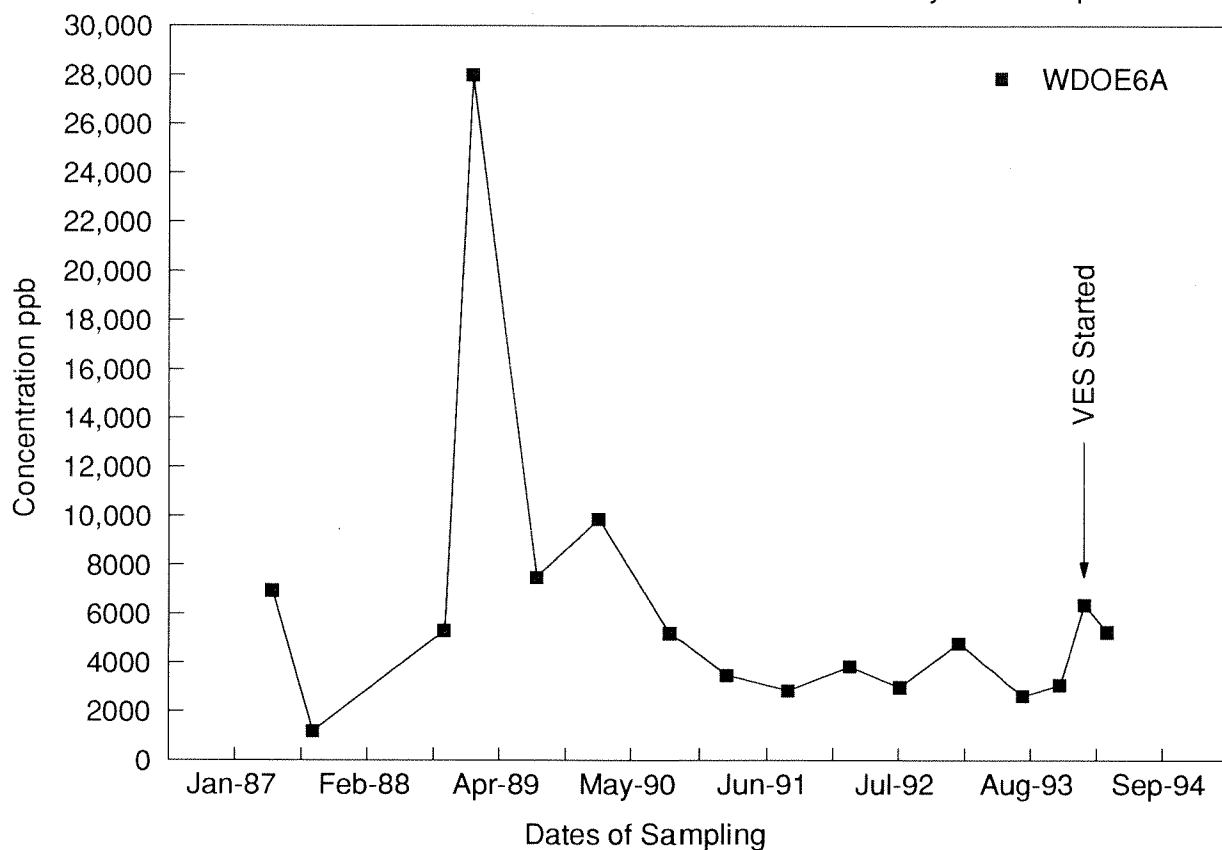
¹ : Value is based on one sample.

² : Value represents the mean of duplicate samples.

The upper and lower aquifers consist of recessional outwash and advance outwash, respectively. These units are separated by the Vashon Till which is a regional aquitard.

Figure 3

BTEX Concentrations in WDOE-6A and MW-8A from May 1987 to April 1994



APPENDIX A

Analytical Results

Restover Truck Stop

January 31–February 1 and April 11–12, 1994

Manchester Environmental Laboratory

7411 Beach Drive East, Port Orchard, Washington 98366

CASE NARRATIVE

March 18, 1994

Subject: Restover Truck Stop
Samples: 94 05-8050 through 8056
Case No. DOE - 581Z
Officer: Pam Marti
By: Julia Ratmeyer Folkerts
Organics Analysis Unit

BTEX Analysis

ANALYTICAL METHODS:

Samples were analyzed for BTEX by the EPA SW-846 Method 8020. The method involves purge/trap concentration of analytes into a gas chromatograph equipped with a Photo Ionization Detector (PID). Normal QA/QC procedures were followed.

