Cindy S. Mueller
Project Manager
PO-3034
713/293-3568

Remediation Technology
Fax: 713/293-3305

Conoco Inc.
P. O. Box 4784
Houston, TX 77210-4784

February 23, 1994

Mr. Dave Scheer
Tanks and Spills Section
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

RE: Annual Project Status Report
Site: Conoco Store #23034, 1126 S. Robert Street, W. St. Paul
Site ID#: LEAK0000858

Dear Mr. Scheer:

Enclosed is an Annual Project Status Report for the above referenced site. A CAD was submitted for the site in July of 1990. Start-up of the groundwater system was delayed until January 28, 1994 due to access and City construction requirements. The soil ventilation system will become operational once the vents are no longer submerged.

Please call me if you have any questions.

Sincerely,

Cindy Mueller

Cindy Mueller
Project Manager

Enclosure

SITE NAME: Conoco-So. Robert
SITE ID NUMBER: LEAK 858

PETROLEUM TANK RELEASE REPORT CHECKLIST

In order to facilitate report review, the MPCA staff requests your assistance in completing this form which should be attached to all incoming reports. The form will be used to screen reports for completeness and to characterize the degree of contamination at the site.

SITE CHARACTERIZATION

	YES	NO
Emergency:		
Vapor or explosive hazard?		
- if yes, has this been addressed?		
Actual drinking water supply impacts?		
- if yes, has alternate supply been provided?		
Ground Water and Soil:		
Has ground water been impacted?		
Is there free product?		
- if yes, has recovery been initiated?		
Are there downgradient receptors at risk?		
Did you answer "yes" to any question, 7 through 14, on the Hydrogeologic Setting and Ground Water Characterization Worksheet?		
Is this a progress report?	X	
- if yes, is it quarterly or annual?	ANNUAL	

RECEIVED
FEB 25 1994
MPCA, HAZARDOUS WASTE DIVISION

REPORT CONTENTS

Check the appropriate report type and completed sections (as outlined in the "Petroleum Tank Release Reports" document).

[] Excavation Report Form
- [] All applicable sections completed
- [] Figures
- [] Lab reports with chain of custody forms

[] RI Report
- [] Introduction
- [] Background, incl Twp/Rng, Lat/Long
- [] Excavation Form
- [] RI Results
- [] Discussion
- [] Conclusions
- [] Recommendations
- [] Proposed CAD
- [] Appendices, incl IGWIS form
- [] Tables, figures
- [] Hydrogeologic Characterization Worksheet

[] CAD Report
- [] Proposed CAD
- [] Appropriate sections of appendices
- [] Figures

[X] Progress Reports
- [X] Introduction
- [X] Background
- [X] Corrective action
- [X] Ground water monitoring results
- [X] Discussion
- [X] Conclusions
- [X] Recommendations
- [X] Appendices
- [X] Tables, figures

If recommendations are included in the report, provide a brief description (e.g., no further action, modification of ground water recovery system, additional monitoring, etc.):
NA

If a CAD is proposed, provide a brief description (e.g., soil venting, pump and treat, bioremediation, etc.): NA

SITE MONITORING WORKSHEET
Fact Sheet #7
Minnesota Pollution Control Agency
LUST Cleanup Program
April 1993

The Minnesota Pollution Control Agency (MPCA) staff expect this worksheet to simplify the required post-investigation site monitoring reports. Submit this worksheet:

* quarterly, after the remedial investigation (RI) is complete but before corrective action is taken;

* quarterly, during corrective action design (CAD) installation; and

* quarterly, after CAD is operational, along with "CAD System Monitoring Worksheet," (fact sheet #11).

Completion and submittal according to the above schedule fulfills your quarterly site monitoring report requirements. You may include a short cover letter whenever circumstances require. However, you must still submit an annual progress report as described in "Petroleum Tank Release Reports" (fact sheet #3). [NOTE: MPCA staff may reduce the frequency of progress reporting on a site specific basis.]

Where attachments are requested (tables, maps, graphs, etc.), please check off those items attached. The only table not mandatory is that for dissolved oxygen.

MPCA Leak Number: **0000858**

I. Ground Water Monitoring

Please attach the following:

_X_ Cumulative table of ground water monitoring results, including all sample blanks.
_X_ Copies of most recent laboratory reports for ground water analyses, including a copy of the Chain of Custody.
_X_ Cumulative table of ground water elevation and product thickness results.
_X_ Hydrograph for all monitoring and recovery wells.
_X_ Graph(s) showing contaminant concentrations over time for **all** monitoring and recovery wells.
_X_ Ground water contour map based on the most recent ground water elevation data.
___ Table of dissolved oxygen sample results (if collected)

Please describe unusual circumstances that may have influenced the sampling results:

Please detail significant observations made at the site:

II. Vapor Impact Monitoring

If vapor impacts were detected during the remedial investigation, please attach:

a cumulative table of vapor monitoring results. The table should identify the location of all vapor monitoring points (i.e., sewer manholes, basements, etc.)
a map of vapor monitoring locations.

Sampling instrument used:
Sampling method:

NOTE: If vapor concentrations exceed 10 percent of the lower explosive limit, exit the building and contact the local fire department immediately. Then contact the MPCA spills unit at voice 612/297-8610, TDD 612/297-5353 or Greater Minnesota TDD 1-800-627-3529.

Vapor mitigation is required.

III. Recommendations

Use this space to detail any recommendations for modifying the current monitoring schedule:

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

4390 McMENEMY ROAD
SAINT PAUL, MINNESOTA 55127

ANNUAL PROJECT STATUS REPORT
February 16, 1994

CONOCO INCORPORATED
FORMER CONOCO STORE #23034
1126 South Robert St.
West St. Paul, Minnesota
LEAK #00000858
DAHL REPORT #0601-002

COPIES SUBMITTED TO:
Ms. Cindy Mueller, Conoco Inc.
Mr. Dave Scheer, Minnesota Pollution Control Agency (MPCA)

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1.0 INTRODUCTION

Dahl & Associates, Inc. (DAHL) was retained by Conoco Inc. to manage ongoing remediation efforts at former Conoco Store #23034 (LEAK0000858), located at 1126 South Robert St., West St. Paul, Minnesota (Figure 1and 2). This report brings to date all ground-water monitoring data for the period dating from October 23, 1989, through December 21, 1993 and ground-water quality data from May 3, 1990, through December 21, 1993.

In October, 1992, DAHL completed the installation of a corrective action design (CAD) system as specified in DAHL's "*Petroleum Hydrocarbon Release Investigation and Corrective Action Design Report*" submitted to the MPCA on July 23, 1990. Specifications of the system and data collected previous to October, 1989, can be found in that report. MPCA Fact Sheet #7, Site Monitoring Worksheet, has been submitted quarterly since April, 1993.

2.0 SITE ACTIVITIES

Upon completion of the installation, DAHL personnel conducted periodic site inspections. These inspections consisted of collecting water table elevations monthly and ground-water samples quarterly from all monitoring wells. Ground-water elevations have also been collected from the recovery well since its installation in October, 1992.

DAHL anticipated ground-water system start-up immediately following installation, however City of West St. Paul requirements substantially delayed the project due to the electrical design associated with the down well components of the ground-water depression pump. The City initially required that the electrical cable be rated for exposure to gasoline since there was potential for free product to accumulate in the recovery well. DAHL made numerous attempts with various vendors to locate a cable that would meet their requirements and made repeated attempts to reason with City officials regarding this subject. In late July, 1993, the City finally agreed that DAHL's original design incorporated the best available product for that particular environment. On October 7 - 22, 1993, a pump test was conducted to determine influent and effluent concentrations and pumping rate, necessary for Metropolitan Waste Control Commission (MWCC) discharge permits.

In conjunction with the ground-water depression system installation, the soil ventilation system was installed. A portion of the vent system was to be installed in an area that was not previously investigated due to access restrictions imposed by the current property owner. During drilling activities in this area, a product sheen was observed at the soil/water interface. To address this area of elevated impact, DAHL installed one ground-water vent in addition to the initially proposed soil vapor extraction points to evaluate the effectiveness of in-situ ground-water sparging. Per a telephone

conversation with MPCA Hydrologist Dave Scheer on June 8, 1993, a pilot test with the ground-water vent will be conducted to evaluate the effectiveness of that technology at this site.

At the time of system start-up in late July, 1993, it was determined that increased water table elevations had submerged the screens on the soil vapor vents. Currently, the soil ventilation system remains non-operational. The system will be started when water table elevation drops and/or approval is granted to operate the ground-water depression system and sufficient drawdown is achieved. At the time of start-up, the vent system stack will be sampled at 12 hours, 7 and 14 days after start-up. After the third sampling event, the system will be shut down until laboratory analysis of the vent stack is reviewed. Upon review of the laboratory results, if significant emission rates (SER's) are not exceeded, the system will be restarted. If SER's are exceeded, DAHL will propose appropriate actions for controlling the emission rate.

3.0 SAMPLING RESULTS

3.1 Ground-Water Monitoring Results

Ground-water elevation data collected from October, 1989, through December, 1993, is summarized in Table 1. A hydrograph of the water table data is also included. The static water table beneath the site slopes to the northeast at a gradient of approximately 2.01×10^{-2} (Figure 4).

Ground-water samples have been collected quarterly and analyzed for benzene, ethyl benzene, toluene, xylene (BETX), methyl-tertiary-butyl ether (MTBE), and gasoline range organics (GRO). Monitoring well (MW) 3 contains BETX concentrations above Minnesota Department of Health (MDH) recommended allowable limits (RAL's) and MW-2 contains benzene concentrations above RAL's. Ground-water quality sampling results are summarized in Table 2. A graph depicting ground-water quality is included. Laboratory reports and chain of custody records are included in Appendix A.

During the pump test, the influent and effluent were sampled two times and were laboratory analyzed for BETX, MTBE, and GRO. Included in Table 3 are the results from the two sampling events. Laboratory analysis from samples collected during the pump test indicated that effluent concentrations are below the discharge limits set by the

MWCC. On January 13, 1994, DAHL was granted approval by the MWCC to start the ground-water system. The ground-water system was started on January 28, 1994.

3.2 Soil Vent System Results

The soil vent system will be monitored monthly and effluent samples will be collected from the vent stack quarterly. The samples will be laboratory analyzed for BETX and total hydrocarbons as gasoline (THG). If necessary, alterations will be made to the monitoring and sampling schedules upon review of the data and laboratory results collected from system start-up. Soil vapor probes are positioned over the site monitor the effective vacuum. This measurement will be used to analyze the system's performance and its effective area of influence.

4.0 PRODUCT RECOVERY

4.1 Free Product Recovery

Free phase gasoline has been detected at this site in MW-3, the monitoring well closest to the recovery well (Figure 3). However, free product has not accumulated in this area since the March 13, 1991, site visit. In the event free product does accumulate, DAHL will make the necessary modifications to the system to remove the free phase product.

4.2 Ground-Water Treatment System

One change was made to the initially designed ground-water treatment system. DAHL replaced the tower-type air stripper with a low profile air stripper. The unit utilized is one of Carbonair's Sieve Tray Aerating Technology (STAT) Models. The STAT 80 allows water to enter at the top of the unit and flow across trays individually; air is forced upwards through the openings in the trays. Bubbles from the water form a foam surface which increases turbulence and enhances volatilization. If necessary, more trays may be added to the STAT 80 to increase the removal efficiency of volatile organic compounds.

The equivalent product volume of gasoline removed, in soluble form, via the separator and low profile air stripper can be estimated using the following formula:

Product Volume of Gasoline Removed = $C_{INFLUENT}$ x $G_{EFFLUENT}$ x COEF.

Where:

$C_{INFLUENT}$ = Average influent concentration of total hydrocarbons as gasoline during report period in µg/liter (ppb).

$G_{EFFLUENT}$ = Volume discharged from ground-water system during report period (gallons).

COEF. = Conversion coefficient

When units are specified as above, COEF. is calculated as follows:

$$\text{COEF.} = \frac{3.785(\text{liters/gallon})}{453.5924(\text{Lb/gm}) \times \text{Sp.Gr.GASOLINE}(0.660) \times 8.345(\text{Lb of } H_2O/\text{gallon}) \times 10^6(\mu\text{g/gm})}$$

4.3 Soil Ventilation System

The soil vent discharge will be sampled via EPA Method 18. The sample will be collected utilizing an SKC universal constant flow sample pump which will draw 10 liters of the soil vent effluent through an SKC adsorbent charcoal tube. The tube will then be analyzed for BETX and THG and will yield the number of micrograms of each parameter contained in the 10 liter sample. Emission rates from the soil vent system will be reviewed upon receipt of laboratory analysis. In the event emission rates exceed SER's, DAHL will evaluate methods to reduce or control the rate of emissions.

Determination of the quantity of petroleum hydrocarbons removed from impacted soils via the soil vent system can be expressed in general terms as:

$$GPD = C_{VENT} \times Q_{VENT} \times COEF.$$

Where:

GPD = Quantity of gasoline removed (gallons of gasoline per day)
C_{VENT} = Concentration of SVS exhaust ($mg_{GASOLINE}/l_{AIR}$)
Q_{VENT} = Exhaust rate of SVS (standard cubic feet per minute SCFM)
COEF. = Conversion coefficient

C_{VENT} is determined by laboratory analysis by EPA Method 18 sample.

When units are as specified above, COEF. is calculated as follows:

$$Coef. = 28.32(l_{AIR}/cu.ft._{AIR}) \times 1440(minutes/day) \times 1g/1000mg \times 1kg/1000g \times 0.37\ gal/kg$$

$$Coef. = 0.0151$$

Therefore removal rate is:

$$\mathbf{GPD = C_{VENT}\ (mg_{GASOLINE}/\ l_{AIR}) \times Q_{VENT}(SCFM) \times 0.0151}$$

5.0 CONCLUSIONS

In October, 1992, DAHL installed a ground-water recovery and soil ventilation system at the above referenced site. The addition of a low profile air stripper, one ground-water vent, and the removal of one soil vapor vent were among the changes from the CAD submitted on July 23, 1990. Requirements of City of West St. Paul officials about some of the system's electrical components were finally resolved in late July, 1993, and approval for system start-up was granted. Upon system start-up, it was determined that the soil vapor vents were submerged by ground water, thus the soil vent system remains non-operational. However, the water table has dropped to elevations which allow the system to be stared. DAHL anticipates the soil ventilation system to be started in February, 1994. A pump test on the ground-water system was conducted in October, 1993. Ground-water samples were collected and laboratory results were submitted to the MWCC for review.

Approval to start the ground-water system was granted by the MWCC, and the system was started on January 28, 1994. The ground-water and soil vent portions of the system will be monitored and sampled according to the previously mentioned schedules. Fact sheet #7 will continue to be submitted to the MPCA quarterly, and fact sheet #11 will be submitted once the system is in operation.

The recommendations and methodologies contained in this report represent DAHL's professional opinions and are based on accepted analytical practices and documented industry standards. Services performed on this project have been conducted in a manner consistent with standards of care practiced by members of this profession in this area, under similar time and budget restraints. Beyond this, no warranty is expressed or implied.

This report was prepared by:

Michael P. Watson
Project Manager
Dahl & Associates, Inc.

2-16-94
Date

Daniel W. Wiberg
Project Director
Dahl & Associates, Inc.

2/16/94
Date

TABLES

TABLE 1
WATER TABLE ELEVATION

Conoco Store #23034

Conoco-South Robert, W. St. Paul, Minnesota (VEMN0601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
MW-1	100.47	10/23/89	0.00	17.99	0.00	82.48
	100.47	12/15/89	0.00	18.89	0.00	81.58
	100.47	01/08/90	0.00	19.15	0.00	81.32
	100.47	02/05/90	0.00	19.61	0.00	80.86
	100.47	03/13/90	0.00	20.12	0.00	80.35
	100.47	03/29/90	0.00	19.81	0.00	80.66
	100.47	04/24/90	0.00	19.94	0.00	80.53
*Resurvey	100.45	05/03/90	0.00	20.07	0.00	80.38
	100.45	05/15/90	0.00	19.66	0.00	80.79
	100.45	06/06/90	0.00	19.40	0.00	81.05
	100.45	06/12/90	0.00	18.75	0.00	81.70
	100.45	06/15/90	0.00	18.66	0.00	81.79
	100.45	06/29/90	0.00	17.82	0.00	82.63
	100.45	07/06/90	0.00	17.52	0.00	82.93
	100.45	07/13/90	0.00	17.30	0.00	83.15
	100.45	07/20/90	0.00	17.04	0.00	83.41
	100.45	08/22/90	0.00	15.90	0.00	84.55
	100.45	09/10/90	0.00	15.90	0.00	84.55
	100.45	10/10/90	0.00	15.90	0.00	84.55
	100.45	11/06/90	0.00	16.64	0.00	83.81
	100.45	01/14/91	0.00	17.77	0.00	82.68
	100.45	02/05/91	0.00	18.29	0.00	82.16
	100.45	03/13/91	0.00	18.76	0.00	81.69
	100.45	04/04/91	0.00	18.51	0.00	81.94
	100.45	05/10/91	0.00	17.81	0.00	82.64
	100.45	06/16/91	0.00	16.32	0.00	84.13
	100.45	07/03/91	0.00	15.56	0.00	84.89
	100.45	08/06/91	0.00	15.22	0.00	85.23
	100.45	09/09/91	0.00	15.15	0.00	85.30
	100.45	09/10/91	0.00	15.30	0.00	85.15
	100.45	10/08/91	0.00	14.68	0.00	85.77
	100.45	11/19/91	0.00	15.32	0.00	85.13
	100.45	12/26/91	0.00	14.93	0.00	85.52
	100.45	01/13/92	0.00	14.79	0.00	85.66
	100.45	02/10/92	0.00	15.02	0.00	85.43
	100.45	03/13/92	0.00	14.56	0.00	85.89
	100.45	04/20/92	0.00	14.27	0.00	86.18
	100.45	05/11/92	0.00	13.94	0.00	86.51
	100.45	06/12/92	0.00	14.11	0.00	86.34
	100.45	09/10/92	0.00	13.72	0.00	86.73
*Resurvey	100.45	12/23/92	0.00	14.30	0.00	86.15
	100.45	03/09/93	0.00	15.87	0.00	84.58
	100.45	06/10/93	0.00	13.90	0.00	86.55
	100.45	07/19/93	0.00	11.99	0.00	88.46
	100.45	07/28/93	0.00	12.08	0.00	88.37
	100.45	09/17/93	0.00	12.55	0.00	87.90
12:00 hrs.	100.45	09/29/93	0.00	12.75	0.00	87.70
14:30 hrs.	100.45	09/29/93	0.00	12.72	0.00	87.73

