CHRISTINE O. GREGOIRE
Director

92-e45

WA-13-0030GW

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
*7171 Cleanwater Lane, Building 8, LH-14 • Olympia, Washington 98504-6814*

March 5, 1992

TO: Mike Kuntz

FROM: Pam Marti PM

SUBJECT: Restover Truck Stop Ground Water Monitoring Round VII

## INTRODUCTION

The seventh round of ground water monitoring at the Restover Truck Stop was completed by the Toxics, Compliance, and Ground Water Investigations Section on August 13-14 and September 5, 1991. Two domestic supply and four monitoring wells were sampled for benzene, toluene, ethylbenzene, and total xylenes (BTEX) and dissolved iron. Figure 1 shows the locations of the sampled wells. Monitoring wells MW-15A and MW-16 were inaccessible for this sampling round.

## METHODS

### Ground Water Sampling

Prior to sample collection, static water level measurements were obtained from 11 on-site wells using an electronic water level indicator which was rinsed with deionized water and wiped clean between measurements. Prior to sampling, monitoring wells (Figure 1) were purged with either a centrifugal pump or decontaminated teflon bailer until pH, temperature, and conductivity readings stabilized, and a minimum of three well volumes had been removed. Purge water from all wells, except WDOE-6A, was discharged onto the ground near each well. Purge water from WDOE-6A was collected and then treated by pumping it through a series of activated granulated carbon filters.

Wells were sampled in order of increasing contamination, based on previous sample results. Wells MW-15A and MW-16 were not sampled this round because site access was denied by the property owner. Historically, analytical results from MW-15A, located in the upper aquifer, have shown low concentrations of BTEX; while well MW-16, located in the lower aquifer, have shown no contaminants. Monitoring well samples were collected using decontaminated, bottom-emptying teflon bailers. Supply wells were sampled at the tap nearest the pump. Samples for volatile organics analysis were collected free of headspace and preserved with 1:1 hydrochloric

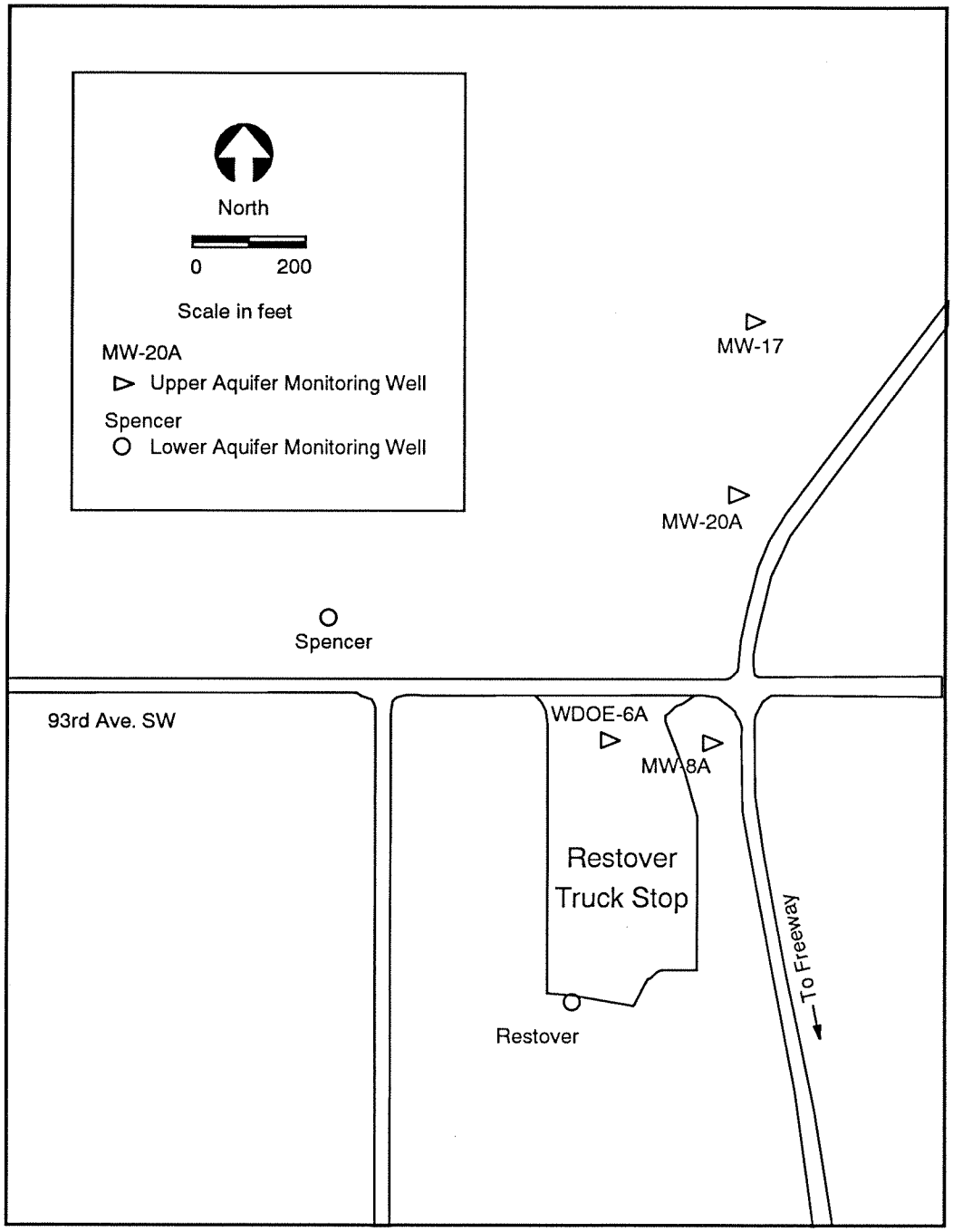


Figure 1: Sampling Locations, Restover Truck Stop

Round VII - August 1991

acid. Samples for dissolved metals were field filtered using dedicated, in-line, 0.45 $\mu$m polycarbonate membrane filters and were preserved with 1 mL of nitric acid to a pH $< 2$.