BLANKS:

No analyte was found in the blanks.

HOLDING TIMES:

The samples were analyzed within the recommended holding time.

SURROGATES:

Surrogate recoveries were within acceptable limits.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

A matrix spike and matrix spike duplicate were analyzed using sample 94-05 8050 Recoveries ranged from 97% to 104%.

ANALYTICAL COMMENTS:

No analytical problems were encountered in the analyses. The data is acceptable for use as qualified.

DATA QUALIFIER CODES:

- U - The analyte was not detected at or above the reported value.
- J - The analyte was positively identified. The associated numerical value is an estimate.
- UJ - The analyte was not detected at or above the reported estimated result.
- REJ - The data are unusable for all purposes.
- EXP - The result is equal to the number before EXP times 10 to the power of the number after EXP. As an example 3EXP6 equals 3×10^6 .
- NAF - Not analyzed for.
- N - For organic analytes there is evidence the analyte is present in this sample.
- NJ - There is evidence that the analyte is present. The associated numerical result is an estimate.
- E - This qualifier is used when the concentration of the associated value exceeds the known calibration range.
- * - The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)


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Manchester Environmental Laboratory

7411 Beach Drive East, Port Orchard, Washington 98366

CASE NARRATIVE

March 16, 1994

Subject: Restover Truck Stop
Samples: 94 05-8050 through 8056
Case No. DOE-581Z
Officer: Pam Marti
By: Julia Ratmeyer Folkerts 
Organics Analysis Unit

WTPH-Gasoline

ANALYTICAL METHODS:

Samples were analyzed for gasoline by the Washington Total Petroleum Hydrocarbons - Gasoline (WTPH-G) method. The method involves purge/trap concentration of analytes into a gas chromatograph equipped with a Flame Ionization Detector (FID). Normal QA/QC procedures were followed.

METHOD BLANK:

No analyte was found in the blank.

SURROGATE RECOVERY:

Surrogate recoveries were within the acceptable range; due to matrix effects, however, surrogate recoveries were a bit high (161% and 162%) for samples 8051 and 8052, respectively.

METHOD DUPLICATES:

A duplicate was run on sample 8054. The Relative Percent Difference (RPD) was 11%.

ANALYTICAL COMMENTS:

There were no problems encountered in the analysis. The data is acceptable for use as qualified.

DATA QUALIFIER CODES:

- U - The analyte was not detected at or above the reported value.
- J - The analyte was positively identified. The associated numerical value is an estimate.
- UJ - The analyte was not detected at or above the reported estimated result.
- REJ - The data are unusable for all purposes.
- EXP - The result is equal to the number before EXP times 10 to the power of the number after EXP. As an example 3EXP6 equals 3×10^6 .
- NAF - Not analyzed for.
- N - For organic analytes there is evidence the analyte is present in this sample.
- NJ - There is evidence that the analyte is present. The associated numerical result is an estimate.
- E - This qualifier is used when the concentration of the associated value exceeds the known calibration range.
- * - The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

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Project: DOE-581Z RESTOVER TRUCK STOP

Officer: PZM Account: D3K01

Laboratory: Ecology, Manchester

Sample No: 94 058050 Description: RESTOVER

Source: Well (Drinking Water Supply)

Begin Date: 94/02/01 :

VOA - PP Scan	Water-Total Result	Units
Benzene	0.200U	ug/l
o-XYLENE	0.200U	ug/l
Ethylbenzene	0.200U	ug/l
Toluene	0.200U	ug/l
Total Xylenes	0.600U	ug/l
m p-XYLENE	0.400U	ug/l
p-Difluorobenzene	100	% Recov

VOA - PP Scan	Water-Total Result	Units
Matrix Spike #1		
Benzene	102	% Recov
Ethylbenzene	103	% Recov
Toluene	101	% Recov
Total Xylenes	104	% Recov
p-Difluorobenzene	100	% Recov