	100.45	09/30/93	0.00	12.40	0.00	88.05
	100.45	10/07/93	0.00	12.79	0.00	87.66
	100.45	10/22/93	0.00	13.51	0.00	86.94
	100.45	12/21/93	0.00	14.59	0.00	85.86
MW-2	100.77	10/23/89	0.00	19.23	0.00	81.54
	100.77	12/15/89	0.00	20.14	0.00	80.63
	100.77	01/08/90	0.00	20.40	0.00	80.37
	100.77	02/05/90	0.00	20.93	0.00	79.84
	100.77	03/13/90	0.00	21.30	0.00	79.47
	100.77	03/29/90	0.00	20.87	0.00	79.90
	100.77	04/24/90	0.00	21.18	0.00	79.59
*Resurvey	100.74	05/03/90	0.00	21.48	0.00	79.26
	100.74	05/15/90	0.00	20.89	0.00	79.85
	100.74	06/06/90	0.00	20.62	0.00	80.12
	100.74	06/12/90	0.00	19.92	0.00	80.82
	100.74	06/15/90	0.00	19.85	0.00	80.89
	100.74	06/29/90	0.00	18.93	0.00	81.81
	100.74	07/06/90	0.00	18.63	0.00	82.11
	100.74	07/13/90	0.00	18.39	0.00	82.35
	100.74	07/20/90	0.00	18.15	0.00	82.59
	100.74	08/22/90	0.00	16.93	0.00	83.81
	100.74	09/10/90	0.00	17.00	0.00	83.74
	100.74	10/10/90	0.00	17.13	0.00	83.61
	100.74	11/06/90	0.00	17.81	0.00	82.93
	100.74	01/14/91	0.00	19.00	0.00	81.74
	100.74	02/05/91	0.00	19.50	0.00	81.24
	100.74	03/13/91	0.00	19.92	0.00	80.82
	100.74	04/04/91	0.00	19.51	0.00	81.23
	100.74	05/10/91	0.00	19.30	0.00	81.44
	100.74	06/16/91	0.00	17.38	0.00	83.36
	100.74	07/03/91	0.00	16.55	0.00	84.19
	100.74	08/06/91	0.00	16.29	0.00	84.45
	100.74	09/09/91	0.00	16.23	0.00	84.51
	100.74	09/10/91	0.00	16.36	0.00	84.38
	100.74	10/08/91	0.00	15.68	0.00	85.06
	100.74	11/19/91	0.00	16.30	0.00	84.44
	100.74	12/26/91	0.00	16.03	0.00	84.71
	100.74	01/13/92	0.00	15.94	0.00	84.80
	100.74	02/10/92	0.00	16.20	0.00	84.54
	100.74	03/13/92	0.00	15.65	0.00	85.09
	100.74	04/20/92	0.00	15.30	0.00	85.44
	100.74	05/11/92	0.00	14.85	0.00	85.89
	100.74	06/12/92	0.00	15.00	0.00	85.74
	100.74	09/10/92	0.00	14.70	0.00	86.04
*Resurvey	100.77	12/23/92	0.00	15.40	0.00	85.37
	100.77	03/09/93	0.00	16.96	0.00	83.81
	100.77	06/10/93	0.00	14.90	0.00	85.87
	100.77	07/19/93	0.00	12.85	0.00	87.92
	100.77	07/28/93	0.00	12.99	0.00	87.78
	100.77	09/17/93	0.00	13.49	0.00	87.28
12:00 hrs.	100.77	09/29/93	0.00	13.73	0.00	87.04
14:30 hrs.	100.77	09/29/93	0.00	13.70	0.00	87.07
	100.77	09/30/93	0.00	13.37	0.00	87.40
	100.77	10/07/93	0.00	13.78	0.00	86.99
	100.77	10/22/93	0.00	14.69	0.00	86.08
	100.77	12/21/93	0.00	15.67	0.00	85.10

MW-3	101.05	10/23/89	0.00	20.77	0.00	80.28
	101.05	12/15/89	21.54	22.35	0.81	78.70
	101.05	01/08/90	22.07	22.47	0.40	78.58
	101.05	02/05/90	22.53	22.91	0.38	78.14
	101.05	03/13/90	22.91	23.37	0.46	77.68
	101.05	03/29/90	22.82	23.14	0.32	77.91
	101.05	04/24/90	22.99	23.39	0.40	77.66
*Resurvey	101.05	05/03/90	22.99	23.30	0.31	77.75
	101.05	05/15/90	22.71	22.92	0.21	78.13
	101.05	06/06/90	21.33	22.60	1.27	78.45
	101.05	06/12/90 ^	22.22	23.00	0.78	78.05
	101.05	06/15/90 ^	21.20	21.74	0.54	79.31
	101.05	06/29/90 ^	19.39	20.08	0.69	80.97
	101.05	07/06/90	19.67	19.70	0.03	81.35
	101.05	07/13/90	0.00	19.41	0.00	81.64
	101.05	07/20/90	0.00	19.22	0.00	81.83
	101.05	08/22/90	0.00	18.04	0.00	83.01
	101.05	09/10/90	0.00	18.27	0.00	82.78
	101.05	10/10/90	0.00	18.49	0.00	82.56
	101.05	11/06/90	0.00	19.24	0.00	81.81
	101.05	01/14/91	20.50	20.58	0.08	80.47
	101.05	02/05/91	21.00	21.05	0.05	80.00
	101.05	03/13/91	21.66	21.68	0.02	79.37
	101.05	04/04/91	0.00	21.28	0.00	79.77
	101.05	05/10/91	0.00	20.42	0.00	80.63
	101.05	06/16/91	0.00	18.26	0.00	82.79
	101.05	07/03/91	0.00	17.62	0.00	83.43
	101.05	08/06/91	0.00	17.36	0.00	83.69
	101.05	09/09/91	0.00	17.51	0.00	83.54
	101.05	09/10/91	0.00	17.67	0.00	83.38
	101.05	10/08/91	0.00	16.96	0.00	84.09
	101.05	11/19/91	0.00	17.81	0.00	83.24
	101.05	12/26/91	0.00	17.38	0.00	83.67
	101.05	01/13/92	0.00	17.39	0.00	83.66
	101.05	02/10/92	0.00	17.65	0.00	83.40
	101.05	03/13/92	0.00	17.28	0.00	83.77
	101.05	04/20/92	0.00	16.57	0.00	84.48
	101.05	05/11/92	0.00	16.04	0.00	85.01
	101.05	06/12/92	0.00	16.42	0.00	84.63
	101.05	09/10/92	0.00	16.00	0.00	85.05
*Resurvey	101.04	12/23/92	0.00	16.61	0.00	84.43
	101.04	03/09/93	0.00	18.38	0.00	82.66
	101.04	06/10/93	0.00	16.02	0.00	85.02
	101.04	07/19/93	0.00	13.79	0.00	87.25
	101.04	07/28/93	0.00	14.12	0.00	86.92
	101.04	09/17/93	0.00	14.71	0.00	86.33
12:00 hrs.	101.04	09/29/93	0.00	14.97	0.00	86.07
14:30 hrs.	101.04	09/29/93	0.00	15.52	0.00	85.52
	101.04	09/30/93	0.00	15.48	0.00	85.56
	101.04	10/07/93	0.00	15.08	0.00	85.96
	101.04	10/22/93	0.00	16.86	0.00	84.18
	101.04	12/21/93	0.00	17.17	0.00	83.87
MW-4	100.68	05/03/90	0.00	23.93	0.00	76.75
	100.68	07/13/90	0.00	19.82	0.00	80.86
	100.68	07/20/90	0.00	19.65	0.00	81.03

	100.68	08/22/90	0.00	18.60	0.00	82.08
	100.68	09/10/90	0.00	18.94	0.00	81.74
	100.68	10/10/90	0.00	19.22	0.00	81.46
	100.68	11/06/90	0.00	19.99	0.00	80.69
	100.68	01/14/91	0.00	21.30	0.00	79.38
	100.68	02/05/91	0.00	21.83	0.00	78.85
	100.68	03/13/91	0.00	22.35	0.00	78.33
	100.68	04/04/91	0.00	22.21	0.00	78.47
	100.68	05/10/91	0.00	21.14	0.00	79.54
	100.68	06/16/91	0.00	18.53	0.00	82.15
	100.68	07/03/91	0.00	18.14	0.00	82.54
	100.68	08/06/91	0.00	18.10	0.00	82.58
	100.68	09/09/91	0.00	18.35	0.00	82.33
	100.68	09/10/91	0.00	18.40	0.00	82.28
	100.68	10/08/91	0.00	17.76	0.00	82.92
	100.68	11/19/91	0.00	17.70	0.00	82.98
	100.68	12/26/91	0.00	18.10	0.00	82.58
	100.68	01/13/92	0.00	18.18	0.00	82.50
	100.68	02/10/92	0.00	18.50	0.00	82.18
	100.68	03/13/92	0.00	17.88	0.00	82.80
	100.68	04/20/92	0.00	17.22	0.00	83.46
	100.68	05/11/92	0.00	16.63	0.00	84.05
	100.68	06/12/92	0.00	17.19	0.00	83.49
	100.68	09/10/92	0.00	16.84	0.00	83.84
*Resurvey	100.66	12/23/92	0.00	17.42	0.00	83.24
	100.66	03/09/93	0.00	19.19	0.00	81.47
	100.66	06/10/93	0.00	16.20	0.00	84.46
	100.66	07/19/93	0.00	14.42	0.00	86.24
	100.66	07/28/93	0.00	14.90	0.00	85.76
	100.66	09/17/93	0.00	15.57	0.00	85.09
12:00 hrs.	100.66	09/29/93	0.00	15.81	0.00	84.85
14:30 hrs.	100.66	09/29/93	0.00	15.78	0.00	84.88
	100.66	09/30/93	0.00	15.49	0.00	85.17
	100.66	10/07/93	0.00	15.96	0.00	84.70
	100.66	10/22/93	0.00	16.96	0.00	83.70
	100.66	12/21/93	0.00	18.07	0.00	82.59
MW-5	102.13	12/23/92	0.00	17.03	0.00	85.10
	102.13	03/09/93	0.00	18.73	0.00	83.40
	102.13	06/10/93	0.00	16.53	0.00	85.60
	102.13	07/19/93	0.00	14.40	0.00	87.73
	102.13	07/28/93	0.00	14.62	0.00	87.51
	102.13	09/17/93	0.00	15.15	0.00	86.98
12:00 hrs.	102.13	09/29/93	0.00	15.41	0.00	86.72
14:30 hrs.	102.13	09/29/93	0.00	15.43	0.00	86.70
	102.13	09/30/93	0.00	15.28	0.00	86.85
	102.13	10/07/93	0.00	15.10	0.00	87.03
	102.13	10/22/93	0.00	16.67	0.00	85.46
	102.13	12/21/93	0.00	17.54	0.00	84.59
RW-1	100.61	12/23/92	0.00	16.00	0.00	84.61
	100.61	03/09/93	0.00	17.92	0.00	82.69
	100.61	06/10/93	0.00	15.54	0.00	85.07
	100.61	07/19/93	0.00	13.82	0.00	86.79
	100.61	07/28/93	0.00	14.13	0.00	86.48
	100.61	09/17/93	0.00	14.74	0.00	85.87
	100.61	09/20/93	0.00	16.13	0.00	84.48

	100.61	09/27/93	0.00	14.12	0.00	86.49
12:00 hrs.	100.61	09/29/93	0.00	14.94	0.00	85.67
14:30 hrs.	100.61	09/29/93	0.00	25.40	0.00	75.21
	100.61	09/30/93	0.00	25.64	0.00	74.97
	100.61	10/07/93	0.00	15.10	0.00	85.51
	100.61	10/22/93	0.00	25.72	0.00	74.89
	100.61	12/08/93	0.00	16.65	0.00	83.96
	100.61	12/21/93	0.00	16.92	0.00	83.69

Explanation:

All measurments are in feet (ft).
D.T.P - *Depth-to-Product*
D.T.W - *Depth-to-Water*
P.T. - *Product Thickness*
W.T.E - *Water-Table-Elevation*
^ - Data corrected for possible base measurement error.

TABLE 2
GROUNDWATER ANALYSIS SUMMARY
Conoco Store #23034
Conoco-South Robert, W. St. Paul, Minnesota (VEMN0601)

WELL #	DATE	B	E	T	X	THG/GRO	MTBE
MW-1	05/03/90	ND	ND	ND	ND	ND	ND
	09/10/90	ND	ND	ND	ND	ND	ND
	03/13/91	ND	ND	ND	ND	ND	ND
	09/09/91	ND	ND	ND	ND	ND	ND
	12/26/91	ND	ND	ND	ND	ND	ND
	03/13/92	ND	ND	ND	ND	ND	ND
	06/12/92	ND	ND	ND	ND	ND	ND
	09/10/92	ND	ND	ND	ND	ND	ND
	12/23/92 *	ND	ND	ND	ND	ND	ND
	03/09/93	ND	ND	ND	ND	ND	ND
	06/10/93	ND	ND	ND	ND	ND	ND
	09/17/93	ND	ND	ND	ND	ND	ND
	12/21/93	ND	ND	ND	ND	ND	ND
MW-2	05/03/90	6600	4	12	6900	27000	1600
	09/10/90	7300	950	17000	9600	48000	1600
	03/13/91	8200	1200	13000	10000	68000	3000
	09/09/91	8500	1300	9300	10000	48000	3000
	12/26/91	3800	1200	1100	4400	23000	ND
	03/13/92	2100	800	1200	2300	11000	ND
	06/12/92	2500	1100	1000	2600	17000	220
	09/10/92	4200	1300	1400	3100	19000	ND
	12/23/92 *	5800	1500	2800	4000	27000	ND
	03/09/93	5300	1300	3800	4500	21000	ND
	06/10/93	240	ND	120	230	1200	ND
	09/17/93	210	250	ND	370	3100	ND
	12/21/93	4100	1500	360	1900	15000	ND
MW-3	05/03/90						
	09/10/90	9700	2000	23000	16000	82000	1500
	03/13/91	9200	3900	23000	26000	110000	2600
	09/09/91	11000	3000	22000	20000	79000	4900
	12/26/91	7700	2300	10000	14000	77000	1600
	03/13/92	10000	2800	17000	15000	64000	ND
	06/12/92	8100	2500	16000	14000	72000	290
	09/10/92	9800	ND	22000	17000	75000	ND
	12/23/92 *	8100	2700	16000	15000	82000	ND
	03/09/93	6500	3000	20000	17000	74000	ND
	06/10/93	6400	2700	11000	13000	52000	ND
	09/17/93	4300	2200	14000	11000	40000	ND
	12/21/93	5900	3100	20000	16000	64000	ND
MW-4	05/03/90	ND	ND	ND	2	41	ND
	09/10/90	ND	ND	ND	ND	19	ND
	03/13/91	ND	ND	ND	1	40	ND
	09/09/91	ND	ND	ND	ND	ND	16
	12/26/91	ND	ND	ND	ND	ND	ND
	03/13/92	ND	ND	ND	ND	ND	ND

	06/12/92	ND	ND	ND	ND	ND	ND
	09/10/92	ND	ND	ND	ND	ND	ND
	12/23/92 *	ND	ND	ND	ND	ND	ND
	03/09/93	ND	ND	ND	ND	ND	ND
	06/10/93	ND	ND	ND	ND	ND	ND
	09/17/93	ND	ND	ND	ND	ND	ND
	12/21/93	ND	ND	ND	ND	ND	ND
MW-5	12/23/92 *	ND	ND	ND	ND	ND	ND
	03/09/93	ND	ND	ND	ND	ND	ND
	06/10/93	ND	ND	ND	ND	ND	ND
	09/17/93	ND	ND	ND	ND	ND	ND
	12/21/93	ND	ND	ND	ND	ND	ND

Explanation: *B=benzene*
E=ethyl benzene
T=toluene
X=total xylenes
THG=total hydrocarbons as gasoline
MTBE=methyl-tert-butyl-ether
Pb=lead
THFO=total hydrocarbons as #2 fuel oil
GRO=gasoline range organics
**=denotes GRO replaces THG per MPCA guidlines as of October 1, 1992*

TABLE 3
GROUNDWATER INFLUENT/EFFLUENT ANALYSIS

Conoco Store #23034

Conoco-South Robert, W. St. Paul, Minnesota (VEMN0601)

	DATE	B	E	T	X	THG/GRC	MTBE
Influent	10/15/93	730	530	3700	3900	14000	ND
	10/22/93	1100	440	4200	4600	16000	ND
Effluent	10/15/93	ND	ND	21	30	210	ND
	10/22/93	8	ND	32	47	310	ND

Explanation:

All values are expressed in ug/L which is equivilant to parts-per-billion (ppb)
B = benzene
E = ethyl benzene
T = toluene
X = xylenes
THG = total hydrocarbons as gasoline
GRO = gasoline range organics
MTBE = methyl-tert-butyl ether

TABLE 4

SOIL VAPOR VENT/GROUND WATER VENT CONSTRUCTION SUMMARY

Conoco Store #23034

Conoco-South Robert, W. St. Paul, Minnesota (VEMN0601)

SOIL VAPOR VENT DESIGN

Soil vapor vent (SVV)	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6
Grade elevation	97.82	97.75	97.72	99.14	98.76	97.96
Screen diameter (inches)	2	2	2	2	2	2
Slot size	0.01	0.01	0.01	0.01	0.01	0.01
Length of screen (feet)	10	10	10	10	10	10
Top of bentonite seal	6	6	6	6	6	6
Top of screen pack	7	7	7	8	8	7
Top of screen	9	9	9	10	10	9
Bottom of screen	19	19	19	20	20	19
Bottom of boring	20	20	20	21	21	20