Prior to sample collection, field equipment (i.e., bailers) was pre-cleaned with sequential washes of Liquinox, hot tap water, 10% nitric acid, distilled-deionized water and pesticide-grade acetone, then air-dried and wrapped in aluminum foil until used in the field. The peristaltic pump and tubing used for filtration of dissolved iron samples was rinsed between samples using 500 mL of 10% nitric acid followed by 500 mL of deionized water. Chain-of-custody procedures were followed in accordance with Manchester Laboratory protocol (Huntamer, 1991).

**Quality Assurance**

Quality control samples collected in the field consisted of a transfer blank, a filter blank, a transport blank, and a blind field duplicate. A transfer blank for BTEX was obtained by running organic-free water through a decontaminated bailer and collecting the rinsate in a sample container. The filter blank for dissolved iron analysis was obtained by pumping organic-free water through a peristaltic pump and an in-line filter. Transport blanks for both BTEX and metals were carried unopened throughout the sampling period. Duplicate samples (labeled MW-8B) were obtained from monitoring well MW-8A. In addition to quality control samples collected in the field, matrix spike, matrix spike duplicates, and surrogate compound recoveries were performed in the laboratory.

BTEX analyses were performed by Analytical Resources, Inc., in Seattle. Dissolved iron analyses were performed by the Ecology/EPA Laboratory in Manchester. Quality assurance review was conducted by Stuart Magoon and Myrna McIntosh of the Manchester Laboratory and have been included in Appendix A. All data are considered acceptable for use. The transfer, transport, and method blank results showed no laboratory or field contamination of samples by BTEX. Analytical results for the transport, filter and procedural blanks showed low levels of iron contamination. Samples containing iron concentrations within a factor of ten of the concentrations found in the blanks are flagged with a "B". Analytical results labeled with a "P" indicates the analyte was detected above the instrument detection limit, but below the established minimum quantitation limit.

Matrix spike and surrogate recoveries for BTEX and iron were all within acceptable limits. The relative percent differences between duplicate samples collected from MW-8A were 25.6% for benzene, 6.1% for toluene, 4.3% for ethylbenzene, 0% for total xylenes, and 3.8% for dissolved iron.

**Field Observations**

A distinct hydrocarbon odor was observed from wells MW-8A, MW-20A, and WDOE-6A. Although water from WDOE-6A had an oily sheen, an interface probe did not detect any floating product.

Table 1 shows the water level elevations in on-site wells. Table 2 lists pH, temperature and specific conductance results.

Table 1: Water Table Elevations (MSL)

| Well ID | Elevation (MSL) |
|---|---|
| Upper Aquifer | |
| WDOE-1 | 181.21 |
| WDOE-6A | 181.62 |
| MW-8A | 181.21 |
| MW-15A | INACCESSIBLE |
| MW-17 | 180.76 |
| MW-18A | 181.44 |
| MW-20A | 181.06 |
| MW-23A | 180.58 |
| MW-24A | 181.75 |
| MW-26A | 180.59 |
| MW-27A | 181.23 |
| MW-29A | 180.11 |
| Lower Aquifer | |
| MW-16 | INACCESSIBLE |

Table 2: Field Sampling Results (In Order Sampled)

| Well ID | pH (standard units) | Specific Conductance (umhos/cm) | Temperature (degrees C) | Purge Volume (gals) | Aquifer (Upper/ Lower) |
|---|---|---|---|---|---|
| Spencer | 6.28 | 50 | 11.4 | 121 | Lower |
| Restover | 6.03 | 70 | 11.6 | 207 | Lower |
| MW-8A | 6.28 | 160 | 12.1 | 50 | Upper |
| MW-17 | 5.40 | 35 | 10.7 | 6 | Upper |
| MW-20A | 5.94 | 75 | 12.6 | 7 | Upper |
| WDOE-6A | 6.17 | 178 | 14.4 | 53 | Upper |

## ANALYTICAL RESULTS

Analytical results for BTEX and dissolved iron are presented in Table 3. Detectable concentrations of BTEX were found in three of the six wells sampled; WDOE-6A, MW-8A, and MW-20A which are all located in the upper aquifer. BTEX was not detected in the two domestic supply wells, which tap the lower aquifer. Samples from WDOE-6A had all four BTEX compounds, with a total concentration of 2840 $\mu$g/L. Well WDOE-6A continues to have the highest concentration of any of the wells sampled. Total BTEX concentrations measured at MW-8A and MW-20A were 20 $\mu$g/L and 293 $\mu$g/L, respectively. BTEX concentrations in well MW-20A increased between February and August 1991, but were still lower than concentrations measured in August 1990. BTEX concentrations in this well may fluctuate seasonally although a longer record would be needed to confirm this.

Dissolved iron concentrations in wells WDOE-6A and MW-8A were 4460 $\mu$g/L and 6140 $\mu$g/L, respectively. The Spencer, Restover, and MW-17 wells had low, but detectable levels of iron. These latter data are qualified due to blank contamination.

Table 3: Analytical Results ($\mu$g/L)

| Well ID | Benzene | Toluene | Ethylbenzene | Total Xylene | Dissolved Iron |
|---|---|---|---|---|---|
| Spencer | 1.0 u | 1.0 u | 1.0 u | 2.0 u | 5.8 PB |
| Restover | 1.0 u | 1.0 u | 1.0 u | 2.0 u | 16.3 PB |
| MW-8A | 1.7 | 1.6 | 4.5 | 12 | 6140 |
| MW-8B | 2.2 | 1.7 | 4.7 | 12 | 6380 |
| MW-17 | 1.0 u | 1.0 u | 1.0 u | 2.0 u | 20.6 B |
| MW-20A | 7 u | 10 | 53 | 230 | 174 |
| WDOE-6A | 180 | 630 | 330 | 1700 | 4460 |
| Transfer | 1.0 u | 1.0 u | 1.0 u | 1.0 u | NA |
| Transport | 1.0 u | 1.0 u | 1.0 u | 1.0 u | 8.5 PB |
| Filter | NA | NA | NA | NA | 6.8 PB |

u: Not Detected at Detection Limit Shown
B: Analyte Detected in Associated Blanks
P: Analyte Detected Above Instrument Detection Limit but Below Quantitation Limit
NA: Analyte Not Analyzed

## DISCUSSION

Figure 2 is the water table contour map for the upper aquifer using the water levels measured during the sample round. Ground water moves perpendicular to the contour lines from high potential to low. Ground water flow in the upper aquifer appears to be toward the northwest, which is consistent with the flow pattern observed during previous sample events.

