FINAL

OU-B 31926

# LONG-TERM GROUNDWATER MONITORING

# OCTOBER 1998 SAMPLING

# OPERABLE UNIT B
# POLELINE ROAD DISPOSAL AREA
# FORT RICHARDSON, ALASKA

*Contract No. DACA-85-94-D-0005*
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*Prepared for*

**U.S. ARMY CORPS OF ENGINEERS**
**ALASKA DISTRICT**
**Anchorage, Alaska**
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**Woodward-Clyde**

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# SECTIONONE Introduction

Woodward-Clyde (WC) was contracted by the United States Army Corps of Engineers (USACE) on behalf of the United States Army, Public Works (Army) to conduct long-term groundwater monitoring at Operable Unit B (OUB), the Poleline Road Disposal Area, at Fort Richardson, Alaska. OUB is a former Army disposal area for chemical warfare training materials and has been the subject of several environmental investigations, a feasibility study, and a treatability study.

The objective of long-term groundwater monitoring is twofold: to collect data on groundwater contaminant trends and to devise an appropriate long-term monitoring plan for the site. According to the *Long-Term Groundwater Monitoring Workplan, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska* (WC, September 1997), eight rounds of sampling will be performed initially to evaluate groundwater contaminant trends. The first round of sampling was conducted November 1997 and the second round of sampling was conducted in June 1998. This report describes the sampling and findings for the third round conducted in October 1998.

The tasks to be completed under the *Long-Term Groundwater Monitoring Workplan, Operable Unit B, Poleline Road Disposal Area, Forth Richardson, Alaska* (WC, September 1997) include the following:

- Conduct eight rounds of groundwater sampling for volatile organic compounds (VOCs) in 20 monitoring wells at OUB. Also, conduct sampling for natural attenuation parameters during the first two rounds.
- Set up and maintain a database of VOC groundwater data from OUB using Microsoft Access. Structure the database to accommodate additional data from future long-term monitoring. Enter existing VOC data and update the database after each sampling event.
- Prepare a technical memorandum after each round of sampling that includes the results of the sampling event, a description of changes in contaminant concentrations since the previous sampling event, and recommendations for the next round of sampling.
- Evaluate natural attenuation data after the first two rounds of sampling and revise sampling plan based on the evaluation.
- Evaluate data after the eight rounds of sampling are complete and provide recommendations for the wells to be used for long-term monitoring.

## 3.1 LOCATION

OUB is located on the Fort Richardson Army Post, approximately 10 miles northeast of Anchorage, Alaska. The site is approximately 1 mile south of the Eagle River and 0.6 miles north of the Anchorage Regional Landfill. Access to the area is by Poleline Road, a gravel road that runs northeast-southwest along a power line route and the Eklutna Water Line. The site is bisected by Barrs Boulevard, a gravel road extending from the Glenn Highway to Poleline Road.

## 3.2 SITE DESCRIPTION

The OUB site is a low-lying, relatively flat area which is bordered by wooded hills to the northwest and southeast. The site encompasses four disposal areas, Areas A-1 through A-4 (Figure 3-1). The area was cleared of vegetation during a removal action in 1994. Wetlands are located directly south and southwest of the disposal areas. The remaining area bordering the site is relatively flat and wooded.

## 3.3 GEOLOGY

Regional surficial deposits are fluvially reworked glacial sediments and glacial tills. These deposits appear to be up to 30 feet thick at the site and consist of unstratified to poorly stratified clays, silts, sands, gravels, and boulders. A basal till lies below the surficial deposits and overlies an advance moraine/till complex. Underlying the glacial sediments is bedrock composed of a hard black fissile claystone.

The subsurface soils are dense glacial tills and generally silty sands with some gravel. Thin, discontinuous clay lenses were observed rarely. Observations during drilling confirm a typical fluvio-glacial setting; a heterogeneous system of discontinuous, relatively permeable channels with intervening denser, less permeable sediments.

## 3.4 HYDROGEOLOGY

Four water bearing intervals have been identified at OUB: a perched interval, a shallow interval, an intermediate interval, and a deep aquifer. The detection of contaminants in all four intervals suggests that they are interconnected to some degree. Observations made while drilling indicate that the saturated intervals are separated by zones of very dense, low porosity, compact tills. The compact tills are dry or slightly moist.

The perched interval was observed in borings drilled between Area A-2 and the wetlands, and in Area A-3. The top of the perched interval was encountered at 4 to 10 feet below ground surface (bgs), and the bottom was found at 6 to 12 feet bgs. The average thickness of the perched interval is approximately 5 feet. The perched interval is recharged mainly by surface water from the wetlands, although some recharge also occurs from precipitation. The only well installed in the perched interval is MW-14.

The shallow saturated interval is an average of 10 feet thick; the top was encountered at 20 to 25 feet bgs, and the bottom was found at 28 to 36 feet bgs. Groundwater elevations indicate that

shallow groundwater is flowing in a north-northeast direction. Because of the localized nature of water-bearing zones at this site, it is difficult to tell whether the water-bearing units are hydraulically connected between wells. The shallow interval is recharged by water from the perched interval and by infiltration of precipitation.

The intermediate interval was observed while drilling monitoring well MW-16. The saturated portion of the intermediate interval was encountered at approximately 65 to 95 feet bgs in MW-16. The intermediate saturated interval does not correlate with the other deep wells on site, suggesting that it is an isolated lens with limited continuity. There may be several isolated lenses of saturated material within the intermediate interval.

Five monitoring wells at OUB penetrate the deep aquifer, the top of which was encountered from approximately 80 to 125 feet bgs. The deep aquifer is an advance moraine/till complex with a thickness of between 3 and 40 feet. Groundwater elevations indicate that the flow direction in the deep aquifer is locally to the northeast and regionally to the northwest. Available data indicate that the deep aquifer below the site is not connected with the aquifers used for drinking water in the community of Eagle River (over one mile to the northeast).

The deep aquifer overlies a claystone bedrock unit with unknown thickness. Four of the five deep wells at OUB penetrate the bedrock unit and the well screens extend slightly into the bedrock. The top of bedrock was encountered from 120 to 170 feet beneath the site.

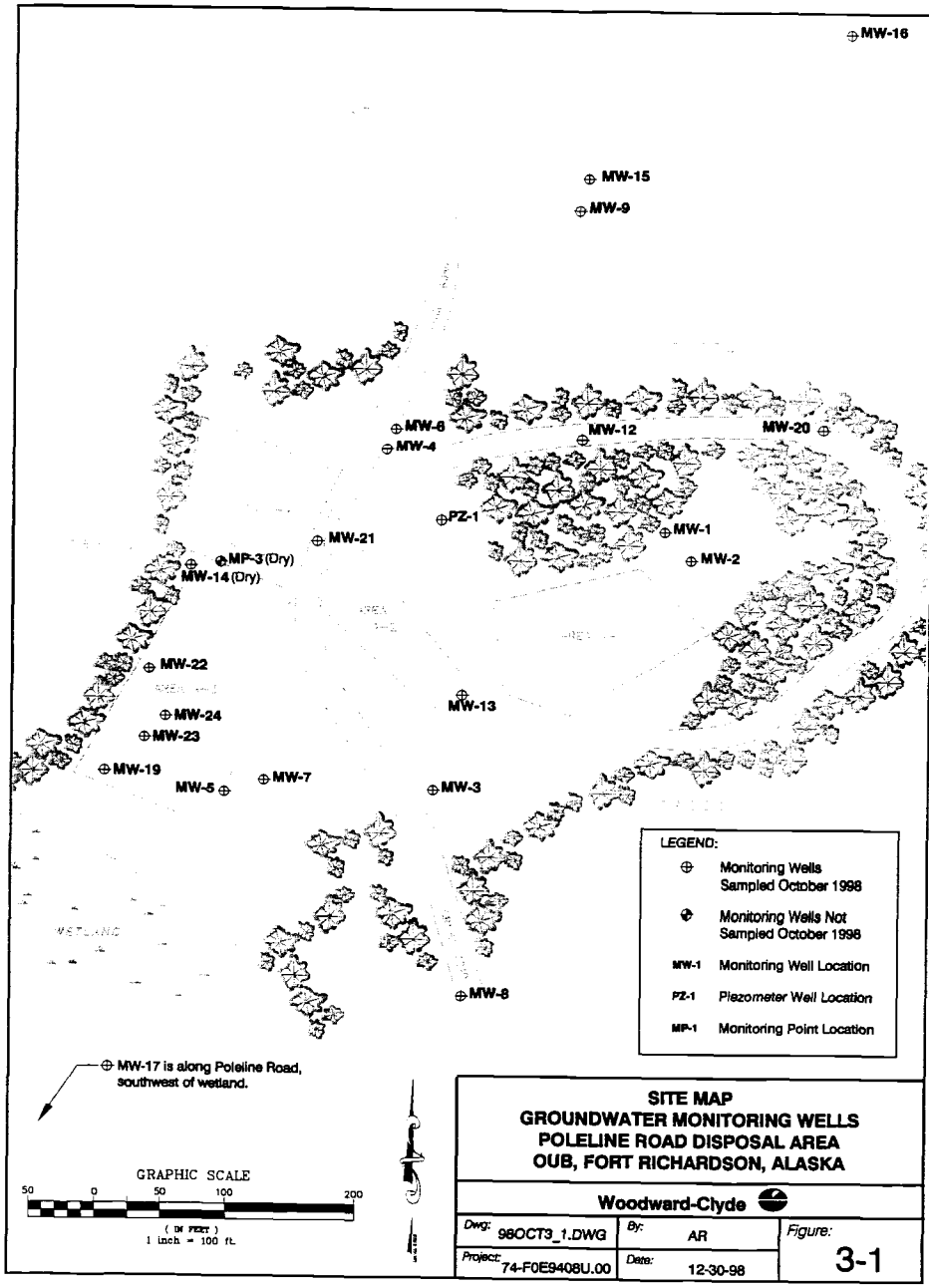
The ultimate discharge area of the water-bearing intervals at OUB is probably the Eagle River, approximately 1 mile north of the site. The Eagle River flows into the Knik Arm of Cook Inlet approximately 5 miles northwest of OUB. The river is not used as a drinking water supply.

## 3.5 LAND USE

The land surrounding OUB currently is used for Army training activities and for recreational purposes. It is unlikely that groundwater beneath the site ever would be used for a drinking water supply. Yield from the intermediate, shallow, and perched saturated intervals may be too low to supply an average household, and the installation of septic systems would preclude use of the shallow or perched intervals for drinking water. The deep aquifer may provide sufficient yield but the installation of drinking water wells in the deep aquifer is unlikely. The Eklutna Water Line, a pipeline which supplies Anchorage and the community of Eagle River with drinking water from Eklutna Lake (over 15 miles from the site), runs immediately west of the site and would provide a relatively inexpensive and reliable source of drinking water.

## 3.6 CURRENT SITE CONDITIONS

A design verification study (DVS) was underway during the November 1997 round of groundwater sampling. The primary objective of the DVS is to evaluate the applicability of six-phase soil heating (SPSH) as an applicable in-situ technology for remediating solvent contaminated soils. The field portion of this study ended December 18, 1997. This study resulted in region of heated soils and groundwater that can be seen in the groundwater temperature at monitoring well MW-22.




**SITE MAP**
**GROUNDWATER MONITORING WELLS**
**POLELINE ROAD DISPOSAL AREA**
**OUB, FORT RICHARDSON, ALASKA**

Woodward-Clyde

| Dwg: 98OCT3_1.DWG | By: AR | Figure: 3-1 |
|---|---|---|
| Project: 74-F0E9408U.00 | Date: 12-30-98 | |

# SECTIONFOUR Field Procedures

The wells selected for sampling during the initial eight rounds of the long-term groundwater monitoring program are shown on the site map (Figure 3-1). The rationale for sampling each well is presented in Table 3-1 of the *Long-Term Groundwater Monitoring Workplan, Operable Unit B, Poleline Road Disposal Area, Forth Richardson, Alaska* (WC, September 1997). Field tasks for the third round of groundwater monitoring included the following:

- collect headspace readings of the vapors in each well,
- measure static water levels,
- purge and sample up to 20 wells for analysis of volatile organic compounds (VOCs).

Groundwater monitoring was conducted in accordance with procedures and protocols presented in Sections 4 through 7 of the *Long-Term Groundwater Monitoring Workplan* and *Addendum No. 1*. Section 4 covers the groundwater monitoring field procedures, Section 5 is the Quality Assurance Project Plan (QAPP), Section 6 and *Addendum No. 1* describe the management of investigation -derived waste, and Section 7 covers health and safety requirements.

Headspace measurements and groundwater levels were measured in 22 monitoring wells. Two of these wells, MW-4 and MW-14, were dry. Measurements using an organic vapor monitor (OVM) showed no volatile organic vapors in the headspace of most of the wells. Five wells had OVM values ranging from 0.2 - 3.0 ppm. Four wells had values greater than 10.0 ppm: MW-24 (10.9 ppm), MW-23 (24.8 ppm), MW-22 (238 ppm), and MW-14 (742 ppm). Groundwater samples were collected from 19 wells for analysis of volatile organic compounds (VOCs). MW-17 was not sampled for VOCs.

## 5.1 VOLATILE ORGANIC COMPOUNDS

Table 5-1 summarizes analytical results for the VOCs detected in groundwater samples collected from 1995 through 1998. Table 5-6 lists the Chemical Abstract Service (CAS) Numbers for the compounds listed in Table 5-1. Eight of the nine VOCs detected in the October 1998 groundwater samples were chlorinated compounds. VOCs were detected in groundwater from all of the sampled monitoring wells, except for MW-9, MW-16, and MW-8. The concentrations and trends of VOCs detected are discussed below.

Table 5-1 is organized so that changes in contaminant concentrations over time can be identified. With each additional round of data added to the tables, trends become clearer. These trends will be noted with either an up arrow or a down arrow on the table. Some wells may be exhibiting a seasonal fluctuation, particularly the shallow wells.

### 5.1.1 Non-Chlorinated VOCs

Benzene was the only non-chlorinated VOC detected in groundwater collected during the October 1998 round of sampling. Benzene was detected in samples from monitoring wells MW-21, MW-22, MW-23, MW-24, and PZ-1 at concentrations of 0.021 ppm, 0.017 ppm, 0.002 ppm, 0.004 ppm, and 0.003 ppm respectively. Benzene concentrations appear to be lowering in MW-21 and PZ-1, and increasing in MW-22.

### 5.1.2 Chlorinated VOCs

Chlorinated VOCs were detected in most of the October 1998 groundwater samples. Two compounds, 1,1,2,2-tetrachloroethane and trichloroethene (TCE), were found at concentrations significantly higher than other chemicals detected at the site. These two contaminants were also detected over the largest area. The compounds, 1,1,2-trichloroethene, and cis- and trans-1,2-dichloroethene were also widespread in their occurrence. Highest VOC concentrations occurred in groundwater samples from the shallow aquifer in and around Area A-3. The highest concentrations of chlorinated VOCs were observed in samples collected from monitoring wells MW-21, MW-22, MW-23, and MW-24.