VOA - PP Scan	Water-Total Result	Units
Matrix Spike #2		
Benzene	98	% Recov
Ethylbenzene	100	% Recov
Toluene	97	% Recov
Total Xylenes	101	% Recov
p-Difluorobenzene	100	% Recov

Misc GC Specified	Water-Total Result	Units
WTPH-G/Gasoline	24U	ug/l
p-Difluorobenzene	90	% Recov

Project: DOE-581Z RESTOVER TRUCK STOP

Officer: PZM Account: D3K01

Laboratory: Ecology, Manchester

Sample No: 94 058051 Description: MW-8A

Source: Well (Test/Observation)

Begin Date: 94/01/31 :

VOA - PP Scan	Water-Total Result	Units
Benzenes	9.0 *	ug/l
o-XYLENE	8.0 *	ug/l
Ethylbenzene	9.0 *	ug/l
Toluene	10.0 *	ug/l
Total Xylenes	36.0 *	ug/l
m p-XYLENE	27.0 *	ug/l
p-Difluorobenzene	87	% Recov

Misc GC Specified	Water-Total Result	Units
WTPH-G/Gasoline	6100 *	ug/l
p-Difluorobenzene	161	% Recov

(Sample Complete)

Project: DOE-581Z RESTOVER TRUCK STOP

Officer: PZM Account: D3K01

Laboratory: Ecology, Manchester

Sample No: 94 058052 Description: MW-8B

Source: Well (Test/Observation)

Begin Date: 94/01/31 :

VOA - PP Scan	Water-Total Result	Units
Benzene	2.0 *	ug/l
o-XYLENE	0.4 *	ug/l
Ethylbenzene	1.4 *	ug/l
Toluene	0.5 *	ug/l
Total Xylenes	5.2 *	ug/l
m p-XYLENE	4.6 *	ug/l
p-Difluorobenzene	72.39	† Recov

Misc GC Specified	Water-Total Result	Units
WTPH-G/Gasoline	5500 *	ug/l
p-Difluorobenzene	162	† Recov

Project: DOE-581Z RESTOVER TRUCK STOP

Officer: PZM Account: D3K01

Laboratory: Ecology, Manchester

Source: Well (Test/Observation)

Sample No: 94 058053 Description: MW-20A

Begin Date: 94/02/01 :

VOA - PP Scan	Water-Total Result	Units
Benzene	0.200U	ug/l
o-XYLENE	0.200U	ug/l
Ethylbenzene	0.200U	ug/l
Toluene	0.200U	ug/l
Total Xylenes	0.600U	ug/l
m p-XYLENE	0.400U	ug/l
p-Difluorobenzene	98.28	% Recov

(Sample Complete)

Project: DOE-581Z RESTOVER TRUCK STOP

Officer: PZM Account: D3K01

Laboratory: Ecology, Manchester

Source: Well (Test/Observation)

Sample No: 94 058054 Description: WDOE-6A

Begin Date: 94/02/01 :

VOA - PP Scan	Water-Total Result	Units
Benzene	710	* ug/l
o-XYLENE	725	* ug/l
Ethylbenzene	540	* ug/l
Toluene	2015	* ug/l
Total Xylenes	3095	* ug/l
m p-XYLENE	2280	* ug/l
p-Difluorobenzene	99	* Recov
-----+-----		
Misc GC Specified	Water-Total Result	Units
WTPH-G/Gasoline	31300	* ug/l
p-Difluorobenzene	108	* Recov
-----+-----		
Misc GC Specified Duplicate #1	Water-Total Result	Units
WTPH-G/Gasoline	28000	* ug/l
p-Difluorobenzene	105	* Recov

Project: DOE-581Z RESTOVER TRUCK STOP

Officer: PZM Account: D3K01

Laboratory: Ecology, Manchester

Sample No: 94 058055 Description: TRANSFER Source: Water (General)

Begin Date: 94/02/01

VOA - PP Scan	Water-Total Result	Units
Benzene	0.200U	ug/l
o-XYLENE	0.200U	ug/l
Ethylbenzene	0.200U	ug/l
Toluene	0.200U	ug/l
Total Xylenes	0.600U	ug/l
m p-XYLENE	0.400U	ug/l
p-Difluorobenzene	100	% Recov