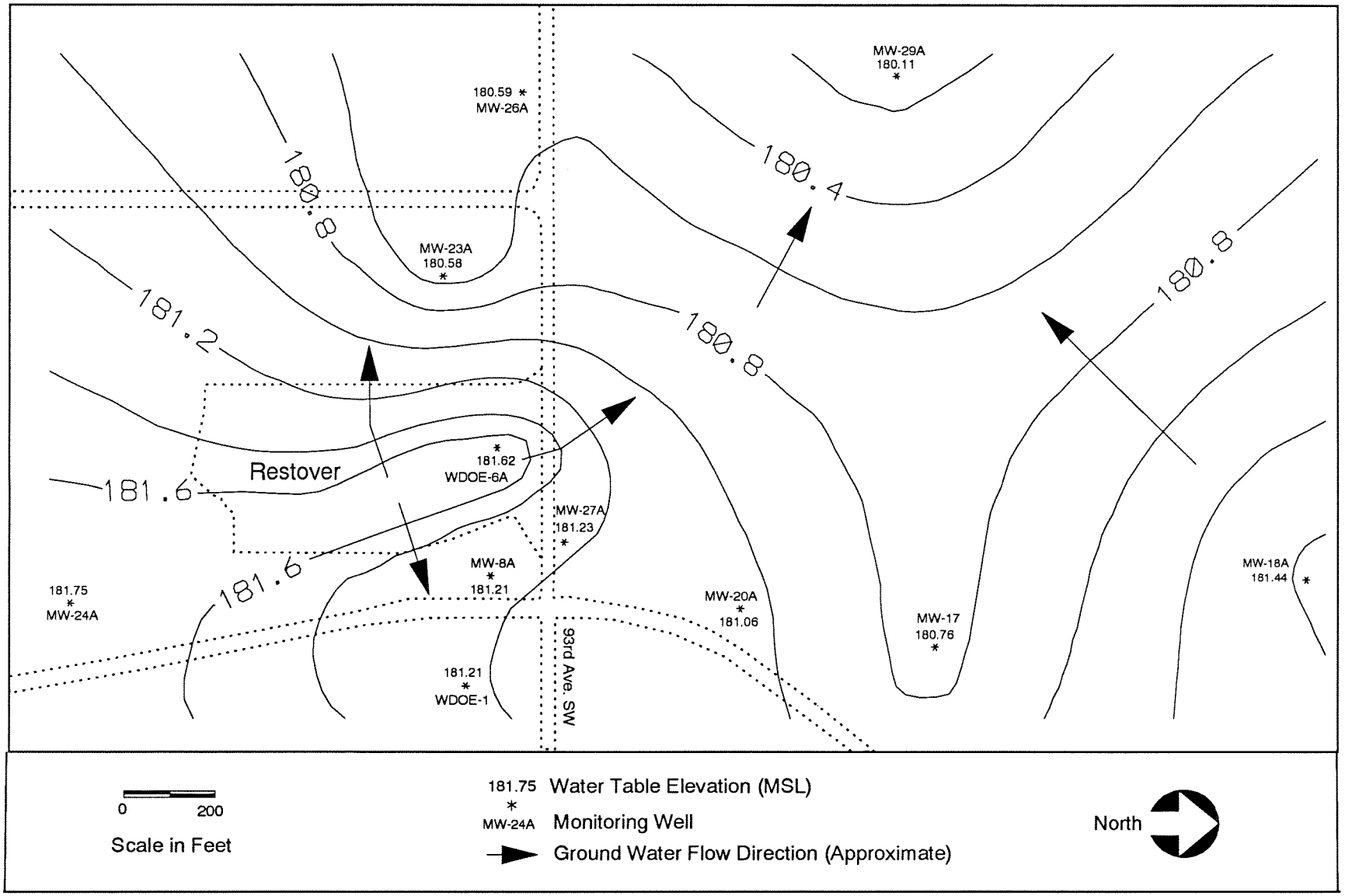


Figure 2: Restover Truck Stop - Water Table Map, August 1991

Table 4 shows BTEX concentrations for sampling events between May 1987 and August 1991. The degree of hydrocarbon contamination in the upper aquifer generally appears to be decreasing (except perhaps at MW-20A) compared to historical data.

Table 4: Historical Restover Truck Stop BTEX Concentrations ($\mu$g/L)

| Well ID | 5/87 | 9/87 | 10/88 | 1/89 | 7/89 | 1/90 | 8/90 | 2/91 | 8/91 |
|---|---|---|---|---|---|---|---|---|---|
| Upper Aquifer | | | | | | | | | |
| WDOE-6A | 6950 | 1180 | 5300 | 28000 | 7490 | 9870 | 5190 | 3460 | 2840 |
| MW-8A | 230 | 388 | 479 | 334 | 58 | 14.1 | 178 | 19 | 20 |
| MW-15A | 1433 | NT | NT | ND | 218 | NT | 285 | 122 | NT |
| MW-20A | 126 | NT | NT | NT | NT | 20 | 1400 | 5 | 293 |
| Lower Aquifer | | | | | | | | | |
| Restover | NT | NT | ND | ND | ND | ND | ND | ND | ND |
| Spencer | ND | | NT | ND | ND | ND | ND | ND | ND |
| MW-12 | 53 | 5 | 7.7 | ND | 4 | ND | 6 | ND | NT |

ND: Compound Not Detected
NT: Compound Not Tested

## CONCLUSIONS

1. BTEX concentrations continue to be elevated in WDOE-6A although concentrations appear to be decreasing overtime. Overall BTEX concentrations in the upper aquifer appear to be decreasing as compared to historical data. Concentration decreases are probably due to combinations of plume spreading, dispersion, biodegradation, reduction of source loading and/or seasonal variability.

2. Dissolved iron continues to be detected at high levels where BTEX contamination is present. The highest concentrations occur near the contamination source and decrease downgradient from the source.

3. Ground water flows generally toward the northwest, which is consistent with previous sampling events.

## RECOMMENDATIONS

1. Monitoring wells WDOE-6A, MW-8A, MW-15A, MW-20A, the Spencer well, and the Restover supply well should continue to be sampled for BTEX and dissolved iron. Anadditional well west of the source, perhaps MW-23A, MW-26A or MW-29A, should be sampled for dissolved iron and BTEX to assess potential contaminant migration in that direction.

