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Chevron Environmental Management Company

2008 Vapor Assessment Report

Former Texaco Facility 211079

1501 South Cushman Street

Fairbanks, Alaska

December 2, 2008

ARCADIS

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2008 Vapor Assessment Report

Former Texaco Facility 211079
1501 South Cushman Street
Fairbanks, Alaska

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Chevron Environmental Management Company

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Table of Contents

Table of Contents

Tables

Figures

Appendices

1. Introduction

On behalf of Chevron Environmental Management Company (Chevron), ARCADIS U.S., Inc. (ARCADIS) has prepared this vapor assessment report for former Texaco 211079 located at 1501 South Cushman Street in Fairbanks, Alaska (the site). This assessment report supplements ARCADIS' 2007 Soil Vapor Assessment report for the site. The site and surrounding area are shown on **Figure 1**. This report summarizes the field activities and results of the vapor assessment conducted on September 14, 2008. This work was conducted under direction of a "qualified person" [18 AAC 75.990 (100), and 18 AAC 78.995 (118)].

2. Site Description

The property was previously operated as a Texaco service station and was closed in 1986. The former service station, car wash, and pump islands are no longer present at the site. Six single-walled steel underground storage tanks (USTs) were installed onsite in 1963. Five of the tanks (four 4,000 gallon and one 6,000 gallon) were reportedly used for gasoline storage and one tank (550 gallon) was used for used oil storage. The USTs, dispenser islands, and product lines were reportedly removed in 1988, although conflicting reports suggest that some of the tanks may have been removed in 1993. Soil and groundwater were observed to be impacted by petroleum during the tank removal in 1988. A remediation system was operated at the site from 1993 to 1998. There is currently a UST for heating oil located on the property.

Groundwater was monitored on a quarterly basis from 1994 to 2000, and was monitored on a semi-annual basis from 2001 to 2006. Remediation via soil vapor extraction (SVE) began in December 1993, and an air sparge (AS) system was later added in June 1994. The system consisted of six vapor extraction wells and seven sparge wells in the former tank pit and dispenser island areas. The system reduced concentrations of dissolved hydrocarbons by up to two orders of magnitude in onsite wells. Following approval from the Alaska Department of Environmental Conservation (ADEC), the AS/SVE system was permanently shut down in December 1998.

The concentrations of dissolved petroleum compounds in groundwater at the site and immediately down-gradient of the site are stable or decreasing. This is evidence that dissolved-phase petroleum hydrocarbons may be undergoing natural attenuation. Light, non-aqueous phase liquid (LNAPL) has not been observed at the site.

The site is mostly paved (the offsite area by monitoring well MW-6 is not paved) and located in a developed area. The site is currently the location of an active church. The petroleum impacts appear to have originated from the original USTs, underground piping and/or the dispenser islands, which were located on the northwestern portion of the site. The environmental impact caused by the release of petroleum hydrocarbons at the site is believed to be limited to the impacts to groundwater, soil, and possibly indoor air. The current potential receptors are commercial or industrial workers, residents (the property immediately down-gradient is residential), site visitors and trespassers.

In December 2006, ARCADIS issued a request for No Further Remedial Action Planned (NFRAP) to be issued by ADEC for the site. In response to this request, ADEC asked for additional information, including details about a domestic water well located to the north of the site, and an investigation into the possibility of a vapor intrusion pathway to indoor air.

In 2007, ARCADIS investigated a single identified domestic water well, located approximately 1,750 feet north of the site (El Dorado Estates). According to Rex Gavin, a member of the El Dorado Estates Board of Directors, the well has only been used for lawn watering.

In order to assess the potential for vapor intrusion at the site, ARCADIS installed a permanent soil vapor probe in 2007 in a location selected based on the highest remaining volatile groundwater concentrations at the site (vapor probe VP-1). The location of vapor probe VP-1 is shown on **Figure 2**. The analytical results indicated concentrations of benzene exceeding the Environmental Protection Agency (EPA) screening level for shallow gas concentrations during 2007 vapor sampling.

