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**CONTINUED SUBSURFACE PETROLEUM HYDROCARBON EVALUATION  
CHEVRON SERVICE STATION  
ANCHORAGE, ALASKA**

Prepared for

**CHEVRON U.S.A. INC.**

Prepared by

**RITTENHOUSE-ZEMAN & ASSOCIATES, INC.**

1400 - 140th Avenue  
Bellevue, WA 98005

January 1988

**W-5410**

2100-26-001



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29 January 1988

W-5410

**Chevron U.S.A. Inc.**  
P.O. Box 220  
Seattle, WA 98101

Attention: **Mr. E. K. Kringlen**  
Maintenance Supervisor, Northwest Division

Subject: **Continued Subsurface Petroleum Hydrocarbon Evaluation**  
**Abandoned Chevron Service Station**  
**Seward Highway and Benson Boulevard**  
**Anchorage, Alaska**

Gentlemen:

We are pleased to present herein a copy of the above referenced report. This report presents the results of our continued subsurface exploration program and hydrocarbon evaluation at the above referenced abandoned service station. Written authorization to perform this evaluation was provided in Chevron U.S.A. contract M26CNW0167X, Change Order No. 30, Release No. 291/1988, dated 18 December 1987.

We appreciate this opportunity to be of service to you and would be pleased to discuss the contents of this report or other aspects of the project at your convenience.

Respectfully submitted,

**RITTENHOUSE-ZEMAN & ASSOCIATES, INC.**

**Sean W. Dennon**  
Hydrogeologist

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## 1.0 SUMMARY

The following report presents results of a continued subsurface exploration and analytical laboratory testing programs which were performed to evaluate the petroleum hydrocarbon concentrations at the subject site. A brief summary of the project considerations is presented below:

- o Our initial subsurface exploration program consisted of advancing one hollow-stem auger boring at the site on 2 September 1987. A monitoring well was installed and a water sample obtained for the purpose of analytical laboratory testing. Discussions with respect to this preliminary study, including analytical laboratory test results, are presented in our subsurface petroleum hydrocarbon evaluation report dated 17 November, 1987.
- o Our continued subsurface exploration program included advancement of three additional hollow-stem auger borings on 10 December 1987. These borings were also completed as monitoring structures, again for the purpose of obtaining samples for laboratory analysis of on-site groundwater.
- o Chemical analyses were conducted on one soil sample selected from each of the three borings. The test results suggest that soil hydrocarbon concentrations are not significant in the interval tested beneath the water table.
- o On 11 December 1987, groundwater was observed at a depth of approximately 11 feet below the ground surface. Subsequent monitoring indicates that groundwater levels have fluctuated only a few tenths of a foot since that date.
- o Chemical analyses were conducted on water samples obtained from each of the four monitoring wells. Laboratory test results indicate that elevated hydrocarbon concentrations exist in monitoring wells MW-1, MW-2 and MW-3.

This summary is presented for introductory purposes only and should be used in conjunction with the full text of this report. The project description, surface and subsurface site conditions, investigative techniques, and evaluation results are presented in the text of

this report. The exploration procedures and logs are presented in Appendix A, while Appendix B presents water level measurements.

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## 2.0 PROJECT DESCRIPTION

The site is located on the northeast corner at the intersection of Benson Boulevard and Seward Highway in Anchorage, Alaska. At the time of our continued phase of exploration, the northern portion of the parcel was occupied by a fast food restaurant under construction. The site was previously occupied by a Chevron service station. We understand that all underground storage tanks, product piping, and conduits were removed prior to our initial site work in September, 1987.

The purpose of this evaluation was to determine if elevated concentrations of petroleum hydrocarbons exist beneath the site in areas other than those present at the location of previously installed and sampled monitoring well MW-1. In addition to providing a means by which groundwater samples can be obtained, monitoring wells provide, through continued monitoring and sampling, valuable information to aid in local hydrogeologic characterization. The scope of our field work consisted of a site reconnaissance, advancement of three additional borings completed as monitoring wells, water sampling, and obtaining water level measurements. The scope of our office and laboratory studies consisted of quantitative analysis of soil and groundwater samples, hydrogeologic evaluations, and report preparation. This report has been prepared for the exclusive use of Chevron U.S.A. Inc. and its agents, for specific application to this project in accordance with generally accepted hydrogeologic practices.