2. All of the upper aquifer wells (8 wells) should be sampled for BTEX and dissolved iron to determine the current extent of the contaminant plume. This has not been done since May 1987.

## REFERENCES

Huntamer, D. and J. Hyre. Manchester Environmental Laboratory - Laboratory Users Manual. July 1991.

BC:kd

cc: Bill Yake
Denis Erickson

State of Washington Department of Ecology
Manchester Environmental Laboratory
7411 Beach Dr. East Port Orchard WA. 98366

Data Review
October 9, 1991

Project: **Restover**

Samples: 338105 338106 338107 338108
338109 338110 338111 338112 368015

Laboratory: Analytical Resources Inc. 8865

By: Stuart Magoon

## Case Summary

All but sample 368015 were received in good condition on August 15, 1991. Sample 368015 was received in good condition on September 6, 1991.

The samples were then transported to Analytical Resources Inc. for analysis, and arrived in good condition on August 16, 1991 and September 9, 1991.

These analyses were reviewed for qualitative and quantitative accuracy, validity, and usefulness.

All nine samples were analyzed by EPA method 8020 for Benzene, Ethylbenzene, Toluene, and Total Xylenes.

## DATA QUALIFIER DEFINITIONS

U - The analyte was not detected at or above the reported result.

UJ - The analyte was not detected at or above the reported estimated result.

J - The analyte was positively identified. The associated numerical result is an estimate.

X - The analyte was detected above the calibration range. The result should be considered an estimated quantity. Dilution required.

## BETX

| Sample | Date Collect | Date Extd | Date Anlz | #Days Collect to anal |
|---|---|---|---|---|
| 338105 | 8/13 | NA | 8/21 | 8 of 14 |
| 338105DPL | 8/13 | NA | 8/21 | 8 of 14 |
| 338106 | 8/13 | NA | 8/21 | 8 of 14 |
| 338107 | 8/14 | NA | 8/21 | 7 of 14 |
| 338107RE | 8/14 | NA | 8/27 | 13 of 14 |
| 338108 | 8/14 | NA | 8/22 | 8 of 14 |
| 338109 | 8/14 | NA | 8/21 | 7 of 14 |
| 338110 | 8/14 | NA | 8/21 | 7 of 14 |
| 338110DL | 8/14 | NA | 8/22 | 8 of 14 |
| 338111 | 8/14 | NA | 8/21 | 7 of 14 |
| 338112 | 8/14 | NA | 8/21 | 7 of 14 |
| 368015 | 9/5 | NA | 9/9 | 4 of 14 |

All these samples were analyzed within the SW-846 recommended holding time.
The "DPL" suffix is an abbreviation for duplicate. The "RE" suffix is an abbreviation for Re-analysis. The "DL" suffix is an abbreviation for dilution.

**Method blank:**

No target analytes were detected in the method blank.

**Surrogates:**

Surrogate recoveries for all these samples, the matrix spikes, and the associated method blanks are reasonable, acceptable and within the advisory QC limits.

**Matrix Spike and Matrix Spike Duplicate (MS/MSD):**

MS and MSD recoveries and precision data are reasonable and acceptable.

**Sample Data:**

This data is acceptable for use without the need for additional data qualifiers.
Analytes that have been qualified with an "X" should not be used for the final report, instead use the result from the dilution analysis.

16 August 1991

**ANALYTICAL RESOURCES INCORPORATED**

Analytical Chemists & Consultants

333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

Stuart Magoon
Washington State Dept. of Ecology
P.O. Box 307
Manchester, WA 98353

**RE: Project 'Restover Truck Stop' - ARI Job #08865**

Dear Stuart,

Please find enclosed the reports for the above referenced samples received 08/16/91 for BETX analysis only. These samples were received in good condition with no discrepancies in paperwork. Instructions indicated that a matrix spike/spike duplicate should be performed, but not on sample 33-8111 or 33-8112.

Samples were first analyzed by Purge and Trap GC/PID in a sequence starting on 08/21/91. Sample 33-8105 was analyzed in duplicate as part of in-house QC. ~~Both~~ results from both have been submitted ~~here~~. Sample **33-8110 (ARI 8865F)** required reanalysis due to the high level ~~individual~~ xylenes ~~found above the calibrated range of the instrument~~. This sample was reanalyzed at dilution on 08/22/91.

Analyses of

The analyst also performed a matrix spike and spike duplicate on 08/28/91, which had been omitted from the first sequence. The associated sample was also reanalyzed on this date.

The spike and spike duplicate results have been summarized on the second page of the sample report. Spike and surrogate recoveries were all within ~~required limits.~~ advisory quality control limits.

If you have questions, please feel free to call me at any time.

Sincerely,

ANALYTICAL RESOURCES, INC.

Susan D. Rosa Dunnihoo
Project Manager

Enclosures

cc: File 08865

**ANALYTICAL RESOURCES INCORPORATED**

Analytical
Chemists &
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## WATER BETX SURROGATE RECOVERY

ARI Job No: 8865

Client: WDOE
Project: Restover
Truck Stop

| Client Sample ID | S1 (TFT) | S (BFB) | TOT OUT |
|---|---|---|---|
| Method Blank | 97.1 | 95.3 | 0 |
| 33-8105 | 94.0 | 94.0 | 0 |
| 33-8105 DPL. | 96.2 | 96.6 | 0 |
| 33-8106 | 98.6 | 98.7 | 0 |
| 33-8107 | 94.4 | 94.3 | 0 |
| 33-8109 | 95.9 | 99.1 | 0 |
| 33-8110 | 96.2 | 97.8 | 0 |
| 33-8111 | 92.4 | 93.9 | 0 |
| 33-8112 | 94.1 | 95.8 | 0 |
| Method Blank | 108 | 110 | 0 |
| 33-8108 | 89.1 | 111 | 0 |
| 33-8110 DL | 106 | 112 | 0 |
| Method Blank | 94.9 | 94.8 | 0 |
| 33-8107 RE | 83.0 | 94.1 | 0 |
| 33-8107 MS | 86.6 | 92.9 | 0 |
| 33-8107 MSD | 82.8 | 88.9 | 0 |
| | | | |
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ADVISORY
QC LIMITS