Groundwater from 13 of the 22 monitoring wells sampled in October 1998 contained one or more compounds that exceeded the Alaska maximum contaminant level (MCL). Table 5-2 summarizes the groundwater samples whose concentrations exceeded the MCLs.

The following is a discussion of the detected concentrations and identifiable trends for each of the detected chlorinated solvents:

1,1-Dichloroethene was detected in seven monitoring wells. 1,1-Dichloroethene is one of the three breakdown products of TCE. Two wells had concentrations equal to or exceeding the MCL (0.007 mg/L).

Consisting of cis and trans 1,2-dichloroethene, total 1,2-dichloroethene was detected in 11 wells. Cis and trans 1,2-dichloroethene are the two other breakdown products of TCE. Seven wells had concentrations exceeding the MCL (0.17 mg/L), with values ranging from 0.208 to 2.92 mg/L. The concentration trend of cis and trans 1,2-dichloroethene is lower in four of the monitoring wells.

TCE was detected in 15 wells. TCE can be a breakdown product of tetrachloroethene (PCE) or 1,1,2,2-tetrachloroethane. All fifteen samples has TCE concentrations that exceeded the MCL (0.005 mg/L). The concentration trend of TCE was lower in seven of the fifteen wells.

Tetrachloroethene was detected in nine monitoring wells. Seven wells had tetrachloroethene concentrations that exceeded or were equal to the MCL (0.005 mg/L). The trend in the concentration of tetrachloroethene was lower in four of the wells (MW-21, PZ-1, MW-5, and MW-4).

1,1,2,2-tetrachloroethane was detected in sixteen monitoring wells. A trend in the concentration of 1,1,2,2-tetrachloroethane was identifiable in seven wells. Six wells decreased in concentration and one increased.

1,1,2-Trichloroethane was detected in nine monitoring wells. 1,1,2-Trichloroethane is a breakdown product of 1,1,2,2-tetrachlorethane. The concentration trend is lower in wells MW-19 and MW-5.

## 5.2 NATURAL ATTENUATION AT OUB

Natural attenuation samples were not collected in October 1998. Analytical results for the groundwater samples collected in November 1997 and June 1998 indicate that there is little or no natural attenuation of contaminants occurring at OUB. The technical protocol for evaluating the natural attenuation of chlorinated solvents in groundwater, developed by T.H. Wiedemeier, et al. (1996) for the U.S. Air Force Center for Environmental Excellence, was used to evaluate results of the November 1997 and June 1998 groundwater sampling at OUB.

Natural attenuation parameters that affect the behavior of organic, inorganic contaminants, inorganic minerals and microbial populations are alkalinity, temperature, pH, oxidation/reduction (redox) potential, dissolved constituents, the physical and chemical characterization of the solids and the microbial processes. Appendix 3 discusses the natural attenuation parameters and the OUB sampling results.

The protocol uses a scoring system to rate the potential for natural attenuation at a site. The score is based on the results of measurement of several chemical and physical parameters for groundwater sampled from the area with the highest concentration of contaminants. The higher the score, the higher the likelihood that natural attenuation is occurring at the site. A score of 0 to 5 indicates inadequate evidence for biodegradation of chlorinated organics, 6 to 14 indicates

limited evidence, 15 to 20 indicates adequate evidence, and a score of greater than 20 indicates strong evidence of biodegradation.

Using results from analysis of June 1998 groundwater samples collected from monitoring well MW-21 (most contaminated well) gives a score of 7, indicating that there is limited evidence for biodegradation of chlorinated solvents at OUB. Only three factors contributed points to the score: dissolved oxygen (3 points), nitrate (2 points), and chloride (2 points).

The low dissolved oxygen and nitrate concentrations indicate that biological activity would not be limited by either (i.e., the low concentrations do not indicate biological activity). The concentration of chloride in MW-21 (29 ppm) was more than 2-times the background concentration (3.1 ppm), indicating that chlorinated solvents were breaking down into daughter products (1,1,2,2-tetrachloroethane to TCE), but not the process that was causing the breakdown. The bacterial counts from 1996 indicate that sufficient numbers of bacteria are not present to result in significant biodegradation of the chlorinated solvents. Based on this interpretation, the evidence for biodegradation of chlorinated solvents is inadequate.

Lower concentrations of contaminants in the groundwater is most likely the result of physical processes, such as dispersion, dilution, hydrolysis, adsorption, and volatilization.

## 5.3 GROUNDWATER ELEVATION

Table 5-5 shows the water level measurements collected at OUB since 1995. The first groundwater samples were collected November 1995 which was at the end of a wet summer and fall. Groundwater level measurements were collected every month starting November 1, 1995 and ending October 2, 1996. The remaining columns in Table 5-5, show the water level measurements collected during the groundwater sampling rounds.

The concentration of contaminants detected in several of the shallow monitoring wells has decreased from November 1997 to October 1998. One explanation is that the concentrations are varying seasonally. It is also suspected that dilution would be the cause of this concentration change. Spring runoff and summer rains, raise the watertable, diluting the contaminant concentrations. The frozen ground in the winter prevents surface water infiltration, causing contaminants to concentrate. The sampling dates should be scheduled so that samples are collected in October, after a summer of surface water infiltration, and in April, after a winter of no surface water infiltration.

TABLE 5-1

SUMMARY OF ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS (VOCS) FOR
1995 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Volatile Organic Compounds Detected (mg/L) In Groundwater Samples Using EPA Method 8260A | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Monitoring Well ID | Benzene | | | | | Toluene | | | | |
| | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | | |
| MW-2 | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-3 | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-8 | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-12 | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-13 | 0.00034 | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | 0.00032 | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-15 | **ND (0.0002)** | -- | ND (0.001) | ND (0.001) | ND (0.001) | **0.00018** | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-17 | -- | -- | ND (0.001) | -- | -- | -- | -- | ND (0.001) | -- | -- |
| MW-19 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-20 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-21 | -- | -- | **0.094** | **0.021** | **0.021** ▼ | -- | -- | ND (0.020) | ND (0.001) | ND (0.001) |
| MW-22 | -- | -- | **0.009** | **0.004** | **0.017** ▲ | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-23 | -- | -- | -- | **0.001** | **0.002** | -- | -- | -- | ND (0.001) | ND (0.001) |
| MW-24 | -- | -- | -- | -- | **0.004** | -- | -- | -- | -- | ND (0.001) |
| PZ-1 | -- | ND (0.10) | **0.022** | **0.002** | **0.003** ▼ | -- | ND (0.10) | ND (0.020) | ND (0.001) | ND (0.001) |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | | |
| MW-14 | **2.9** | **3.3** | -- | -- | -- | ND (0.5) | ND (1.0) | -- | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-5 | ND (0.2) | 0.0013 | **0.004** | ND (0.001) | ND (0.001) ▼ | ND (0.2) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-4 | ND (0.2) | -- | -- | **0.002** | -- | ND (0.2) | -- | -- | ND (0.001) | -- |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | | |
| MW-1 | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-6 | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.002) | -- | **0.001** | ND (0.001) | ND (0.001) |
| MW-7 | ND (0.02) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.02) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-9 | 0.00073 | -- | ND (0.001) | ND (0.001) | ND (0.001) | 0.00073 | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-16 | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |

NOTES:
MW-14 was dry in 1997 and 1998
-- = Not Sampled
NA = Not Analyzed
ND = Analyte Not Detected (Detection Limit in Parentheses)
▼ = Concentration of Contaminant is Trending Lower
▲ = Concentration of Contaminant is Trending Higher

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TABLE 5-1 (CONTINUED)

SUMMARY OF ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS (VOCS) FOR
1995 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Volatile Organic Compounds Detected (mg/L) in Groundwater Samples Using EPA Method 8260A | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Monitoring | Bromodichloromethane | | | | | Carbon Tetrachloride | | | | |
| Well ID | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | | |
| MW-2 | ND (0.0005) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | |
| MW-3 | ND (0.0005) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-8 | ND (0.0005) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-12 | ND (0.0005) | ND (0.0010) | **0.002** | | ND (0.001) | **0.022** | **0.0011** | **0.002** | ND (0.001) | ND (0.001) ▼ |
| MW-13 | ND (0.0005) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | **0.00038** | ND (0.0010) | **0.003** | ND (0.001) | ND (0.001) |
| MW-15 | ND (0.0005) | -- | ND (0.001) | ND (0.001) | ND (0.001) | **0.0014** | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-17 | -- | -- | ND (0.001) | -- | -- | -- | -- | ND (0.001) | -- | -- |
| MW-19 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-20 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-21 | -- | -- | ND (0.020) | ND (0.001) | ND (0.001) | -- | -- | ND (0.020) | ND (0.001) | ND (0.001) |
| MW-22 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) | -- | -- | **0.011** | **0.010** | **0.006** ▼ |
| MW-23 | -- | -- | -- | ND (0.001) | ND (0.001) | -- | -- | -- | ND (0.001) | ND (0.001) |
| MW-24 | -- | -- | -- | -- | ND (0.001) | -- | -- | -- | ND (0.001) | ND (0.001) |
| PZ-1 | -- | ND (0.10) | ND (0.020) | ND (0.001) | ND (0.001) | -- | ND (0.10) | ND (0.020) | ND (0.001) | ND (0.001) |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | | |
| MW-14 | ND (1.3) | ND (1.0) | -- | -- | -- | **2.6** | **2.7** | -- | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-5 | ND (0.50) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.2) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-4 | ND (0.50) | -- | -- | ND (0.001) | -- | ND (0.2) | -- | -- | **0.009** | -- |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | | |
| MW-1 | ND (0.005) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.002) | -- | ND (0.001) | **0.001** | ND (0.001) |
| MW-6 | ND (0.005) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.002) | -- | **0.001** | ND (0.001) | ND (0.001) |
| MW-7 | ND (0.05) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.02) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-9 | ND (0.0005) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-16 | ND (0.0005) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |

NOTES:
MW-14 was dry in 1997 and 1998
-- = Not Sampled
NA = Not Analyzed
ND = Analyte Not Detected (Detection Limit in Parentheses)
▼ = Concentration of Contaminant is Trending Lower
▲ = Concentration of Contaminant is Trending Higher

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TABLE 5-1 (CONTINUED)

SUMMARY OF ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS (VOCS) FOR
1995 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Volatile Organic Compounds Detected (mg/L) in Groundwater Samples Using EPA Method 8260A | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Monitoring Well ID | Chlorobenzene | | | | | Chloroform | | | | |
| | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | | |
| MW-2 | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-3 | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | **0.00053** | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-8 | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-12 | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | **0.002** | ND (0.001) | ND (0.001) |
| MW-13 | **0.00038** | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | **0.0011** | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-15 | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | **0.0016** | -- | **0.002** | ND (0.001) | **0.001** |
| MW-17 | -- | -- | ND (0.001) | -- | -- | -- | -- | ND (0.001) | -- | -- |
| MW-19 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) | -- | -- | **0.001** | ND (0.001) | ND (0.001) |
| MW-20 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-21 | -- | -- | ND (0.020) | ND (0.001) | ND (0.001) | -- | -- | **0.078** | **0.028** | **0.016** ▼ |
| MW-22 | -- | -- | **0.001** | ND (0.001) | **0.002** | -- | -- | **0.012** | **0.001** | **0.01** ▼ |
| MW-23 | -- | -- | -- | ND (0.001) | ND (0.001) | -- | -- | -- | **0.003** | **0.004** |
| MW-24 | -- | -- | -- | -- | ND (0.001) | -- | -- | -- | -- | **0.006** |
| PZ-1 | -- | ND (0.10) | ND (0.020) | ND (0.001) | ND (0.001) | -- | ND (0.10) | ND (0.020) | **0.003** | **0.003** |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | | |
| MW-14 | ND (0.5) | ND (1.0) | -- | -- | -- | **1.4** | ND (1.0) | -- | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-5 | ND (0.2) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.2) | **0.0059** | **0.010** | **0.003** | **0.003** ▼ |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-4 | ND (0.2) | -- | -- | ND (0.001) | -- | ND (0.2) | -- | -- | **0.009** | -- |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | | |
| MW-1 | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.002) | -- | ND (0.001) | ND (0.001) | **0.006** ▲ |
| MW-6 | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-7 | ND (0.02) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.02) | -- | **0.001** | **0.002** | **0.001** |
| MW-9 | 0.00055 | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-16 | ND(0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |

NOTES: MW-14 was dry in 1997 and 1998
-- = Not Sampled
NA = Not Analyzed
ND = Analyte Not Detected (Detection Limit in Parentheses)
▼ = Concentration of Contaminant is Trending Lower
▲ = Concentration of Contaminant is Trending Higher

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TABLE 5-1 (CONTINUED)

SUMMARY OF ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS (VOCS) FOR 1995 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Volatile Organic Compounds Detected (mg/L) In Groundwater Samples Using EPA Method 8260A | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Monitoring Well ID | 1,1-Dichloroethene | | | | | 1,2-Dichloroethene (Total) | | | | |
| | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | | |
| MW-2 | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-3 | ND (0.00019) | -- | ND (0.001) | ND (0.001) | ND (0.001) | 0.012 | -- | 0.046 | 0.005 | ND (0.001) ▼ |
| MW-8 | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-12 | 0.00014 | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | 0.001 | 0.0029 | 0.015 | 0.003 | ND (0.001) |
| MW-13 | 0.00026 | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | 0.001 | ND (0.001) | ND (0.001) |
| MW-15 | 0.00071 | -- | ND (0.001) | ND (0.001) | ND (0.001) | 0.019 | -- | 0.028 | 0.01 | 0.021 |
| MW-17 | -- | -- | ND (0.001) | -- | -- | -- | -- | ND (0.001) | -- | -- |
| MW-19 | -- | -- | 0.002 | ND (0.001) | ND (0.001) | -- | -- | 0.075 | 0.02 | 0.016 ▼ |
| MW-20 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-21 | -- | -- | 0.032 | 0.014 | 0.019 | -- | -- | 5.1 | 1.97 | 2.92 |
| MW-22 | -- | -- | 0.010 | ND (0.001) | 0.007 | -- | -- | 0.71 | 0.208 | 0.920 |
| MW-23 | -- | -- | -- | ND (0.001) | 0.004 | -- | -- | -- | 0.193 | 0.208 |
| MW-24 | -- | -- | -- | -- | 0.005 | -- | -- | -- | -- | 0.307 |
| PZ-1 | -- | ND (0.10) | ND (0.020) | ND (0.001) | 0.003 | -- | .17 | 1.1 | 0.128 | 0.315 |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | | |
| MW-14 | ND (0.5) | ND (1.0) | -- | -- | -- | 49 | 5.9 | -- | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-5 | ND (0.2) | ND (0.0010) | 0.010 | ND (0.001) | 0.005 ▼ | ND (0.2) | 0.33 | 0.65 | 0.256 | 0.500 |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-4 | ND (0.2) | -- | -- | 0.003 | -- | 2 | -- | -- | 0.405 | -- ▼ |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | | |
| MW-1 | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | 0.0053 | -- | 0.004 | 0.005 | 0.006 |
| MW-6 | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | 0.0035 | -- | 0.004 | 0.002 | 0.002 ▼ |
| MW-7 | ND (0.02) | -- | 0.004 | 0.003 | 0.005 | 0.34 | -- | 0.38 | 0.382 | 0.394 |
| MW-9 | 0.0012 | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-16 | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |

NOTES:
MW-14 was dry in 1997 and 1998
-- = Not Sampled
NA = Not Analyzed
ND = Analyte Not Detected (Detection Limit in Parentheses)
▼ = Concentration of Contaminant is Trending Lower
▲ = Concentration of Contaminant is Trending Higher

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TABLE 5-1 (CONTINUED)

SUMMARY OF ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS (VOCS) FOR
1995 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Volatile Organic Compounds Detected (mg/L) in Groundwater Samples Using EPA Method 8260A | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Monitoring | Trichloroethene | | | | | Tetrachloroethene | | | | |
| Well ID | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | | |
| MW-2 | ND (0.0002) | ND (0.0010) | 0.001 | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-3 | 0.26 | -- | 0.27 | 0.037 | 0.062 ▼ | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-8 | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-12 | 0.16 | 0.070 | 0.19 | 0.058 | 0.063 ▼ | 0.00035 | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-13 | 0.0067 | 0.0041 | 0.018 | 0.008 | 0.01 | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-15 | 0.27 | -- | 0.32 | 0.14 | 0.26 | 0.0021 | -- | 0.002 | 0.001 | 0.003 |
| MW-17 | -- | -- | ND (0.001) | -- | -- | -- | -- | ND (0.001) | -- | -- |
| MW-19 | -- | -- | 0.95 | 0.110 | 0.170 ▼ | -- | -- | 0.018 | 0.002 | 0.005 |
| MW-20 | -- | -- | 0.012 | 0.018 | 0.012 | -- | -- | ND (0.001) | 0.001 | ND (0.001) |
| MW-21 | -- | -- | 22 | 12 | 1.1 ▼ | -- | -- | 0.390 | 0.17 | 0.140 ▼ |
| MW-22 | -- | -- | 8.7 | 2.1 | 7.8 | -- | -- | 0.3 | 0.084 | 0.150 |
| MW-23 | -- | -- | -- | 2.2 | 3.2 | -- | -- | -- | 0.052 | 0.086 |
| MW-24 | -- | -- | -- | -- | 3.7 | -- | -- | -- | -- | 0.150 |
| PZ-1 | -- | .94 | 5.4 | 0.93 | 1.3 | -- | ND (0.10) | 0.073 | 0.010 | 0.010 ▼ |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | | |
| MW-14 | 220 | 186 | -- | -- | -- | 11 | 12.3 | -- | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-5 | 4.8 | 3.1 | 8.0 | 3 | 3.7 | ND (0.2) | 0.067 | 0.13 | 0.029 | 0.032 ▼ |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-4 | 14 | -- | -- | 4.1 | -- ▼ | 0.31 | -- | -- | 0.084 | -- ▼ |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | | |
| MW-1 | 0.043 | -- | 0.03 | 0.034 | 0.029 | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-6 | 0.13 | -- | 0.086 | 0.025 | 0.026 ▼ | ND (0.002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-7 | 1.0 | -- | 1.3 | 0.92 | 0.85 ▼ | ND (0.02) | -- | 0.004 | 0.005 | 0.003 |
| MW-9 | 0.00091 | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-16 | 0.00031 | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.0002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |

NOTES:
MW-14 was dry in 1997 and 1998
-- = Not Sampled
NA = Not Analyzed
ND = Analyte Not Detected (Detection Limit in Parentheses)
▼ = Concentration of Contaminant is Trending Lower
▲ = Concentration of Contaminant is Trending Higher

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TABLE 5-1 (CONTINUED)

SUMMARY OF ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS (VOCS) FOR
1995 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Volatile Organic Compounds Detected (mg/L) in Groundwater Samples Using EPA Method 8260A | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Monitoring | 1,1,2,2-Tetrachloroethane | | | | | 1,1,2-Trichloroethane | | | | |
| Well ID | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Oct 1995 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | | |
| MW-2 | ND (0.50) | ND (0.0010) | 0.003 | 0.001 | 0.004 | ND (0.50) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-3 | 0.54 | -- | 0.45 | 0.035 | 0.059 ▼ | 0.0023 | -- | 0.004 | ND (0.001) | ND (0.001) |
| MW-8 | ND (0.50) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.50) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-12 | 0.49 | 0.024 | 0.065 | 0.014 | 0.130 | 0.00078 | ND (0.0010) | 0.002 | ND (0.001) | ND (0.0010) |
| MW-13 | 0.0011 | 0.0011 | 0.009 | 0.058 | 0.056 ▲ | ND (0.50) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-15 | 0.0063 | -- | 0.004 | 0.002 | 0.004 | 0.0013 | -- | 0.003 | ND (0.001) | 0.002 |
| MW-17 | -- | -- | ND (0.001) | -- | -- | -- | -- | ND (0.001) | -- | -- |
| MW-19 | -- | -- | 1.4 | 0.34 | 0.630 | -- | -- | 0.014 | ND (0.001) | 0.003 ▼ |
| MW-20 | -- | -- | 0.01 | 0.15 | 0.120 | -- | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-21 | -- | -- | 62 | 24 | 3.8 ▼ | -- | -- | 0.42 | 0.19 | 0.2 |
| MW-22 | -- | -- | 11 | 3.7 | 15.0 | -- | -- | 0.043 | 0.011 | 0.41 |
| MW-23 | -- | -- | -- | 17 | 18.0 | -- | -- | -- | 0.076 | 0.077 |
| MW-24 | -- | -- | -- | -- | 47 | -- | -- | -- | -- | 0.15 |
| PZ-1 | -- | 1.4 | 19 | 1 | 3.3 ▼ | -- | ND (0.10) | 0.12 | 0.009 | 0.022 |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | | |
| MW-14 | 1900 | 1000 | -- | -- | -- | ND (1.3) | 1 | -- | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-5 | 21 | 9.1 | 19 | 15 | 6 ▼ | ND (0.50) | 0.45 | 0.1 | 0.025 | 0.031 ▼ |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | | |
| MW-4 | 71 | -- | -- | 6 | -- ▼ | ND (0.50) | -- | -- | 0.036 | -- |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | | |
| MW-1 | 0.082 | -- | 0.047 | 0.054 | 0.029 ▼ | ND (0.005) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-6 | 0.52 | -- | 0.006 | 0.013 | 0.019 | ND (0.005) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-7 | 3.1 | -- | 1.5 | 1.8 | 1.500 | ND (0.05) | -- | 0.024 | 0.028 | 0.02 |
| MW-9 | ND (0.50) | -- | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.50) | -- | ND (0.001) | ND (0.001) | ND (0.001) |
| MW-16 | ND (0.002) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) | ND (0.50) | ND (0.0010) | ND (0.001) | ND (0.001) | ND (0.001) |

NOTES:
MW-14 was dry in 1997 and 1998
-- = Not Sampled
NA = Not Analyzed
ND = Analyte Not Detected (Detection Limit in Parentheses)
▼ = Concentration of Contaminant is Trending Lower
▲ = Concentration of Contaminant is Trending Higher

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## TABLE 5-2

## VOLATILE ORGANIC COMPOUNDS THAT EXCEEDED MCLS OCTOBER 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B, POLELINE ROAD DISPOSAL AREA, FORT RICHARDSON, ALASKA | | | |
|---|---|---|---|
| Compound | MCL (mg/L) | Monitoring Well ID | Concentration* (mg/L) |
| benzene | 0.005 | MW- 21 | 0.021 |
| | | MW- 22 | 0.017 |
| carbon tetrachloride | 0.005 | MW-22 | 0.006 |
| 1,2-dichloroethene (total cis- and trans-) | ** | MW-5 | 0.500 |
| | | MW-7 | 0.384 |
| | | MW-21 | 2.92 |
| | | MW-22 | 0.920 |
| | | MW-23 | 0.208 |
| | | MW-24 | 0.307 |
| | | PZ-1 | 0.315 |
| 1,1-dichloroethene | 0.007 | MW-21 | 0.019 |
| | | MW-22 | 0.007 |
| tetrachloroethene (PCE) | 0.005 | MW-5 | 0.032 |
| | | MW-19 | 0.005 |
| | | MW-21 | 0.140 |
| | | MW-22 | 0.150 |
| | | MW-23 | 0.086 |
| | | MW-24 | 0.150 |
| | | PZ-1 | 0.010 |
| trichloroethene (TCE) | 0.005 | MW-1 | 0.029 |
| | | MW-3 | 0.062 |
| | | MW-5 | 3.7 |
| | | MW-6 | 0.026 |
| | | MW-7 | 0.85 |
| | | MW-12 | 0.063 |
| | | MW-13 | 0.01 |
| | | MW-15 | 0.26 |
| | | MW-19 | 0.170 |
| | | MW-20 | 0.012 |
| | | MW-21 | 1.1 |
| | | MW-22 | 7.8 |
| | | MW-23 | 3.2 |
| | | MW-24 | 3.7 |
| | | PZ-1 | 1.3 |

NOTES:

mg/L = milligram per Liter

* Only those concentrations that exceed Maximum Contaminant Levels (MCLs) are shown

** Analysis did not separate cis- and trans-dichloroethene which have MCLs of 0.07 and 0.1 ppm , respectively

## TABLE 5-3

## SUMMARY OF ANALYTICAL RESULTS FOR NATURAL ATTENUATION PARAMETERS FOR 1996 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Natural Attenuation Parameters Detected (ppm) in Groundwater Samples (Nutrients and Electron Acceptors) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Well ID | Ammonia as Nitrogen | | | Total Kjedahl Nitrogen | Nitrate as Nitrogen | | Nitrite as Nitrogen | | Nitrate/Nitrite as Nitrogen |
| | Nov 1996 | Nov 1997 | June 1998 | Nov 1996 | Nov 1996 | June 1998 | Nov 1996 | June 1998 | Nov 1997 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | |
| MW-2 | 0.144 | ND (0.050) | ND (0.050) | 0.271 | 2.1 | 6.11 | ND (0.1) | ND (0.100) | 0.64 |
| MW-3 | -- | ND (0.050) | ND (0.050) | -- | -- | 0.538 | -- | ND (0.100) | 0.36 |
| MW-8 | -- | 0.085 | ND (0.050) | -- | -- | 2.25 | -- | ND (0.100) | 0.75 |
| MW-12 | 0.157 | ND (0.050) | ND (0.050) | 0.452 | 0.24 | 2.62 | ND (0.1) | ND (0.100) | 2.0 |
| MW-13 | 0.37 | ND (0.050) | ND (0.050) | 0.242 | 0.32 | 2.24 | ND (0.1) | ND (0.100) | 2.0 |
| MW-15 | -- | ND (0.050) | ND (0.050) | -- | -- | 0.167 | -- | ND (0.100) | 0.90 |
| MW-17 | -- | ND (0.050) | ND (0.050) | -- | -- | 0.542 | -- | ND (0.100) | 0.74 |
| MW-19 | -- | 1.2 | .71 | -- | -- | ND (0.100) | -- | ND (0.100) | 0.16 |
| MW-20 | -- | ND (0.050) | ND (0.050) | -- | -- | 0.357 | -- | ND (0.100) | 0.37 |
| MW-21 | -- | 0.91 | 0.69 | -- | -- | ND (0.100) | -- | ND (0.100) | ND (0.025) |
| MW-22 | -- | 0.30 | ND (0.050) | -- | -- | 0.691 | -- | ND (0.100) | 0.49 |
| MW-23 | -- | -- | 0.60 | -- | -- | 0.373 | -- | ND (0.100) | -- |
| PZ-1 | 0.232 | 0.43 | 0.23 | 0.76 | ND (0.1) | ND (0.100) | ND (0.1) | ND (0.100) | ND (0.025) |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | |
| MW-14 | 0.122 | -- | -- | 0.365 | ND (2.0) | -- | 0.71 | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | |
| MW-5 | 0.633 | 0.51 | .39 | 0.82 | 2.1 | 2.37 | ND (0.1) | ND (0.100) | 5.6 |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | |
| MW-4 | -- | -- | .35 | -- | -- | 1.17 | -- | ND (0.100) | -- |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | |
| MW-1 | -- | ND (0.050) | ND (0.050) | -- | -- | .423 | -- | ND (0.100) | 0.54 |
| MW-6 | -- | 0.74 | 0.4 | -- | -- | ND (0.100) | -- | ND (0.100) | ND (0.025) |
| MW-7 | -- | 0.41 | 0.31 | -- | -- | ND (0.100) | -- | ND (0.100) | 0.13 |
| MW-9 | -- | ND (0.050) | ND (0.050) | -- | -- | 0.289 | -- | ND (0.100) | 0.30 |
| MW-16 | 0.129 | ND (0.050) | ND (0.050) | ND (0.2) | 0.57 | .601 | ND (0.1) | ND (0.100) | 0.75 |

NOTES:

-- Indicates that well was not sampled

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## TABLE 5-3 (CONTINUED)