At the request of ADEC, an additional groundwater sampling event was conducted in April 2008 following ARCADIS' request for NFRAP. The analytical results indicated concentrations of gasoline range organics (GRO), diesel range organics (DRO), benzene and ethylbenzene exceeding the applicable ADEC groundwater cleanup level (GCL) in at least one groundwater sample.

3. Vapor Sampling

3.1 Sampling Procedures

The existing fittings on vapor probe VP-1 were replaced with air tight 2-way valves. The well head and entire sampling train (valves, tubing, fittings, gauges, SUMMA™ canister) were placed in an enclosure. Helium, used as a tracer compound for a leak test, was then permitted into the enclosure and monitored for concentration stability with a helium detector. Helium concentrations were maintained at approximately 10-20% for the duration of purging and sampling at each location. The leak test is performed to ensure the integrity of the sampling system.

Purging consisted of removing approximately three volumes of stagnant soil gas using a 3-way valve and a personal sample pump. The purge volume was calculated based on the dimensions of the above-ground gauges, tubing, sampling equipment and below-ground tubing.

Following purging, the soil gas sample was then collected using a 6-liter SUMMA™ canister with a laboratory provided flow regulator set to approximately 200 milliliters per minute (mL/min) for a sampling period of approximately 30 minutes. Laboratory supplied SUMMA™ canisters were 100% certified by the laboratory prior to field receipt. Initial and final vacuum gauge readings were taken for each sample and recorded on the soil gas sample collection logs included in **Appendix A**.

A duplicate sample was collected in-line with its parent sample via a laboratory supplied duplicate tee fitting. The parent 6-liter SUMMA™ canister and the duplicate 6-liter SUMMA™ canister each were fitted with a laboratory provided flow regulator set to approximately 100 mL/min to maintain a combined flow of approximately 200 mL/min.

A field blank sample was collected by transferring the contents of a laboratory provided 6-liter pressurized SUMMA™ canister to an evacuated 6-liter SUMMA™ canister using a section of Teflon-lined polyethylene tubing from the batch of tubing used during sampling. A trip blank was also submitted as an evacuated 6-liter SUMMA™ canister that travelled with the batch of canisters but was never opened.

Two ambient air samples were collected, one upwind and one downwind, of the site using evacuated 6-liter SUMMA™ canisters with laboratory supplied flow controllers

set to approximately 200 mL/min. These samples were collected to assess any potential background contributions present in ambient air.

The vapor samples were shipped to Lancaster Laboratories in Lancaster, Pennsylvania for analysis of the following:

- BTEX and naphthalene by USEPA Method TO-15
- Oxygen, carbon dioxide and helium by American Society for Testing and Materials (ASTM) Method D-1946
- Methane by USEPA 18 modified

3.2 Soil Vapor Screening Levels

Soil gas screening levels used in this vapor assessment can be found in Table 2c of the USEPA Draft Guidance for Evaluation the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002). These screening levels are based on an incremental lifetime cancer risk of 1×10^{-6} or a non-cancer hazard index of 1 under a residential exposure scenario. The samples collected from 5 feet below ground surface (bgs) are compared to shallow gas screening levels (≤ 5 feet bgs) and the samples collected from 9 feet bgs are compared to deep soil gas screening levels (>5 feet bgs).

3.3 Soil Vapor Analytical Results

Samples collected from vapor probe VP-1 at 5 feet bgs did not contain concentrations of the analyzed compounds above USEPA screening levels for shallow soil gas. Benzene, ethylbenzene, o-xylene and naphthalene were not detected above the respective laboratory detection limits.

Samples collected from vapor probe VP-1 at 9 feet bgs did not contain concentrations of the analyzed compounds above USEPA screening levels for deep soil gas. Ethylbenzene and naphthalene were not detected above the respective laboratory detection limits.

Soil vapor analytical data is summarized in **Table 1** and on **Figure 3**.

3.4 Fixed Gases and Biodegradation

The presence and concentration of oxygen and carbon dioxide can be indications of biodegradation of soil gas vapors in the subsurface. Due to low concentrations of volatile organic compounds and carbon dioxide with near atmospheric concentrations of oxygen, the potential for biodegradation of vapors in the vicinity of vapor probe VP-1 is inconclusive. A vapor attenuation factor from biodegradation is not applied to the analytical results present in this report. Fixed gas concentrations are summarized in **Table 2**.