S1 (TFT) = Trifluorotoluene 75-127
S2 (BFB) = Bromofluorobenzene 76-122

Asterisked values outside QC Limits

**FORM II-BETX**

**ANALYTICAL RESOURCES INCORPORATED**

Analytical
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Consultants

333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

# BETX METHOD BLANK SUMMARY

ARI Job No: 8865
Lab Sample ID: 0821MB
Date Analyzed: 08/21/91
Matrix: Waters
Instrument ID: GC/PID 1

Client: WDOE
Project: Restover
Truck Stop

Time Analyzed: 20:40
Level: Low

**THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS,MSD:**

| Client Sample ID | Lab Sample ID | Lab File ID | Time Analyzed |
|---|---|---|---|
| 33-8105 | 8865A | 8865A | 04:01 |
| 33-8105 DPL. | 8865ADUP | 8865ADUP | 04:32 |
| 33-8106 | 8865B | 8865B | 05:03 |
| 33-8107 | 8865C | 8865C | 05:35 |
| 33-8109 | 8865E | 8865E | 06:38 |
| 33-8110 | 8865F | 8865F | 07:09 |
| 33-8111 | 8865G | 8865G | 07:41 |
| 33-8112 | 8865H | 8865H | 09:47 |

Comments:

FORM IV BETX

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Chemists &
Consultants

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(206) 621-6490
(206) 621-7523 (FAX)

## BETX METHOD BLANK SUMMARY

ARI Job No: 8865
Lab Sample ID: 0822MB
Date Analyzed: 08/22/91
Matrix: Waters
Instrument ID: GC/PID 1

Client: WDOE
Project: Restover
Truck Stop

Time Analyzed: 16:42
Level: Low

**THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS,MSD:**

| Client Sample ID | Lab Sample ID | Lab File ID | Time Analyzed |
|---|---|---|---|
| 33-8108 | 8865D | 8865D | 19:31 |
| 33-8110 DL | 8865FDL | 8865FDL | 20:05 |

Comments:

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# BETX METHOD BLANK SUMMARY

ARI Job No: 8865
Lab Sample ID: 0827MB
Date Analyzed: 08/27/91
Matrix: Waters
Instrument ID: GC/PID 1

Client: WDOE
Project: Restover
Truck Stop

Time Analyzed: 20:07
Level: Low

**THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS,MSD:**

| Client Sample ID | Lab Sample ID | Lab File ID | Time Analyzed |
|---|---|---|---|
| 33-8107 RE | 8865CRE | 8865CRE | 06:58 |
| 33-8107 MS | 8865CMS | 8865CMS | 07:29 |
| 33-8107 MSD | 8865CMSD | 8865CMSD | 08:00 |

**Comments:**

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Analytical Chemists & Consultants

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# ORGANICS ANALYSIS DATA SHEET
## BETX by Method 602/8020

Matrix: Waters
Level: Low

Project No: Restover Truck Stop
QC Report No: 8865-WDOE
VTSR: 8/16/91

Data Release Authorized: Dom B. Patti
*Report prepared: 09/04/91 - MAC:C PAT*

| | Sample No. | Method Blk. | 33-8108 | 33-8110 DL | Method Blk. | 33-8107 RE |
|---|---|---|---|---|---|---|
| | ARI ID | 0822MB | 8865D | 8865FDL | 0827MB | 8865CRE |
| | Date Analyzed | 8/22/91 | 8/22/91 | 8/22/91 | 8/27/91 | 8/28/91 |
| | Amt Analyzed | 5.0 ml | 5.0 ml | 0.7 ml | 5.0 ml | 5.0 ml |
| CAS Number | Units | µg/L | µg/L | µg/L | µg/L | µg/L |
| 71-43-2 | Benzene | 1.0 U | **1.7** | 7 U | 1.0 U | 1.0 U |
| 108-88-3 | Toluene | 1.0 U | **1.6** | **10** | 1.0 U | 1.0 U |
| 100-41-4 | Ethylbenzene | 1.0 U | **4.5** | **53** | 1.0 U | 1.0 U |
| 1330-20-7 | Total Xylenes | 2.0 U | **12** | **230** | 2.0 U | 2.0 U |
| | *Trifluorotoluene* | *108%* | *89.1%* | *106%* | *94.9%* | *83.0%* |
| | *Bromobenzene* | *110%* | *111%* | *112%* | *94.8%* | *84.1%* |

| | Sample No. | 33-8107 MS | 33-8107 MSD | MS/MSD Recoveries | | |
|---|---|---|---|---|---|---|
| | ARI ID | 8865CMS | 8865CMSD | SAMPLE: 33-8107 | | |
| | Date Analyzed | 8/28/91 | 8/28/91 | | | |
| | Amt Analyzed | 5.0 ml | 5.0 ml | | | |
| CAS Number | Units | µg/L | µg/L | % MS REC | % MSD REC | RPD |
| 71-43-2 | Benzene | - | - | 98.2% | 99.8% | -1.6 |
| 108-88-3 | Toluene | - | - | 99.4% | 101% | -1.4 |
| 100-41-4 | Ethylbenzene | - | - | 98.2% | 100% | -2.1 |
| 1330-20-7 | Total Xylenes | - | - | 99.6% | 102% | -1.9 |
| | *Trifluorotoluene* | *86.6%* | *82.8%* | | | |
| | *Bromobenzene* | *92.9%* | *88.9%* | | | |

Value — If the result is a value greater than or equal to the detection limit, report value.

U — Indicates compound was analyzed for but not detected at the given detection limit.

NR — Analysis not required.

B — This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.

K — This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.