## SUMMARY OF ANALYTICAL RESULTS FOR NATURAL ATTENUATION PARAMETERS FOR 1996 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Natural Attenuation Parameters Detected (ppm) in Groundwater Samples (Nutrients and Electron Acceptors Continued) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Well ID | Chloride | | | Ferrous Iron (mg/L) | | | Manganese | Phosphorous (Total) | Residue (Total) | Sulfate | | |
| | Nov 1996 | Nov 1997 | June 1998 | Nov 1996 | Nov 1997 | June 1998 | Nov 1996 | Nov 1996 | Nov 1996 | Nov 1996 | Nov 1997 | June 1998 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | | | | |
| MW-2 | 1.6 | 1.6 | 2.6 | 0.864 | ND (0.200) | ND (0.1) | 0.111 | 0.749 | 2400 | 17.3 | 11 | 10 |
| MW-3 | -- | 3.7 | 2.8 | -- | ND (0.200) | ND (0.1) | -- | -- | -- | -- | 14 | 10 |
| MW-8 | -- | 1.6 | 1.6 | -- | 0.200 | ND (0.1) | -- | -- | -- | -- | 25 | 14 |
| MW-12 | 1.67 | 3.2 | 4.9 | 0.246 | ND (0.200) | ND (0.1) | 1.84 | 0.421 | 1030 | 17 | 15 | 11 |
| MW-13 | 1.74 | 2.4 | 3.4 | 0.218 | ND (0.200) | ND (0.1) | 0.0304 | 0.047 | 186 | 17 | 14 | 9.9 |
| MW-15 | -- | 6.3 | 4.4 | -- | ND (0.200) | ND (0.1) | -- | -- | -- | -- | 11 | 9.2 |
| MW-17 | -- | 3.6 | 3.1 | -- | ND (0.200) | ND (0.1) | -- | -- | -- | -- | 28 | 13 |
| MW-19 | -- | 2.1 | 1.7 | -- | 5.5 | ND (0.1) | -- | -- | -- | -- | 3.7 | 6.7 |
| MW-20 | -- | 1.7 | 1.7 | -- | ND (0.200) | ND (0.1) | -- | -- | -- | -- | 8.4 | 8.6 |
| MW-21 | -- | 42 | 29 | -- | 4 | ND (0.1) | -- | -- | -- | -- | 78 | 220 |
| MW-22 | -- | 33 | 15 | -- | 0.500 | 2 | -- | -- | -- | -- | 20 | 17 |
| MW-23 | -- | -- | 5.7 | -- | -- | 7 | -- | -- | -- | -- | -- | 88 |
| PZ-1 | 2.13 | 16 | 4.6 | 0.0937 | 1.4 | ND (0.1) | 0.815 | 0.059 | 237 | 26.9 | 65 | 86 |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | | | | |
| MW-14 | 127 | -- | -- | ND (0.05) | -- | -- | 0.511 | 0.342 | 996 | 44 | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | | | | |
| MW-5 | 7.33 | 12 | 9.1 | 0.595 | 0.400 | 2 | 0.537 | 0.029 | 294 | 82.3 | 79 | 130 |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | | | | |
| MW-4 | -- | -- | 7.4 | -- | -- | ND (0.1) | -- | -- | -- | -- | -- | 51 |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | | | | |
| MW-1 | -- | 2.4 | 2.0 | -- | ND (0.200) | ND (0.1) | -- | -- | -- | -- | 13 | 12 |
| MW-6 | -- | 14 | 14 | -- | ND (0.200) | ND (0.1) | -- | -- | -- | -- | 5.3 | 6.1 |
| MW-7 | -- | 4.3 | 4.1 | -- | ND (0.200) | ND (0.1) | -- | -- | -- | -- | 15 | 12 |
| MW-9 | -- | 3.0 | 2.9 | -- | ND (0.200) | ND (0.1) | -- | -- | -- | -- | 12 | 12 |
| MW-16 | 23.2 | 22 | 21 | 0.761 | 0.200 | ND (0.1) | ND (0.02) | 0.028 | 576 | 16.8 | 17 | 19 |

NOTES:

-- Indicates that well was not sampled

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TABLE 5-3 (CONTINUED)

SUMMARY OF ANALYTICAL RESULTS FOR NATURAL ATTENUATION PARAMETERS FOR 1996 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | Natural Attenuation Parameters Detected (ppm) in Groundwater Samples (Metabolic End Products) | | | | | |
|---|---|---|---|---|---|---|
| Well ID | Ethane | Ethene | Methane | Sulfide | | |
| | Nov 1996 | Nov 1996 | Nov 1996 | Nov 1996 | Nov 1997 | June 1998 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | |
| MW-2 | ND (0.02) | ND (0.06) | ND (0.02) | ND (0.0500) | ND (0.0500) | ND (0.100) |
| MW-3 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-8 | -- | -- | -- | -- | ND (0.100) | ND (0.100) |
| MW-12 | ND (0.02) | ND (0.06) | ND (0.02) | ND (0.0500) | ND (0.0500) | ND (0.100) |
| MW-13 | ND (0.02) | ND (0.06) | ND (0.02) | ND (0.0500) | ND (0.0500) | ND (0.100) |
| MW-15 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-17 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-19 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-20 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-21 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-22 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-23 | -- | -- | -- | -- | -- | ND (0.100) |
| PZ-1 | ND (0.02) | ND (0.06) | ND (0.02) | ND (0.0500) | ND (0.0500) | ND (0.100) |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | |
| MW-14 | ND (0.02) | ND (0.06) | ND (0.02) | ND (0.0500) | -- | -- |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | |
| MW-5 | ND (0.02) | ND (0.06) | ND (0.02) | ND (0.0500) | ND (0.0500) | ND (0.100) |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | |
| MW-4 | -- | -- | -- | -- | -- | ND (0.100) |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | |
| MW-1 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-6 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-7 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-9 | -- | -- | -- | -- | ND (0.0500) | ND (0.100) |
| MW-16 | ND (0.02) | ND (0.06) | ND (0.02) | ND (0.0500) | ND (0.0500) | ND (0.100) |

NOTES:

-- Indicates that well was not sampled

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## TABLE 5-3 (CONTINUED)

## SUMMARY OF ANALYTICAL RESULTS FOR NATURAL ATTENUATION PARAMETERS FOR 1996 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B | Natural Attenuation Parameters Detected in Groundwater Samples (Substrates and Others) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FORT RICHARDSON, ALASKA | Substrates (ppm) | | | Others | | | | | |
| Well ID | Total Organic Carbon | | | Alkalinity (ppm) | | | Heterotrophic Plate Count (col/L) | Oil Degrading Bacteria (col/L) | Sulfate Reducing Bacteria (col/L) |
| | Nov 1996 | Nov 1997 | June 1998 | Nov 1996 | Nov 1997 | June 1998 | Nov 1996 | Nov 1996 | Nov 1996 |
| **WELLS SCREENED IN SHALLOW AQUIFER** | | | | | | | | | |
| MW-2 | 1.3 | 1.1 | 3.9 | -- | 130 | 64 | 1300 | ND (20) | Negative |
| MW-3 | -- | 1.2 | 1.1 | -- | 160 | 140 | -- | -- | -- |
| MW-8 | -- | 1.5 | 2.6 | -- | 120 | 98 | -- | -- | -- |
| MW-12 | 1.4 | 0.90 | 1.5 | -- | 68 | 66 | 72 | ND (20) | Negative |
| MW-13 | 1.2 | 1.1 | 1.7 | -- | 160 | 120 | 200 | ND (20) | Negative |
| MW-15 | -- | 0.85 | 1.1 | -- | 98 | 85 | -- | -- | -- |
| MW-17 | -- | 1.5 | 2.5 | -- | 110 | 69 | -- | -- | -- |
| MW-19 | -- | 8.6 | 8.9 | -- | 190 | 180 | -- | -- | -- |
| MW-20 | -- | 1.1 | 1.6 | -- | 94 | 93 | -- | -- | -- |
| MW-21 | -- | 9.6 | 5.8 | -- | 160 | 97 | -- | -- | -- |
| MW-22 | -- | 3.4 | 2.4 | -- | 130 | 120 | -- | -- | -- |
| MW-23 | -- | -- | 7.2 | -- | -- | 77 | -- | -- | -- |
| PZ-1 | 2.6 | 3.7 | 1.7 | -- | 160 | 74 | 490 | ND (20) | Negative |
| **WELL SCREENED IN PERCHED AQUIFER** | | | | | | | | | |
| MW-14 | 5.2 | -- | | -- | -- | | 2 | ND (20) | Negative |
| **WELL SCREENED IN SHALLOW-INTERMEDIATE AQUIFER** | | | | | | | | | |
| MW-5 | 4.4 | 5.9 | 5.6 | -- | 56 | 35 | 201 | ND (20) | Negative |
| **WELL SCREENED IN INTERMEDIATE AQUIFER** | | | | | | | | | |
| MW-4 | -- | -- | 2.6 | -- | -- | 78 | -- | -- | -- |
| **WELL SCREENED IN DEEP AQUIFER** | | | | | | | | | |
| MW-1 | -- | 1.8 | 1.4 | -- | 150 | 150 | -- | -- | -- |
| MW-6 | -- | 0.80 | 0.83 | -- | 280 | 270 | -- | -- | -- |
| MW-7 | -- | 3.8 | 4.3 | -- | 220 | 220 | -- | -- | -- |
| MW-9 | -- | 0.59 | 1.1 | -- | 110 | 110 | -- | -- | -- |
| MW-16 | ND (0.05) | 0.39 | 1.0 | -- | 110 | 110 | 204 | ND (20) | Negative |

NOTES:

-- Indicates that well was not sampled

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## TABLE 5-4

## SUMMARY OF FIELD MEASUREMENTS FOR 1996 THROUGH 1998 GROUNDWATER SAMPLES

**OPERABLE UNIT B, POLELINE ROAD DISPOSAL AREA, FORT RICHARDSON, ALASKA**

| Aquifer(s) Screened | Well Identification | Dissolved Oxygen (ppm) | | | | Oxidation Reduction Potential (mV) | | | | pH | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 |
| Shallow | MW-2 | 9.63 | 20.44* | 11.2 | 8.9 | 63.3 | 46** | 139 | -- | 7.49 | 6.17 | 6.23 | 7.0 |
| Shallow | MW-3 | -- | 0.00 | 9.4 | 8.65 | -- | 370/136 | 108 | -- | -- | 7.71 | 7.38 | 7.19 |
| Shallow | MW-8 | -- | *** | 9.4 | 6.18 | -- | 43** | 163 | -- | -- | 6.22 | 6.54 | 7.09 |
| Shallow | MW-12 | 3.9 | 24.01* | 13.0 | 10.84 | 94.2 | 48** | 129 | -- | 7.48 | 6.13 | 6.76 | 6.61 |
| Shallow | MW-13 | 8.3 | *** | 9.1 | 8.47 | 81.9 | 53** | 113 | -- | 7.50 | 6.00 | 6.86 | 6.7 |
| Shallow | MW-15 | -- | *** | 11.4 | 12.03 | -- | 43** | 190 | -- | -- | 6.23 | 7.8 | 7.90 |
| Shallow | MW-17 | -- | *** | 12.5 | -- | -- | 57** | 227 | -- | -- | 5.89 | 7.4 | -- |
| Shallow | MW-19 | -- | 0.00 | -1.0 | -0.32 | -- | *** | -68 | -- | -- | *** | 6.57 | 6.46 |
| Shallow | MW-20 | -- | 0.0 | 11.0 | 9.64 | -- | 207/115 | 84 | -- | -- | 7.65 | 6.89 | 6.86 |
| Shallow | MW-21 | -- | 22.5* | -0.26 | 0.17 | -- | 55/79 | 73 | -- | -- | 6.4 | 6.52 | 6.35 |
| Shallow | MW-22 | -- | 3.87 | 4.0 | 4.61 | -- | *** | 108 | -- | -- | *** | 6.41 | 6.29 |
| Shallow | MW-23 | -- | -- | -0.06 | 0.03 | -- | -- | 79 | -- | -- | -- | 6.26 | 6.16 |
| Shallow | MW-24 | -- | -- | -- | 0.22 | -- | -- | -- | -- | -- | -- | -- | 5.97 |
| Shallow | PZ-1 | 3.65 | 19* | -.7 | 0.01 | -75.5 | 148/110 | 147 | -- | 7.04 | 6.9 | 6.18 | 6.52 |
| Perched | MW-14 | 4.38 | -- | -- | -- | 112.8 | -- | -- | -- | 7.22 | -- | -- | -- |
| Shallow-Intermediate | MW-5 | 4.33 | 17.78* | 6.3 | 0.05 | 5.4 | 42** | 134 | -- | 6.67 | 6.22 | 6.2 | 5.98 |
| Intermediate | MW-4 | -- | -- | 11.27 | -- | -- | -- | 168 | -- | -- | -- | 6.56 | -- |
| Deep | MW-1 | -- | 20.64* | 12.1 | 10.16 | -- | 44** | 134 | -- | -- | 6.19 | 7.6 | 7.58 |
| Deep | MW-6 | -- | 17.37* | 1.9 | 0.15 | -- | 312/74 | 93 | -- | -- | 8.38 | 9.05 | 9.0 |
| Deep | MW-7 | -- | 19.54* | 10.6 | 3.97 | -- | 43** | 128 | -- | -- | 6.25 | 7.49 | 7.31 |
| Deep | MW-9 | -- | 47.2* | 9.1 | 9.40 | -- | 284/155 | 140 | -- | -- | 7.68 | 7.71 | 7.76 |
| Deep | MW-16 | 8.77 | *** | 6.96 | 7.8 | -10.2 | 49** | 189 | -- | 7.22 | 6.15 | 7.6 | 7.5 |

NOTES:

Where two values are recorded for Oxidation Reduction Potential, two instruments were used for the measurement

-- Indicates that well was not sampled

* Indicates values higher than expected (suspect ambient temperature too cold for proper operation of instrument)

** Indicates values lower than expected (instrument not reading oxidation reduction potential )

*** Indicates erratic readings (suspect ambient temperature too cold for proper operation of instrument)

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TABLE 5-4 (continued)

## SUMMARY OF FIELD MEASUREMENTS FOR 1996 THROUGH 1998 GROUNDWATER SAMPLES

| OPERABLE UNIT B, POLELINE ROAD DISPOSAL AREA, FORT RICHARDSON, ALASKA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Aquifer(s) Screened | Well Identification | Specific Conductance (µS/cm) | | | | Temperature (°F) | | | |
| | | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 | Nov 1996 | Nov 1997 | June 1998 | Oct 1998 |
| Shallow | MW-2 | 163 | 261 | 159 | 230 | 41.1 | 43.7 | 41.18 | 5.0 |
| Shallow | MW-3 | -- | 237 | 237 | 274 | -- | 38.3 | 37.94 | 3.8 |
| Shallow | MW-8 | -- | 265 | 200 | 233 | -- | 39.0 | 37.04 | 3.4 |
| Shallow | MW-12 | 194 | 182 | 156 | 247 | 40.3 | 39.0 | 38.3 | 4.1 |
| Shallow | MW-13 | 228 | 344 | 237 | 272 | 43.5 | 41.7 | 40.82 | 7.4 |
| Shallow | MW-15 | -- | 203 | 160 | 175 | -- | 40.6 | 38.48 | 6.8 |
| Shallow | MW-17 | -- | 295 | 140 | -- | -- | 39.7 | 37.4 | -- |
| Shallow | MW-19 | -- | 358 | 320 | 336 | -- | 41.2 | 40.64 | 5.3 |
| Shallow | MW-20 | -- | 150 | 171 | 198 | -- | 36.1 | 38.3 | 3.9 |
| Shallow | MW-21 | -- | 475 | 566 | 567 | -- | 39.6 | 42.44 | 6.8 |
| Shallow | MW-22 | -- | 413 | 291 | 334 | -- | 70.9 | 60.62 | 13.3 |
| Shallow | MW-23 | -- | -- | 289 | 302 | -- | -- | 41.9 | 6.0 |
| Shallow | MW-24 | -- | -- | -- | 321 | -- | -- | -- | 6.6 |
| Shallow | PZ-1 | 229 | 395 | 269 | 380 | 41.0 | 37.6 | 41.72 | 6.2 |
| Perched | MW-14 | 638 | -- | -- | -- | 44.9 | -- | -- | -- |
| Shallow-Intermediate | MW-5 | 233 | 350 | 313 | 417 | 42.6 | 34.0 | 40.46 | 6.6 |
| Intermediate | MW-4 | -- | -- | 249 | -- | -- | -- | 34.72222222 | -- |
| Deep | MW-1 | -- | 308 | 253 | 272 | -- | 43.7 | 40.46 | 6.2 |
| Deep | MW-6 | -- | 471 | 459 | 516 | -- | 41.4 | 41.72 | 6.3 |
| Deep | MW-7 | -- | 427 | 361 | 394 | -- | 45.7 | 43.52 | 4.5 |
| Deep | MW-9 | -- | 174 | 202 | 217 | -- | 37.4 | 38.66 | 3.6 |
| Deep | MW-16 | 225 | 308 | 250 | 280 | 41.1 | 49.5 | 40.64 | 4.0 |