## 3.0 SITE CONDITIONS

The field exploration for this study was performed on 10 and 11 December 1987, with additional water samples and water level information being obtained on 19 January 1988. Detailed surface and subsurface conditions are described below, while the exploration procedures and logs are provided in Appendix A. The approximate locations of the explorations are indicated on the Site and Exploration Plan, Figure 1. Figures 2 and 3 represent groundwater potentiometric contour maps for 11 December 1987 and 19 January 1988, respectively. Quantitative laboratory analysis results, as well as supporting hydrogeologic data and documentation are presented in the text and appendices of this report.

### 3.1 Surface Conditions

Prior to our field work, the service station building and foundation, underground petroleum storage tanks, product piping and conduits, and dispensing systems had been demolished and/or removed. At the time of our field work (10 and 11 December 1987), a fast food restaurant was under construction in the northern portion of the property (see Figure 1). Overhead electrical powerlines existed along the west and north property boundaries. These powerlines, in conjunction with the restaurant under construction, limited the area in which explorations could be advanced. Although covered with snow, the site appeared to be surfaced with sand and gravel as suggested at our boring locations. Reportedly, some portions along the west, south, and north boundaries were covered with a thin layer of asphalt.

### 3.2 Subsurface Conditions

The subsurface exploration program for this phase of the project consisted of advancing three hollow-stem auger borings to depths ranging from 18.5 to 21.5 feet below the ground surface. At the direction of Chevron U.S.A. Inc., these eight-inch diameter borings were completed as monitoring well installations. The borings were located in a manner such that: 1) areas adjacent to previous underground storage tanks or dispensing systems be evaluated; 2) at least one well be in a down-gradient position relative to the underground storage tanks, etc.; 3) adequate coverage of the site be achieved, including one up-gradient monitoring well location; 4) future, long-term monitoring (one year) or well abandonment not be hampered. In addition, the location of the existing structure and overhead power easements restricted access somewhat at the locations of monitoring wells MW-2 and MW-3.

The subsurface conditions at each of our exploration locations were interpreted to be generally consistent, with only minor changes observed due to variations in soil contact elevations and/or ground surface elevations. Each of our explorations encountered surficial, medium dense, dark brown and black, silty, gravelly, fine to coarse sand fill to depths of about 2 to 3.5 feet. Beneath this fill material, medium dense, moist, brown, fine to medium sand with variable minor amounts of silt and gravel was encountered. Extending to 7.5 to 8 feet, these sands graded to moist, brown-gray, silty, gravelly sand. At depths ranging from 10 to 11 feet, these dense sands became dense to very dense, wet to saturated, medium and dark gray, gravelly, medium to coarse sand with a trace of silt. These well-graded sands were encountered to the terminated depth of each exploration.

Geologic boring logs indicating the soil and groundwater conditions encountered at each location are included in Appendix A.

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The granular deposits reflect the geologic depositional environment characteristics of this area, namely fluvial and deltaic deposits of sand and gravel associated with meltwater runoff from the last of several major glacial episodes which affected the Anchorage area. Such deposits are wide-spread throughout the area and often are associated with small surface lakes or ponds. Such a surface pond was present immediately west and northwest of this site prior to area-wide development.

#### **4.0 SOIL AND WATER SAMPLING PROCEDURES**

Soil sampling for subsequent hydrocarbon concentration analysis was conducted at the site on 10 December 1987. The soil samples at each interval were recovered utilizing procedures intended to minimize the risk of cross-contamination between sampled intervals. Prior to each sampling, the tools were thoroughly scrubbed with a stiff brush and a detergent solution consisting of Alconox and water, and then rinsed with potable water and liberal quantities of deionized water. After sampling, recovered samples were homogenized in the field and then rapidly placed in laboratory-prepared glass vials, and then tightly sealed with a Teflon-lined threaded cap. The retained portions of the samples were kept on ice throughout the field program. Selected samples were subsequently transferred to an analytical testing laboratory in strict accordance with Rittenhouse-Zeman and Associates, Inc. "chain of custody" procedures.