Misc GC Specified	Water-Total Result	Units
WTPH-G/Gasoline	24U	ug/l
p-Difluorobenzene	91	% Recov

(Sample Complete)

Project: DOE-581Z RESTOVER TRUCK STOP

Officer: PZM

Account: D3K01

Laboratory: Ecology, Manchester

Sample No: 94 058056 Description: TRANSPOR

Source: Water (General)

Begin Date: 94/02/01 :

VOA - PP Scan	Water-Total Result	Units
Benzene	0.200U	ug/l
o-XYLENE	0.200U	ug/l
Ethylbenzene	0.200U	ug/l
Toluene	0.200U	ug/l
Total Xylenes	0.600U	ug/l
m p-XYLENE	0.400U	ug/l
p-Difluorobenzene	100	‡ Recov

Misc GC Specified	Water-Total Result	Units
WTPH-G/Gasoline	24U	ug/l
p-Difluorobenzene	96	‡ Recov

Project: DOE-581Z RESTOVER TRUCK STOP

Officer: PZM Account: D3K01

Blank ID: BW4038

VOA - PP Scan	Water-Total
Blank #1	Result Units
Benzenes	0.200U ug/l
o-XYLENE	0.200U ug/l
Ethylbenzene	0.200U ug/l
Toluene	0.200U ug/l
Total Xylenes	0.600U ug/l
m p-XYLENE	0.400U ug/l
p-Difluorobenzene	100 % Recov

Misc GC Specified	Water-Total
Blank #1	Result Units
WTPH-G/Gasoline	24U ug/l
p-Difluorobenzene	94 % Recov


(Sample Complete)

MANCHESTER ENVIRONMENTAL LABORATORY

7411 Beach Drive E , Port Orchard Washington 98366

CASE NARRATIVE

May 9, 1994

Subject: Restover Truck Stop
Samples: 94 - 158105 to -158106, -158108 to -158113
Case No. DOE-066X
Officer: Pam Marti
By: Dickey D. Huntamer 
Organics Analysis Unit

BETX ANALYSIS

ANALYTICAL METHODS:

The samples were analyzed by EPA Method SW-846 - 8020. Normal laboratory QA/QC procedures were performed with the analyses.

HOLDING TIMES:

The samples were analyzed within the recommended holding times.

BLANKS:

The EPA five times rule was applied to all target compounds which were found in the blank. Compounds that were found in the sample and in the blank were considered real and not the result of contamination if the levels in the sample are greater than or equal to five times the amount of compounds in the associated method blank. No target compounds were detected in the laboratory blank.

SURROGATES:

All surrogate recoveries were within acceptable limits however two samples , -158108 and -158109 had recoveries of 63.2% and 62.4% respectively which was considerably lower than the 90+ % recoveries for the other samples. No qualifiers were added to the results for these samples since the recoveries were above the 50% lower acceptance limit.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

A matrix spike and spike duplicate was analyzed using sample -168040. Recoveries ranged from 98.8% to 100.5. The Relative Percent Differences (RPD) was less than 1% for all compounds. The recovery and RPD data was within acceptable limits.

ANALYTICAL COMMENTS:

No problems were encountered in the analysis of these samples. The data is acceptable to use without additional qualifiers.

DATA QUALIFIER CODES:

- U - The analyte was not detected at or above the reported value.
- J - The analyte was positively identified. The associated numerical value is an estimate.
- UJ - The analyte was not detected at or above the reported estimated result.
- REJ - The data are unusable for all purposes.
- EXP - The result is equal to the number before EXP times 10 to the power of the number after EXP. As an example 3EXP6 equals 3×10^6 .
- NAF - Not analyzed for.
- N - For organic analytes there is evidence the analyte is present in this sample.
- NJ - There is evidence that the analyte is present. The associated numerical result is an estimate.
- E - This qualifier is used when the concentration of the associated value exceeds the known calibration range.
- * - The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