Soil vapor vent (SVV)	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11
Grade elevation	99.93	98.94	99.53	99.47	98.98
Screen diameter (inches)	2	2	2	2	2
Slot size	0.01	0.01	0.01	0.01	0.01
Length of screen (feet)	10	10	10	10	10
Top of bentonite seal	8	7	6	8	7
Top of screen pack	10	9	8	10	9
Top of screen	12	11	10	12	11
Bottom of screen	22	21	20	22	21
Bottom of boring	23	22	21	23	22

Ground water vent (GWV)	GWV-1
Grade elevation	98.25
Screen diameter (inches)	2
Slot size	0.01
Length of screen (feet)	3
Top of bentonite seal	15
Top of screen pack	20
Top of screen	27
Bottom of screen	30
Bottom of boring	31

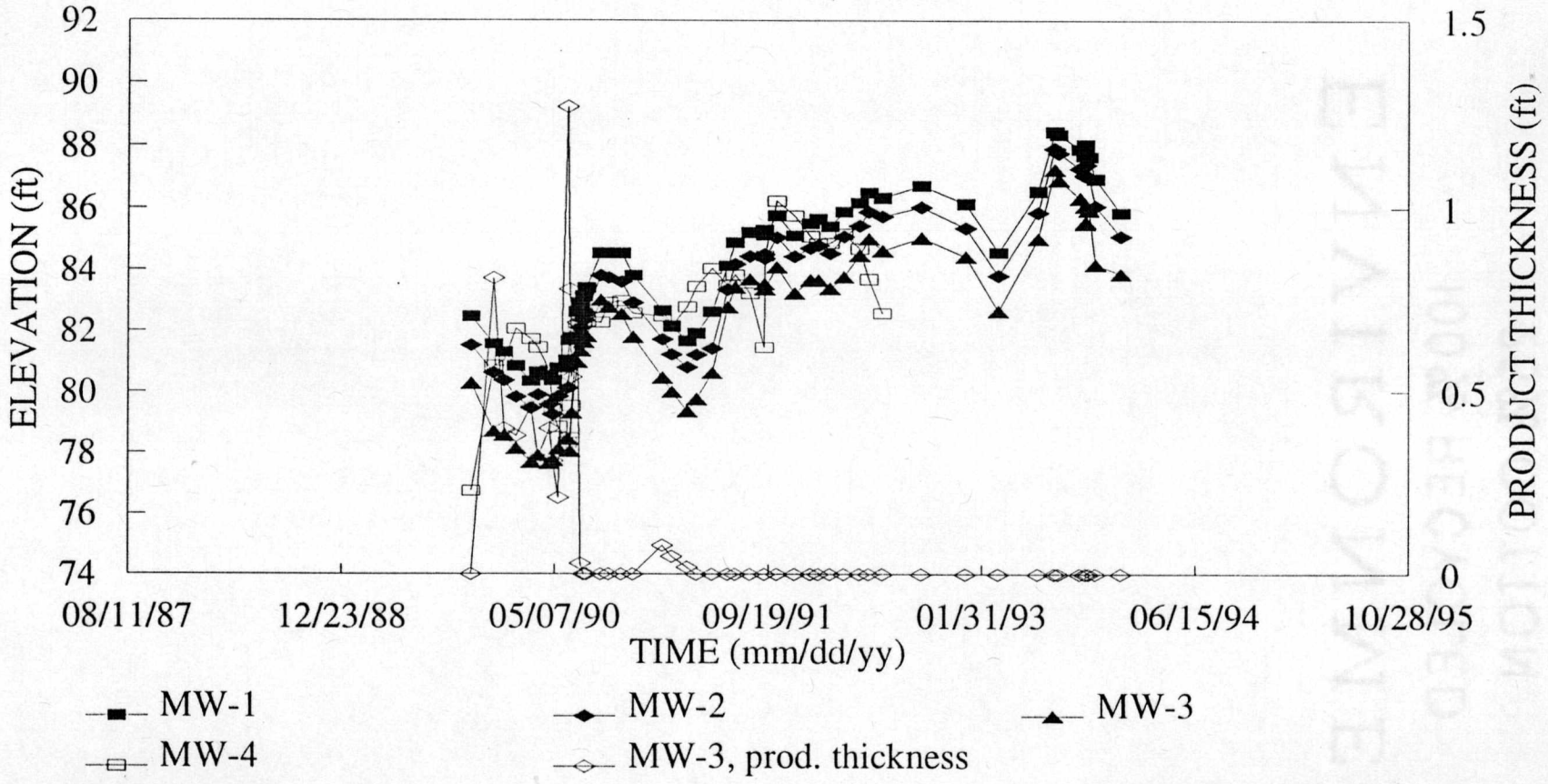
Notes:

Elevations expressed as feet site datum.
Benchmark: Top nut of fire hydrant located on northwest corner of South Robert St. and Butler Ave.
Elevation: 100.00 feet site datum.
Source: Assumed elevation.
Values denote depth below grade in feet.

GRAPHS

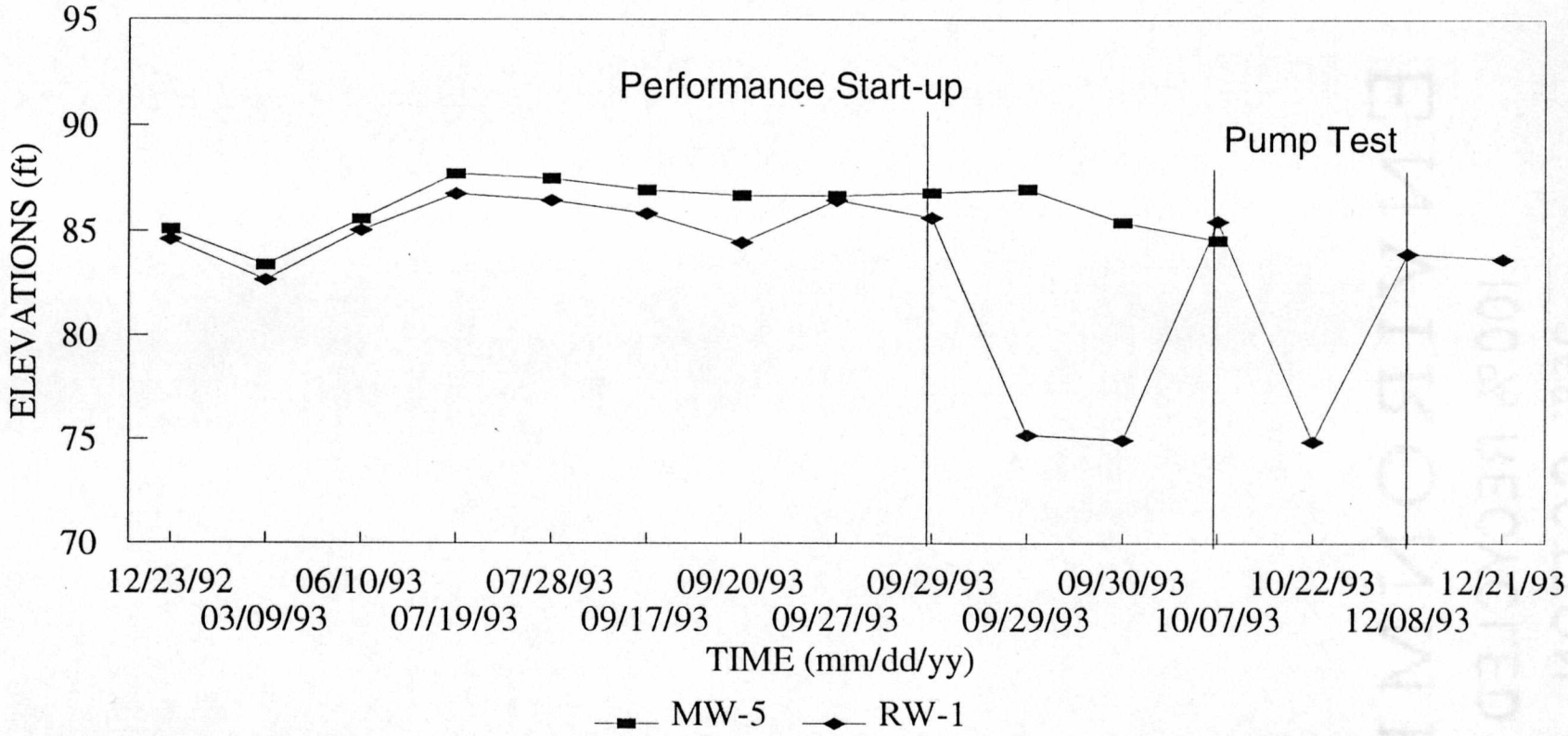
GROUND-WATER ELEVATIONS/PRODUCT THICKNESS

Conoco South Robert, VEMN0601



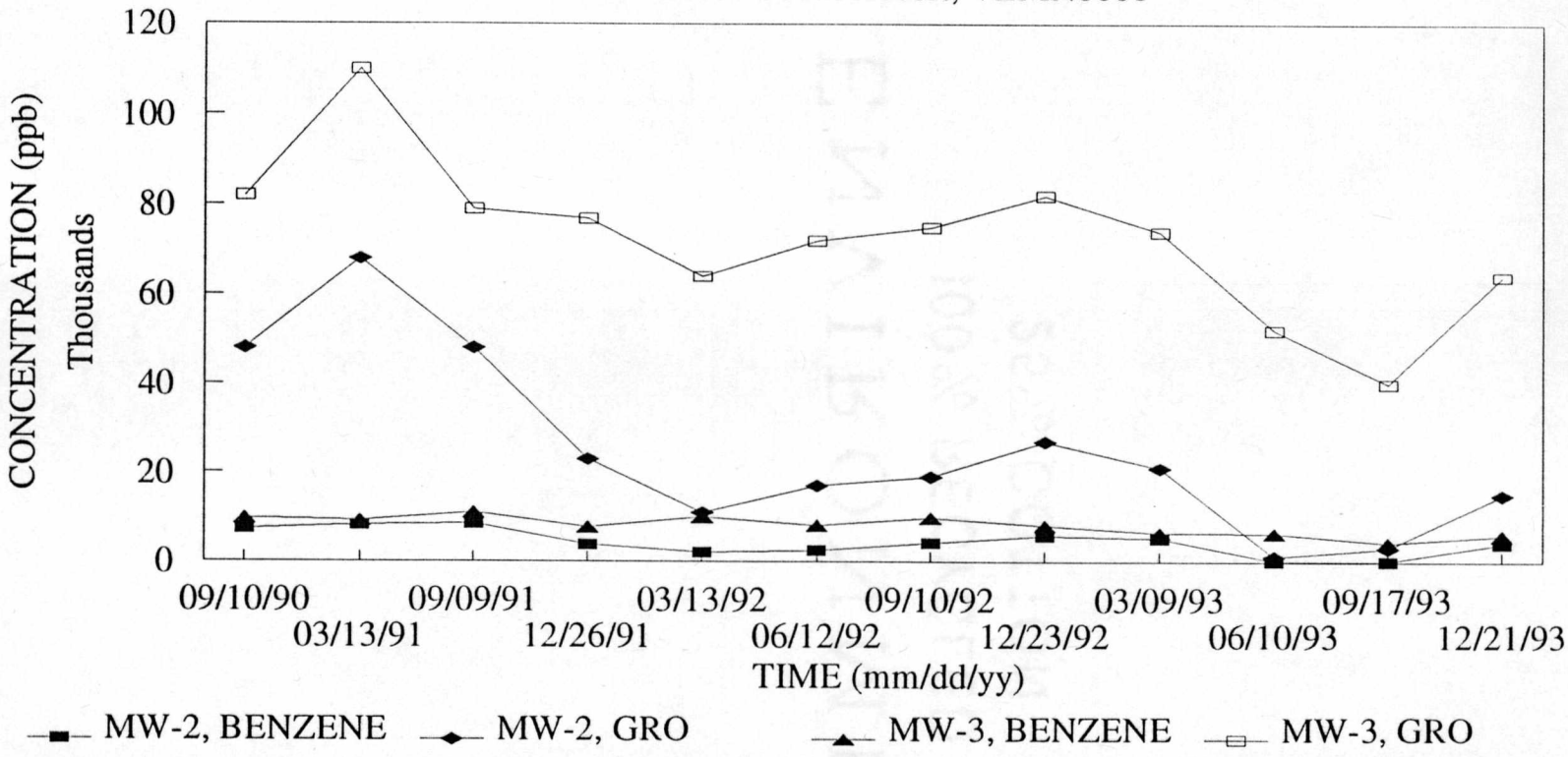
GROUND-WATER ELEVATIONS, MW-5 & RW-1

Conoco South Robert, VEMN0601



CONCENTRATIONS vs. TIME, MW-2 & MW-3

Conoco South Robert, VEMN0601



FIGURES

PROJECT SITE LOCATION

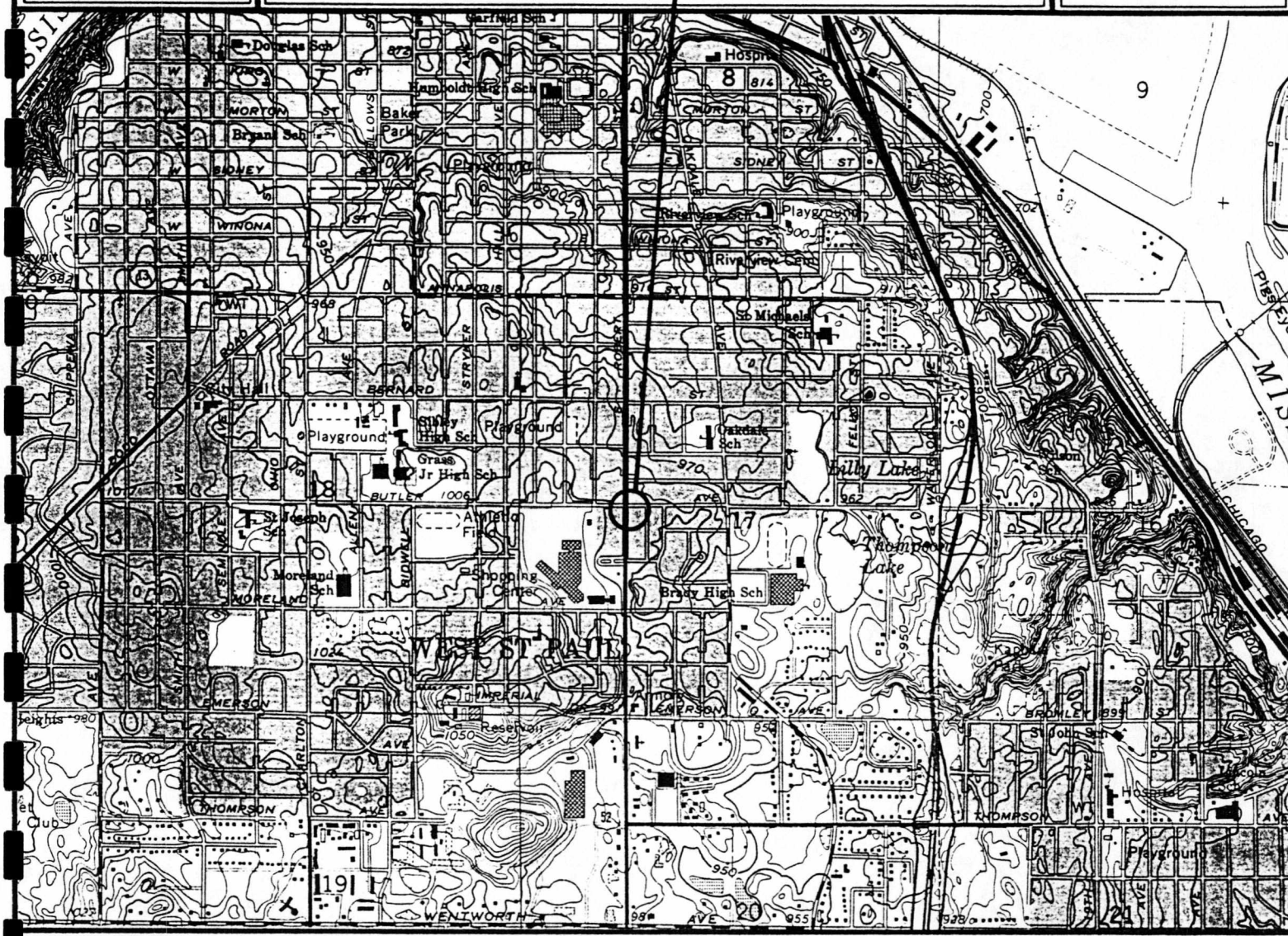
NORTH

W E

S

MINN.

QUADRANGLE LOCATION



SCALE 1:24 000

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

ROAD CLASSIFICATION

Heavy-duty ——— Light-duty - - - -

Medium-duty ——— Unimproved dirt - - - - -

Interstate Route U. S. Route State Route

BASED ON U.S.G.S 7.5 MINUTE SERIES (TOPOGRAPHIC) MAP

4390 McMenemy Road
Saint Paul, MN. 55127
Telephone (612) 490-2905

DAHL & ASSOCIATES, INC.

Environmental Operations

Consultants, Contractors & Engineers.

LOCATION MAP

CONOCO INC.

ST. PAUL, MINNESOTA

U.S.G.S. STANDARD: ST. PAUL WEST, MINN.

Date Drawn	12-27-89	Drawn By	RON D.	Approved By	DW
Project Number	MN-601	Drawing Number	A-01-A	Figure Number	

DAIRY QUEEN

BUTLER AVENUE

SOUTH ROBERT STREET

TRAFFIC LIGHT PANEL

FORMER DISPENSER ISLAND

BENCH

SIGN

FORMER USTs

FORMER DISPENSER ISLAND

BUILDING

NANCY RADDATZ DANCE

STOFFEL'S CHIRO

NORTH

W E

S

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility company.

SCALE:

0 10' 20'

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers
4330 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL STD NO: VEMN0601-B-00-B

SITE PLAN

1126 ROBERT STREET SOUTH
WEST ST. PAUL , MINNESOTA

PLOT SCALE 1" = 20'

AutoCAD FILE NAME 0601-03A

PLOT DATE 2/16/94

DATE DRAWN	10/26/93
DRAWN BY	Jim N.
APPROVED BY	
DRAWING NUMBER	B-03A-A
PROJECT NUMBER	VEMN0601
FIGURE NUMBER	2

DAIRY QUEEN

BUTLER AVENUE

SOUTH ROBERT STREET

TRAFFIC LIGHT PANEL

FORMER DISPENSER ISLAND

RW-1

BENCH

SIGN

FORMER USTs

FORMER DISPENSER ISLAND

BUILDING

NANCY RADDATZ DANCE

STOFFEL'S CHIRO

NORTH

W E

S

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility company.