Water sampling for subsequent hydrocarbon analysis was conducted at the site on 11 December 1987. Following development, each well was "purged" prior to sampling. Approximately five times the well volume of water was removed from each well, using a stainless steel bailer. The bailer was cleaned prior to use in each well by procedures consistent with those described above for soil sampling. Following the purging process, the wells were sampled in the order in which they were purged.

#### **5.0 HYDROCARBON CONCENTRATION ANALYSES**

The hydrocarbon concentration analyses were subcontracted to Northern Testing Laboratories, Inc. in Anchorage, Alaska. The soil samples were analyzed by EPA method 8020 by gas chromatography for volatile aromatic compounds. Volatile aromatic compounds include those constituents of gasoline and related fuels such as benzene,

toluene, ethylbenzene, xylene (commonly referred to as BTEX). The water samples were analyzed by EPA method 602, also for volatile aromatic compounds. The test results are reported in milligrams per kilogram (mg/kg) for soil and micrograms per liter (ug/l) for water, which are equivalent to parts per million (ppm), and parts per billion (ppb) respectively. All sample analyses are presented in Table 1 of this report which indicates the exploration and sample number as well as the measured hydrocarbon concentration of the sample tested. A copy of the test certificate is included with this report (Table 1). Laboratory results for the 19 January 1988 sampling event had not been received as of the writing of this report.

## 6.0 MONITORING WELL OBSERVATIONS

At the direction of Chevron U.S.A. Inc., long-term monitoring of the on-site wells will include sampling once a month for three months with quarterly events taking place for the remainder of an extended monitoring period of one year.

Each of the four monitoring wells were sampled on 11 December 1987 and 19 January 1988. Monitoring well MW-1, was sampled following its installation on 10 September 1987. Static water level measurements were obtained at the time of sampling, including readings taken before and after "purging" of the wells. Measurements were obtained utilizing an Olympic electronic water level probe graduated to tenths of a foot. Measurements were reproduced with the aid of water-gauging paste and a steel tape graduated to hundredths of a foot. In addition, the thickness of any free-phase liquid hydrocarbon product was measured at this time. Measureable accumulation of free-phase product has not been observed in any of the monitoring structures during the first three sampling events.

Although the water levels measured since the time of well completion are fluctuating (probably due to seasonal influence), comparison of the respective data suggests the direction of groundwater migration to be relatively unchanged with time (see Appendix B). Each prepared potentiometric map supports our initial conclusion of an inferred west-northwesterly gradient (see Figures 2 and 3). Additional water level information from each of the monitoring wells is presented in Appendix B. Monitoring well as-built data is presented on the boring logs contained in Appendix A.

Rittenhouse-Zeman & Associates, Inc. completed a vertical control survey using a self-leveling level employing differential elevation techniques. The ground surface adjacent to



each well in addition to the top of each monitoring structure (PVC) was surveyed to 0.01 foot precision relative to a common datum. The benchmark utilized (to which each reported elevation is referenced) was the base of a steel powerpole near the northwest property corner (see Figure 1), assigned an elevation of 100.00 feet for the purpose of this study.

## 7.0 CONCLUSIONS

Subsequent monitoring and associated analytical laboratory data provide information to aid in determination of the fugitive product source. Three of the four monitoring wells exhibit characteristics associated with subsurface hydrocarbon contamination. The location(s) of the monitoring wells in conjunction with reported laboratory results and the inferred direction of groundwater migration, suggest the product source location to be (or have been) within the subsurface on-site soils. Water samples obtained from monitoring wells MW-1, MW-2 and MW-3, were analyzed in the laboratory, and contained elevated concentrations of purgeable aromatic compounds (benzene, toluene, ethylbenzene, xylene, etc.). A water sample from monitoring well MW-4 did not reflect petrochemical concentrations consistent with the previous three. This is likely the result of its up-gradient position relative to the potential fugitive product source area(s). Analytical laboratory data is contained in Table 1 of this report, which represents copies of the actual test certificates.

It should be noted that a detailed historical assessment was not performed for this site. Domestic water supply wells were not observed in the immediate vicinity and are not likely to be present within a limited radius of the site due to area-wide retail development. A comprehensive assessment utilizing field reconnaissance and available local records would be necessary to evaluate potential and/or likely ramifications of the on-site hydrocarbon concentrations.