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## ORGANICS ANALYSIS DATA SHEET
### BETX by Method 602/8020

Matrix: Waters
Level: Low

Project No: **Restover Truck Stop**
QC Report No: 8865-WDOE
VTSR: 8/16/91

Data Release Authorized: Dan B. Potter
*Report prepared: 09/04/91 - MAC:C PAT*

| CAS Number | | Sample No. | Method Blk. | 33-8105 | 33-8105 DPL. | 33-8106 | 33-8107 |
|---|---|---|---|---|---|---|---|
| | | ARI ID | 0821MB | 8865A | 8865A DUP | 8865B | 8865C |
| | | Date Analyzed | 8/21/91 | 8/22/91 | 8/22/91 | 8/22/91 | 8/22/91 |
| | | Amt Analyzed | 5.0 ml | 5.0 ml | 5.0 ml | 5.0 ml | 5.0 ml |
| | | Units | µg/L | µg/L | µg/L | µg/L | µg/L |
| 71-43-2 | Benzene | | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| 108-88-3 | Toluene | | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| 100-41-4 | Ethylbenzene | | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| 1330-20-7 | Total Xylenes | | 2.0 U | 2.0 U | 2.0 U | 2.0 U | 2.0 U |
| | | *Trifluorotoluene* | *97.1%* | *94.0%* | *96.2%* | *98.6%* | *94.4%* |
| | | *Bromobenzene* | *95.3%* | *94.0%* | *96.6%* | *98.7%* | *94.3%* |

| CAS Number | | Sample No. | 33-8109 | 33-8110 | 33-8111 | 33-8112 |
|---|---|---|---|---|---|---|
| | | ARI ID | 8865E | 8865F | 8865G | 8865H |
| | | Date Analyzed | 8/22/91 | 8/22/91 | 8/22/91 | 8/22/91 |
| | | Amt Analyzed | 5.0 ml | 5.0 ml | 5.0 ml | 5.0 ml |
| | | Units | µg/L | µg/L | µg/L | µg/L |
| 71-43-2 | Benzene | | **2.2** | **9.7** | 1.0 U | 1.0 U |
| 108-88-3 | Toluene | | **1.7** | **15** | 1.0 U | 1.0 U |
| 100-41-4 | Ethylbenzene | | **4.7** | **69** | 1.0 U | 1.0 U |
| 1330-20-7 | Total Xylenes | | **12** | **220 K** | 2.0 U | 2.0 U |
| | | *Trifluorotoluene* | *95.9%* | *96.2%* | *92.4%* | *94.1%* |
| | | *Bromobenzene* | *99.1%* | *97.8%* | *93.9%* | *95.8%* |

Value — If the result is a value greater than or equal to the detection limit, report value.

U — Indicates compound was analyzed for but not detected at the given detection limit.

NR — Analysis not required.

B — This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.

K — This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.

16 August 1991

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Stuart Magoon
Washington State Dept. of Ecology
P.O. Box 307
Manchester, WA 98353

**RE: Project 'Restover Truck Stop' - ARI Job #08865(II)**
Dear Stuart,

Please find enclosed the reports for the above referenced sample received 09/09/91 for BETX analysis only. Instructions indicated that a matrix spike/spike duplicate should not be performed.

The sample was analyzed by Purge and Trap GC/PID in a sequence starting on 9/09/91. The first analysis gave analytes above the linear range of the instrument. The sample was reanalyzed at dilution. The first analysis has been presented as a 'duplicate' on the report page enclosed.

If you have questions, please feel free to call me at any time.

Sincerely,

ANALYTICAL RESOURCES, INC.

Susan D. Rosa Dunnihoo
Project Manager

Enclosures

cc: File 08865(II)

**ANALYTICAL RESOURCES INCORPORATED**

Analytical Chemists & Consultants

333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

## ORGANICS ANALYSIS DATA SHEET - Method 602/8020
## BETX by GC-PID

Matrix: Water
Level: Low

QC Report No: 8865 II-WDOE
Project No: Restover Truck Stop

Data Release Authorized: _____
*Report prepared: 9/11/91 - MAC:K kas*

Date Received: 9/9/91

| | Sample No. | Meth. Blank | 368015 | 368015 |
|---|---|---|---|---|
| | ARI ID | 0909MB | 8865I | 8865Idup |
| | Date Analyzed | 09/09/91 | 09/09/91 | 09/09/91 |
| | Amt Analyzed | 0.200 mls | 0.179 mls | 1.250 mls |
| CAS Number | Units | µg/L | µg/L | µg/L |
| 71-43-2 | Benzene | 25 U | **180** | **170** |
| 108-88-3 | Toluene | 25 U | **630** | **430 X** |
| 100-41-4 | Ethylbenzene | 25 U | **330** | **300** |
| 1330-20-7 | Total Xylenes | 50 U | **1700** | **1100 X** |

**Surrogate Recoveries**

| | | | |
|---|---|---|---|
| Trifluorotoluene | 97.6% | 93.3% | 97.5% |
| Bromobenzene | 98.0% | 98.2% | 103% |

Data Reporting Qualifiers

Value — If the result is a value greater than or equal to the detection limit, report the value.

U — Indicates compound was analyzed for but not detected at the given detection limit.

X — Indicates a value above the linear range of the detector. Dilution required.

B — This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.

J — Indicates an estimated value when result is less than specified detection limit.

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# WATER BETX SURROGATE RECOVERY

ARI Job No: 8865

Client: WDOE
Project: Restover Truck Stop

| Client Sample ID | S1 (TFT) | S (BFB) | TOT OUT |
|---|---|---|---|
| 368015 | 93.3 | 98.2 | 0 |
| 368015-DUP | 97.5 | 103 | 0 |
| Meth Blank | 97.6 | 98.0 | 0 |

ADVISORY QC LIMITS

S1 (TFT) = Trifluorotoluene 75-127
S2 (BFB) = Bromofluorobenzene 76-122

Asterisked values outside QC Limits

**FORM II-BETX**

**ANALYTICAL RESOURCES INCORPORATED**

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Chemists &
Consultants

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Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

## BETX METHOD BLANK SUMMARY

ARI Job No: 8865
Lab Sample ID: 0909MB
Date Analyzed: 09/09/91
Matrix: Waters
Instrument ID: GC/PID 1

Client: WDOE
Project: Restover Truck Stop

Time Analyzed: 17:03
Level: Low

**THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS,MSD:**

| Client Sample ID | Lab Sample ID | Lab File ID | Time Analyzed |
|---|---|---|---|
| 368015 | 8865 I | R09097 | 19:40 |
| 368015-DUP | 8865 I DUP | R09098 | 20:12 |

**Comments:**

**WASHINGTON STATE DEPARTMENT OF ECOLOGY**
**ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES**
**MANCHESTER LABORATORY**

September 11, 1991

TO: Pam Marti

FROM: Myrna McIntosh

SUBJECT: QA Summary of Restover Truck Stop water samples

**SAMPLE RECEIPT:**

The samples from the Restover Truck Stop water project were received by the Manchester Laboratory on 08/15/91 in good condition.