3.5 Ambient Air Analytical Results

Two ambient air samples were collected during the September 14, 2008 vapor sampling event to assess potential background sources present in ambient air. Based on an approximate wind direction from the northeast to the southwest, one upwind ambient air sample was collected northeast of vapor probe VP-1 and one downwind ambient air sample was collected southwest of vapor probe VP-1. The approximate locations of these ambient air samples are shown on **Figure 4**.

Benzene, toluene, m/p-xylenes and o-xylene were detected at concentrations above the laboratory detection limits in both ambient air samples. Ethylbenzene was detected at a concentration above the laboratory detection limit in the upwind ambient air sample. There is no screening level established for these ambient samples. The ambient air analytical data are summarized in **Table 3** and **Figure 4**.

The concentrations in ambient air presented here are in most cases equivalent or higher than the concentrations in the soil gas samples collected from vapor probe VP-1. This indicates significant background concentrations potentially attributable to factors other than subsurface contamination. ADEC provides information on background levels of chemicals reported in indoor air in Appendix B of their 2004 technical memorandum (ADEC, 2004).

Additionally, ADEC cites research conducted in Anchorage (Schlapia and Morris, 1998) and Fairbanks (Maxwell, 2004) which found outdoor concentrations of BTEX at levels exceeding the shallow soil gas screening levels. This research, combined with the ambient air analytical results, indicate that the ambient air may contain higher concentrations of the target compounds than the soil gas concentrations and act as a major background source at this site.

4. Vapor Sampling Data Quality Assurance

For data quality assurance (QA) purposes, multiple QA techniques were employed during the September 14, 2008 vapor sampling. A leak test was performed at each sample location to ensure integrity of the sampling system and to demonstrate that ambient air was not being permitted into the sampling train or entering the subsurface, potentially biasing the samples. In addition, a field blank and a trip blank were submitted to assess background contamination due to equipment or bias due to contamination during transport to and from the laboratory. Canister pressures were also analyzed from field documents and laboratory receipt documents to ensure there were not leaks during transport.

4.1 Leak Test Analytical Results

A leak test was performed at each sampling location with the exception of the ambient air samples, trip blank and field blank. The respective well head and entire sampling train (valves, tubing, fittings, gauges, SUMMA™ canister) were placed within an enclosure. Helium, used as the tracer compound for the leak test, was then permitted into the enclosure and monitored for concentration stability with a helium detector. Helium concentrations were maintained at approximately 10-20% for the duration of purging and sampling at each location.

Helium was not detected above the laboratory detection limit of 0.05 % by volume in the samples collected from vapor probe VP-1. This indicates that the integrity of the sampling train was maintained throughout sampling and confirms the absence of atmospheric leakages into the samples. Helium analytical results are summarized in **Table 2**.

4.2 Field Blank and Trip Blank Analytical Results

There were no detections of the analyzed compounds in the field blank sample above the laboratory reporting limit, demonstrating that sampling equipment did not bias the samples. Additionally, there were no detections of the analyzed compounds above the laboratory detection limit in the trip blank sample. Analytical results for quality assurance samples are summarized in **Table 3**.

4.3 Canister Vacuum Readings

An initial vacuum reading was taken for each SUMMA™ canister during field setup for sampling. A final vacuum reading was taken at the end of the sampling period. These readings were recorded on the respective soil gas sample collection logs included in **Appendix A**. Upon laboratory receipt, a final vacuum pressure was recorded by the laboratory to assess whether leakage occurred during transport.