The conclusions presented in this report are our professional opinions based on the explorations and analysis conducted for this project. The boring locations, sample intervals, and analytical laboratory testing procedures were completed within the site and proposal constraints so as to yield the information necessary to formulate our conclusions.

We appreciate this opportunity to be of service to you on this phase of the Benson Blvd. and Seward Highway Chevron service station project. If you have any questions regarding

Chevron U.S.A. Inc.

29 January 1988

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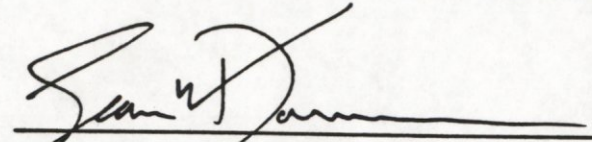
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this report or other aspects of the project, please do not hesitate to call at your convenience.

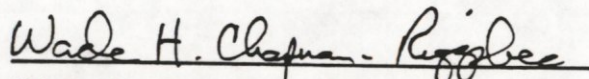
Respectfully submitted,

RITTENHOUSE-ZEMAN & ASSOCIATES



Sean W. Donnan

Hydrogeologist



Wade H. Chapman-Riggsbee, P.G.

Principal Hydrogeologist

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**APPENDIX A**

**W-5410**

**SUBSURFACE EXPLORATION**

## APPENDIX A W-5410

### SUBSURFACE EXPLORATION

The field exploration program conducted for this study consisted of advancing a series of three hollow-stem auger borings. The approximate exploration locations are illustrated on the Site and Exploration Plan, Figure 1. The locations were obtained in the field by taping from existing site features and should be considered accurate to the degree implied by the method used.