RW- RECOVERY WELL

SCALE:
0 1"
0 10' 20'

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers
4390 McMenemy Road
Saint Paul, MN 55127
Phone (612)490-2305
FAX (612)490-3777

DAHL STD NO: VEMN0601-B-00-B

MONITORING WELL\RECOVERY WELL LOCATIONS

1126 ROBERT STREET SOUTH
WEST ST. PAUL, MINNESOTA

PLOT SCALE 1" = 20'

AutoCAD FILE NAME 0601-06A

PLOT DATE 2/16/94

DATE DRAWN	10/26/93
DRAWN BY	Jim N.
APPROVED BY	
DRAWING NUMBER	B-06A-A
PROJECT NUMBER	VEMN0601
FIGURE NUMBER	3

DAIRY QUEEN

BUTLER AVENUE

SOUTH ROBERT STREET

NORTH

W E

S

83.70

84.2

85.4

85.0

84.6

85.8

TRAFFIC LIGHT PANEL

FORMER DISPENSER ISLAND

MW-1 84.18

84.2

BENCH

SIGN

86.08

FORMER USTs

85.46

84.6

FORMER DISPENSER ISLAND

BUILDING

86.6

86.2

85.8

85.4

85.0

NANCY RADDATZ DANCE

STOFFEL'S CHIRO

85.94

MW-1

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility company.

GROUND-WATER GRADIENT DATA:
• BASED ON DATA COLLECTED ON 10/22/93

SCALE:
0 10' 20'

DAHL
& ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers
4390 McMenemy Road
Saint Paul, MN 55127
Phone (612)490-2405
FAX (612)490-3777

DAHL STD NO: VEMN0601-B-00-B

GROUND-WATER GRADIENT

1126 ROBERT STREET SOUTH
WEST ST. PAUL, MINNESOTA

PLOT SCALE 1" = 20'

AutoCAD FILE NAME 0601-15C

PLOT DATE 10/26/93

DATE DRAWN	10/26/93
DRAWN BY	Jim N.
APPROVED BY	
DRAWING NUMBER	B-15-C
PROJECT NUMBER	VEMN0601
FIGURE NUMBER	

DAIRY QUEEN

BUTLER AVENUE

SOUTH ROBERT STREET

NORTH

W E S

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility company.

RW– RECOVERY WELL
SW– SOIL VAPOR VENT
SVP– SOIL VAPOR PROBE
GWV– GROUND–WATER VENT

UTILITY POLE
E ELECTRIC
T TELEPHONE LINE
ST STORM SEWER
SS SANITARY SEWER
W WATER
G GAS

SCALE:
0 10' 20'

TRAFFIC LIGHT PANEL
FORMER DISPENSER ISLAND
BENCH
SIGN
FORMER DISPENSER ISLAND
FORMER USTs
BUILDING
SYSTEM BUILDING
NANCY RADDATZ DANCE
STOFFEL'S CHIRO

RW-1
SW-1
SW-2
SW-3
SW-4
SW-5
SW-6
SW-7
SW-8
SW-9
SW-10
SW-11
SVP-1
SVP-2
SVP-3
SVP-4
GWV-1
MW-1
MW-2
MW-3

35'-0"
12'
8'
5'

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers
4330 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL STD NO: VEMN0601-B-00-B

RECOVERY SYSTEM LAYOUT

S. ROBERT STREET
WEST ST. PAUL, MINNESOTA

PLOT SCALE	1" = 20'
AutoCAD FILE NAME	0601-16D
PLOT DATE	2/16/94
DATE DRAWN	02/15/93
DRAWN BY	Jim N.
APPROVED BY	
DRAWING NUMBER	B- 16 -D
PROJECT NUMBER	VEMN0601
FIGURE NUMBER	

APPENDICES

Appendix A - Laboratory Reports
Appendix B - Soil Vapor Vent/Probe/Ground-Water Vent As-builts

APPENDIX A

Laboratory Reports

Huntingdon

Twin City Testing Corporation
662 Cromwell Avenue
St. Paul, Minnesota 55114-1776
(612) 645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493 0601

DATE: December 30, 1993

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco-Robert

LABORATORY NO: 4410 94-2120
HPN: 2120

INTRODUCTION

This report presents the results of the analyses of five samples received on December 22, 1993, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on December 21, 1993. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

TWIN CITY TESTING CORPORATION

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	MW-1	MW-4	MW-5	
TCT ID:		12108	12111	12112	
Parameter:					**PQL**
Benzene	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Ethyl benzene	ND	ND	ND	ND	5
Total xylenes	ND	ND	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	ND	ND	5
Surrogate Recovery:					
α,α,α-Trifluorotoluene	96%	95%	105%	105%	
Gasoline Range Organics	ND	ND	ND	ND	30
Surrogate Recovery:					
α,α,α-Trifluorotoluene	97%	97%	103%	104%	
Date Collected:		12/21/93	12/21/93	12/21/93	
Date Analyzed:	12/30/93	12/31/93	12/31/93	12/31/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-2**	
TCT ID:	12109	
Parameter:		**PQL**
Benzene	4,100	250
Toluene	360	250
Ethyl benzene	1,500	250
Total xylenes	1,900	250
Methyl-tert-Butyl Ether	ND	250
Surrogate Recovery:		
α,α,α-Trifluorotoluene	103%	
Gasoline Range Organics	15,000	1,500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	101%	
Date Collected:	12/21/93	
Date Analyzed:	12/31/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-3**	
TCT ID:	12110	
Parameter:		**PQL**
Benzene	5,900	500
Toluene	20,000	500
Ethyl benzene	3,100	500
Total xylenes	16,000	500
Methyl-tert-Butyl Ether	ND	500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	102%	
Gasoline Range Organics	64,000	3,000
Surrogate Recovery:		
α,α,α-Trifluorotoluene	100%	
Date Collected:	12/21/93	
Date Analyzed:	12/31/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

in city ___ting [redacted] corporation [redacted] [redacted] HA[redacted]OF- TO[redacted]REC[redacted]RD [redacted] [redacted] [redacted] TCT NO. 4600[redacted]

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CLIENT NAME: DAHL & Associates
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4390 McMenemy Rd
CLIENT ADDRESS (CITY, STATE, ZIP): St Paul MN 55127
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE / PHONE: 490-2905
SAMPLED BY PRINT NAME/SIGNATURE: SHANNON SKELTON / [signature]

TCT CONTACT: D. Walker
PROJECT NAME: DAHL
CLIENT P.O. # / PROJECT NO.: 24930601
BILL TO (CO. NAME, ADDRESS): DAHL
REPORT TO: Mike WATSON

MW

TCT USE ONLY	
PROJ. MGR.	Dencen
PRIORITY	
INVOICE #	
JOB NAME	HPN 3120
CUSTODY SEAL INTACT/NUMBER Y/N	
TEMPERATURE OF CONTAINER	T=9°C
SAMPLE CONDITION	ok

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

	BETX	MTBE	GRO					
FILTERED (YES/NO)	N	N	N					
PRESERVED (CODE)	E	E	E					
REFRIGERATED (Y/N)	Y	Y	Y					

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ______

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BETX	MTBE	GRO						NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	MW-1	H2O	12-21-93	P.M	X	X	X						3 ✓	40ml Pst	12108
2	MW-2	|	|	|	X	X	X						3 ✓	|	12109
3	MW-3	|	|	|	X	X	X						3 ✓	|	12110
4	MW-4	|	|	|	X	X	X						3 ✓	|	12111
5	MW-5	|	|	|	X	X	X						3	|	12112
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[signature]	12-21		[signature]	12-2?	1600
			[signature]	1222	1600

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* SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon
Consulting Engineers Environmental Services

Twin City Testing Corporation
662 Cromwell Avenue
St. Paul, Minnesota 55114-1776
(612) 645-7801

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493 0601

DATE: November 9, 1993

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco Inc.

LABORATORY NO: 4410 94-1323
IIPN: 1323

INTRODUCTION

This report presents the results of the analyses of two samples received on October 25, 1993, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on October 22, 1993. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

TWIN CITY TESTING CORPORATION

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID: **Method Blank**

TCT ID: _____

Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	104%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	102%	
Date Analyzed:	10/29/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**Influent**	
TCT ID:	8291	
Parameter:		**PQL**
Benzene	1,100	120
Toluene	4,200	120
Ethyl benzene	440	120
Total xylenes	4,600	120
Methyl-tert-Butyl Ether	ND	120
Surrogate Recovery:		
α,α,α-Trifluorotoluene	103%	
Gasoline Range Organics	16,000	750
Surrogate Recovery:		
α,α,α-Trifluorotoluene	102%	
Date Collected:	10/22/93	
Date Analyzed:	10/29/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**Method Blank**	**Effluent**	
TCT ID:		8292	
Parameter:			**PQL**
Benzene	ND	8	5
Toluene	ND	32	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	47	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	93%	91%	
Total Hydrocarbons as Gasoline	ND	310	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	92%	89%	
Date Collected:		10/22/93	
Date Analyzed:	11/1/93	11/1-2/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 8292

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	13	4	10/29/93	160.2
Chemical Oxygen Demand	22	20	11/1/93	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

[redacted] HA [redacted] OF- TO [redacted] RE[redacted] D [redacted] [redacted] TCT NO. [redacted]

CLIENT NAME	DAHL + ASSOCIATES
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)	4390 MCMENEMY RD
CLIENT ADDRESS (CITY, STATE, ZIP)	ST. PAUL MN 55127
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE / PHONE	612-490-2805
SAMPLED BY PRINT NAME/SIGNATURE	MARK SMITH / Mark Smith

TCT CONTACT	D WALKER
PROJECT NAME	2493 0601
CLIENT P.O. # / PROJECT NO.	DAHL
BILL TO (CO. NAME, ADDRESS)	MIKE WATSON
REPORT TO	

TCT USE ONLY

PROJ. MGR.	Deneen
PRIORITY	
INVOICE #	
JOB NAME	HPN# 1323
CUSTODY SEAL INTACT/NUMBER Y/N	
TEMPERATURE OF CONTAINER	T=18°C
SAMPLE CONDITION	ok

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

POSSIBLE HAZARD: YES ____ UNKNOWN X (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB X
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

	BETX	MTBE	GRO	TPH AS GAS	TSS	COD		
FILTERED (YES/NO)	N	N	N	N	N	N		
PRESERVED (CODE)	E	E	E	E	A	C		
REFRIGERATED (Y/N)	Y	Y	Y	Y	Y	Y		

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BETX	MTBE	GRO	TPH AS GAS	TSS	COD			NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	INFLUENT	H_2O	10-22-93	11:30	X	X	X						3	40ml P+T	8291
2	EFFLUENT	H_2O	10-22-93	11:30	X	X		X	X	X			5	40ml P+T 1-1L CUBE 1-250 ml PLASTIC	8292
3															
4															
5															
6															
7															
8															
9															
10															

Additional Comments

** Abby Notice TPH as GAS **

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith			[signature]	10/25	5:00

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* SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon

Twin City Testing Corporation
662 Cromwell Avenue
St. Paul, Minnesota 55114-1776
(612) 645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493 0601

DATE: October 29, 1993

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco-Robert

LABORATORY NO: 4410 93-2787
HPN: 1240

INTRODUCTION

This report presents the results of the analyses of two samples received on October 18, 1993, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on October 15, 1993. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

TWIN CITY TESTING CORPORATION

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID: **Method Blank**

TCT ID:

Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	76%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	77%	
Date Analyzed:	10/25/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**Influent**	
TCT ID:	7871	
Parameter:		**PQL**
Benzene	730	250
Toluene	3,700	250
Ethyl benzene	530	250
Total xylenes	3,900	250
Methyl-tert-Butyl Ether	ND	250
Surrogate Recovery:		
α,α,α-Trifluorotoluene	76%	
Gasoline Range Organics	14,000	1,500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	77%	
Date Collected:	10/15/93	
Date Analyzed:	10/25/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Effluent	
TCT ID:		7872	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	21	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	30	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	76%	75%	
Total Hydrocarbons as Gasoline	ND	210	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	73%	73%	
Date Collected:		10/15/93	
Date Analyzed:	10/25/93	10/25/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 7872

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	18	4	10/21/93	160.2
Chemical Oxygen Demand	27	20	10/20/93	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN OF CUSTODY RECORD

TCT NO. 40151

CLIENT NAME	DAAL & ASSOCIATES
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)	4390 McMENEMY RD
CLIENT ADDRESS (CITY, STATE, ZIP)	ST PAUL MN 55127
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE / PHONE	612-490-2905
SAMPLED BY PRINT NAME/SIGNATURE	MARK SMITH / Mark Smith

TCT CONTACT	Dwalker
PROJECT NAME	24930601
CLIENT P.O. # / PROJECT NO.	DAAL
BILL TO (CO. NAME, ADDRESS)	MIKE WATSON
REPORT TO	

TCT USE ONLY	
PROJ. MGR.	Deneen
PRIORITY	
INVOICE #	
JOB NAME	HPN # 1240
CUSTODY SEAL INTACT/NUMBER Y/N	N/A
TEMPERATURE OF CONTAINER	Dropped off
SAMPLE CONDITION	o/c

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

POSSIBLE HAZARD: YES ____ UNKNOWN X (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB X
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

	BETX	MTBE	GRO	TSS	COD	TPH/GAS
FILTERED (YES/NO)	N	N	N	N	N	N
PRESERVED (CODE)	E	E	E	A	C	D
REFRIGERATED (Y/N)	Y	Y	Y	Y	Y	Y

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BETX	MTBE	GRO	TSS	COD	TPH/GAS		NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
3 1	INFLUENT	H_2O	10-15-93	14:00	X	X	X					3	40ml P+T	7871
5 2	EFFLUENT	H_2O	10-15-93	14:00	X	X		X	X	X		5	3 40ml P+T, 1-1L CUBE, 1-250ml PLASTIC	7872
3														
4														
5														
6														
7														
8														
9														
10														

Additional Comments

* ABBY - Please notice TPH/GAS for Effluent *

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith					
			Paula Kraus	10/18	4:00

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* SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon
Consulting Engineers Environmental Scientists

Twin City Testing Corporation
737 Pelham Boulevard
St. Paul, Minnesota 55114-1776
(612) 645-3601
Fax: (612) 659-7515

REPORT OF: CHEMICAL ANALYSES

PROJECT: VEMN 0601

DATE: September 30, 1993

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco Inc.

LABORATORY NO: 4410 93-2564
HPN: 844

INTRODUCTION

This report presents the results of the analyses of five samples received on September 20, 1993, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on September 17, 1993. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

TWIN CITY TESTING CORPORATION

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	MW-1	MW-4	MW-5	
TCT ID:		5762	5765	5766	
Parameter:					**PQL**
Benzene	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Ethyl benzene	ND	ND	ND	ND	5
Total xylenes	ND	ND	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	ND	ND	5
Surrogate Recovery:					
α,α,α-Trifluorotoluene	102%	102%	103%	102%	
Gasoline Range Organics	ND	ND	ND	ND	30
Surrogate Recovery:					
α,α,α-Trifluorotoluene	100%	101%	101%	100%	
Date Collected:		9/17/93	9/17/93	9/17/93	
Date Analyzed:	9/29/93	9/29/93	9/29/93	9/29/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-2**	
TCT ID:	5763	
Parameter:		**PQL**
Benzene	210	50
Toluene	ND	50
Ethyl benzene	250	50
Total xylenes	370	50
Methyl-tert-Butyl Ether	ND	50
Surrogate Recovery:		
α,α,α-Trifluorotoluene	100%	
Gasoline Range Organics	3,100	300
Surrogate Recovery:		
α,α,α-Trifluorotoluene	97%	
Date Collected:	9/17/93	
Date Analyzed:	9/29-30/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-3**	
TCT ID:	5764	
Parameter:		**PQL**
Benzene	4,300	1,200
Toluene	14,000	1,200
Ethyl benzene	2,200	1,200
Total xylenes	11,000	1,200
Methyl-tert-Butyl Ether	ND	1,200
Surrogate Recovery:		
α,α,α-Trifluorotoluene	102%	
Gasoline Range Organics	40,000	7,500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	101%	
Date Collected:	9/17/93	
Date Analyzed:	9/29/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

[redacted] in [redacted] testing [redacted] HA F-[redacted]TO EC) [redacted] TCT No. [redacted]525[redacted]

corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CLIENT NAME: Dahl & Associates

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4390 McMenemy RD

CLIENT ADDRESS (CITY, STATE, ZIP): St Paul MN 55127

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE: 490 2905

SAMPLED BY PRINT NAME/SIGNATURE: Dahl & Associates [signature]

TCT CONTACT: D. Walker

PROJECT NAME: Dahl

CLIENT P.O. # / PROJECT NO.: VEMN 0601

BILL TO (CO. NAME, ADDRESS): Dahl

REPORT TO: Mike Watson / Jonathan Parks

TCT USE ONLY	
PROJ. MGR.	Deneen
PRIORITY	
INVOICE #	
JOB NAME	HPN # 844
CUSTODY SEAL INTACT/NUMBER Y/N	N/A
TEMPERATURE OF CONTAINER	Courier
SAMPLE CONDITION	OK

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

	BTX	MTBE	GRO
FILTERED (YES/NO)	N	N	N
PRESERVED (CODE)	E	E	E
REFRIGERATED (Y/N)	Y	Y	Y

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BTX	MTBE	GRO						NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	MW-1	H_2O	9-17-93	P.M	X	X	X						3	40ml P&T	5762
2	MW-2	↓	↓	↓	X	X	X						3	↓	5763
3	MW-3	↓	↓	↓	X	X	X						3	↓	5764
4	MW-4	↓	↓	↓	X	X	X						3	↓	5765
5	MW-5	↓	↓	↓	X	X	X						3	↓	5766
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[signature]	9-17-93				
			Paula [signature]	9/20/93	4:00

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* SEE REVERSE SIDE FOR INSTRUCTIONS

twin city testing corporation
662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: VEMN 601

DATE: June 25, 1993

REPORTED TO: Dahl & Associates
Attn: Dan Wiberg
4390 McMenemy Drive
St. Paul, MN 55127

Conoco-So. Robert

LABORATORY NO: 4410 93-1828

INTRODUCTION

This report presents the results of the analyses of five samples received on June 11, 1993, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on June 10, 1993. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

TWIN CITY TESTING CORPORATION

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	MW-1	MW-4	MW-5	
TCT ID:		320181	320184	320185	
Parameter:					**PQL**
Benzene	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	5
Ethyl benzene	ND	ND	ND	ND	5
Total xylenes	ND	ND	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	ND	ND	5
Surrogate Recovery:					
α,α,α-Trifluorotoluene	116%	65%[1]	111%	110%	
Gasoline Range Organics	ND	ND	ND	ND	30
Surrogate Recovery:					
α,α,α-Trifluorotoluene	114%	85%	104%	104%	
Date Collected:		6/10/93	6/10/93	6/10/93	
Date Analyzed:	6/21/93	6/18/93	6/18/93	6/18-19/93	

[1] Surrogate recovery outside recommended quality control limits, see reanalysis.