NOTES:

Where two values are recorded for Oxidation Reduction Potential, two instruments were used for the measurement

-- Indicates that well was not sampled

* Indicates values higher than expected (suspect ambient temperature too cold for proper operation of instrument)

** Indicates values lower than expected (instrument not reading oxidation reduction potential )

*** Indicates erratic readings (suspect ambient temperature too cold for proper operation of instrument)

OU-B 31950

## TABLE 5-5
## GROUNDWATER ELEVATIONS POLELINE ROAD DIPOSAL AREA

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | | Groundwater Elevation in Feet | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monitoring Well | Saturated Interval | 11/1/95 | 12/4/95 | 1/3/96 | 2/1/96 | 3/1/96 | 4/1/96 | 5/1/96 | 6/3/96 | 7/1/96 | 8/2/96 | 9/3/96 | 10/2/96 |
| MW-2 | Shallow | 274.11 | 273.43 | 272.69 | 272.30 | 272.08 | 271.88 | 271.62 | 271.80 | 271.76 | 271.61 | 271.37 | 271.22 |
| MW-3 | Shallow | 274.01 | 272.84 | 271.55 | 270.78 | 269.97 | 269.49 | 269.33 | 269.42 | 269.41 | 269.38 | 269.28 | 269.26 |
| MW-8 | Shallow | 276.67 | 276.04 | 275.20 | 274.61 | 274.15 | 273.84 | 273.59 | 273.65 | 273.60 | 273.53 | 273.45 | 273.34 |
| MW-12 | Shallow | 273.75 | 273.04 | 272.24 | 271.76 | 271.38 | 271.10 | 270.70 | 270.92 | 270.82 | 270.57 | 270.29 | 270.13 |
| MW-13 | Shallow | 275.88 | 275.21 | 274.46 | 273.90 | 273.52 | 273.22 | 272.98 | 273.02 | 272.99 | 272.96 | 272.91 | 272.83 |
| MW-15 | Shallow | 271.92 | 270.83 | 269.83 | 269.29 | 268.36 | 268.22 | 267.17 | 267.20 | 267.03 | 266.89 | 266.21 | 265.74 |
| MW-17 | Shallow | 285.40 | 284.54 | 283.69 | 283.06 | 282.59 | 282.28 | 282.36 | 282.70 | 282.64 | 282.37 | 282.15 | 281.97 |
| MW-19 | Shallow | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MW-20 | Shallow | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MW-21 | Shallow | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MW-22 | Shallow | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MW-23 | Shallow | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MW-24 | Shallow | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| PZ-1 | Shallow | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MW-14 | Perched | 290.93 | 289.93 | 289.05 | 288.37 | 287.71 | 287.28 | 288.80 | 290.38 | 289.89 | 289.37 | 289.08 | 288.72 |
| MW-5 | Shallow-Intermediate | 277.44 | 276.59 | 275.33 | 275.15 | 274.60 | 274.24 | 273.85 | 274.10 | 274.16 | 274.00 | 273.88 | 273.76 |
| MW-4 | Intermediate | 237.77 | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | 238.33 |
| MW-1 | Deep | 173.27 | 173.26 | 173.22 | 173.28 | 173.18 | 173.32 | | 173.29 | 173.18 | 173.24 | 173.18 | 173.32 |
| MW-6 | Deep | 177.36 | 177.24 | 177.40 | 177.53 | 177.32 | 177.68 | 177.35 | 177.63 | 177.33 | 177.44 | 177.42 | 177.71 |
| MW-7 | Deep | 226.71 | 226.37 | 226.30 | 226.38 | 226.12 | 226.40 | 226.08 | 226.30 | 225.97 | 226.09 | 226.09 | 226.33 |
| MW-9 | Deep | Dry | 160.16 | 160.13 | 159.94 | Dry | 159.09 | Dry | Dry | 158.08 | 158.10 | 158.08 | 158.02 |
| MW-16 | Deep | 162.38 | 162.19 | 162.11 | 162.11 | 161.56 | 161.39 | 160.51 | 160.41 | 160.00 | 160.17 | 160.12 | 160.30 |

Notes: No surveying data is available for MW-19 through MW-24, and PZ-1.
NS - Not Sampled, NA - Not Available

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## TABLE 5-5 (continued)
## GROUNDWATER ELEVATIONS POLELINE ROAD DIPOSAL AREA

| OPERABLE UNIT B<br>FORT RICHARDSON, ALASKA | | Groundwater Elevation in Feet | | | |
|---|---|---|---|---|---|
| Monitoring Well | Saturated Interval | 11/4/96 | 11/10/97 | 6/8/98 | 10/21/98 |
| MW-2 | Shallow | 271.01 | 273.31 | 275.22 | 273.97 |
| MW-3 | Shallow | NS | 272.56 | 275.05 | 274.3 |
| MW-8 | Shallow | NS | 275.35 | 277.16 | 276.45 |
| MW-12 | Shallow | 269.94 | 272.84 | 274.62 | 273.62 |
| MW-13 | Shallow | 272.73 | 274.79 | 276.27 | 275.72 |
| MW-15 | Shallow | 265.03 | 271.68 | 274.67 | 272.12 |
| MW-17 | Shallow | 281.80 | 284.86 | 281.08 | 284.97 |
| MW-19 | Shallow | NA | 274.34 | 273.81 | 275.00 |
| MW-20 | Shallow | NA | 269.96 | 271.85 | 270.72 |
| MW-21 | Shallow | NA | 272.44 | 273.70 | 273.39 |
| MW-22 | Shallow | NA | 291.91 | 274.52 | 275.40 |
| MW-23 | Shallow | NA | NA | 272.65 | 274.04 |
| MW-24 | Shallow | NA | NA | 272.87 | 274.01 |
| PZ-1 | Shallow | -29.51 | 271.85 | 273.01 | *NS* |
| MW-14 | Perched | 288.91 | Dry | Dry | 285.07 |
| MW-5 | Shallow-Intermediate | 273.64 | 276.30 | 276.52 | 276.93 |
| MW-4 | Intermediate | NS | Dry | 243.25 | *Dry* |
| MW-1 | Deep | NS | 173.39 | 173.35 | 173.12 |
| MW-6 | Deep | NS | 177.54 | 177.64 | 177.28 |
| MW-7 | Deep | NS | 226.53 | 226.85 | 227.09 |
| MW-9 | Deep | NS | NS | 157.82 | 160.21 |
| MW-16 | Deep | 160.00 | 159.46 | 160.02 | 162.2 |

Notes: No surveying data is available for MW-19 through MW-24, and PZ-1.
NS - Not Sampled, NA - Not Available

OU-B 31952

## TABLE 5-6

## VOLATILE ORGANIC COMPOUNDS
### Chemical Abstract Service (CAS) Numbers

| Compound Title | Common Name | CAS Number |
|---|---|---|
| Benzene | Benzene | 71-43-2 |
| Toluene | Methylbenzene | 108-88-3 |
| Bromodichloromethane | Bromodichloromethane | 75-27-4 |
| Carbon Tetrachloride | Tetrachloromethane | 56-23-5 |
| Chlorobenzene | Chlorobenzene | 108-90-7 |
| Chloroform | Trichloromethane | 67-66-3 |
| Vinylidene Chloride | 1,1 Dichloroethene | 75-35-4 |
| Acetylene Dichloride | Cis-1,2 Dichloroethene | 156-59-2 |
| Acetylene Dichloride | Trans-1,2 Dichloroethene | 156-60-5 |
| Trichloroethylene | Trichloroethene | 79-01-6 |
| Tetrachloroethylene | Tetrachoroethene | 127-18-4 |
| Tetrachloroethane | 1,1,2,2 Tetracholoroethane | 79-34-5 |
| 1,1,2 Trichloroethane | 1,1,2 Trichloroethane | 79-00-5 |

## 6.1 CONCLUSIONS

The conclusions of the Technical Memorandum for the June 1998 sampling (WC, Oct. 1998) was that little biodegradation of chlorinated solvents was occurring at the site and that any decreases are the result of physical processes such as dilution, dispersion, hydrolysis and volatilization. Based on this conclusion, groundwater samples collected October 1998 were not analyzed for natural attenuation parameters.

The general tend for the concentration of solvents in groundwater at the site appears to be slowly decreasing. Variability in the concentration between sampling events, possibly caused by seasonal fluctuations, continues to make identification of trends difficult. A downward trend in the concentration could be the result of the physical processes mentioned above, the high vacuum extraction test in 1998, and the soil heating test in 1997. These two tests resulted in the removal of several hundred pounds of chlorinated solvents from the site, which may now be impacting the concentration of solvents in the groundwater. Additional sampling of the groundwater will help identify the impact these tests.

## 6.2 RECOMMENDATIONS

The following recommendations are based upon the results of the first three rounds of long-term groundwater monitoring at OUB:

- Continue analyzing groundwater samples for chlorinated solvents biyearly. Trends are now becoming identifiable and additional rounds of sampling will help characterize these trends as either seasonal fluctuations or true reductions in the mass of contaminants.
- The samples should be collected in April and October. Collecting the samples in April would allow the aquifer to go several months without surface water infiltration, potentially allowing the concentration of VOCs to increase. Collecting the samples in October would allow the most surface water to infiltrate into the aquifers, potentially allowing the concentrations to be lowered by dilution.

Wiedemeier, T.H., M.A. Swanson, D.E. Moutoux, K, Gordon, J.T., Wilson, B.H. Wilson, D.H. Kampbell, J.E. Hansen, P. Haas, and F.H. Chapelle. 1996. "Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. U.S. Air Force Center for Environmental Excellence, San Antonio.

Wilson, B.H., J.T. Wilson, and D. Luce. 1996 "Design and Interpretation of Microcosm Studies for Chlorinated Compounds" U. S. Environmental Protection Agency. 1996. "Proceedings of the Symposium on Natural Attenuation of Chlorinated Organics in Ground Water, September 11-13, Dallas, Texas.

Woodward-Clyde, *Long-Term Groundwater Monitoring Workplan, Operable Unit B, Poleline Road Disposal Area, Forth Richardson, Alaska* (September 1997).

# APPENDIX 1

## Laboratory Reports from MultiChem Environmental Services

OU-B 31957

MAS I.D. # 821621

**MultiChem**
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : HVE

| MAS # | CLIENT DESCRIPTION | DATE SAMPLED | MATRIX |
|---|---|---|---|
| 821621-1 | 98HVE124GW | 10/22/98 | WATER |
| 821621-2 | 98HVE123GW | 10/22/98 | WATER |
| 821621-3 | 98HVET24TB | 10/22/98 | WATER |

----- TOTALS -----

| MATRIX | # SAMPLES |
|---|---|
| WATER | 3 |

MAS STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

MAS I.D. # 821621

MultiChem
ANALYTICAL SERVICES

# ANALYTICAL SCHEDULE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : HVE

| ANALYSIS | TECHNIQUE | REFERENCE | LAB |
|---|---|---|---|
| VOLATILE ORGANICS ANALYSIS | GCMS | EPA 8260A | R |

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

MAS I.D. # 821621

# CASE NARRATIVE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : HVE

---

## CASE NARRATIVE: VOLATILE ORGANICS ANALYSIS

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The following anomalies were associated with the preparation and/or analysis of the samples in this accession:

The 23.8 percent difference (%D) of the continuing calibration compound (CCC) vinyl chloride exceeded the method stated limit of +/-20% in the continuing calibration standard analyzed for the first shift on November 5, 1998. Since this anomaly indicated a potential high bias, and reportable concentrations of vinyl chloride were not detected in any of the associated samples, no further corrective action was performed.

All vials for sample 821621-3 (98HVET24TB) contained head space. The vial with the least amount of head space was used for analysis. No further corrective action was performed.

Several compound exceeded their calibration ranges in the undiluted analyses of the samples identified as 821621-1 (98HVE124GW) and 821621-2 (98HVE123GW). The samples were reanalyzed at the appropriate dilutions six days outside of the recommended 14 day hold time. The affected concentrations have been flagged "X" on the appropriate data summary sheets. This anomaly affects only the flagged dilutions. No further corrective action was performed.

The recovery of the surrogate spiking compound toluene-d8 fell below the current MultiChem recovery range of 89-110% for the sample identified as 821621-1 (98HVE124GW). The sample was reanalyzed at a 50 fold dilution six days outside of the method recommended 14 day hold time. The toluene-d8 recovery was in control in the diluted analysis and was used for reporting purposes. This anomaly was flagged "D6" and "X" for reporting purposes. No further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 821621

OU-B 31960

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/05/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821621

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/05/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 85 | 64 - 145 |
| TOLUENE-D8 | 99 | 89 - 110 |
| BROMOFLUOROBENZENE | 86 | 82 - 112 |

MAS I.D. # 821621 **OU-B** **31962**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821621

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 87 | 64 - 145 |
| TOLUENE-D8 | 99 | 89 - 110 |
| BROMOFLUOROBENZENE | 87 | 82 - 112 |

MAS I.D. # 821621

OU-B 31965

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/11/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 84 | 64 - 145 |
| TOLUENE-D8 | 100 | 89 - 110 |
| BROMOFLUOROBENZENE | 99 | 82 - 112 |

MAS I.D. = 821621-1 **OU-B** **31966**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98HVE124GW | DATE ANALYZED | : 11/05/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | <1 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | 5 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 87 | |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | 6 | |
| CIS-1,2-DICHLOROETHENE | 220 | D6X |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | <1 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | <1 | |
| BENZENE | 4 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 3700 | D6X |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 150 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 150 | |
| 1,1,1,2-TETRACHLOROETHANE | 6 | |
| CHLOROBENZENE | <1 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 47000 | D9X |

D6 = Value from a 50 fold diluted analysis.
X = Value from a diluted analysis performed outside of the 14 day hold time.
D9 = Value from a 500 fold diluted analysis.

MAS I.D. # 321621-1 **OU-B 31967**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98HVE124GW | DATE ANALYZED | : 11/05/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 87 | 64 - 145 |
| TOLUENE-D8 | 101 D6X | 89 - 110 |
| BROMOFLUOROBENZENE | 89 | 82 - 112 |

D6 = Value from a 50 fold diluted analysis.
X = Value from a diluted analysis performed outside of the 14 day hold time.