Final laboratory vacuum readings were corrected for elevation differences between the laboratory in Lancaster, Pennsylvania (approximately 368 feet above sea level) and the site in Fairbanks, Alaska (approximately 446 feet above sea level). The approximate relationship between elevation and vacuum gauge readings recommended by the laboratory is 1 inch of mercury (in Hg) per 1,000 feet in elevation gain. The laboratory vacuum readings were adjusted for comparison to the site readings using the following correction:

$$Vac_{corr}^{lab} = Vac_{un}^{lab} + \left(-78\ feet \times \frac{1\ in\ Hg}{1{,}000\ feet}\right)$$

where:

Vac_{corr}^{lab} = laboratory vacuum reading, corrected for elevation (in Hg)

Vac_{un}^{lab} = laboratory vacuum reading, uncorrected for elevation (in Hg)

Table 4 summarizes the canister vacuum readings. The field blank sample shows an increase in vacuum of approximately 8.12 in Hg upon arrival at the lab. A crack in the vacuum gauge glass (as indicated in the field notes for this sample) likely caused a false reading in the field; however, upon laboratory receipt, the canister still contained an adequate vacuum and sample volume to allow for proper analysis.

The average change in vacuum for the remaining sample canisters is a decrease of 0.36 in Hg with a standard deviation of ± 0.68 in Hg. These values can be considered negligible and may simply reflect human error in analog vacuum readings in the field compared to digital vacuum readings in the laboratory.

5. Laboratory Data Quality Assurance Summary

As required by ADEC (Technical Memorandum 06-002, dated August 20, 2008), ARCADIS completed a laboratory data review checklist for the Lancaster laboratory

report from the 2008 vapor sampling event. The laboratory reports and associated data review checklist is included as **Appendix B**. The following QA summary describes six parameters, related to the quality and usability of the data presented in this report.

5.1 Precision

Based on the laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) relative percent differences, the data meet precision objectives. A field duplicate was collected for the vapor samples. The relative percent differences (RPDs) for the analyzed compounds were 0% for the vapor field duplicate with the exception of toluene, m/p-xylenes and oxygen with RPDs of 7.41%, 40% and 6.45%, respectively. Data quality or usability does not appear to be affected.

RPDs were calculated using the following formula:

$$RPD = \left| \frac{R_1 - R_2}{\left(\frac{R_1 + R_2}{2}\right)} \times 100 \right|$$

Where:

RPD = relative percent difference (%)
R_1 = sample concentration (ppbv or %)
R_2 = field duplicate concentration (ppbv or %)

5.2 Accuracy

The data meet accuracy objectives as indicated by the laboratory quality control samples (LCS), which were within method/laboratory limits.

5.3 Representativeness

The data appear to be representative of site conditions and are generally consistent with expected soil and vapor concentrations.

5.4 Comparability

These data are reported using the same units and formats as previous monitoring reports to allow for comparison.

5.5 Completeness

The results appear to be valid and usable, and thus, the laboratory results have 100% completeness.

5.6 Sensitivity

The sensitivity of the analyses was adequate for the samples as the laboratory reporting limits were less than the applicable vapor screening levels. A trip blank sample was submitted with the vapor samples for analysis of BTEX, naphthalene, oxygen, carbon dioxide, methane and helium. The vapor trip blank sample did not contain analyte concentrations above the laboratory reporting limits.

6. Updated Conceptual Site Model

The site is paved (offsite area by monitoring well MW-6 is not paved), located in a developed area and is currently the location of an active church. The petroleum impacts appear to have originated from the original USTs, underground piping and/or the dispenser islands, which were located on the northwestern portion of the site. The environmental impact caused by the release of petroleum hydrocarbons at the site is believed to be limited to the impacts to groundwater, soil, and possibly indoor air. The current potential receptors are commercial or industrial workers, residents (property immediately down-gradient is residential), and site visitors or trespassers.

Future potential receptors include residents and construction workers. The nature of these vapor assessment activities was designed to investigate the potential for an inhalation pathway. Other receptors which were considered, and were subsequently ruled out include: farmers, subsistence harvesters and subsistence consumers. These receptors were excluded because the site is developed and is located in a commercial area.

As requested in ADEC's response to ARCADIS' NFRAP request, a single identified domestic water well, located approximately 1,750 feet north of the site (El Dorado Estates) was investigated for its use, exact location and final depth. According to Rex

Gavin, a member of the El Dorado Estates Board of Directors, the well has only been used for lawn watering. An updated conceptual site model scoping form and graph are included in **Appendix C**.