==> Transaction #: 05061300 Laboratory: (WE) Ecology, Manchester Lab

Work Group: (51) VOA - PP Scan

Instrument: (PEPIDFID) Perkin-Elmer PID/FID

Method: (?????????) Unspecified

Chemist: (BLC) Carrell, Bob DOE Hours Worked:

Project: DOE-066X RESTOVER TRUCK STOP Prg Ele#: D3K01

Prj Off: Marti, Pam DOE Analysis Due: 940413 Revised Due:

*** Sample Records in Transaction ***

Seq#	Sample #	QA	Date/Time	Description	Alternate Keys
01	94158105	LBK1	940411	MW-9A	
02	94158105		940411	MW-9A	
03	94158106		940411	MW-18A	
04	94158108		940411	MW-8A	
05	94158109		940411	MW-8B	
06	94158110		940411	MW-20A	
07	94158111		940411	MW-30	
08	94158112		940412	WDOE-6A	
09	94158113		940412	TRANSFER	
10	94158106	LMX1	940411	MW-18A	
11	94158106	LMX2	940411	MW-18A	

Record Type: TRNIN3 Date Verified: May 9, 1994 By: Carrell
Transaction Status: New Transaction...First/Printing...Unverified.
Processed: 6-MAY-94 13:06:42 Status: N Batch: (In CUR DB)

6-MAY-94

Washington State Department of Ecology
*** Lab Analysis Report ***

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Transaction #: 05061300 Seq #: 01 (51) VOA - PP Scan
Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Blank ID : BW4109D
Sample No.: 94 158105

Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds:
QA Code: (LBK1) Lab Blank Sample #1 Peaks Total:
Date Extracted: Date Analyzed: 940419 # Days to Ext/Anal: 0/ 8

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	0.2U	
2	108883	Toluene	ug/l	0.2U	
3	100414	Ethylbenzene	ug/l	0.2U	
4	1330207	Total Xylenes	ug/l	0.6U	
5	-540363	p-Difluorobenzene	% Recov	99.8	(Surr) PR

Transaction #: 05061300 Seq #: 02 (51) VOA - PP Scan
 Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158105 - ~~DOE-066X~~ Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds:
 QA Code: () Unspecified Peaks Total:
 Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	72.8	
2	108883	Toluene	ug/l	12.4	
3	100414	Ethylbenzene	ug/l	66.6	
4	1330207	Total Xylenes	ug/l	213.8	
5	-540363	p-Difluorobenzene	% Recov	101.3	(Surr) PR

Transaction #: 05061300 Seq #: 03 (51) VOA - PP Scan
 Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158106 (600-12A) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds:
 QA Code: () Unspecified Peaks Total:
 Date Extracted: Date Analyzed: 940419 # Days to Ext/Anal: 0/ 8

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	0.2U	
2	108883	Toluene	ug/l	0.2U	
3	100414	Ethylbenzene	ug/l	0.2U	
4	1330207	Total Xylenes	ug/l	0.6U	
5	-540363	p-Difluorobenzene	% Recov	100.1	(Surr) PR

*** Lab Analysis Report ***

Transaction #: 05061300 Seq #: 04 (51) VOA - PP Scan

Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158108 Alternate Keys:

Samp Matrix: (10) Water-Total

Units: (11) ug/l %Slds:

QA Code: () Unspecified

Peaks Total:

Date Extracted: Date Analyzed: 940420

Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	1.7	
2	108883	Toluene	ug/l	0.2U	
3	100414	Ethylbenzene	ug/l	0.4	
4	1330207	Total Xylenes	ug/l	1.1	
5	-540363	p-Difluorobenzene	% Recov	63.2	(Surr) PR

Transaction #: 05061300 Seq #: 05 (51) VOA - PP Scan
 Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158109 (m 3-2P) Alternate Keys:

Samp Matrix: (10) Water-Total

Units: (11) ug/l

%Slds:

QA Code: () Unspecified

Peaks Total:

Date Extracted:

Date Analyzed: 940419

Days to Ext/Anal: 0/ 8

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	1.9	
2	108883	Toluene	ug/l	1.8	
3	100414	Ethylbenzene	ug/l	0.5	
4	1330207	Total Xylenes	ug/l	1.3	
5	-540363	p-Difluorobenzene	% Recov	62.4	(Surr) PR