**HOLDING TIMES:**

All analyses were performed within the specified holding times for metals analysis (28 days for mercury, 180 days for all other metals).

**INSTRUMENT CALIBRATION:**

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10% during the run and again at the end of the analytical run. All initial and continuing calibration verification standards were within the control limits of +/- 10%. AA calibration gave correlation coefficients greater than the criteria of 0.995. A correlation coefficient of 0.995 or higher means that the calibration is acceptable.

**PROCEDURAL BLANKS:**

The procedural blanks associated with these samples contained trace levels of iron. Samples with iron values within 10 times the level found in the blank are flagged with "B".

**SPIKED SAMPLE ANALYSIS:**

Spiked sample and duplicate spiked sample analysis were performed on sample number 338106. All spike recoveries were within the acceptable limits of +/- 25% for water sample analysis.

**PRECISION DATA:**

The duplicate results of the spiked and duplicate spiked sample were used to calculate precision related to the analysis of these samples. The % RPD for all parameters was well within the +/- 20% window for duplicate analysis.

**ICP SERIAL DILUTION ANALYSIS:**

The Relative Percent Difference (RPD) between sample results and the results for a serial dilution of the same sample were less than 10%.

**SUMMARY:**

The data generated by the analysis of the Restover water project can be used with confidence. Trace amounts of iron were found in the blank and samples levels within 10 times the levels of the blank are flagged with "B" indicating the possibility of low iron contamination.

If you have any questions about the results or the methods used to obtain these results please call me at SCAN 744-4737.

cc Bill Kammin

*** Analysis Report ***

==> Transaction #: 09091345 Laboratory: (WE) Ecology, Manchester Lab

Work Group: (38) Metals - ICP Scan

Instrument: (ICP ) ICP, Jarrell-Ash AtomComp 1100 (DOE)

Method: (EP1-200.7 ) Inductively Coupled Plasma Atomic Emissions Analysis

Chemist: (AGH) Hedley, Art DOE Hours Worked:

Project: DOE-024S RESTOVER TRUCK STOP Prg Ele#: D3K01

Prj Off: Marti, Pam DOE Analysis Due: 910815 Revised Due:

*** Sample Records in Transaction ***

| Seq# | Sample # | QA | Date/Time | Description | Alternate Keys | | |
|---|---|---|---|---|---|---|---|
| 01 | 91338106 | LBK1 | 910813 | RESTOVER | | | |
| 02 | 91338106 | LBK2 | 910813 | RESTOVER | | | |
| 03 | 91338105 | | 910813 | SPENCER | | | |
| 04 | 91338106 | | 910813 | RESTOVER | | | |
| 05 | 91338106 | LMX1 | 910813 | RESTOVER | | | |
| 06 | 91338106 | LMX2 | 910813 | RESTOVER | | | |
| 07 | 91338107 | | 910814 | MW-17 | | | |
| 08 | 91338108 | | 910814 | MW-8A | | | |
| 09 | 91338109 | | 910814 | MW-8B | | | |
| 10 | 91338110 | | 910814 | MW-20A | | | |
| 11 | 91338112 | | 910814 | TRANSPOR | | | |
| 12 | 91338113 | | 910814 | FILTER | | | |

Record Type: TRNIN3 Date Verified: 9/9/91 By:
Transaction Status: New Transaction...First Printing...Unverified.
Processed: 9-SEP-91 14:27:23 Status: N Batch: (In CUR DB)

*** Lab Analysis Report ***

Transaction #: 09091345 Seq #: 01 (38) Metals - ICP Scan
Proj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

Blank ID : PB 34.43
Sample No.: 91 338106 Alternate Keys:

Samp Matrix: (11) Water-Filtered Units: (00) %Slds:
QA Code: (LBK1) Lab Blank Sample #1 Peaks Total:
Date Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 21

| Line | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 3.4P |

*** Lab Analysis Report ***

Transaction #: 09091345 Seq #: 02 (38) Metals - ICP Scan
Proj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

Blank ID : PB 34.44
Sample No.: 91 338106 Alternate Keys:

Samp Matrix: (11) Water-Filtered Units: (00) %Slds:
QA Code: (LBK2) Lab Blank Sample #2 Peaks Total:
Date Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 21

| Line | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 9.6P |

*** Lab Analysis Report ***

Transaction #: 09091345 Seq #: 03 (38) Metals - ICP Scan
Proj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 91 338105 Alternate Keys:

Samp Matrix: (11) Water-Filtered Units: (00) %Slds:
QA Code: ( ) Unspecifed Peaks Total:
Date Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 21

| Line | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 5.8PB |

*** Lab Analysis Report ***

Transaction #: 09091345 Seq #: 04 (38) Metals - ICP Scan
Proj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 91 338106 Alternate Keys:

Samp Matrix: (11) Water-Filtered Units: (00) %Slds:
QA Code: ( ) Unspecifed Peaks Total:
Date Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 21

| Line | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 16.3PB |

*** Lab Analysis Report ***

Transaction #: 09091345 Seq #: 05 (38) Metals - ICP Scan
Proj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 91 338106 Alternate Keys:

Samp Matrix: (11) Water-Filtered Units: (94) % Recov %Slds:
QA Code: (LMX1) Lab Mtrx Spike #1 (% Rec Peaks Total:
Date Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 21

| Line | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss ug/l | % Recov | 96 |

*** Lab Analysis Report ***

'ransaction #: 09091345 Seq #: 06 (38) Metals - ICP Scan
'roj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

ample No.: 91 338106 Alternate Keys:

amp Matrix: (11) Water-Filtered Units: (94) % Recov %Slds:
)A Code: (LMX2) Lab Mtrx Spike #2 (% Rec Peaks Total:
)ate Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 21

| ine | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss ug/l | % Recov | 96 |

*** Lab Analysis Report ***

'ransaction #: 09091345 Seq #: 07 (38) Metals - ICP Scan
'roj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

;ample No.: 91 338107 Alternate Keys:

;amp Matrix: (11) Water-Filtered Units: (00) %Slds:
)A Code: ( ) Unspecifed Peaks Total:
)ate Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 20

| ;ine | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 20.6B |

*** Lab Analysis Report ***

Transaction #: 09091345 Seq #: 08 (38) Metals - ICP Scan
Proj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 91 338108 Alternate Keys:

Samp Matrix: (11) Water-Filtered Units: (00) %Slds:
QA Code: ( ) Unspecifed Peaks Total:
Date Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 20

| Line | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 6140 |

*** Lab Analysis Report ***

'ransaction #: 09091345 Seq #: 09 (38) Metals - ICP Scan
'roj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

ample No.: 91 338109 Alternate Keys:

amp Matrix: (11) Water-Filtered Units: (00) %Slds:
A Code: ( ) Unspecifed Peaks Total:
ate Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 20

| ine | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 6380 |

*** Lab Analysis Report ***

Transaction #: 09091345 Seq #: 10 (38) Metals - ICP Scan
Proj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 91 338110 Alternate Keys:

Samp Matrix: (11) Water-Filtered Units: (00) %Slds:
QA Code: ( ) Unspecifed Peaks Total:
Date Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 20

| Line | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 174 |

*** Lab Analysis Report ***

Transaction #: 09091345 Seq #: 11 (38) Metals - ICP Scan
Proj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

Sample No.: 91 338112 Alternate Keys:

Samp Matrix: (11) Water-Filtered Units: (00) %Slds:
QA Code: ( ) Unspecifed Peaks Total:
Date Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 20

| Line | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 8.5PB |

*** Lab Analysis Report ***

'ransaction #: 09091345 Seq #: 12 (38) Metals - ICP Scan
'roj Code : DOE-024S RESTOVER TRUCK STOP PE # : D3K01

;ample No.: 91 338113 Alternate Keys:

;amp Matrix: (11) Water-Filtered Units: (00) %Slds:
)A Code: ( ) Unspecifed Peaks Total:
)ate Extracted: Date Analyzed: 910903 # Days to Ext/Anal: 0/ 20

| ;ine | Par # | Parameter Description | Units | Value |
|---|---|---|---|---|
| 1 | 01046 | Iron Fe-Diss | ug/l | 6.8PB |

**WASHINGTON STATE DEPARTMENT OF ECOLOGY**
**ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES**
**MANCHESTER LABORATORY**

September 26, 1991

TO: Pam Marti

FROM: Myrna McIntosh

SUBJECT: QA Summary of Restover Truck Stop

**SAMPLE RECEIPT:**

The samples from the Restover Truck Stop project were received by the Manchester Laboratory on 09/06/91 in good condition.

**HOLDING TIMES:**

All analyses were performed within the specified holding times for metals analysis (28 days for mercury, 180 days for all other metals).

**INSTRUMENT CALIBRATION:**

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10% during the run and again at the end of the analytical run. All initial and continuing calibration verification standards were within the control limits of +/- 10%. AA calibration gave correlation coefficients greater than the criteria of 0.995. A correlation coefficient of 0.995 or higher means that the calibration is acceptable.

**PROCEDURAL BLANKS:**

The procedural blanks associated with these samples showed trace levels of iron. All the samples showed at least ten times the amount found in the blank, therefore the samples are not qualified.

**SPIKED SAMPLE ANALYSIS:**

Spiked sample and duplicate spiked sample analysis were performed on sample number 368015. All spike recoveries were within the acceptable limits of +/- 25% for water sample analysis.

**PRECISION DATA:**

The duplicate results of the spiked and duplicate spiked sample were used to calculate precision related to the analysis of these samples. The % RPD for all parameters was well within the +/- 20% window for duplicate analysis.

**ICP SERIAL DILUTION ANALYSIS:**

The Relative Percent Difference (RPD) between sample results and the results for a serial dilution of the same sample were less than 10%.

**SUMMARY:**

The data generated by the analysis of the above referenced samples can be used without qualification.

If you have any questions about the results or the methods used to obtain these results please call me at SCAN 744-4737.

cc Bill Kammin

Washington State Department of Ecology
Sample/Project Analysis Results



Project: DOE-024T RESTOVER TRUCK STOP

Officer: PZM Account: D3K01

Laboratory: Ecology, Manchester

Sample No: 91 368015 Description: WDOE-6A

Source: Well (Test/Observation)

Begin Date: 91/09/05 :

All but Contract Data

| Metals - ICP Scan | | Water-Filtere Result | Units |
|---|---|---|---|
| Iron | Fe-Diss | 4460 * | ug/l |

| Metals - ICP Scan Matrix Spike #1 | | Water-Filtere Result | Units |
|---|---|---|---|
| Iron | Fe-Diss | 101 | % Recov |

| Metals - ICP Scan Matrix Spike #2 | | Water-Filtere Result | Units |
|---|---|---|---|
| Iron | Fe-Diss | 104 | % Recov |

| Contract Lab Program | Water-Total Result | Units |
|---|---|---|
| BTEX | REQ | CLP |

(Sample Complete)

Project: DOE-024T RESTOVER TRUCK STOP

Officer: PZM

Account: D3K01

Blank ID: PB 37.75

| Metals - ICP Scan Blank #1 | | Water-Filtere Result | Units |
|---|---|---|---|
| Iron | Fe-Diss | 7.8P* | ug/l |

(Sample Complete)

## Data Qualifiers

| Code | Definition |
|---|---|
| B | Analyte was also found in the analytical method blank indicating the sample may have been contaminated. |
| 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 $3 \times 10^6$. |
| E | Reported result is an estimate because of the presence of interference. |
| J | The analyte was positively identified. The associated numerical result is an estimate. |
| N | For organic analytes there is evidence the analyte is present in this sample.<br>For metals analytes the spike sample recovery is not within control limits. |
| NJ | There is evidence that the analyte is present. The associated numerical result is an estimate. |
| NAF | Not analyzed for. |
| P | The analyte was detected above the instrument detection limit but below the established minimum quantitation limit. |
| REJ | The data are unusable for all purposes. |
| U | The analyte was not detected at or above the reported result. |
| UJ | The analyte was not detected at or above the reported estimated result. |
| "*" | The analyte was present in the sample. Used as a visual aid to locate detected compounds on the report sheet. |

**Data Qualifiers for Microbiology**

| Code | Definition |
|---|---|
| X | High background count |
| P | Greater than |
| A | Less than |
| S | Spreader |
| O | Bottle overfull; can't shake sample |