7. Conclusions

Vapor samples collected in September 2008 from vapor probe VP-1 did not contain concentrations of benzene, ethylbenzene, toluene, m/p-xylenes, o-xylene or naphthalene above the respective USEPA soil gas screening levels for shallow or deep gas (as applicable) for residential areas. These data indicate that the possibility of vapor intrusion pathway to indoor air does not appear to exist.

Ambient air samples collected during the vapor sampling event contained concentrations of benzene, toluene, ethylbenzene, m/p-xylenes and o-xylenes in at least one sample suggesting that background interference due to ambient air concentrations may play a significant role in indoor air assessment.

8. References

ADEC. 2004. Draft Evaluation of Vapor Intrusion Pathway at Contaminated Sites Technical Memorandum. June 28, 16 pp.

Maxwell, Robert A. 2004. "Monitoring of Volatile Organic Compounds in Alaska Health Houses." Cold Climate Housing Research Center. Fairbanks, Alaska.

Schlapia, A. and S.S. Morris. 1998. "Architectural, Behavioral and Environmental Factors Associated with VOCs in Anchorage Homes." Presented at the Air and Waste Management Association's 91st Annual Meeting and Exhibition, June 14-18, 1998, San Diego, California.

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Tables

Table 1
Vapor Probe Analytical Data

Former Texaco 211079, 1501 South Cushman Street
Fairbanks, Alaska

Vapor Probe	Depth (ft)	Sample Date	Benzene	Toluene	Ethylbenzene	m/p-Xylenes	o-Xylene	Naphthalene
EPA Screening Level (Shallow Gas):			**0.98**	**1,100**	**5.1**	**16,000**	**16,000**	**5.7**
VP-1	**5**	08/09/07	2.2	62	2.6	4.4	1.8	<0.4
		8/9/2007[D]	1.1	22	1.8	3.1	1.3	<0.4
		09/14/08	**<0.2**	**1.4**	**<0.2**	**0.26**	**<0.2**	**<0.4**
		9/14/2008[D]	**<0.2**	**1.3**	**<0.2**	**0.39**	**<0.2**	**<0.4**
EPA Screening Level (Deep Gas):			**9.80**	**11,000**	**510.0**	**160,000**	**160,000**	**57**
VP-1	**9**	08/09/07	4.6	44	2.4	4.0	1.6	<0.4
		09/14/08	**1**	**1.7**	**<0.2**	**0.53**	**0.22**	**<0.4**

Notes:
Results are reported in parts per billion by volume (ppbv)
Bold Type = Results of most recent sampling event
Highlighted values indicate an exceedance of the respective EPA screening level
[D]Duplicate of the preceding sample
< = not detected greater than the laboratory reporting limit
EPA screening levels for shallow gas concentration based on residential land use

Table 2
Fixed Gases and Tracer Gas

Former Texaco 211079, 1501 South Cushman Street
Fairbanks, Alaska

Vapor Probe	Depth (ft)	Sample Date	Methane	Oxygen	Carbon dioxide	Helium
VP-1	**5**	08/09/07	0.00036	19	<0.025	--
		8/9/2007[D]	0.00032	21	<0.025	--
		09/14/08	**<0.00040**	**16**	**<0.025**	**<0.05**
		9/14/2008[D]	**<0.00040**	**15**	**<0.025**	**<0.05**
		08/09/07	0.00048	23	<0.025	--
		09/14/08	**<0.00040**	**18**	**<0.025**	**<0.05**

Notes:
Results are reported in percentage by volume (%v)
Bold Type = Results of most recent sampling event
[D]Duplicate of the preceding sample
< = not detected greater than the laboratory reporting limit
"--" = not analyzed

Table 3
Ambient Air and Quality Assurance Samples

Former Texaco 211079, 1501 South Cushman Street
Fairbanks, Alaska

Sample	Sample Date	Benzene	Toluene	Ethylbenzene	m/p-Xylenes	o-Xylene	Naphthalene
AMB-UP	**09/14/08**	**0.67**	**1.7**	**0.23**	**0.75**	**0.29**	**<0.4**
AMB-DOWN	**09/14/08**	**0.59**	**1.5**	**<0.20**	**0.60**	**0.23**	**<0.4**
Field Blank	**09/14/08**	**<0.40**	**<0.40**	**<0.40**	**<0.40**	**<0.40**	**<0.80**
Trip Blank	**09/14/08**	**<0.20**	**<0.20**	**<0.20**	**<0.20**	**<0.20**	**<0.40**