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1828

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-1**	
TCT ID:	320181	
Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	111%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	104%	
Date Analyzed:	6/28/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1828

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-2**	
TCT ID:	320182	
Parameter:		**PQL**
Benzene	240	120
Toluene	120	120
Ethyl benzene	ND	120
Total xylenes	230	120
Methyl-tert-Butyl Ether	ND	120
Surrogate Recovery:		
α,α,α-Trifluorotoluene	106%	
Gasoline Range Organics	1,200	750
Surrogate Recovery:		
α,α,α-Trifluorotoluene	98%	
Date Collected:	6/10/93	
Date Analyzed:	6/18/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1828

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-3**	
TCT ID:	320183	
Parameter:		**PQL**
Benzene	6,400	250
Toluene	11,000	250
Ethyl benzene	2,700	250
Total xylenes	13,000	250
Methyl-tert-Butyl Ether	ND	250
Surrogate Recovery:		
α,α,α-Trifluorotoluene	117%	
Gasoline Range Organics	52,000	1,500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	113%	
Date Collected:	6/10/93	
Date Analyzed:	6/21/93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1828

[redacted] n [redacted] testin_ corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

[redacted] [redacted] IAI =-(OI EC[redacted] [redacted] [redacted] TCT N 4[redacted]95[redacted]

TCT CONTACT	Deneen Walker ~~NANCY WHALEY~~
PROJECT NAME	VEMN-0601
CLIENT P.O. # / PROJECT NO.	
BILL TO (CO. NAME, ADDRESS)	DAHL
REPORT TO	MIKE WATSON / JONATHAN PAETZ

TCT USE ONLY	
PROJ. MGR.	Deneen
PRIORITY	Normal
INVOICE #	93-1828
JOB NAME	Dahl-VEM01.10
CUSTODY SEAL INTACT/NUMBER Y/N	N-A
TEMPERATURE OF CONTAINER	Dropped off
SAMPLE CONDITION	OK

CLIENT NAME	MIKE WATSON / DAHL & ASSOCIATES
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)	4390 McMENEMY RD
CLIENT ADDRESS (CITY, STATE, ZIP)	ST. PAUL MN, 55127
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE / PHONE	612-490-2905
SAMPLED BY PRINT NAME/SIGNATURE	MARK SMITH / Mark Smith

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

	BETX	GRO	MTBE
FILTERED (YES/NO)	N	N	N
PRESERVED (CODE)	E	E	E
REFRIGERATED (Y/N)	Y	Y	Y

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ______

POSSIBLE HAZARD: YES ____ UNKNOWN X (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB X
(ADDITIONAL CHARGES MAY BE ASSESSED)

	ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BETX	GRO	MTBE					NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
3	1	MW-1	H_2O	6-10-93	10:30	X	X	X					3	40ml P+T	32C181
3	2	MW-2	↓	↓	10:45	X	X	X					↓	↓	32C182
3	3	MW-3	↓	↓	11:45	X	X	X					↓	↓	32C183
3	4	MW-4	↓	↓	11:00	X	X	X					↓	↓	32C184
3	5	MW-5	↓	↓	11:30	X	X	X					↓	↓	32C185
	6														
	7														
	8														
	9														
	10														

Additional Comments	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Mark Smith			[signature]	6/11	3:30
				Paula Kr[illegible]	6/11/93	4:00

C813 Rev. 10/91

* SEE REVERSE SIDE FOR INSTRUCTIONS

twin city testing corporation
662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: VEMN 0601

DATE: March 22, 1993

Conoco Inc./South Robert

REPORTED TO: Dahl & Associates
Attn: Dan Wiberg
4390 McMenemy Drive
St. Paul, MN 55127

LABORATORY NO: 4410 93-1128

INTRODUCTION

This report presents the results of the analyses of five samples received on March 10, 1993, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on March 9, 1993. If samples are not consumed in the analysis, they are held for three months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

TWIN CITY TESTING CORPORATION

Deneen E. Walker
Project Manager

Stephanie A. Kidder
Lab Manager

DEW\SAK\sew

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in μg/L which is equivalent to parts-per-billion)

Client ID: **METHOD BLANK**

TCT ID:

Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	98%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	97%	
Date Analyzed:	3-11-93, 3-12-93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1128

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in μg/L which is equivalent to parts-per-billion)

Client ID:	**MW-1**	
TCT ID:	311478	
Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	98%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	101%	
Date Collected:	3-9-93	
Date Analyzed:	3-12-93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1128

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-2**	
TCT ID:	311479	
Parameter:		**PQL**
Benzene	5300	500
Toluene	3800	500
Ethyl benzene	1300	500
Total xylenes	4500	500
Methyl-tert-Butyl Ether	ND	500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	97%	
Gasoline Range Organics	21000	3000
Surrogate Recovery:		
α,α,α-Trifluorotoluene	97%	
Date Collected:	3-9-93	
Date Analyzed:	3-12-93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1128

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in μg/L which is equivalent to parts-per-billion)

Client ID:	**MW-3**	
TCT ID:	311480	
Parameter:		**PQL**
Benzene	6500	1200
Toluene	20000	1200
Ethyl benzene	3000	1200
Total xylenes	17000	1200
Methyl-tert-Butyl Ether	ND	1200
Surrogate Recovery:		
α,α,α-Trifluorotoluene	80%	
Gasoline Range Organics	74000	7500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	83%	
Date Collected:	3-9-93	
Date Analyzed:	3-12-93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1128

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in μg/L which is equivalent to parts-per-billion)

Client ID:	**MW-4**	
TCT ID:	311481	
Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	98%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	100%	
Date Collected:	3-9-93	
Date Analyzed:	3-11-93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1128

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in μg/L which is equivalent to parts-per-billion)

Client ID:	**MW-5**	
TCT ID:	311482	
Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	93%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	95%	
Date Collected:	3-9-93	
Date Analyzed:	3-12-93	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

LABORATORY NO: 4410 93-1128

[redacted] uir y tir [redacted] V2-[illegible] [redacted] CHA[redacted]OF-[redacted]STC RE D [redacted] MW/[illegible] [redacted] TCT [redacted]2922

corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CLIENT NAME: DAHL & Assoc.

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4390 McMenemy Rd.

CLIENT ADDRESS (CITY, STATE, ZIP): St. Paul, MN. 55127

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE: 490-2905

SAMPLED BY PRINT NAME/SIGNATURE: J. Howard / [signature]

TCT CONTACT: N. Whaley

PROJECT NAME: YEMN-[illegible] 0601

CLIENT P.O. # / PROJECT NO.: Dahl

BILL TO (CO. NAME, ADDRESS): Mike Watson

REPORT TO:

TCT USE ONLY	
PROJ. MGR.	Nancy
PRIORITY	Normal
INVOICE #	4410 93-1128
JOB NAME	Dahl - VE601.9
CUSTODY SEAL INTACT/NUMBER Y/N	N/A
TEMPERATURE OF CONTAINER	cool
SAMPLE CONDITION	good

PREPAY Y/N	N
CHECK NO.	↓
CHECK AMOUNT	↓

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

	BETX	MTBE	GRO
FILTERED (YES/NO)	N	N	N
PRESERVED (CODE)	E	E	E
REFRIGERATED (Y/N)	Y	Y	Y

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BETX	MTBE	GRO						NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	✓ MW-1	H_2O	3-9-93	11:15	X	X	X						3	pint	311478
2	✓ MW-2	↓	↓	11:30	X	X	X						↓	↓	311479
3	✓ MW-3	↓	↓	12:00	X	X	X						↓	↓	311480
4	✓ MW-4	↓	↓	11:45	X	X	X						↓	↓	311481
5	✓ MW-5	↓	↓	12:15	X	X	X						↓	↓	311482
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[signature]	3/8	15:00	[signature]	3/10	4:00pm

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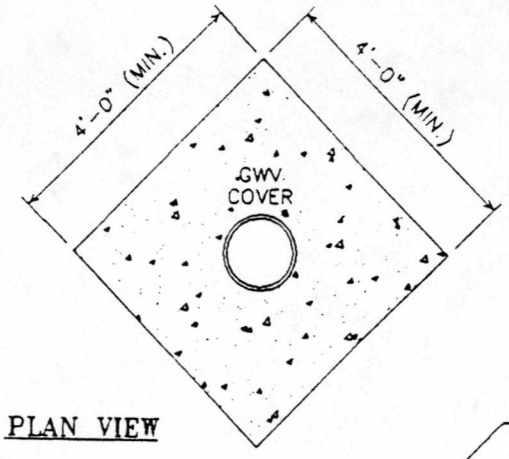
* SEE REVERSE SIDE FOR INSTRUCTIONS

APPENDIX B

Soil Vapor Vent/Probe/Ground-Water Vent As-builts

Reference Information:

G.W.V. Number 1
Date Installed 11-6-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. _____



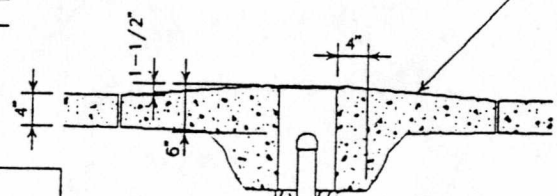
PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:

9.75
16.25



Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Grout:

Interval 10'-2'
Depth (Grade to Top) 2'
Type Concrete

Casing:

Length 27'
Diameter 2"
Joints B&S
Type PVC

Bentonite Seal:

Depth (Grade to Top) 15'
Thickness 5'
Type Enviroplug

Screen:

Length 3'
Screen Interval 30'-27'
Diameter 2"
Slot Size .010"
Joints B&S
Type PVC
Make Timco

VENT Pack:

Depth (Grade to Top) 20'
Thickness 11'
Above Screen 7'
Below Screen 1'
Type Red Flint #30
Interval 31'-25'
Natural Pack:
Interval 31'-30'

Water Table:

Depth From Grade 17'
(While Drilling)

Boring:

Depth (Grade to Bottom) 31'
Diameter of Hole 8"

Depth (Grade to Bottom) 30'

Note:
Overall Length of Screen & Casing 30'

Note:
All Depths & Heights Measured From Grade.

CROSS SECTION

4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL
& ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

PROPOSED GROUND-WATER VENTILATION VENT

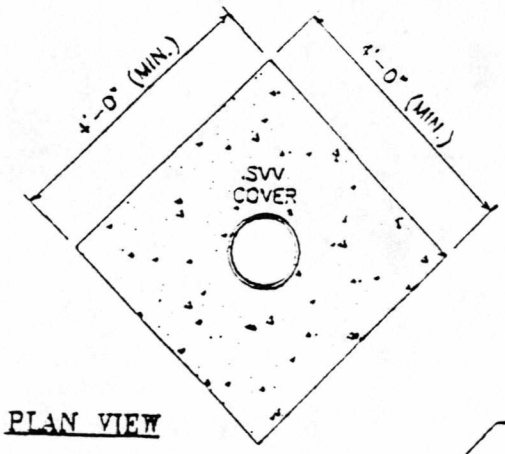
DAHL STD NO: DAHL-GWV-PRO

DATE DRAWN	03/09/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		

PLOT DATE 03/09/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'

Reference Information:

S.V.V. Number 1
Date Installed 10-14-92
Driller/Co. GL
Rig B-57
Method HSA
Ground Surface Elev. 97.82



PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:

Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 9
Diameter 2"
Joints None
Type PVC

Screen:

Length 10
Screen Interval 89-79 (9-19)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Water Table:

Depth From Grade 14'
(While Drilling)

Boring:

Depth (Grade to Bottom) 20'
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.

Grout:

Interval 6'-4'
Depth (Grade to Top) 4'
Type Concrete

Bentonite Seal:

Depth (Grade to Top) 6'
Thickness 2
Type Quick gel

VENT Pack:

Depth (Grade to Top) 7
Thickness 13
Above Screen 2
Below Screen 1
Type #15
Interval 20'-7'
Natural Pack:
Interval

Depth (Grade to Bottom) 19'

Note:
Overall Length of Screen & Casing 19'

CROSS SECTION

4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

SOIL VAPOR VENT AS BUILT

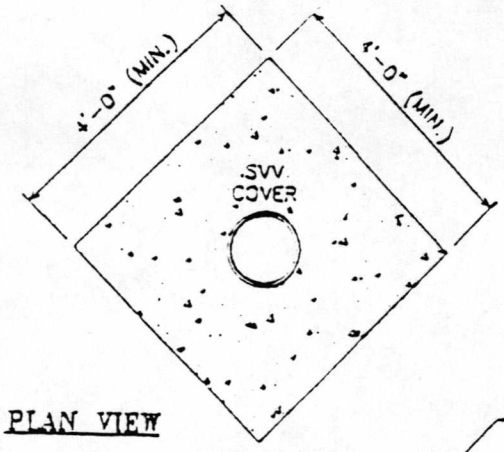
DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		

PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'

Reference Information:

S.V.V. Number 2
Date Installed 10-14-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.75

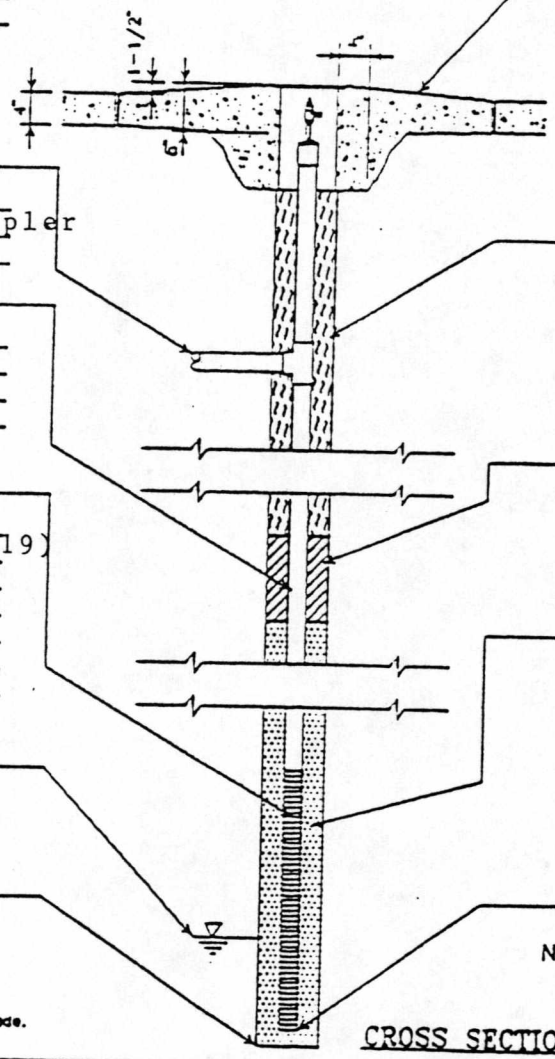


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above gra
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:



Surface Seal:

Type Concrete
Height 2" Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 9
Diameter 2"
Joints None
Type PVC

Grout:

Interval 6'-4'
Depth (Grade to Top) 4'
Type concrete

Screen:

Length 10
Screen Interval 89-79 (9-19)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Bentonite Seal:

Depth (Grade to Top) 6'
Thickness 2
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 7
Thickness 13
Above Screen 2
Below Screen 1
Type #15
Interval 20'-7'
Natural Pack:
Interval

Water Table:

Depth From Grade 14'
(While Drilling)

Boring:

Depth (Grade to Bottom) 20'
Diameter of Hole 8"

Depth (Grade to Bottom) 19'

Note:
Overall Length of Screen & Casing 19'

Note:
All Depths & Heights Measured From Grade.