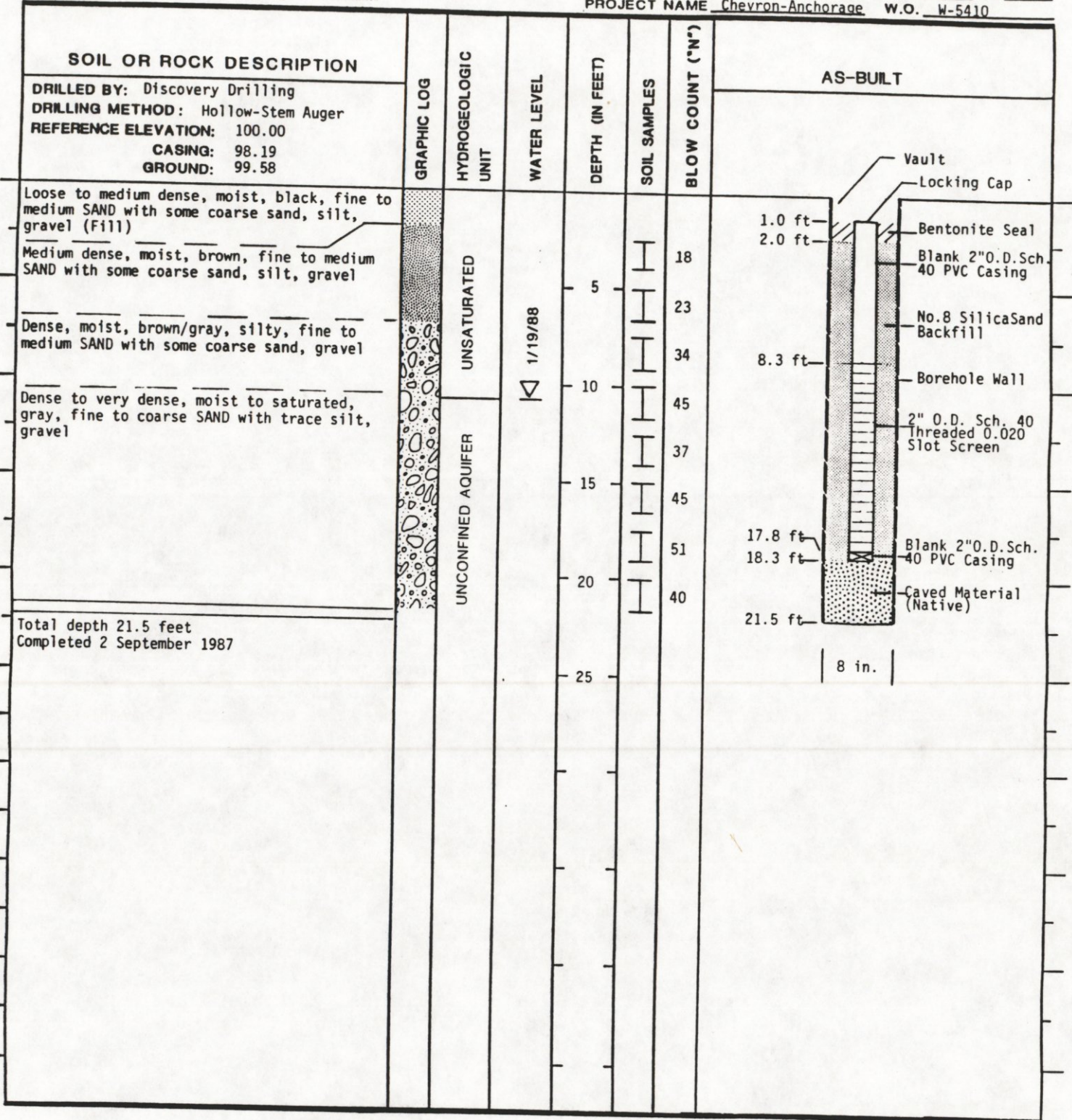
#### Hollow Stem Auger Borings

The borings were drilled on 10 December 1987, by a local exploration drilling company under subcontract to our firm. The borings consisted of advancing a 4-inch inside diameter, hollowstem auger with a truck-mounted drill rig. During the drilling process, samples were generally obtained at 2.5 or 5.0 foot depth intervals. The borings were continuously observed and logged by a hydrogeologist from our firm.

Representative samples were obtained by using the Standard Penetration Test Procedure as described in ASTM:D 1586. This test and sampling method consists of driving a standard 2-inch outside diameter split barrel sampler a distance of 18 inches into the soil with a 140 pound hammer free-falling a distance of 30 inches. The number of blows for each 6 inch interval is recorded. The number of blows required to drive the sampler the final 12 inches is considered the Standard Penetration Resistance ("N") or blow count. The blow count is presented numerically on the boring logs in this appendix. If a total of 50 blows is recorded within one 6-inch interval, the blow count is recorded as 50 blows for the number of inches of penetration. The resistance, or "N" value, provides a measure of the relative density of granular soils or the relative consistency of cohesive soils.

The boring logs presented in this appendix are based on the drilling action, inspection of the samples secured, laboratory results and field logs. The various types of soils are indicated as well as the depths where the soils or characteristics of the soils changed. It should be noted that these changes may have been gradual, and if the changes occurred between sample intervals, the depths of the changes were interpreted.

The groundwater conditions observed during the exploration program are indicated on the boring logs. These subsurface water conditions were evaluated by observing the moisture condition of the samples, or the free water on the sampling rods. The groundwater level is indicated on the boring logs where appropriate by a triangular water symbol. Monitoring wells were installed in each of the borings to monitor groundwater levels, and to provide for future groundwater sampling events. The wells consist of 2-inch diameter Schedule 40 PVC and incorporate a monitoring interval of approximately 10 vertical feet located at a depth which intersects the groundwater table surface. This was accomplished by surrounding a 10-foot section of 0.020 inch slotted PVC screen with No. 8 silica sand in the bore hole. A bentonite seal was installed above this sand pack. Documentation of installation parameters for each individual monitoring well is provided on the boring logs.