Notes:
All results are reported in parts per billion by volume (ppbv)
Bold Type = Results of most recent sampling event
< = not detected greater than the laboratory reporting limit

Table 4
Canister Vacuum Readings

Former Texaco 211079, 1501 South Cushman Street
Fairbanks, Alaska

Vapor Probe	Depth (ft)	Sample Date	Initial Field Vacuum	Final Field Vacuum	Final Lab Vacuum	Final Lab Vacuum (Corrected for Elevation)[1]	Change in Vacuum[2]
Vapor Probe Samples							
VP-1	5	09/14/08	30	5	4.2	4.1	0.88
		09/14/08[D]	28.5	11.5	11.0	10.9	0.58
	9	09/14/08	28	5.5	6.0	5.9	-0.42
Quality Assurance Samples							
AMB-UP	--	09/14/08	26	5	5.5	5.4	-0.42
AMB-DOWN	--	09/14/08	29.5	5.5	4.4	4.3	1.18
Field Blank[3]	--	09/14/08	20	5	13.2	13.1	-8.12
Trip Blank	--	09/14/08	--	--	--	--	--

Notes:
Readings are reported in inches of mercury (in Hg)
[D]Duplicate of the preceding sample
[1]Elevation Correction = Final Lab Vacuum - 0.078
[2]Change in Vacuum = Final Lab Vacuum (Corrected) - Final Field Vacuum
[3]Field notes indicate a crack on the vacuum gauge glass for this canister

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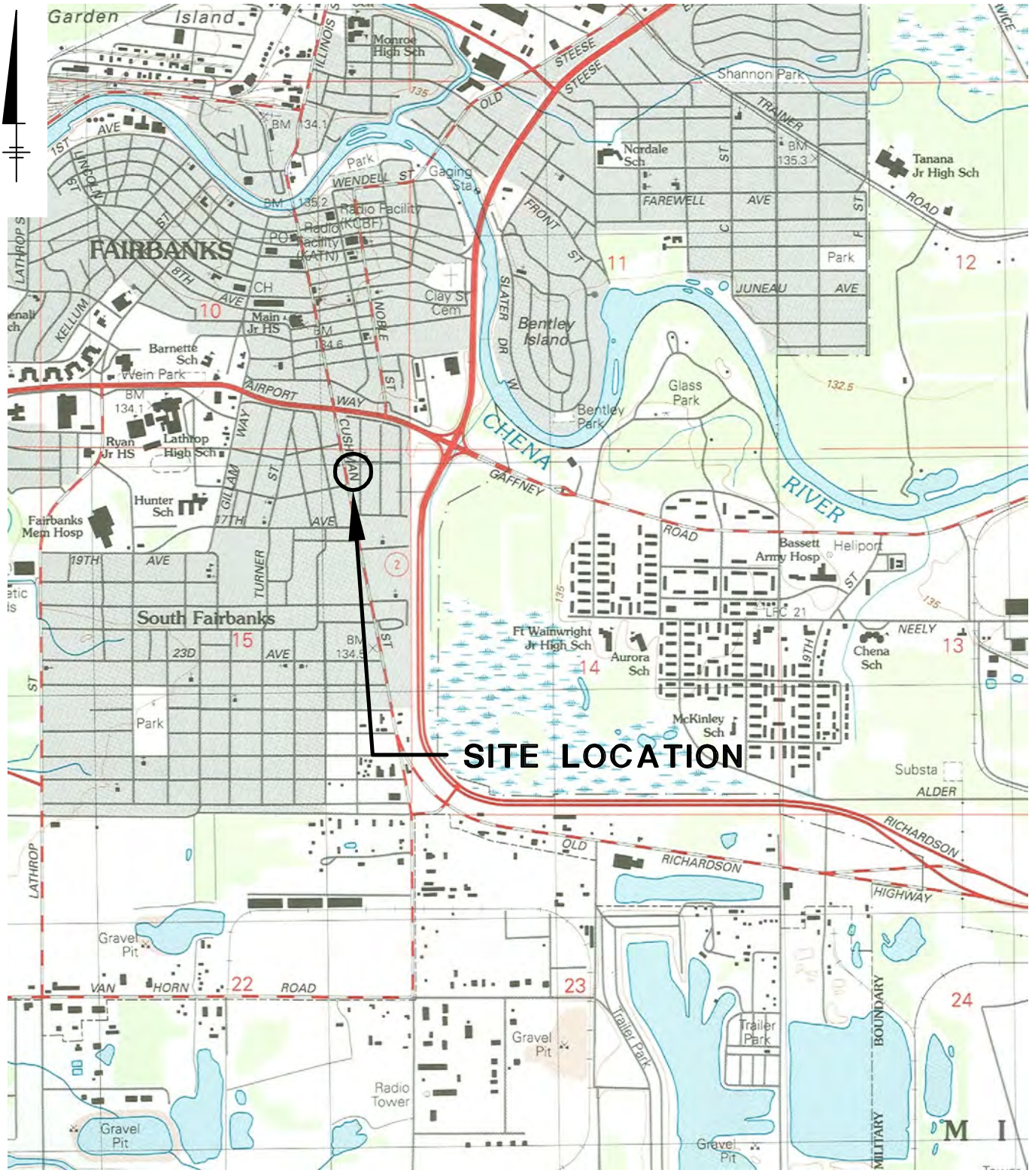
Figures