CROSS SECTION

4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

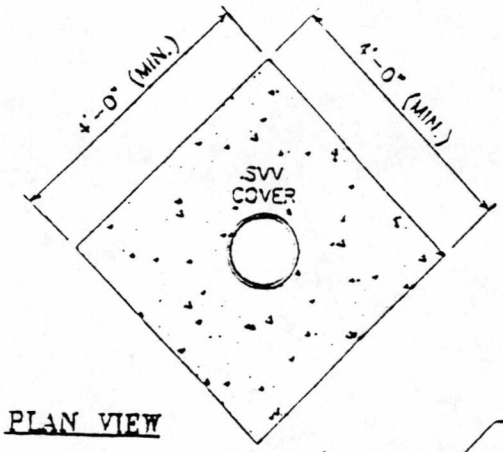
SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.V. Number 3
Date Installed 10-15-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.72

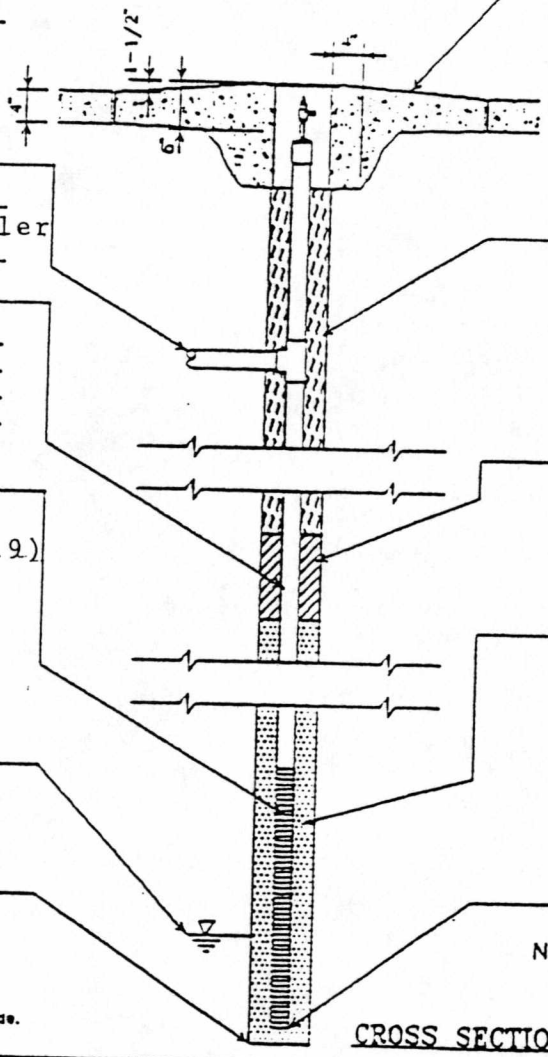


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:



CROSS SECTION

Surface Seal:

Type Concrete
Height 2" Above Grade

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 9
Diameter 2"
Joints None
Type PVC

Screen:

Length 10
Screen Interval 89-79 (9-19)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Water Table:

Depth From Grade 14'
(While Drilling)

Boring:

Depth (Grade to Bottom) 20'
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.

Grout:

Interval 6'-4'
Depth (Grade to Top) 4'
Type Concrete

Bentonite Seal:

Depth (Grade to Top) 6'
Thickness 2
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 7
Thickness 13
Above Screen 2
Below Screen 1
Type #15
Interval 20'-7'
Natural Pack:
Interval

Depth (Grade to Bottom) 19'

Note:
Overall Length of Screen & Casing 19'

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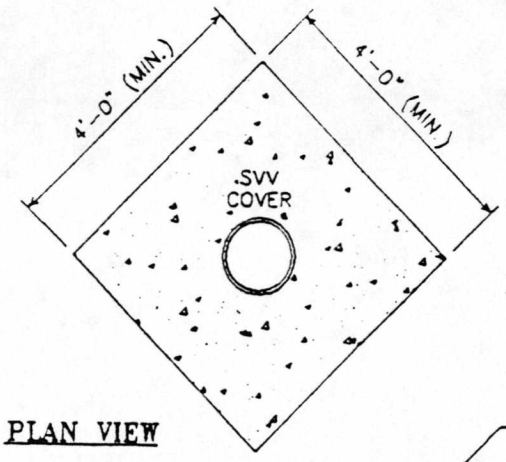
SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.V. Number 4
Date Installed 10-15-92
Driller/Co. GL/Dan1
Rig B-57
Method HSA
Ground Surface Elev. 99.14



PLAN VIEW

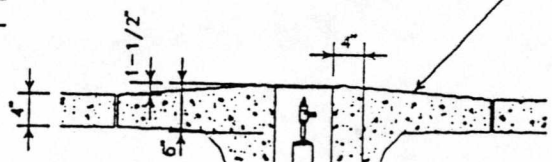
Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grad
Type of Prot. Cover Univ. valve

Summary of Construction:

Surface Seal:

Type Concrete
Height 2" (Above Grade)



Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 10'
Diameter 2"
Joints None
Type PVC

Screen:

Length 10'
Screen Interval 89-79 (10-20)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Water Table:

Depth From Grade 14'
(While Drilling)

Boring:

Depth (Grade to Bottom) 21'
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.

Grout:

Interval 6'-4'
Depth (Grade to Top) 4'
Type Concrete

Bentonite Seal:

Depth (Grade to Top) 6'
Thickness 2'
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 8'
Thickness 13
Above Screen 2'
Below Screen 1'
Type Red Flint #15
Interval 21'-8'
Natural Pack:
Interval

Depth (Grade to Bottom) 20'

Note:
Overall Length of
Screen & Casing 20'

CROSS SECTION

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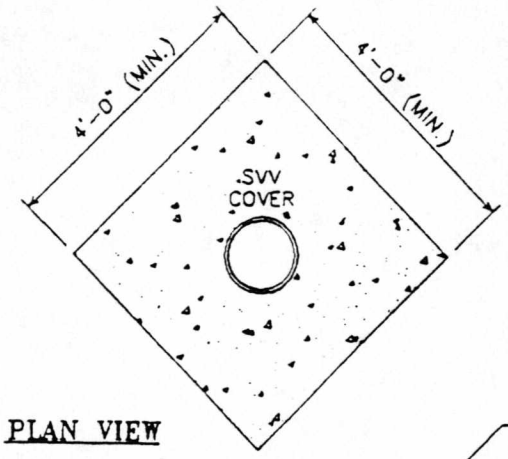
SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.V. Number 5
Date Installed 10-14-92
Driller/Co. G.L./Dahl
Rig B-57
Method HSA
Ground Surface Elev. 98.76

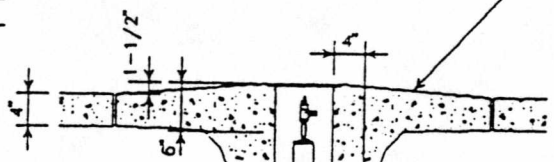


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above gra
Type of Prot. Cover Univ.valve

Summary of Construction:



Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 10'
Diameter 2"
Joints None
Type PVC

Screen:

Length 10'
Screen Interval 89-79 (10-20)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Water Table:

Depth From Grade (While Drilling) 14'

Boring:

Depth (Grade to Bottom) 21'
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.

Grout:

Interval 6'-4'
Depth (Grade to Top) 11"
Type Concrete

Bentonite Seal:

Depth (Grade to Top) 6'
Thickness 2
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 8'
Thickness 13
Above Screen 2'
Below Screen 1'
Type Red Flint #15
Interval 21'-8'
Natural Pack:
Interval

Depth (Grade to Bottom) 20'

Note:
Overall Length of Screen & Casing 20'

CROSS SECTION

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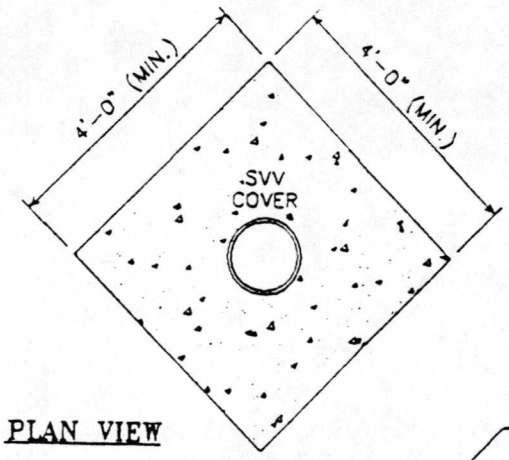
SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.V. Number 6
Date Installed 10-14-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.96

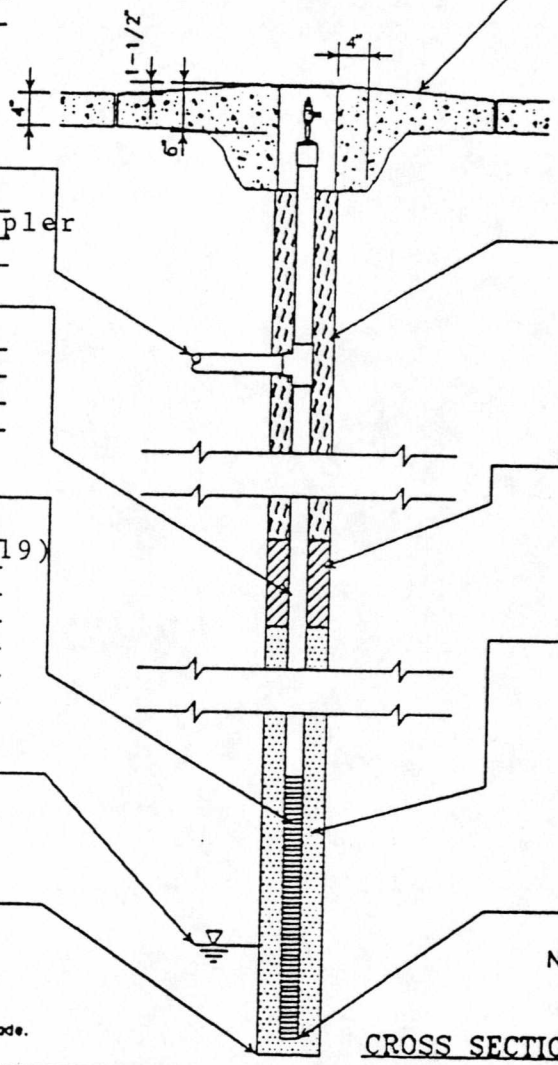


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. Valv
#65-8012

Summary of Construction:



CROSS SECTION

Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 9
Diameter 2"
Joints None
Type PVC

Grout:

Interval 6'-4'
Depth (Grade to Top) 4'
Type Concrete

Screen:

Length 10
Screen Interval 89-79 (9-19)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Bentonite Seal:

Depth (Grade to Top) 6'
Thickness 2
Type Quick Gel

Water Table:

Depth From Grade (While Drilling) 14'

VENT Pack:

Depth (Grade to Top) 7
Thickness 13
Above Screen 2
Below Screen 1
Type #15
Interval 20'-7'
Natural Pack:
Interval

Boring:

Depth (Grade to Bottom) 20'
Diameter of Hole 8"

Depth (Grade to Bottom) 19'

Note:
All Depths & Heights Measured From Grade.

Note:
Overall Length of Screen & Casing 19'

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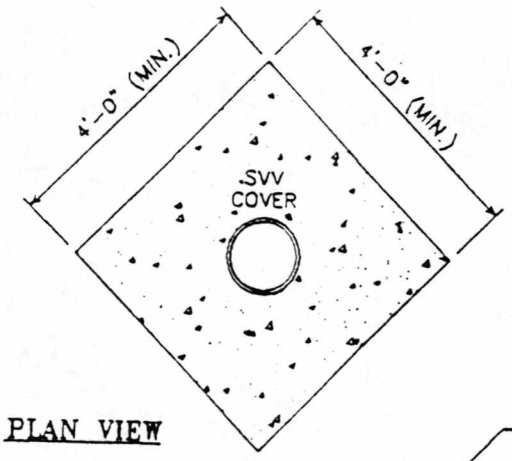
DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		

PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'

Reference Information:

S.V.V. Number 7
Date Installed 10-12-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 99.93



PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:

Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 12'
Diameter 2"
Joints None
Type PVC

Grout:

Interval 8'-4'
Depth (Grade to Top) 4'
Type Concrete

Screen:

Length
Screen Interval 88-78 (12-22)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Bentonite Seal:

Depth (Grade to Top) 8'
Thickness 2'
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 10'
Thickness 13'
Above Screen 2'
Below Screen 1'
Type Red Flint #15
Interval 23'-10'
Natural Pack:
Interval

Water Table:

Depth From Grade (While Drilling) 15

Boring:

Depth (Grade to Bottom) 23'
Diameter of Hole 8"

Depth (Grade to Bottom) 22'

Note:
All Depths & Heights Measured From Grade.

Note:
Overall Length of Screen & Casing 22'

CROSS SECTION

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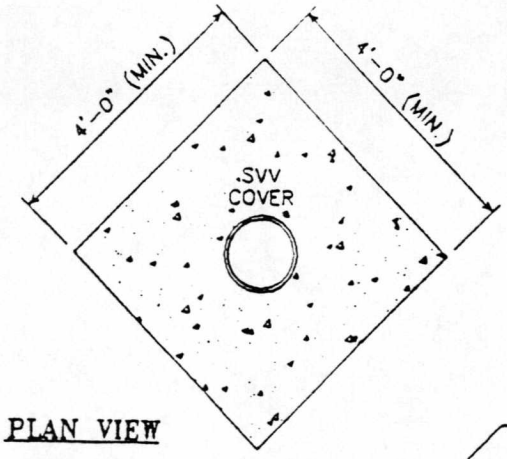
SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.V. Number 8
Date Installed 10-12-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 98.94

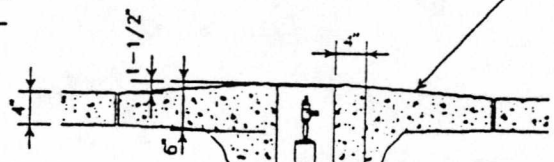


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. Valve #65-8012

Summary of Construction:



Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 11
Diameter 2"
Joints None
Type PVC

Grout:

Interval 7'-4'
Depth (Grade to Top) 4'
Type Concrete

Screen:

Length 10
Screen Interval 88-78' (11-21')
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Bentonite Seal:

Depth (Grade to Top) 7
Thickness 2
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 9
Thickness 13
Above Screen 2
Below Screen 1
Type #15
Interval 22-9
Natural Pack:
Interval

Water Table:

Depth From Grade (While Drilling) 15

Boring:

Depth (Grade to Bottom) 22'
Diameter of Hole 8"

Depth (Grade to Bottom) 21'

Note:
Overall Length of Screen & Casing 21'

Note:
All Depths & Heights Measured From Grade.

CROSS SECTION

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SOIL VAPOR VENT AS BUILT

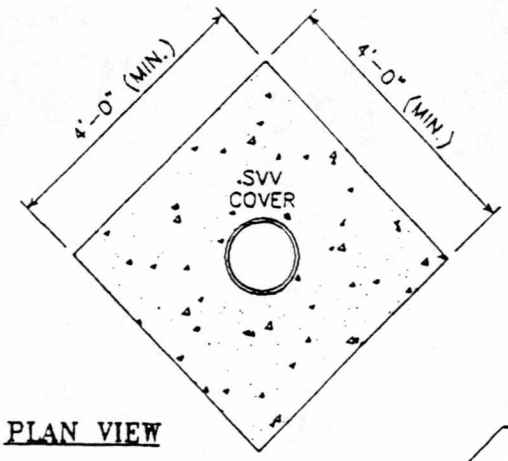
DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		

PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'

Reference Information:

S.V.V. Number 9
Date Installed 10-13-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 99.53

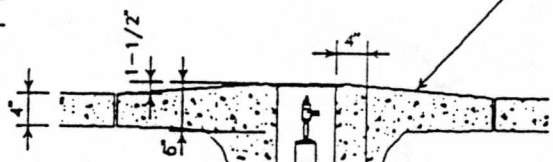


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ.valve

Summary of Construction:



Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 10'
Diameter 2'
Joints None
Type PVC

Screen:

Length 10'
Screen Interval 89-79 (10-20)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Water Table:

Depth From Grade 14'
(While Drilling)

Boring:

Depth (Grade to Bottom) 21'
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.

Grout:

Interval 6'-4'
Depth (Grade to Top) 11'
Type Concrete

Bentonite Seal:

Depth (Grade to Top) 6'
Thickness 2
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 8'
Thickness 13
Above Screen 2'
Below Screen 1'
Type Red Flint #15
Interval 21'-8'
Natural Pack:
Interval

Depth (Grade to Bottom) 20'

Note:
Overall Length of Screen & Casing 20'

CROSS SECTION

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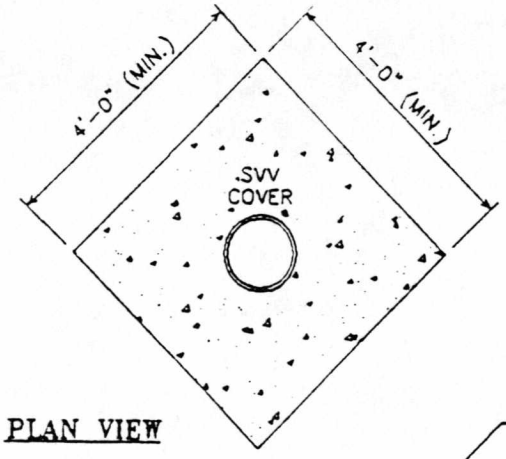
SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.V. Number 10
Date Installed 10-13-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 99.47

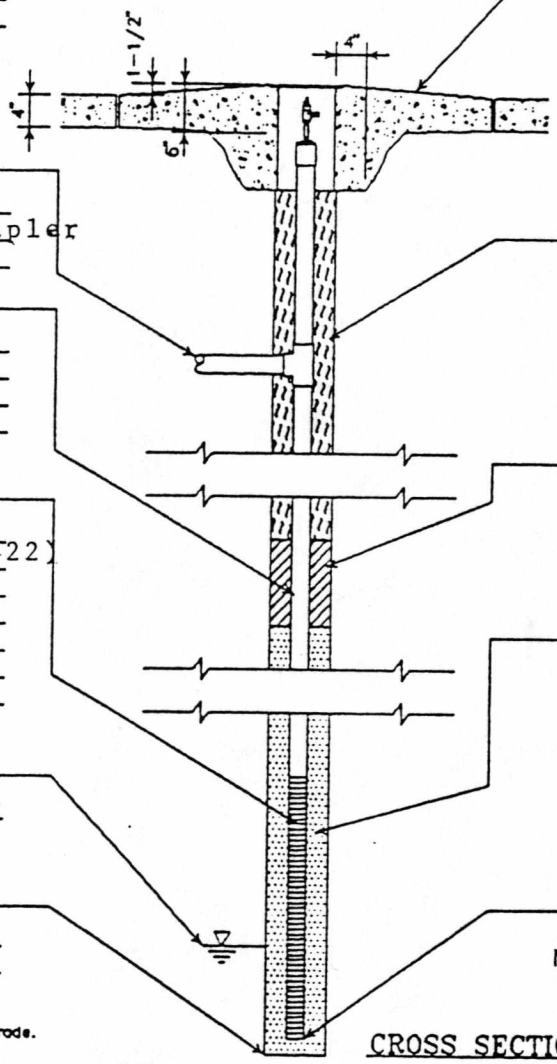


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:



CROSS SECTION

Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 12'
Diameter 2"
Joints None
Type PVC

Screen:

Length
Screen Interval 88-78 (12-22)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Water Table:

Depth From Grade 15
(While Drilling)

Boring:

Depth (Grade to Bottom) 23'
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.