SAMPLING

- I 2' OD SPLIT SPOON SAMPLE
- II 3' OD SHELBY SAMPLE
- ☒ 2.5' ID RING SAMPLE
- B BULK SAMPLE
- \* SAMPLE NOT RECOVERED

GROUNDWATER

- ▽ WATER LEVEL AT TIME OF DRILLING
- ATD -OR AS NOTED



SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HYDROGEOLOGIC UNIT	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	BLOW COUNT ("N")	AS-BUILT
DRILLED BY: Discovery Drilling DRILLING METHOD: Hollow-Stem Auger REFERENCE ELEVATION: 100.00 CASING: 98.51 GROUND: 99.35							
Loose to medium dense, moist, dark brown to black, fine SAND, with some silt and a trace of coarse sand and gravel (Fill)		UNSATURATED	1/19/88 	5	I	24	Vault Locking Cap 0.8 ft Native Backfill Blank 2"O.D. Sch. 40 PVC Casing
Medium dense, moist, medium brown, fine to medium SAND with a trace to some silt and gravel				10	I	77	4.5 ft 5.9 ft 7.0 ft Bentonite Seal No.8 Silica Sand Backfill Borehole Wall
Dense, moist, brown-gray, silty, gravelly SAND				15	I	44	2"O.D. Sch.40 Threaded 0.020 Slot Screen
Dense to very dense, wet, medium gray, medium to coarse SAND with some gravel to gravelly (variable) and a trace of silt		UNCONFINED AQUIFER		20	I	50/3"	16.4 ft 17.2 ft Blank 2"O.D. Sch. 40 PVC Casing Caved Material (Native)
Total depth 21.5 feet Boring completed 10 December 1987				25			21.5 ft 8 in.

**SAMPLING**

- I 2' OD SPLIT SPOON SAMPLE
- II 3' OD SHELBY SAMPLE
- ☒ 2.5' ID RING SAMPLE
- B BULK SAMPLE
- \* SAMPLE NOT RECOVERED

**GROUNDWATER**

- ▽ WATER LEVEL AT TIME OF DRILLING -OR AS NOTED
- ATD



SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HYDROGEOLOGIC UNIT	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	BLOW COUNT ('N')	AS-BUILT
DRILLED BY: Discovery Drilling DRILLING METHOD: Hollow-Stem Auger REFERENCE ELEVATION: 100.00 CASING: 98.78 GROUND: 100.05							
Loose to medium dense, moist, dark brown, fine SAND with some silt, coarse sand and gravel	[Pattern]	UNSATURATED	1/19/88	5	I	20	Vault Locking Cap 1.3 ft Native Backfill Blank 2" O.D. Sch. 40 PVC Casing 3.7 ft Bentonite Seal 5.5 ft No. 8 Silica Sand Backfill 8.2 ft Borehole Wall 2" O.D. Sch. 40 Threaded 0.020 Slot Screen
Medium dense, moist, medium brown, fine SAND with a trace of silt and gravel	[Pattern]			10	I	74	17.5 18.0 ft 18.5 ft Blank 2" O.D. Sch. 40 PVC Casing Caved Material (Native) 8 in.
Medium dense to dense, moist, brown-gray, silty, gravelly SAND	[Pattern]	UNCONFINED AQUIFER	▽	15	I	55	
Dense to very dense, wet, dark gray, gravelly medium to coarse SAND with a trace of silt	[Pattern]			20	I		
Total depth 18.5 feet Boring completed 10 December 1987				25			

SAMPLING

- I 2" OD SPLIT SPOON SAMPLE
- II 3" OD SHELBY SAMPLE
- ☒ 2.5" ID RING SAMPLE
- B BULK SAMPLE
- \* SAMPLE NOT RECOVERED

GROUNDWATER

- ▽ ATD WATER LEVEL AT TIME OF DRILLING -OR AS NOTED





SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HYDROGEOLOGIC UNIT	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	BLOW COUNT ("N")	AS-BUILT
							AS-BUILT
DRILLED BY: Discovery Drilling DRILLING METHOD: Holo-Stem Auger REFERENCE ELEVATION: 100.00 CASING: 98.47 GROUND: 99.78							
Loose to medium dense, moist, dark brown, fine to medium SAND with some silt, coarse sand and gravel (Fill)		UNSATURATED		5	I	20	Vault Locking Cap 1.3 ft Native Backfill Blank 2" O.D. Sch. 40 PVC Casing Bentonite Seal 4.7 ft 5.2 ft 6.2 ft No. 8 Silica Sand Backfill Borehole Wall 2" O.D. Sch. 40 Threaded 0.020 Slot Screen
Medium dense, moist, medium brown, fine SAND with a trace of silt and gravel		UNSATURATED		10	I	70	
Medium dense to dense, moist, brown-gray, silty, gravelly SAND		UNSATURATED	1/19/88	15	I	52	
Dense to very dense, wet, medium to dark gray, gravelly, medium to coarse SAND with a trace of silt		UNCONFINED AQUIFER		20			16.0 ft 16.5 ft 19.0 ft Blank 2" O.D. Sch. 40 PVC Casing Caved material (Native)
Total depth 19.0 feet Boring completed 10 December 1987				25			8 in.