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98HVE123GW | DATE ANALYZED | : 11/05/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | <1 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | 4 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 58 | |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | 4 | |
| CIS-1,2-DICHLOROETHENE | 150 | |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | <1 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | <1 | |
| BENZENE | 2 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 3200 | D9X |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 77 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 86 | |
| 1,1,1,2-TETRACHLOROETHANE | 2 | |
| CHLOROBENZENE | <1 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 18000 | D9X |

D9 = Value from a 500 fold diluted analysis.
X = Value from a diluted analysis performed outside of the 14 day hold time.

MAS I.D. # 821621-2

**OU-B 31969**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98HVE123GW | DATE ANALYZED | : 11/05/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 94 | 64 - 145 |
| TOLUENE-D8 | 89 | 89 - 110 |
| BROMOFLUOROBENZENE | 86 | 82 - 112 |

MAS I.D. # 821621-3

**OU-B 31970**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98HVET24TB | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821621-3

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : HVE | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98HVET24TB | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 86 | 64 - 145 |
| TOLUENE-D8 | 98 | 89 - 110 |
| BROMOFLUOROBENZENE | 87 | 82 - 112 |

MAS I.D. # 321621

**OU-B 31972**

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : HVE
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 11/05/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 60.6 | 121 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 55.8 | 112 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 44.2 | 88 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 50.3 | 101 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 54.4 | 109 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 83 | N/A | 64 - 145 |
| TOLUENE-D8 | 101 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 86 | N/A | 82 - 112 |

MAS I.D. # 821621 **OU-B 31973**

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : HVE
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 11/06/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 59.9 | 120 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 59.3 | 119 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 47.7 | 95 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 53.0 | 106 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 59.5 | 119 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 87 | N/A | 64 - 145 |
| TOLUENE-D8 | 99 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 85 | N/A | 82 - 112 |

MAS I.D. # 821621

**OU-B 31974**

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : HVE
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 11/11/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 60.5 | 121 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 59.5 | 119 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 44.6 | 89 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 51.8 | 104 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 55.2 | 110 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 85 | N/A | 64 - 145 |
| TOLUENE-D8 | 100 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 100 | N/A | 82 - 112 |

MAS I.D. # 821621

OU-B 31975

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : HVE
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : 821624-3
DATE EXTRACTED : N/A
DATE ANALYZED : 11/06/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 65.0 | 130 | 63.6 | 127 | 2 |
| BENZENE | <1.00 | 50.0 | 59.9 | 120 | 57.6 | 115 | 4 |
| TRICHLOROETHENE | <1.00 | 50.0 | 44.9 | 90 | 44.3 | 89 | 1 |
| TOLUENE | <1.00 | 50.0 | 52.3 | 105 | 51.6 | 103 | 1 |
| CHLOROBENZENE | <1.00 | 50.0 | 60.1 | 120 | 57.3 | 115 | 5 |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 49 - 157 | 20 |
| BENZENE | 72 - 138 | 20 |
| TRICHLOROETHENE | 77 - 134 | 20 |
| TOLUENE | 82 - 135 | 20 |
| CHLOROBENZENE | 72 - 138 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 73 | 73 | 64 - 145 |
| TOLUENE-D8 | 97 | 97 | 89 - 110 |
| BROMOFLUOROBENZENE | 83 | 86 | 82 - 112 |

MAS I.D. # 821624 **OU-B 31976**

CASE NARRATIVE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : PRDA

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CASE NARRATIVE: VOLATILE ORGANICS ANALYSIS

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The following anomalies were associated with the preparation and/or analysis of the samples in this accession:

The sample 821624-2 was identified as (98PRDA108DW) on the Chain Of Custody (COC) form. However, all sample vials were identified as (98PRDA108GW). The Data Summary sheet uses the identification from the COC form. No further corrective action was performed.

The samples identified as 821624-1 (98PRDAT01GW), 821624-2 (98PRDA108DW) were analyzed one day outside of the method recommended 14 day hold time. No further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 821624

**MultiChem**
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

OU-B 31977

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : PRDA

| MAS # | CLIENT DESCRIPTION | DATE SAMPLED | MATRIX |
|---|---|---|---|
| 821624-1 | 98PRDAT01GW | 10/22/98 | WATER |
| 821624-2 | 98PRDA108DW | 10/22/98 | WATER |
| 821624-3 | 98PRDA109GW | 10/23/98 | WATER |
| 821624-4 | 98PRDA130GW | 10/23/98 | WATER |
| 821624-5 | 98PRDA115GW | 10/23/98 | WATER |

----- TOTALS -----

| MATRIX | # SAMPLES |
|---|---|
| WATER | 5 |

MAS STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

MAS I.D. # 821624

**MultiChem**
ANALYTICAL SERVICES

ANALYTICAL SCHEDULE

**OU-B 31978**

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : PRDA

| ANALYSIS | TECHNIQUE | REFERENCE | LAB |
|---|---|---|---|
| VOLATILE ORGANICS ANALYSIS | GCMS | EPA 8260A | R |

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

# VOLATILE ORGANICS ANALYSIS
## DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821624 **OU-B** **31980**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 87 | 64 - 145 |
| TOLUENE-D8 | 99 | 89 - 110 |
| BROMOFLUORCBENZENE | 87 | 82 - 112 |

MAS I.D. # 821624

OU-B 31981

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821624

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U | DATE RECEIVED | : N/A |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 90 | 64 - 145 |
| TOLUENE-D8 | 96 | 89 - 110 |
| BROMOFLUOROBENZENE | 90 | 82 - 112 |

MAS I.D. # 321624-1 OU-B 31983

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDAT01GW | DATE ANALYZED | : 11/06/98* |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

* = Analyzed outside of the recommended holding time.

MAS I.D. # 821624-1

OU-B 31984

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDAT01GW | DATE ANALYZED | : 11/06/98* |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 87 | 64 - 145 |
| TOLUENE-D8 | 96 | 89 - 110 |
| BROMOFLUOROBENZENE | 88 | 82 - 112 |

* = Analyzed outside of the recommended holding time.

MAS I.D. # 321624-2

**OU-B 31985**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA108DW | DATE ANALYZED | : 11/06/98* |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

* = Analyzed outside the recommended holding time.

MAS I.D. # 821624-2 **OU-B** **31986**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/22/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA108DW | DATE ANALYZED | : 11/06/98* |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 86 | 64 - 145 |
| TOLUENE-D8 | 95 | 89 - 110 |
| BROMOFLUOROBENZENE | 86 | 82 - 112 |

* = Analyzed outside of the recommended holding time.

MAS I.D. # 321624-3

OU-B 31987

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/23/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA109GW | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821624-3

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/23/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA109GW | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 86 | 64 - 145 |
| TOLUENE-D8 | 97 | 89 - 110 |
| BROMOFLUOROBENZENE | 89 | 82 - 112 |

MAS I.D. # 821624-4 **OU-B 31989**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/23/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA130GW | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821624-4 **OU-B** **31990**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/23/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA130GW | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 86 | 64 - 145 |
| TOLUENE-D8 | 97 | 89 - 110 |
| BROMOFLUOROBENZENE | 87 | 82 - 112 |

MAS I.D. # 321624-5 **OU-B** **31991**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/23/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA115GW | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | <1 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | <1 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 4 | |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | 1 | |
| CIS-1,2-DICHLOROETHENE | 17 | |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | <1 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | <1 | |
| BENZENE | <1 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 260 | D3 |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 2 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 3 | |
| 1,1,1,2-TETRACHLOROETHANE | <1 | |
| CHLOROBENZENE | <1 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 4 | |

D3 = Value from a 5 fold diluted analysis.

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/23/98 |
| PROJECT # | : E9408U | DATE RECEIVED | : 10/24/98 |
| PROJECT NAME | : PRDA | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA115GW | DATE ANALYZED | : 11/06/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 86 | 64 - 145 |
| TOLUENE-D8 | 98 | 89 - 110 |
| BROMOFLUOROBENZENE | 88 | 82 - 112 |

MAS I.D. # 821624

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : PRDA
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 11/06/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 59.9 | 120 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 59.3 | 119 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 47.7 | 95 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 53.0 | 106 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 59.5 | 119 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 87 | N/A | 64 - 145 |
| TOLUENE-D8 | 99 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 85 | N/A | 82 - 112 |

MAS I.D. # 321624

OU-B 31994

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : PRDA
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 11/06/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 54.1 | 108 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 49.7 | 99 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 45.3 | 91 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 46.7 | 93 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 52.5 | 105 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 93 | N/A | 64 - 145 |
| TOLUENE-D8 | 95 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 90 | N/A | 82 - 112 |

MAS I.D. # 821624

OU-B 31995

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U
PROJECT NAME : PRDA
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : 821624-3
DATE EXTRACTED : N/A
DATE ANALYZED : 11/06/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 65.0 | 130 | 63.6 | 127 | 2 |
| BENZENE | <1.00 | 50.0 | 59.9 | 120 | 57.6 | 115 | 4 |
| TRICHLOROETHENE | <1.00 | 50.0 | 44.9 | 90 | 44.3 | 89 | 1 |
| TOLUENE | <1.00 | 50.0 | 52.3 | 105 | 51.6 | 103 | 1 |
| CHLOROBENZENE | <1.00 | 50.0 | 60.1 | 120 | 57.3 | 115 | 5 |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 49 - 157 | 20 |
| BENZENE | 72 - 138 | 20 |
| TRICHLOROETHENE | 77 - 134 | 20 |
| TOLUENE | 82 - 135 | 20 |
| CHLOROBENZENE | 72 - 138 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 73 | 73 | 64 - 145 |
| TOLUENE-D8 | 97 | 97 | 89 - 110 |
| BROMOFLUOROBENZENE | 83 | 86 | 82 - 112 |

MAS I.D. # 821626

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING, FT. RICHARDSON

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CASE NARRATIVE: VOLATILE ORGANICS ANALYSIS

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The following anomaly was associated with the preparation and/or analysis of the samples in this accession:

The 22.8 percent difference (%D) for the continuing calibration verification (CCV) compound 1,2-dichloropropane exceeded the method stated limit of +/-20% in the CCV standard analyzed on November 8, 1998. This anomaly indicated a potential high bias for this compound. Since positive results for 1,2-dichloropropane were not detected above the reporting limit in any of the associated samples, no further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 821626

MultiChem
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING, FT. RICHARDSON

| MAS # | CLIENT DESCRIPTION | DATE SAMPLED | MATRIX |
|---|---|---|---|
| 821626-1 | 98PRDA-116GW | 10/26/98 | WATER |
| 821626-2 | 98PRDA 102GW | 10/26/98 | WATER |
| 821626-3 | 98PRDA-132GW | 10/26/98 | WATER |
| 821626-4 | 98PRDA-101GW | 10/26/98 | WATER |
| 821626-5 | 98PRDA-135GW | 10/26/98 | WATER |

----- TOTALS -----

| MATRIX | # SAMPLES |
|---|---|
| WATER | 5 |

MAS STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

MAS I.D. # 821626

MultiChem
ANALYTICAL SERVICES

# ANALYTICAL SCHEDULE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING, FT. RICHARDSON

| ANALYSIS | TECHNIQUE | REFERENCE | LAB |
|---|---|---|---|
| VOLATILE ORGANIC COMPOUNDS | GCMS | EPA 8260A | R |

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

MAS I.D. # 321626

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 321626

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 69 | 64 - 145 |
| TOLUENE-D8 | 100 | 89 - 110 |
| BROMOFLUOROBENZENE | 94 | 82 - 112 |

MAS I.D. # 821626-1

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-116GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821626-1

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-116GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 69 | 64 - 145 |
| TOLUENE-D8 | 98 | 89 - 110 |
| BROMOFLUOROBENZENE | 96 | 82 - 112 |

MAS I.D. # 321626-2

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA 102GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | 4 |

MAS I.D. # 321626-2

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA 102GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | 64 - 145 |
| TOLUENE-D8 | 99 | 89 - 110 |
| BROMOFLUOROBENZENE | 97 | 82 - 112 |

MAS I.D. # 621626-3

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-132GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | 4 |

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 821626-3

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-132GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | 64 - 145 |
| TOLUENE-D8 | 99 | 89 - 110 |
| BROMOFLUOROBENZENE | 98 | 82 - 112 |

MAS I.D. # 321626-4

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-101GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | 6 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | 29 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | 29 |

MAS I.D. # 321626-4

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-101GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | 64 - 145 |
| TOLUENE-D8 | 98 | 89 - 110 |
| BROMOFLUOROBENZENE | 95 | 82 - 112 |

MAS I.D. # 321626-3

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-135GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821626-5

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/26/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/27/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-135GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | 64 - 145 |
| TOLUENE-D8 | 97 | 89 - 110 |
| BROMOFLUOROBENZENE | 97 | 82 - 112 |

MAS I.D. # 821626

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | SAMPLE I.D. # | : BLANK |
| PROJECT # | : E9408U-5700 | DATE EXTRACTED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | | |

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 61.7 | 123 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 60.4 | 121 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 42.8 | 86 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 52.7 | 105 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 60.7 | 121 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | N/A | 64 - 145 |
| TOLUENE-D8 | 100 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 95 | N/A | 82 - 112 |

MAS I.D. # 821626

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : 821626-1
DATE EXTRACTED : N/A
DATE ANALYZED : 11/08/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 63.5 | 127 | 63.4 | 127 | 0 |
| BENZENE | <1.00 | 50.0 | 63.2 | 126 | 62.2 | 124 | 2 |
| TRICHLOROETHENE | <1.00 | 50.0 | 45.1 | 90 | 44.2 | 88 | 2 |
| TOLUENE | <1.00 | 50.0 | 52.6 | 105 | 53.0 | 106 | 1 |
| CHLOROBENZENE | <1.00 | 50.0 | 60.1 | 120 | 59.9 | 120 | 0 |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 49 - 157 | 20 |
| BENZENE | 72 - 138 | 20 |
| TRICHLOROETHENE | 77 - 134 | 20 |
| TOLUENE | 82 - 135 | 20 |
| CHLOROBENZENE | 72 - 138 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 69 | 70 | 64 - 145 |
| TOLUENE-D8 | 96 | 99 | 89 - 110 |
| BROMOFLUOROBENZENE | 95 | 96 | 82 - 112 |

MAS I.D. # 821629

MultiChem
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING, FT. RICHARDSON

| MAS # | CLIENT DESCRIPTION | DATE SAMPLED | MATRIX |
|---|---|---|---|
| 821629-1 | 98PRDA-120GW | 10/28/98 | WATER |
| 821629-2 | 98PRDA-112GW | 10/28/98 | WATER |
| 821629-3 | 98PRDA-113GW | 10/28/98 | WATER |
| 821629-4 | 98PRDA-103GW | 10/28/98 | WATER |
| 821629-5 | 98PRDA-136GW | 10/27/98 | WATER |