Grout:

Interval 8'-4'
Depth (Grade to Top) 4'
Type Concrete

Bentonite Seal:

Depth (Grade to Top) 8'
Thickness 2'
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 10'
Thickness 13'
Above Screen 2'
Below Screen 1'
Type Red Flint #15
Interval 23'-10'
Natural Pack:
Interval

Depth (Grade to Bottom) 22

Note:
Overall Length of Screen & Casing 22'

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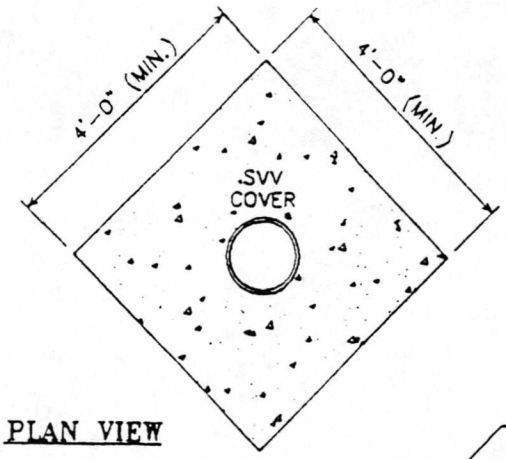
SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.V. Number 11
Date Installed 10-12-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 98.98

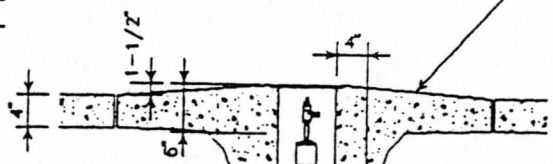


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ, valve #65-8012

Summary of Construction:



Surface Seal:

Type Concrete
Height 2" (Above Grade)

Vent Line:

Diameter 2"
Joints Plain End/coupler
Type PVC

Casing:

Length 11
Diameter 2"
Joints None
Type PVC

Screen:

Length 10
Screen Interval 88-78' (11-21')
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Water Table:

Depth From Grade 15
(While Drilling)

Boring:

Depth (Grade to Bottom) 22'
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.

Grout:

Interval 7'-4'
Depth (Grade to Top) 4'
Type Concrete

Bentonite Seal:

Depth (Grade to Top) 7
Thickness 2
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 9
Thickness 13
Above Screen 2
Below Screen 1
Type #15
Interval 22-9
Natural Pack:
Interval

Depth (Grade to Bottom) 21'

Note:
Overall Length of Screen & Casing 21'

CROSS SECTION

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SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SVV-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1' = 2'			

Reference Information:

DAHL Well Number MW-5
Unique Well Number 479491
Date Installed 10-16-92
Driller/Co. Dahl
Rig B-57
Method HSA
Ground Surface Elev. 99.93

Summary of Construction:

Joint Locations (Below Grade)

Casing:

Length 15
Diameter 2"
Joints Flush thread
Type Timco

Screen:

Length 10'
Screen Interval 87-77 (13'-23')
Diameter 2"
Slot Size .010
Joints Flush thread
Type PVC
Make Timco

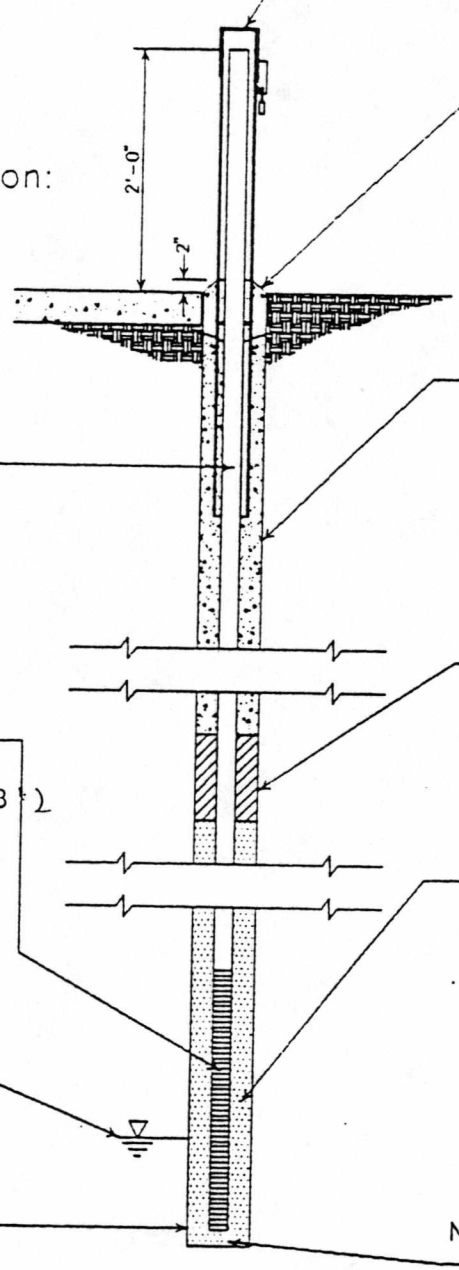
Water Table:

Depth From Grade 15'
(While Drilling)

Boring:

Depth (Grade to Bottom) 23'
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.



Above Grade Completion:

Protective case: 4"x5' Steel
Locking Cover: Slip Steel
Lock Number: 2121

Collar & Surface Seal:

Interval 3" above grade
Thickness 3'
Type Concrete

Grout:

Depth (Grade to Top) 9-0'
Thickness 9'
Type Neat Cement

Bentonite Seal:

Depth (Grade to Top) 9
Thickness 2
Type Quick Gel

Well Pack:

Depth (Grade to Top) 11'
Thickness 12'
Above Screen 2'
Below Screen -
Type #30 Red Flint
Interval 23'-11'
Natural Pack:
Interval

Note:
Overall Length of Screen & Casing 25'

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MONITORING WELL AS BUILT

DAHL STD NO: MWELL-MW-ASB					
DATE DRAWN	04/16/93	DRAWN BY	Jim 92.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 10/06/93	AutoCAD FILE NAME	PLOT SCALE 1' = 2'			

DAHL & ASSOCIATES, INC.

Geologic Report: SOIL BORING LOG

Project Name: CONOCO-S. ROBERT
Job Number: VEMN-0601

HOLE ID: MW-5
Geologist: MW

DATE: 10-16-92
Driller/Co.: GL/DAHL

Depth (feet)	Sample #	Sample Type	Description of Material: General	USCS	PID/FID (ppm)	Blow Counts	H2O
0-12'			Brown fine sand with trace of silt, clay, small gravel				
			moist	SMSP			
2-14	1	AS	Same soil as above, very moist	SMSP			
14-16	2	AS	Increase in gravel, very moist to wet @ 15', same soil	SPSM			
17-19	3	AS	Darker brown, sl. odor, same soil w/increase in silt, wet	SMSP			
19-21	4	AS	Same soil as above, wet	SMSP			
20-22	5	AS	Same soil as above, wet	SMSP			
22-24	6	AS	Same soil as above, wet	SMSP			
			EOB @ 24'				

DRILLING SUMMARY

Drill/Method:	G.L.
Time Start:	1:00 PM
Time Complete:	2:30PM
Total Time:	1.5 HRS.
Drilling Rate:	

PID/FID INFORMATION

Make:	
Model:	
Unit ID:	
ppm Span Gas:	
Time of Calibration:	

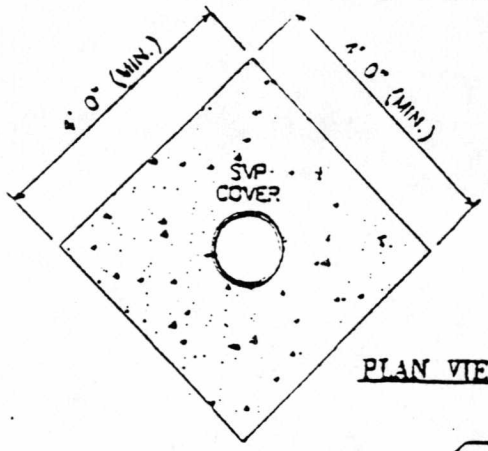
ELEVATION DATA

Surveyed:	
Surface Elevation:	
WATER LEVEL:	15

Water level indicated on log: *
Depth of oxidation on log: ox

Reference Information:

S.V.P. Number 1 U
Date Installed 10-15-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.72



PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:

Surface Seal:

Type Concrete
Height 2" (Above Grade)

Grout:

Interval 5'-4'
Grout Neat Cement
Type Concrete

Casing:

Length 9'
Diameter 2"
Joints None
Type Timco

Screen:

Length 1
Screen Interval 90-89' (9-10')
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Bentonite Seal:

Depth (Grade to Top) 5'
Thickness 2'
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 7'
Thickness 4'
Above Screen 2'
Below Screen 1
Type #15
Interval 11-7'
Natural Pack:
Interval

Water Table:

Depth From Grade (While Drilling) 14'

Boring:

Depth (Grade to Bottom) 11'
Diameter of Hole 8"

Depth (Grade to Bottom) 10'

Note:
Overall Length of Screen & Casing 10'

Note:
All Depths & Heights Measured From Grade.

CROSS SECTION

4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

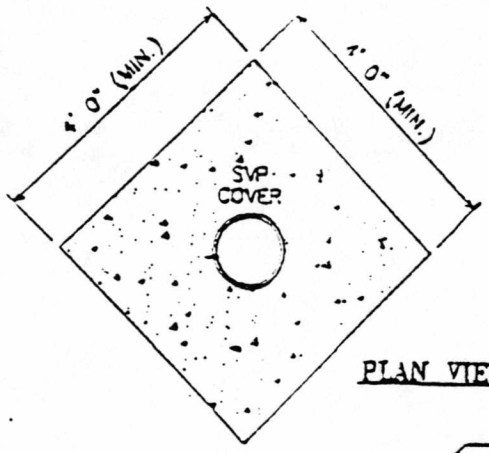
SOIL VAPOR PROBE AS BUILT

DAHL STD NO: DAHL-SVP-ASB					
DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/04/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.P. Number 1 L
Date Installed 10-15-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.72

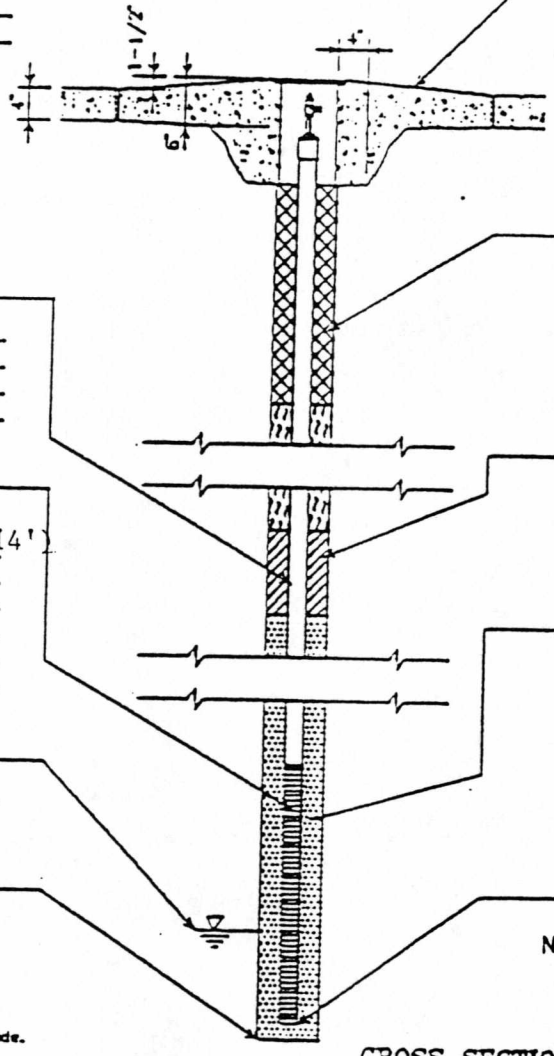
Summary of Construction:



PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012



Surface Seal:

Type Concrete
Height 2" (Above Grade)

Grout:

Interval 5'-4'
Grout Neat Cement
Type Concrete

Casing:

Length 13'
Diameter 2"
Joints None
Type PVC

Screen:

Length 1
Screen Interval 85-84' (13-14')
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Bentonite Seal:

Depth (Grade to Top) 11'
Thickness 2
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 12
Thickness 4
Above Screen 2
Below Screen 1
Type #15
Interval 15'-12'
Natural Pack:
Interval

Water Table:

Depth From Grade (While Drilling) 14'

Boring:

Depth (Grade to Bottom) 15'
Diameter of Hole 8"

Depth (Grade to Bottom) 14'

Note:
Overall Length of Screen & Casing 14'

Note:
All Depths & Heights Measured From Grade.

CROSS SECTION

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SOIL VAPOR PROBE AS BUILT

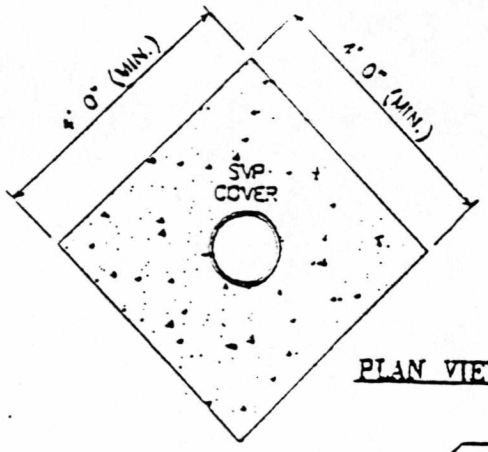
DAHL STD NO: DAHL-SVP-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE	03/04/92	AutoCAD FILE NAME	A- -A	PLOT SCALE	1" = 2'

Reference Information:

S.V.P. Number 2 0
Date Installed 10-15-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.71

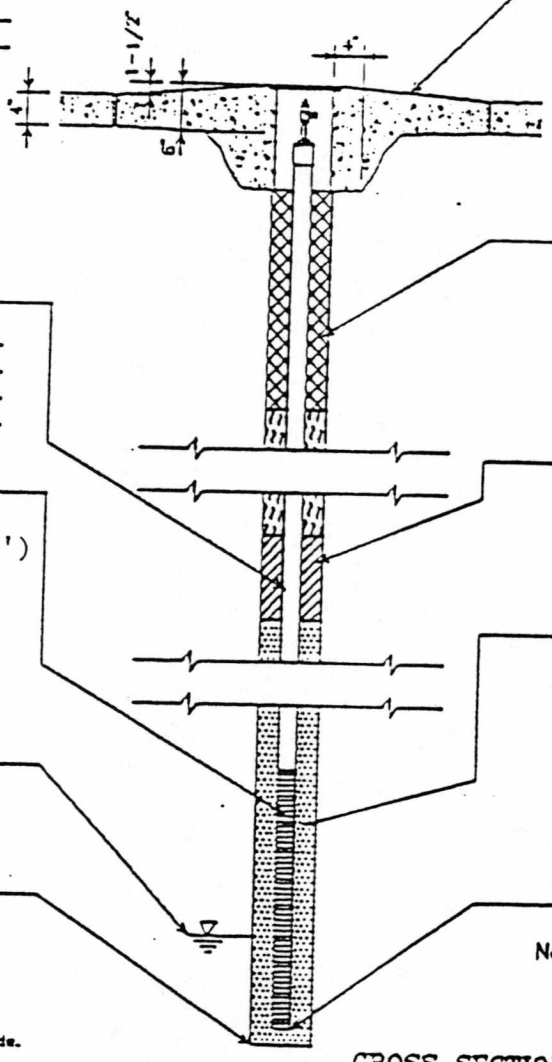
Summary of Construction:



PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012



Surface Seal:

Type Concrete
Height 2" (Above Grade)

Grout:

Interval 5'-4'
Grout Neat Cement
Type Concrete

Casing:

Length 9'
Diameter 2"
Joints None
Type Timco

Screen:

Length 1
Screen Interval 90-89' (9-10')
Diameter 2"
Slot Size .050
Joints R&S
Type PVC
Make Timco

Bentonite Seal:

Depth (Grade to Top) 5'
Thickness 2'
Type Quick Gel

VENT Pack:

Depth (Grade to Top) 7'
Thickness 4'
Above Screen 2'
Below Screen 1'
Type #15
Interval 11-7'
Natural Pack:
Interval

Water Table:

Depth From Grade (While Drilling) 14'

Boring:

Depth (Grade to Bottom) 11'
Diameter of Hole 8"

Depth (Grade to Bottom) 10'

Note:
Overall Length of Screen & Casing 10'

Note:
All Depths & Heights Measured From Grade.