- SAMPLING**
- I 2" OD SPLIT SPOON SAMPLE
  - II 3" OD SHELBY SAMPLE
  - ☒ 2.5" ID RING SAMPLE
  - B BULK SAMPLE
  - \* SAMPLE NOT RECOVERED

- GROUNDWATER**
- ▽ WATER LEVEL AT TIME OF DRILLING
  - ATD -OR AS NOTED

**APPENDIX B**  
**W-5410**

**WATER TABLE DATA**

**WATER TABLE DATA****MONITORING WELL MW-1**Approximate Surface Elevation 98.18 (ft) <sup>1)</sup>

<u>DATE</u>	<u>TIME</u>	<u>WATER TABLE ELEVATION 1)</u>	<u>DEPTH TO WATER</u>
4 September 1987	1400	87.10	11.09
11 December 1987	1110	87.61	10.58
19 January 1988	1230	87.51	10.68

**NOTES:**

1) Based on arbitrary datum

-Surface elevation represents top of well casing



**WATER TABLE DATA**

Appendix B (cont.)

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**MONITORING WELL MW-2**

Approximate Surface Elevation 98.51 (ft) <sup>1)</sup>

<u>DATE</u>	<u>TIME</u>	<u>WATER TABLE ELEVATION 1)</u>	<u>DEPTH TO WATER</u>
11 December 1987	0933	87.48	11.03
19 January 1988	1220	87.37	11.14

**NOTES:**

1) Based on arbitrary datum

-Surface elevation represents top of well casing



**WATER TABLE DATA**

Appendix B (cont.)

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**MONITORING WELL MW-3**

Approximate Surface Elevation 98.78 (ft) <sup>1)</sup>

<u>DATE</u>	<u>TIME</u>	<u>WATER TABLE ELEVATION 1)</u>	<u>DEPTH TO WATER</u>
11 December 1987	0940	87.63	11.15
19 January 1988	1240	87.52	11.26

**NOTES:**

1) Based on arbitrary datum

-Surface elevation represents top of well casing



**WATER TABLE DATA**

Appendix B (cont.)

0045

**MONITORING WELL MW-4**

Approximate Surface Elevation 98.47 (ft) <sup>1)</sup>

<u>DATE</u>	<u>TIME</u>	<u>WATER TABLE ELEVATION 1)</u>	<u>DEPTH TO WATER</u>
11 December 1987	0952	87.76	10.71
19 January 1988	1210	87.65	10.82

**NOTES:**

1) Based on arbitrary datum

-Surface elevation represents top of well casing



# NORTHERN TESTING LABORATORIES, INC.

600 UNIVERSITY PLAZA WEST, SUITE A  
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FAIRBANKS, ALASKA 99709  
ANCHORAGE, ALASKA 99503

907-479-3115  
907-277-8378

Rittenhouse-Zeman & Associates  
1400 - 140th Avenue N.E.  
Bellevue, Washington 98005

Attn: Sean Donnan

Source: Job # W-5410  
Sample ID#: A121187-5C, 6C, 7C

Date Arrived: 12/11/87  
Time Arrived: 1650  
Date Sampled: 12/10, 11,  
Time Sampled: Various  
Date Completed: 12/22/87

Parameter	Unit	MW-2, S-3	MW-3, S-3	MW-4, S-3
		A121187-5C	A121187-6C	A121187-7C

## Purgeable Aromatics: EPA Method 8020

Compound	Unit	MW-2, S-3	MW-3, S-3	MW-4, S-3
Benzene	mg/kg	<0.1	<0.1	<0.1
Chlorobenzene	mg/kg	<0.1	<0.1	<0.1
1,2-Dichlorobenzene	mg/kg	<0.3	<0.3	<0.3
1,3-Dichlorobenzene	mg/kg	<0.3	<0.3	<0.3
1,4-Dichlorobenzene	mg/kg	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.7	0.5	<0.2
Toluene	mg/kg	1.4	0.2	0.2
Xylenes	mg/kg	2.3	2.1	0.2

Reported By:

*Carol J. Garrison*

Date: 12/28/87

Carol J. Garrison, Vice-President



# NORTHERN TESTING LABORATORIES, INC.

600 UNIVERSITY PLAZA WEST, SUITE A  
2505 FAIRBANKS STREET

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ANCHORAGE, ALASKA 99503

907-479-3115  
907-277-8378

Rittenhouse-Zeman & Associates  
1400 - 140th Avenue N.E.  
Bellevue, Washington 98005

Attn: Sean Donnan

Date Arrived: 12/11/87  
Time Arrived: 1650  
Date Sampled: 12/10, 11,  
Time Sampled: Various  
Date Completed: 12/22/87

Source: Job # W5410  
Sample ID#: A121187-8C, 9C, 10C

Parameter	Unit	MW-1, S-2	MW-2, S-1	MW-3, S-1
		A121187-8C	A121187-9C	A121187-10C

Purgeable Aromatics: EPA Method 602

Benzene	ug/L	423	278	3900
Chlorobenzene	ug/L	<5.0	<50	<4.0
1,2-Dichlorobenzene	ug/L	<10	<100	<8.0
1,3-Dichlorobenzene	ug/L	<10	<100	<8.0
1,4-Dichlorobenzene	ug/L	<7.5	<75	<6.0
Ethylbenzene	ug/L	172	192	2060
Toluene	ug/L	1180	753	12100
Xylenes	ug/L	771	7470	9900

Reported By:

*Carol J. Garrison*

Date: 12/28/87

Carol J. Garrison, Vice-President





# NORTHERN TESTING LABORATORIES, INC.

600 UNIVERSITY PLAZA WEST, SUITE A  
2505 FAIRBANKS STREET

FAIRBANKS, ALASKA 99709  
ANCHORAGE, ALASKA 99503

907-479-3115  
907-277-8378

Rittenhouse-Zeman & Associates  
1400 - 140th Avenue N.E.  
Bellevue, Washington 98005

Attn: Sean Donnan

Source: Job # W-5410  
Sample ID#: A121187-11C, 12C

Date Arrived: 12/11/87  
Time Arrived: 1650  
Date Sampled: 12/10, 11/  
Time Sampled: Various  
Date Completed: 12/22/87

=====  
Parameter Unit MW-4, S-1 Travel Blank  
A121187-11C A121187-12C  
=====

Purgeable Aromatics: EPA Method 602

Benzene	ug/L	0.3	<0.2
Chlorobenzene	ug/L	<0.2	<0.2
1,2-Dichlorobenzene	ug/L	<0.4	<0.4
1,3-Dichlorobenzene	ug/L	<0.4	<0.4
1,4-Dichlorobenzene	ug/L	<0.3	<0.3
Ethylbenzene	ug/L	<0.2	<0.2
Toluene	ug/L	0.2	<0.2
Xylenes	ug/L	<0.6	<0.6

Reported By:

*Carol J. Garrison*

Date: 12/28/87

=====  
Carol J. Garrison, Vice-President



# NORTHERN TESTING LABORATORIES, INC.

600 UNIVERSITY PLAZA WEST, SUITE A  
2505 FAIRBANKS STREET

FAIRBANKS, ALASKA 99709  
ANCHORAGE, ALASKA 99503

907-479-3115  
907-277-8378

## Quality Control Report

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Client: RZA, Inc.  
ID#: A121187-5C through 12C

Listed below are quality control assurance reference samples with a known concentration prior to analysis. The acceptable limits represent a 95% confidence interval established by the Environmental Protection Agency or by our laboratory through repetitive analyses of the reference sample. The reference samples indicated below were analyzed at the same time as your sample, ensuring the accuracy of your results.

Sample #	Parameter	Unit	Result	True Value
Varian Mix 16	Benzene	ug/L	8.3	10.0
	Toluene	ug/L	11.0	10.0
	Ethylbenzene	ug/L	10.7	10.0
	Chlorobenzene	ug/L	10.7	10.0
	1,4-Dichlorobenzene	ug/L	9.3	10.0
	1,2-Dichlorobenzene	ug/L	9.7	10.0

Reported By: \_\_\_\_\_

*Carol J. Garrison*

Date: 12/28/87

Carol J. Garrison, Vice-President