Transaction #: 05061300 Seq #: 06 (51) VOA - PP Scan
 Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158110 (rc 00-20A) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds:
 QA Code: () Unspecified Peaks Total:
 Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	1.2	
2	108883	Toluene	ug/l	2.3	
3	100414	Ethylbenzene	ug/l	13.0	
4	1330207	Total Xylenes	ug/l	42.1	
5	-540363	p-Difluorobenzene	% Recov	100.3	(Surr) PR

Transaction #: 05061300 Seq #: 07 (51) VOA - PP Scan
Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158111 (100-20) Alternate Keys:

Samp Matrix: (10) Water-Total

Units: (11) ug/l %Slds:

QA Code: () Unspecified

Peaks Total:

Date Extracted:

Date Analyzed: 940420

Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	688	
2	108883	Toluene	ug/l	206	
3	100414	Ethylbenzene	ug/l	488	
4	1330207	Total Xylenes	ug/l	1018	
5	-540363	p-Difluorobenzene	% Recov	101.2	(Surr) PR

Transaction #: 05061300 Seq #: 08 (51) VOA - PP Scan
 Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158112 (DOE-066X-6A) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds:
 QA Code: () Unspecified Peaks Total:
 Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 8

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	386	
2	108883	Toluene	ug/l	1542	
3	100414	Ethylbenzene	ug/l	570	
4	1330207	Total Xylenes	ug/l	2744	
5	-540363	p-Difluorobenzene	% Recov	99.4	(Surr) PR

Transaction #: 05061300 Seq #: 09 (51) VOA - PP Scan
 Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158113 (TRANSFER) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds:
 QA Code: () Unspecified Peaks Total:
 Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 8

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	ug/l	0.2U	
2	108883	Toluene	ug/l	0.3	
3	100414	Ethylbenzene	ug/l	0.2U	
4	1330207	Total Xylenes	ug/l	0.6U	
5	-540363	p-Difluorobenzene	% Recov	100.4	(Surr) PR

Transaction #: 05061300 Seq #: 10 (51) VOA - PP Scan
Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158106

Alternate Keys:

Samp Matrix: (10) Water-Total Units: (94) % Recov %Slds:
QA Code: (LMX1) Lab Mtrx Spike #1 (% Rec Peaks Total:
Date Extracted: Date Analyzed: 940421 # Days to Ext/Anal: 0/ 10

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	% Recov	100.5	
2	108883	Toluene	% Recov	100.0	
3	100414	Ethylbenzene	% Recov	100.3	
4	1330207	Total Xylenes	% Recov	99.2	
5	-540363	p-Difluorobenzene	% Recov	100.0	(Surr) PR

Transaction #: 05061300 Seq #: 11 (51) VOA - PP Scan
 Proj Code : DOE-066X RESTOVER TRUCK STOP

PE # : D3K01

Sample No.: 94 158106

Alternate Keys:

Samp Matrix: (10) Water-Total Units: (94) % Recov %Slds:
 QA Code: (LMX2) Lab Mtrx Spike #2 (% Rec Peaks Total:
 Date Extracted: Date Analyzed: 940421 # Days to Ext/Anal: 0/ 10

Line	Par #	Parameter Description	Units	Value	
1	71432	Benzene	% Recov	100.0	
2	108883	Toluene	% Recov	99.7	
3	100414	Ethylbenzene	% Recov	99.8	
4	1330207	Total Xylenes	% Recov	98.8	
5	-540363	p-Difluorobenzene	% Recov	99.8	(Surr) PR

==> Transaction #: 05050827 Laboratory: (WE) Ecology, Manchester Lab

Work Group: (70) Misc GC Specified

Instrument: (PEPIDFID) Perkin-Elmer PID/FID

Method: (WTPH-G) Washington Total Petroleum Hydrocarbon-Gas

Chemist: (BLC) Carrell, Bob DOE Hours Worked:

Project: DOE-066X RESTOVER TRUCK STOP Prg Ele#: D3K01

Prj Off: Marti, Pam DOE Analysis Due: 940413 Revised Due:

*** Sample Records in Transaction ***

Seq#	Sample #	QA	Date/Time	Description	Alternate Keys
01	94158105		940411	MW-9A	
02	94158106		940411	MW-18A	
03	94158108		940411	MW-8A	
04	94158109		940411	MW-8B	
05	94158110		940411	MW-20A	
06	94158111		940411	MW-30	
07	94158112		940412	WDOE-6A	
08	94158105	LBK1	940411	MW-9A	

Record Type: TRNIN3 Date Verified: Carrell By: 5-5-94
Transaction Status: New Transaction...First Printing...Unverified.
Processed: 5-MAY-94 08:32:34 Status: N Batch: (In CUR DB)

Transaction #: 05050827 Seq #: 01 (70) Misc GC Specified
Proj Code : DOE-066X RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 94 158105 (mc-94) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (10) mg/l %Slds:
QA Code: () Unspecified Peaks Total:
Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value	
1	-400004	WTPH-G/Gasoline	mg/l	2.5	
2	-540363	p-Difluorobenzene	% Recov	101.9	(Surr) PR

Transaction #: 05050827 Seq #: 02 (70) Misc GC Specified
Proj Code : DOE-066X RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 94 158106 (M O - 8A) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (10) mg/l %Slds:
QA Code: (.) Unspecified Peaks Total:
Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value
1	-400004	WTPH-G/Gasoline	mg/l	0.2U
2	-540363	p-Difluorobenzene	% Recov	96.0 (Surr) PR

Transaction #: 05050827 Seq #: 03 (70) Misc GC Specified
Proj Code : DOE-066X RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 94 158108 (MO-BA) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (10) mg/l %Slds:
QA Code: (.) Unspecified Peaks Total:
Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value	
1	-400004	WTPH-G/Gasoline	mg/l	1.4	
2	-540363	p-Difluorobenzene	% Recov	116.6	(Surr) PR

Transaction #: 05050827 Seq #: 04 (70) Misc GC Specified
Proj Code : DOE-066X RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 94 158109 (m d -8F) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (10) mg/l %Slds:
QA Code: () Unspecified Peaks Total:
Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value
1	-400004	WTPH-G/Gasoline	mg/l	1.9J
2	-540363	p-Difluorobenzene	% Recov	INTRFRNCE (Surr) PR

Transaction #: 05050827 Seq #: 05 (70) Misc GC Specified
Proj Code : DOE-066X RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 94 158110 (m D-20A) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (10) mg/1 %Slds:
QA Code: (.) Unspecified Peaks Total:
Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value
1	-400004	WTPH-G/Gasoline	mg/l	2.1J
2	-540363	p-Difluorobenzene	% Recov	INTRFRNCE (Surr) PR

Transaction #: 05050827 Seq #: 06 (70) Misc GC Specified
Proj Code : DOE-066X RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 94 158111 (ms-25) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (10) mg/l %Slds:
QA Code: () Unspecified Peaks Total:
Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value	
1	-400004	WTPH-G/Gasoline	mg/l	12.1	
2	-540363	p-Difluorobenzene	% Recov	106.6	(Surr) PR

Transaction #: 05050827 Seq #: 07 (70) Misc GC Specified
Proj Code : DOE-066X RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 94 158112 (DOE-GA) Alternate Keys:

Samp Matrix: (10) Water-Total Units: (10) mg/l %Slds:
QA Code: () Unspecified Peaks Total:
Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 8

Line	Par #	Parameter Description	Units	Value	
1	-400004	WTPH-G/Gasoline	mg/l	25.9	
2	-540363	p-Difluorobenzene	% Recov	113.4	(Surr) PR

Transaction #: 05050827 Seq #: 08 (70) Misc GC Specified
Proj Code : DOE-066X RESTOVER TRUCK STOP PE # : D3K01

Blank ID : BW4109D
Sample No.: 94 158105

Alternate Keys:

Samp Matrix: (10) Water-Total Units: (10) mg/l %Slds:
QA Code: (LBK1) Lab Blank Sample #1 Peaks Total:
Date Extracted: Date Analyzed: 940420 # Days to Ext/Anal: 0/ 9

Line	Par #	Parameter Description	Units	Value
1	-400004	WTPH-G/Gasoline	mg/l	0.2U
2	-540363	p-Difluorobenzene	% Recov	98.0 (Surr) PR