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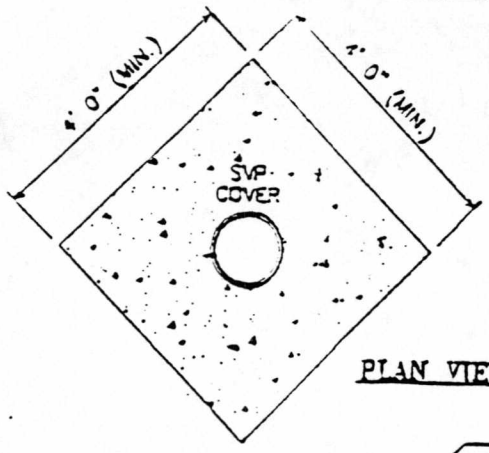
SOIL VAPOR PROBE AS BUILT

DAHL STD NO: DAHL-SVP-ASB					
DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/04/92	AutoCAD FILE NAME A- -A	PLOT SCALE	1" = 2'		

Reference Information:

S.V.P. Number 2 L
Date Installed 10-15-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.71

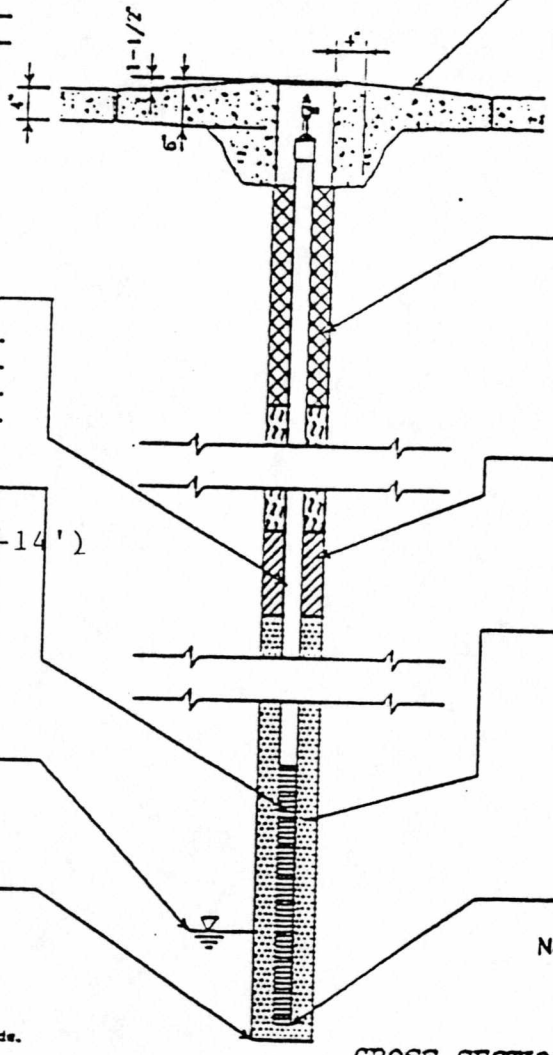


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:



Surface Seal:
Type Concrete
Height 2" (Above Grade)

Grout:
Interval 5'-4'
Grout Neat Cement
Type Concrete

Casing:
Length 13'
Diameter 2"
Joints None
Type PVC

Bentonite Seal:
Depth (Grade to Top) 11'
Thickness 2
Type Quick Gel

Screen:
Length 1
Screen Interval 85-84' (13-14')
Diameter 2"
Slot Size 050
Joints B&S
Type PVC
Make Timco

VENT Pack:
Depth (Grade to Top) 12
Thickness 4
Above Screen 2
Below Screen 1
Type #15
Interval 15'-10'
Natural Pack:
Interval

Water Table:
Depth From Grade (While Drilling) 14'

Boring:
Depth (Grade to Bottom) 15'
Diameter of Hole 8"

Depth (Grade to Bottom) 14'

Note:
Overall Length of Screen & Casing 14'

Note:
All Depths & Heights Measured From Grade.

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SOIL VAPOR PROBE AS BUILT

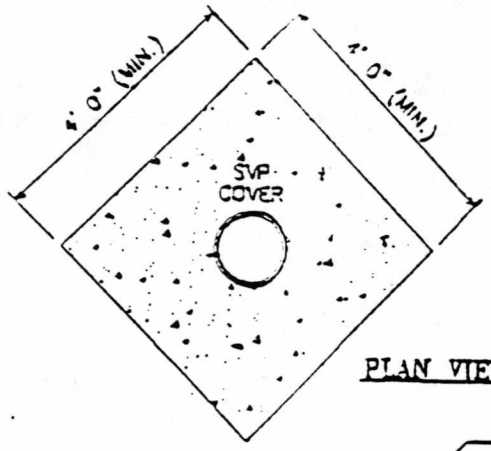
DAHL STD NO: DAHL-SVP-AS8

PLOT DATE 03/04/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'	DATE DRAWN 03/04/92	DRAWN BY Jim M.	APPR. BY
			PROJECT NUMBER	DRAWING NUMBER A- -A	

Reference Information:

S.V.P. Number 3 U
Date Installed 10-16-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.79

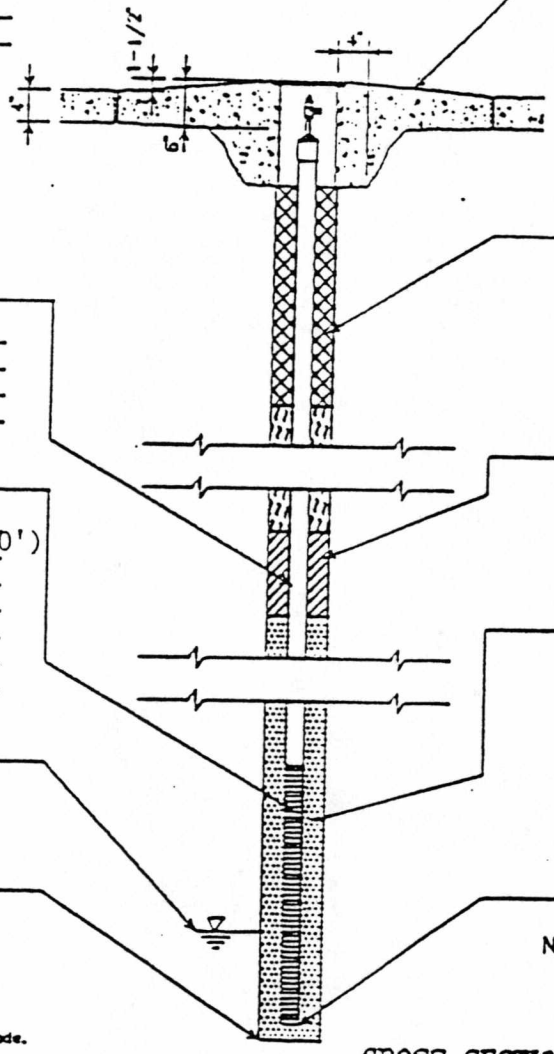
Summary of Construction:



PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012



Surface Seal:
Type Concrete
Height 2" (Above Grade)

Grout:
Interval 5'-4'
Grout Neat Cement
Type Concrete

Casing:
Length 9'
Diameter 2"
Joints None
Type Timco

Bentonite Seal:
Depth (Grade to Top) 5'
Thickness 2'
Type Quick Gel

Screen:
Length 1
Screen Interval 90-89' (9-10')
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

VENT Pack:
Depth (Grade to Top) 7'
Thickness 4'
Above Screen 2'
Below Screen 1'
Type #15
Interval 11-7'
Natural Pack:
Interval

Water Table:
Depth From Grade (While Drilling) 14'

Boring:
Depth (Grade to Bottom) 11'
Diameter of Hole 8"

Depth (Grade to Bottom) 10'

Note:
Overall Length of Screen & Casing 10'

Note:
All Depths & Heights Measured From Grade.

CROSS SECTION

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SOIL VAPOR PROBE AS BUILT

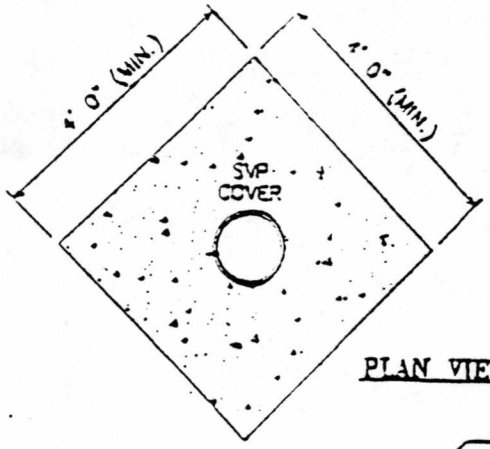
DAHL STD NO: DAHL-SVP-AS8

DATE DRAWN	03/04/92	DRAWN BY	Jim M.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/04/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			

Reference Information:

S.V.P. Number 3 L
Date Installed 10-16-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 97.79

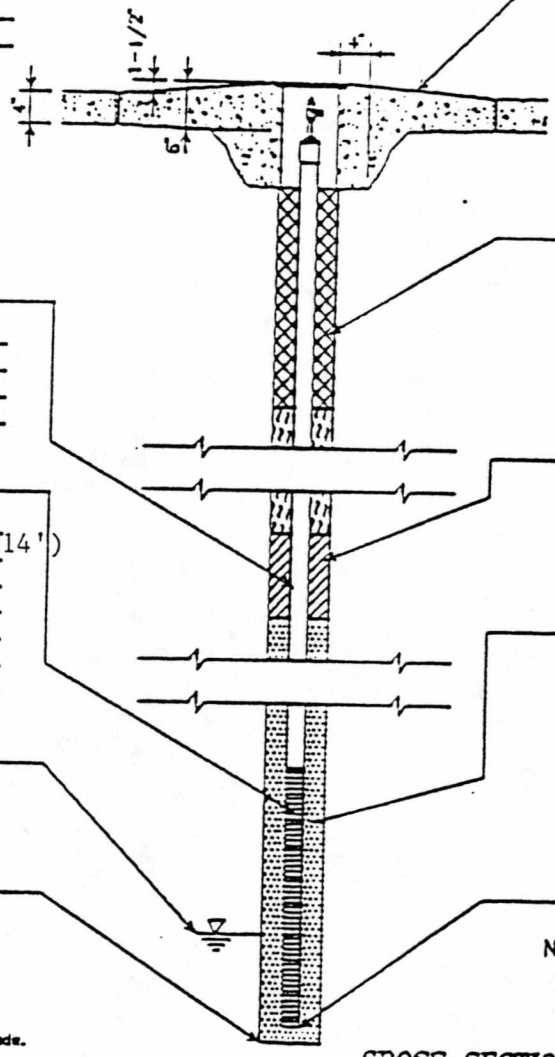
Summary of Construction:



PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012



Surface Seal:

Type Concrete
Height 2" (Above Grade)

Grout:

Interval 5'-4'
Grout Neat Cement
Type Concrete

Casing:

Length 13'
Diameter 2"
Joints None
Type PVC

Bentonite Seal:

Depth (Grade to Top) 11'
Thickness 2
Type Quick Gel

Screen:

Length 1
Screen Interval 85-84' (13-14')
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

VENT Pack:

Depth (Grade to Top) 12
Thickness 4
Above Screen 2
Below Screen 1
Type #15
Interval 15-12'
Natural Pack: Interval

Water Table:

Depth From Grade (While Drilling) 14'

Boring:

Depth (Grade to Bottom) 15'
Diameter of Hole 8"

Depth (Grade to Bottom) 14'

Note:
Overall Length of Screen & Casing 14'

Note:
All Depths & Heights Measured From Grade.

CROSS SECTION

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DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

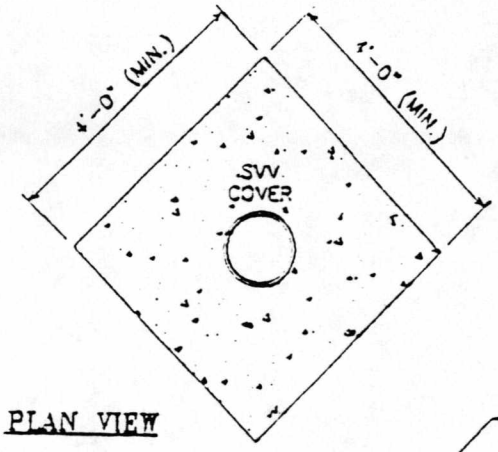
SOIL VAPOR PROBE AS BUILT

DAHL STD NO: DAHL-SVP-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE	03/04/92	AutoCAD FILE NAME	A- -A	PLOT SCALE	1" = 2'

Reference Information:

S.V.V. Number 4 U
Date Installed 10-16-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 99.47

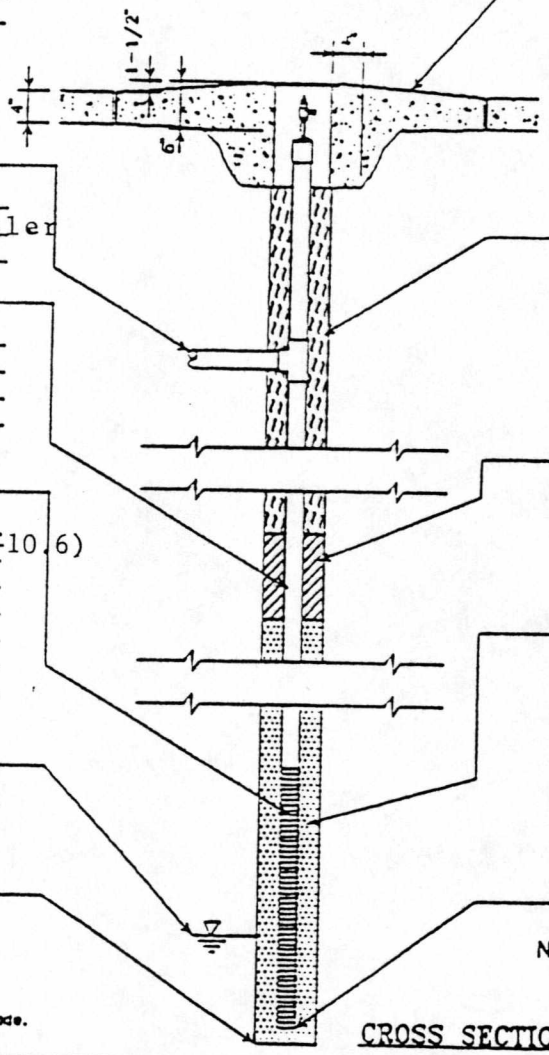


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:



CROSS SECTION

Surface Seal:
Type Concrete
Height 2" (Above Grade)

Vent Line:
Diameter 2"
Joints Plain End/coupler
Type Timco

Casing:
Length 9'
Diameter 2'
Joints None
Type Timco

Screen:
Length 1'
Screen Interval 90-84" (9.6-10.6)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

Water Table:
Depth From Grade (While Drilling) 15'

Boring:
Depth (Grade to Bottom) 11'6"
Diameter of Hole 8"

Note:
All Depths & Heights Measured From Grade.

Grout:
Interval 6'-4'
Depth (Grade to Top) 4'
Type Concrete

Bentonite Seal:
Depth (Grade to Top) 6
Thickness 1
Type Quick Gel

VENT Pack:
Depth (Grade to Top) 7
Thickness 3
Above Screen 2
Below Screen 1
Type #15
Interval 10-7
Natural Pack:
Interval

Depth (Grade to Bottom) 10'6"

Note:
Overall Length of Screen & Casing 10'6"

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DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

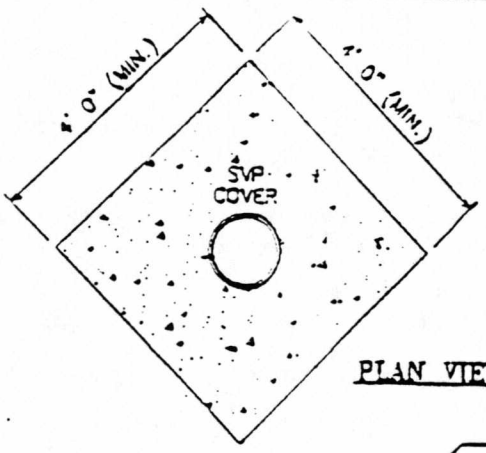
SOIL VAPOR VENT AS BUILT

DAHL STD NO: DAHL-SW-ASB

DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/05/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1' = 2'			

Reference Information:

S.V.P. Number 4 L
Date Installed 10-16-92
Driller/Co. GL/Dahl
Rig B-57
Method HSA
Ground Surface Elev. 99.47

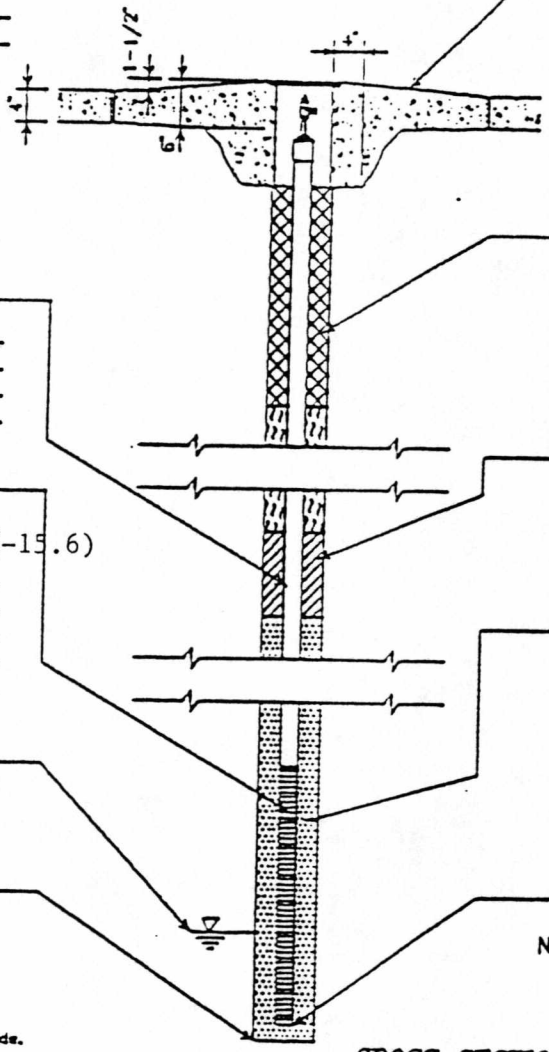


PLAN VIEW

Near Grade Completion:

Height of Casing At grade
Height of Cover 2" above grade
Type of Prot. Cover Univ. valve #65-8012

Summary of Construction:



Surface Seal:
Type Concrete
Height 2" (Above Grade)

Grout:
Interval 6'-2'
Grout Neat Cement
Type Concrete

Casing:
Length 14'
Diameter 2"
Joints None
Type Timco

Bentonite Seal:
Depth (Grade to Top) 10'
Thickness 2'
Type Quick Gel

Screen:
Length 1
Screen Interval 85-84 (14.6-15.6)
Diameter 2"
Slot Size .050
Joints B&S
Type PVC
Make Timco

VENT Pack:
Depth (Grade to Top) 12'6"
Thickness 4'
Above Screen 2'
Below Screen 1'
Type #15
Interval 16'-13'
Natural Pack:
Interval

Water Table:
Depth From Grade 15'
(While Drilling)

Boring:
Depth (Grade to Bottom) 16'6"
Diameter of Hole 8"

Depth (Grade to Bottom) 15'6"

Note:
Overall Length of Screen & Casing 15'6"

Note:
All Depths & Heights Measured From Grade.

CROSS SECTION

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DAHL
& ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

SOIL VAPOR PROBE AS BUILT

DAHL STD NO: DAHL-SVP-ASB					
DATE DRAWN	03/04/92	DRAWN BY	Jim N.	APPR. BY	
PROJECT NUMBER		DRAWING NUMBER	A- -A		
PLOT DATE 03/04/92	AutoCAD FILE NAME A- -A	PLOT SCALE 1" = 2'			