----- TOTALS -----

| MATRIX | # SAMPLES |
|---|---|
| WATER | 5 |

MAS STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

MAS I.D. # 821629

MultiChem
ANALYTICAL SERVICES

ANALYTICAL SCHEDULE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING, FT. RICHARDSON

| ANALYSIS | TECHNIQUE | REFERENCE | LAB |
|---|---|---|---|
| VOLATILE ORGANIC COMPOUNDS | GCMS | EPA 8260A | R |

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

MAS I.D. # 821629

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING, FT. RICHARDSON

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CASE NARRATIVE: VOLATILE ORGANICS ANALYSIS

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The following anomaly was associated with the preparation and/or analysis of the samples in this accession:

The 22.8 percent difference (%D) for the continuing calibration verification (CCV) compound 1,2-dichloropropane exceeded the method stated limit of +/-20% in the CCV standard analyzed on November 8, 1998. This anomaly indicated a potential high bias for this compound. Since positive results for 1,2-dichloropropane were not detected above the reporting limit in any of the associated samples, no further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 821629

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 321629

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 321629

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 69 | 64 - 145 |
| TOLUENE-D8 | 100 | 89 - 110 |
| BROMOFLUOROBENZENE | 94 | 82 - 112 |

MAS I.D. # 321629-1

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : 29408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-120GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | 12 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | 120 |

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 321629-1

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-120GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | 64 - 145 |
| TOLUENE-D8 | 97 | 89 - 110 |
| BROMOFLUOROBENZENE | 95 | 82 - 112 |

MAS I.D. # 321629-2

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-112GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | 4 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | 63 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | 130 |

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 821629-2

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-112GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | 64 - 145 |
| TOLUENE-D8 | 97 | 89 - 110 |
| BROMOFLUOROBENZENE | 97 | 82 - 112 |

MAS I.D. # 821629-3

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-113GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | 10 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | 56 |

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 321629-3

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-113GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | 64 - 145 |
| TOLUENE-D8 | 97 | 89 - 110 |
| BROMOFLUOROBENZENE | 96 | 82 - 112 |

MAS I.D. # 821629-4

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-103GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | 2 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | 10 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | 62 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | 59 |

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 321629-4

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-103GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 71 | 64 - 145 |
| TOLUENE-D8 | 95 | 89 - 110 |
| BROMOFLUOROBENZENE | 97 | 82 - 112 |

MAS I.D. # 321629-8

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/27/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-136GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 321629-5

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/27/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/28/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-136GW | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 71 | 64 - 145 |
| TOLUENE-D8 | 98 | 89 - 110 |
| BROMOFLUOROBENZENE | 97 | 82 - 112 |

MAS I.D. # 821629

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | SAMPLE I.D. # | : BLANK |
| PROJECT # | : E9408U-5700 | DATE EXTRACTED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | | |

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 61.7 | 123 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 60.4 | 121 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 42.8 | 86 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 52.7 | 105 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 60.7 | 121 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | N/A | 64 - 145 |
| TOLUENE-D8 | 100 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 95 | N/A | 82 - 112 |

MAS I.D. # 821629

**MultiChem**
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : 821626-1
DATE EXTRACTED : N/A
DATE ANALYZED : 11/08/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 63.5 | 127 | 63.4 | 127 | 0 |
| BENZENE | <1.00 | 50.0 | 63.2 | 126 | 62.2 | 124 | 2 |
| TRICHLOROETHENE | <1.00 | 50.0 | 45.1 | 90 | 44.2 | 88 | 2 |
| TOLUENE | <1.00 | 50.0 | 52.6 | 105 | 53.0 | 106 | 1 |
| CHLOROBENZENE | <1.00 | 50.0 | 60.1 | 120 | 59.9 | 120 | 0 |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 49 - 157 | 20 |
| BENZENE | 72 - 138 | 20 |
| TRICHLOROETHENE | 77 - 134 | 20 |
| TOLUENE | 82 - 135 | 20 |
| CHLOROBENZENE | 72 - 138 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 69 | 70 | 64 - 145 |
| TOLUENE-D8 | 96 | 99 | 89 - 110 |
| BROMOFLUOROBENZENE | 95 | 96 | 82 - 112 |

MAS I.D. # 821633

MultiChem
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING

| MAS # | CLIENT DESCRIPTION | DATE SAMPLED | MATRIX |
|---|---|---|---|
| 821633-1 | 98PRDA-106GW | 10/28/98 | WATER |
| 821633-2 | 98PRDA-105GW | 10/28/98 | WATER |
| 821633-3 | 98PRDA-1PZGW | 10/29/98 | WATER |
| 821633-4 | 98PRDA-119GW | 10/29/98 | WATER |
| 821633-5 | 98PRDA-121GW | 10/29/98 | WATER |
| 821633-6 | 98PRDA-107GW | 10/29/98 | WATER |
| 821633-7 | 98PRDA-122GW | 10/29/98 | WATER |
| 821633-8 | TRIP BLANK | 10/28/98 | WATER |

----- TOTALS -----

| MATRIX | # SAMPLES |
|---|---|
| WATER | 8 |

MAS STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

OU-B 32032

MAS I.D. # 821633

MultiChem
ANALYTICAL SERVICES

# ANALYTICAL SCHEDULE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING

| ANALYSIS | TECHNIQUE | REFERENCE | LAB |
|---|---|---|---|
| VOLATILE ORGANICS ANALYSIS | GCMS | EPA 8260A | R |

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

MAS I.D. # 321633

CASE NARRATIVE

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING

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CASE NARRATIVE: VOLATILE ORGANICS ANALYSIS

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The following anomalies were associated with the preparation and/or analysis of the samples in this accession:

The percent difference (%D) of the continuing calibration compound (CCC) 1,2-dichloropropane exceeded the method stated limit of +/-20% in the continuing calibration standard analyzed on November 8, 1998. Since this anomaly indicated a potential high bias, and reportable concentrations of 1,2-dichloropropane were not detected in any of the associated samples, no further corrective action was performed.

The target compound methylene chloride was detected in the sample identified as 821633-8 (Trip Blank) at a concentration above the reporting limit. Since methylene chloride was not detected in any of the associated samples, no further corrective action was performed.

The recovery of the surrogate spiking compound toluene-d8 fell below the current MultiChem recovery range of 89-110% in the undiluted analyses of the samples identified as 821633-4 (98PRDA-119GW) and 821633-5 (98PRDA-121GW). Since both samples required dilutions, and the surrogate recovery was within control limits in the dilution, the recoveries from the diluted analyses were used for reporting purposes. No further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 321633

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821633

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 69 | 64 - 145 |
| TOLUENE-D8 | 100 | 89 - 110 |
| BROMOFLUOROBENZENE | 94 | 82 - 112 |

MAS I.D. # 821633

# VOLATILE ORGANICS ANALYSIS
## DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821633

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : DUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 82 | 64 - 145 |
| TOLUENE-D8 | 101 | 89 - 110 |
| BROMOFLUOROBENZENE | 105 | 82 - 112 |

MAS I.D. # 821633

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/11/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. = 821633

OU-B 32039

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : N/A |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : N/A |
| PROJECT NAME | : SUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : METHOD BLANK | DATE ANALYZED | : 11/11/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 84 | 64 - 145 |
| TOLUENE-D8 | 100 | 89 - 110 |
| BROMOFLUOROBENZENE | 99 | 82 - 112 |

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-106GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | <5 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | 2 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | 26 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | 19 |

MAS I.D. # 9821633-1

**OU-B 32041**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-106GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 81 | 64 - 145 |
| TOLUENE-D8 | 96 | 89 - 110 |
| BROMOFLUOROBENZENE | 104 | 82 - 112 |

MAS I.D. # 321633-2 **OU-B** **32042**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-105GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | <1 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | 5 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 110 | |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | 3 | |
| CIS-1,2-DICHLOROETHENE | 390 | D7 |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | <1 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | <1 | |
| BENZENE | <1 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 3700 | D7 |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 31 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 32 | |
| 1,1,1,2-TETRACHLOROETHANE | <1 | |
| CHLOROBENZENE | <1 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 6000 | D7 |

D7 = Value from a 100 fold diluted analysis.

MAS I.D. # 821633-2

OU-B 32043

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-105GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 81 | 64 - 145 |
| TOLUENE-D8 | 90 | 89 - 110 |
| BROMOFLUOROBENZENE | 104 | 82 - 112 |

OU-B 32044

MAS I.D. # 821633-3

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-1PZGW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | <1 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | 3 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 65 | |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | 3 | |
| CIS-1,2-DICHLOROETHENE | 250 | D6 |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | <1 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | <1 | |
| BENZENE | 3 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 1300 | D6 |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 22 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 10 | |
| 1,1,1,2-TETRACHLOROETHANE | <1 | |
| CHLOROBENZENE | <1 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 3300 | D6 |

D6 = Value from a 50 fold diluted analysis.

MAS I.D. # 821633-3

**OU-B 32045**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-1PZGW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 80 | 64 - 145 |
| TOLUENE-D8 | 95 | 89 - 110 |
| BROMOFLUOROBENZENE | 107 | 82 - 112 |

MAS I.D. # 821633-4

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : CUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-119GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | <1 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | <1 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 5 | |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | <1 | |
| CIS-1,2-DICHLOROETHENE | 11 | |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | <1 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | <1 | |
| BENZENE | <1 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 170 | |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 3 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 5 | |
| 1,1,1,2-TETRACHLOROETHANE | <1 | |
| CHLOROBENZENE | <1 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 630 | D4 |

D4 = Value from a 10 fold diluted analysis.

MAS I.D. # 321633-4 **OU-B 32047**

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-119GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 82 | 64 - 145 |
| TOLUENE-D8 | 102 D4 | 89 - 110 |
| BROMOFLUOROBENZENE | 104 | 82 - 112 |

D4 = Value from a 10 fold diluted analysis.

MAS I.D. # 821633-8

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-121GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | 9 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | 19 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 720 | D7 |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | 16 | |
| CIS-1,2-DICHLOROETHENE | 2200 | D7 |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | 4 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | <1 | |
| BENZENE | 21 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 11000 | D7 |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 200 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 140 | |
| 1,1,1,2-TETRACHLOROETHANE | <1 | |
| CHLOROBENZENE | <1 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 38000 | D9 |

D7 = Value from a 100 fold diluted analysis.
D9 = Value from a 500 fold diluted analysis.

MAS I.D. # 821633-5

OU-B 32049

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-121GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 84 | | 64 - 145 |
| TOLUENE-D8 | 99 | D7 | 89 - 110 |
| BROMOFLUOROBENZENE | 107 | | 82 - 112 |

D7 = Value from a 100 fold diluted analysis.

MAS I.D. # 9811633-6

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-107GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | <1 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | 5 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 74 | |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | 1 | |
| CIS-1,2-DICHLOROETHENE | 310 | D6 |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | <1 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | <1 | |
| BENZENE | <1 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 850 | D6 |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 20 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 3 | |
| 1,1,1,2-TETRACHLOROETHANE | <1 | |
| CHLOROBENZENE | <1 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 1500 | D6 |

D6 = Value from a 50 fold diluted analysis.

MAS I.D. # 9811633-6

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : SUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-107GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 84 | 64 - 145 |
| TOLUENE-D8 | 95 | 89 - 110 |
| BROMOFLUOROBENZENE | 105 | 82 - 112 |

MAS I.D. # 9821633-7

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-122GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS | |
|---|---|---|
| DICHLORODIFLUOROMETHANE | <1 | |
| CHLOROMETHANE | <5 | |
| VINYL CHLORIDE | <1 | |
| BROMOMETHANE | <1 | |
| CHLOROETHANE | <1 | |
| TRICHLOROFLUOROMETHANE | <1 | |
| 1,1-DICHLOROETHENE | 7 | |
| METHYLENE CHLORIDE | <5 | |
| TRANS-1,2-DICHLOROETHENE | 190 | |
| 1,1-DICHLOROETHANE | <1 | |
| CHLOROFORM | 10 | |
| CIS-1,2-DICHLOROETHENE | 730 | D7 |
| BROMOCHLOROMETHANE | <1 | |
| 2,2-DICHLOROPROPANE | <1 | |
| 1,1,1-TRICHLOROETHANE | <1 | |
| 1,2-DICHLOROETHANE | <1 | |
| 1,1-DICHLOROPROPENE | <1 | |
| CARBON TETRACHLORIDE | 6 | |
| BENZENE | 17 | |
| DIBROMOMETHANE | <1 | |
| 1,2-DICHLOROPROPANE | <1 | |
| TRICHLOROETHENE | 7800 | D7 |
| BROMODICHLOROMETHANE | <1 | |
| CIS-1,3-DICHLOROPROPENE | <3 | |
| TRANS-1,3-DICHLOROPROPENE | <3 | |
| 1,1,2-TRICHLOROETHANE | 41 | |
| TOLUENE | <1 | |
| 1,2-DIBROMOETHANE(EDB) | <1 | |
| 1,3-DICHLOROPROPANE | <1 | |
| CHLORODIBROMOMETHANE | <2 | |
| TETRACHLOROETHENE | 150 | |
| 1,1,1,2-TETRACHLOROETHANE | 5 | |
| CHLOROBENZENE | 2 | |
| ETHYLBENZENE | <1 | |
| BROMOFORM | <3 | |
| STYRENE | <1 | |
| TOTAL XYLENES | <1 | |
| 1,1,2,2-TETRACHLOROETHANE | 15000 | D7 |

D7 = Value from a 100 fold diluted analysis.

# VOLATILE ORGANICS ANALYSIS
## DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/29/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : 98PRDA-122GW | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 81 | 64 - 145 |
| TOLUENE-D8 | 92 | 89 - 110 |
| BROMOFLUOROBENZENE | 105 | 82 - 112 |

MAS I.D. = 821633-8

# VOLATILE ORGANICS ANALYSIS
## DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : OUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : TRIP BLANK | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| DICHLORODIFLUOROMETHANE | <1 |
| CHLOROMETHANE | <5 |
| VINYL CHLORIDE | <1 |
| BROMOMETHANE | <1 |
| CHLOROETHANE | <1 |
| TRICHLOROFLUOROMETHANE | <1 |
| 1,1-DICHLOROETHENE | <1 |
| METHYLENE CHLORIDE | 6 |
| TRANS-1,2-DICHLOROETHENE | <1 |
| 1,1-DICHLOROETHANE | <1 |
| CHLOROFORM | <1 |
| CIS-1,2-DICHLOROETHENE | <1 |
| BROMOCHLOROMETHANE | <1 |
| 2,2-DICHLOROPROPANE | <1 |
| 1,1,1-TRICHLOROETHANE | <1 |
| 1,2-DICHLOROETHANE | <1 |
| 1,1-DICHLOROPROPENE | <1 |
| CARBON TETRACHLORIDE | <1 |
| BENZENE | <1 |
| DIBROMOMETHANE | <1 |
| 1,2-DICHLOROPROPANE | <1 |
| TRICHLOROETHENE | <1 |
| BROMODICHLOROMETHANE | <1 |
| CIS-1,3-DICHLOROPROPENE | <3 |
| TRANS-1,3-DICHLOROPROPENE | <3 |
| 1,1,2-TRICHLOROETHANE | <1 |
| TOLUENE | <1 |
| 1,2-DIBROMOETHANE(EDB) | <1 |
| 1,3-DICHLOROPROPANE | <1 |
| CHLORODIBROMOMETHANE | <2 |
| TETRACHLOROETHENE | <1 |
| 1,1,1,2-TETRACHLOROETHANE | <1 |
| CHLOROBENZENE | <1 |
| ETHYLBENZENE | <1 |
| BROMOFORM | <3 |
| STYRENE | <1 |
| TOTAL XYLENES | <1 |
| 1,1,2,2-TETRACHLOROETHANE | <1 |

MAS I.D. # 821633-8

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | DATE SAMPLED | : 10/28/98 |
| PROJECT # | : E9408U-5700 | DATE RECEIVED | : 10/31/98 |
| PROJECT NAME | : SUB GW MONITORING | DATE EXTRACTED | : N/A |
| CLIENT I.D. | : TRIP BLANK | DATE ANALYZED | : 11/10/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| 1,2,3-TRICHLOROPROPANE | <1 |
| ISOPROPYLBENZENE | <1 |
| BROMOBENZENE | <1 |
| N-PROPYLBENZENE | <1 |
| 2-CHLOROTOLUENE | <1 |
| 4-CHLOROTOLUENE | <1 |
| 1,3,5-TRIMETHYLBENZENE | <1 |
| TERT-BUTYLBENZENE | <1 |
| 1,2,4-TRIMETHYLBENZENE | <1 |
| SEC-BUTYLBENZENE | <1 |
| 1,3-DICHLOROBENZENE | <2 |
| 1,4-DICHLOROBENZENE | <2 |
| P-ISOPROPYLTOLUENE | <2 |
| 1,2-DICHLOROBENZENE | <2 |
| N-BUTYLBENZENE | <1 |
| 1,2-DIBROMO-3-CHLOROPROPANE | <3 |
| 1,2,4-TRICHLOROBENZENE | <5 |
| NAPHTHALENE | <5 |
| HEXACHLOROBUTADIENE | <3 |
| 1,2,3-TRICHLOROBENZENE | <5 |

| SURROGATE PERCENT RECOVERY | | LIMITS |
|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 81 | 64 - 145 |
| TOLUENE-D8 | 102 | 89 - 110 |
| BROMOFLUOROBENZENE | 107 | 82 - 112 |

MAS I.D. # 821633

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | SAMPLE I.D. # | : BLANK |
| PROJECT # | : E9408U-5700 | DATE EXTRACTED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | | |

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLORCETHENE | <1.00 | 50.0 | 61.7 | 123 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 60.4 | 121 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 42.8 | 86 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 52.7 | 105 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 60.7 | 121 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 70 | N/A | 64 - 145 |
| TOLUENE-D8 | 100 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 95 | N/A | 82 - 112 |

MAS I.D. # 321633

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : WOODWARD-CLYDE CONSULTANTS
PROJECT # : E9408U-5700
PROJECT NAME : OUB GW MONITORING
SAMPLE MATRIX : WATER
EPA METHOD : 8260A

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 11/10/98
UNITS : ug/L

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 64.5 | 129 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 62.0 | 124 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 44.3 | 89 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 51.8 | 104 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 54.7 | 109 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 80 | N/A | 64 - 145 |
| TOLUENE-D8 | 102 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 103 | N/A | 82 - 112 |

MAS I.D. # 821633

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | SAMPLE I.D. # | : BLANK |
| PROJECT # | : E9408U-5700 | DATE EXTRACTED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE ANALYZED | : 11/11/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | | |

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 60.5 | 121 | N/A | N/A | N/A |
| BENZENE | <1.00 | 50.0 | 59.5 | 119 | N/A | N/A | N/A |
| TRICHLOROETHENE | <1.00 | 50.0 | 44.6 | 89 | N/A | N/A | N/A |
| TOLUENE | <1.00 | 50.0 | 51.8 | 104 | N/A | N/A | N/A |
| CHLOROBENZENE | <1.00 | 50.0 | 55.2 | 110 | N/A | N/A | N/A |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 55 - 148 | 20 |
| BENZENE | 79 - 133 | 20 |
| TRICHLOROETHENE | 83 - 124 | 20 |
| TOLUENE | 83 - 131 | 20 |
| CHLOROBENZENE | 80 - 140 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 85 | N/A | 64 - 145 |
| TOLUENE-D8 | 100 | N/A | 89 - 110 |
| BROMOFLUOROBENZENE | 100 | N/A | 82 - 112 |

MAS I.D. # 821633

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

| | | | |
|---|---|---|---|
| CLIENT | : WOODWARD-CLYDE CONSULTANTS | SAMPLE I.D. # | : 821626-1 |
| PROJECT # | : E9408U-5700 | DATE EXTRACTED | : N/A |
| PROJECT NAME | : OUB GW MONITORING | DATE ANALYZED | : 11/08/98 |
| SAMPLE MATRIX | : WATER | UNITS | : ug/L |
| EPA METHOD | : 8260A | | |

| COMPOUNDS | SAMPLE RESULT | SPIKE ADDED | SPIKED RESULT | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | <1.00 | 50.0 | 63.5 | 127 | 63.4 | 127 | 0 |
| BENZENE | <1.00 | 50.0 | 63.2 | 126 | 62.2 | 124 | 2 |
| TRICHLOROETHENE | <1.00 | 50.0 | 45.1 | 90 | 44.2 | 88 | 2 |
| TOLUENE | <1.00 | 50.0 | 52.6 | 105 | 53.0 | 106 | 1 |
| CHLOROBENZENE | <1.00 | 50.0 | 60.1 | 120 | 59.9 | 120 | 0 |

| CONTROL LIMITS | % REC. | RPD |
|---|---|---|
| 1,1-DICHLOROETHENE | 49 - 157 | 20 |
| BENZENE | 72 - 138 | 20 |
| TRICHLOROETHENE | 77 - 134 | 20 |
| TOLUENE | 82 - 135 | 20 |
| CHLOROBENZENE | 72 - 138 | 20 |

| SURROGATE RECOVERIES | SPIKE | DUP. SPIKE | LIMITS |
|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 69 | 70 | 64 - 145 |
| TOLUENE-D8 | 96 | 99 | 89 - 110 |
| BROMOFLUOROBENZENE | 95 | 96 | 82 - 112 |

# APPENDIX 2

## Natural Attenuation Parameters

## NATURAL ATTENUATION PARAMETERS

The behavior of organic and inorganic contaminants, inorganic minerals, and microbial populations is affected by the geochemistry of the subsurface environment. Primary geochemical parameters that characterize the subsurface include:

- alkalinity
- temperature
- pH
- redox potential
- dissolved constituents (including electron acceptors)
- the physical and chemical characterization of the solids
- microbial processes

The most important of these in relation to biological processes are:

- alkalinity
- redox potential
- the concentration of electron acceptors
- the chemical nature of the solids

Selected parameters were measured to help identify what types of natural processes may be degrading contaminants at the site. Laboratory results for analysis of selected natural attenuation parameters are summarized in Table 5-3, and field measurements are summarized in Table 5-4. These tables include data from analysis of samples collected in November 1996, November 1997, and June 1998.

Three bacteria count tests (heterotrophic plate count, oil degrading bacteria, and sulfate reducing bacteria) were completed on groundwater samples collected in 1996. The results indicated virtually no bacterial populations in groundwater at the site. Based on these results, no additional tests for bacterial populations have been completed.

**Alkalinity**

Carbon dioxide generated during biodegradation causes an increase in alkalinity. Thus, biologically active portions of a plume may be identified in the field by their increased alkalinity (compared with background levels), and alkalinity can be one of the parameters used to identify where to collect biologically active core material.

The alkalinity of water sampled from the background well (MW-17) was 110 ppm in November 1997 and 69 ppm in June 1998. Alkalinity values for samples collected from the shallow aquifer in June 1998 ranged from 66 ppm to 180 ppm. Alkalinity in water from monitoring well MW-5 (shallow-intermediate aquifers) was 35 ppm. Water sampled from the deep aquifer had alkalinity values of 110 ppm to 270 ppm.

The alkalinity of the water where high concentrations of VOCs are found is not significantly higher than the alkalinity of water with no detectable concentrations of VOCs. This suggests that little to no biodegradation is occurring.

### Oxidation/Reduction Potential

The redox potential of ground water is a measure of electron activity that indicates the relative ability of a solution to accept or transfer electrons. Most redox reactions in the subsurface are microbially catalyzed during metabolism of native organic matter or contaminants. According to Wilson, et al. (1996), when the redox potential is less than 50 mV against Ag/AgCl, a reductive pathway is possible. All of the oxidation reduction potential (ORP) measurements taken in June 1998 were greater than 50 mV, except for the sample from MW-19. The low reading from MW-19 is most likely the result of water from the wetlands moving into the site. Water from the wetlands appears to have a lower redox potential.

Since the redox potential exceeds 50 mV in nearly all of the samples, this suggests that little to no biodegradation is occurring.

## Electron Acceptors

In order to identify the predominant microbial and geochemical processes occurring in situ at the time of sample collection, it is critical to measure the available electron acceptors. Nitrate and sulfate are found naturally in most groundwater and will subsequently be used as electron acceptors once oxygen is consumed. Oxidized forms of iron and manganese can be used as electron acceptors before sulfate reduction, and their reduced forms scavenge oxygen to the extent that strict anaerobes (some sulfate reducers and all methanogens) can develop. Sulfate is found in many depositional environments, and sulfate reduction may be very common in contaminated groundwater. In environments where sulfate is depleted, carbonate becomes the electron acceptor, with methane gas produced as an end product.

### Dissolved Oxygen

According to Wilson et al. (1996), the reductive pathways necessary for bioremediation require dissolved oxygen concentrations of less than 0.05 ppm At higher concentrations, dissolved oxygen is toxic to the reductive pathway (vinyl chloride, for example, is oxidized when the oxygen concentration is greater than 1 ppm). The dissolved oxygen concentration in water from three of the shallow monitoring wells (MW-19, MW-21, and MW-23) measured nearly 0 ppm, suggesting appropriate conditions necessary for reductive pathways. Dissolved oxygen measurements in water from the other wells were generally around 9 to 12 ppm.

### Nitrate and Nitrite

Nitrate reducing conditions are indicated when nitrate and nitrite occur together. Also, for reductive pathways, the optimum concentration of nitrate should be less than 1 ppm.

The concentration of nitrate as nitrogen was less than 1 ppm in all samples except those from the shallow monitoring wells MW-2 (6.11 ppm), MW-8 (2.25 ppm), MW-12 (2.62 ppm), MW-13 (2.25 ppm); shallow-intermediate well MW-5 (2.37 ppm); and intermediate well MW-4 (1.17 ppm). The range of concentrations of nitrate as nitrogen in samples from the shallow aquifer

appear to be slightly higher then values in samples from the deep aquifer. No nitrite as nitrogen was detected in groundwater samples collected in June 1998.

**Sulfate**

For reductive pathways, the optimum concentration for sulfate is less than 20 ppm. Sulfate concentrations in samples from the shallow and shallow-intermediate aquifers ranged from 6.7 ppm to 220 ppm, and ranged from 6.1 ppm to 19 ppm in samples from the deep aquifers. The samples from the shallow and shallow-intermediate aquifers with relatively high sulfate concentrations are from wells with relatively high VOC concentrations.

**Ferrous Iron**

Reductive pathways are possible when the concentration of iron (II) is greater than about 1 to 1.5 ppm. Ferrous iron concentrations in samples from two of the shallow wells (MW-22 and MW-23) were above 1.5 ppm. Ferrous iron in these wells measures 2 ppm, and 7 ppm, respectively.

**Temperature, Specific Conductance, and pH**

Temperature and pH affect biodegradation of contaminants. Although biological growth can occur over a wide range of temperatures, most microorganisms are active primarily between 50°F and 95°F. Measured groundwater temperatures during the November 1997 round of sampling ranged from 37.0°F to 60.6°F with all but one of the measurements below 50°F. The temperature measured at MW-22 was elevated above normal values due to the soil heating project completed in 1997.

An optimum pH range for most microorganisms is between 6.0 and 8.0. Many microorganisms, however, can tolerate a pH range of 5.0 to 9.0. Most groundwater in uncontaminated aquifers has a pH in the 5.0 to 9.0 range. Active oxidation of sulfides may cause pH levels to be as low as 4.0. In carbonate-buffered groundwater, pH values may be as high as 9.0. Measured pH during the June 1998 round of groundwater sampling ranged from 6.18 to 9.05 with water from the shallow aquifer being slightly lower (6.18 to 7.8) than water from the deep aquifer (7.49 to 9.05).

**Chloride**

Inorganic chloride accumulates as a result of reductive dechlorination. In aquifers with a low background of inorganic chloride, the concentration of inorganic chloride should increase as the chlorinated solvents degrade. The sum of the inorganic chloride plus the contaminant being degraded should remain relatively consistent along the groundwater flow path.

The concentration of chloride in groundwater from the background well (MW-17) was 3.6 ppm in November 1997 and 3.1 ppm in June 1998. Chloride concentrations in samples from the shallow and shallow-intermediate aquifers ranged from 1.6 ppm to 29 ppm with the higher concentrations occurring in wells which also had high concentrations of VOCs. Chloride concentrations in samples from the deep aquifer ranged from 2.0 ppm to 14 ppm. The relatively high value of 14 ppm occurred in the sample from monitoring well MW-16, and appears anomalous.

**Ammonia**

Ammonia as nitrogen was found in four of the groundwater samples collected from the shallow aquifer (0.23 ppm to 0.71 ppm), the shallow-intermediate aquifer (0.39 ppm), the intermediate aquifer (0.35 ppm), and the deep aquifer (0.31 ppm to 0.4 ppm).

**Sulfide**

A reductive pathway is possible when the concentration for sulfide is greater than 1 ppm. Sulfide was not detected in any of the 1996, 1997 or 1998 groundwater samples. The analytical detection limit for the June 1998 samples was 0.1 ppm.

**Total Organic Carbon**

Total organic carbon (TOC) represents a source of carbon and energy that drive dechlorination and influences contaminant migration. Optimum values for TOC are greater than 20 ppm. Although TOC was present in all of the June 1998 samples, the concentration was never greater than 8.9 ppm. TOC concentrations in samples from the shallow aquifer ranged from 1.1 ppm to 8.9 ppm. The TOC concentration for the sample from the shallow-intermediate aquifer was 5.6 ppm. TOC concentrations in samples from the deep aquifer ranged from 0.83 ppm to 4.3 ppm.