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE: FAIRBANKS (D-2) SE, AK., 1992, FAIRBANKS NORTH STAR BOROUGH, SECTION: 15, TOWNSHIP: 1S, RANGE: 1W

0 2000' 4000'

APPROXIMATE GRAPHIC SCALE

FORMER CHEVRON FACILITY #211079
1501 CUSHMAN STREET, FAIRBANKS, ALASKA
2008 VAPOR ASSESSMENT REPORT

SITE LOCATION MAP

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FIGURE 1

CITY:TMAPA,FL DIV/GROUP:85 DB:JAR LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
I:\YR_2008\B0045823\0001\000022008 VAR45823N01.dwg LAYOUT: 1 SAVED: 11/6/2008 10:06 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/12/2008 5:33 PM BY: RICHARDS, JIM
XREFS: IMAGES: ALASKA.jpg Fairbanks-SE.jpg PROJECTNAME: ---

SOURCE: Base map 'SITE PLAN' (Job #77CH.21079.04.0270) provided by SECOR, 3017 Kilgore Rd., Rancho Cordova, CA, (916) 861-0400. Map drawn full scale, map date Oct. 10, 2005.

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1501 CUSHMAN STREET, FAIRBANKS, ALASKA
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SITE MAP

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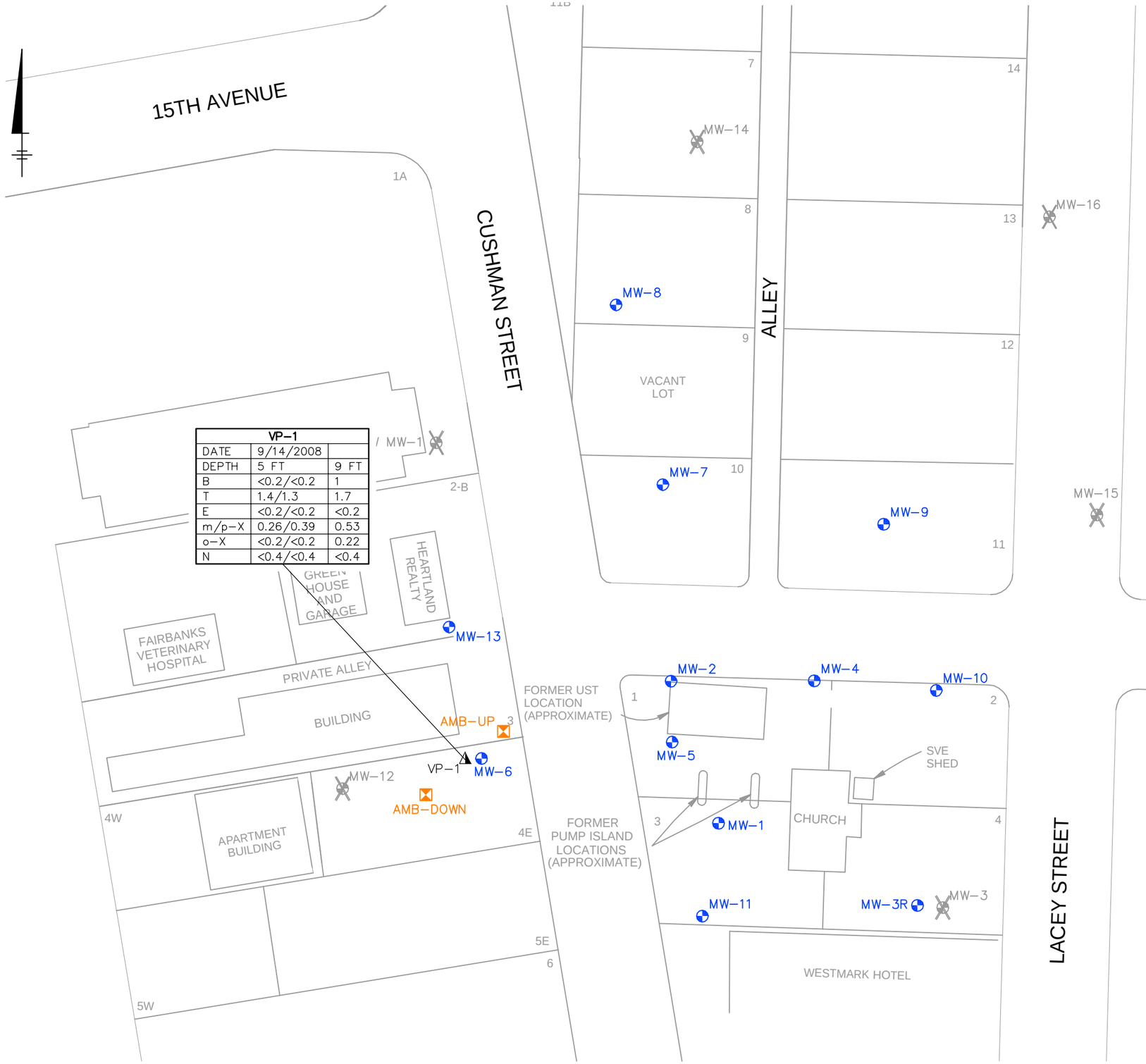
FIGURE
2



VP-1		
DATE	9/14/2008	
DEPTH	5 FT	9 FT
B	<0.2/<0.2	1
T	1.4/1.3	1.7
E	<0.2/<0.2	<0.2
m/p-X	0.26/0.39	0.53
o-X	<0.2/<0.2	0.22
N	<0.4/<0.4	<0.4

LEGEND

- MONITORING WELL
- DESTROYED MONITORING WELL
- SOIL VAPOR PROBE LOCATION
- AMBIENT AIR SAMPLE LOCATION

SAMPLE LOCATION	
DATE	SAMPLE DATE
DEPTH	SAMPLE DEPTH
B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
m/p-X	m/p-XYLENES
o-X	o-XYLENE
N	NAPHTHALENE

RESULTS REPORTED IN PARTS PER BILLION BY VOLUME (ppbv)

<0.2/<0.2 = DUPLICATE SAMPLE

BOLD VALUES INDICATE AN EXCEEDANCE OF THE RESPECTIVE EPA SCREENING LEVEL

NOTE: AMBIENT AIR SAMPLE LOCATIONS ARE APPROXIMATE.

0 50' 100'

GRAPHIC SCALE

SOURCE: Base map 'SITE PLAN' (Job #77CH.21079.04.0270) provided by SECOR, 3017 Kilgore Rd., Rancho Cordova, CA, (916) 861-0400. Map drawn full scale, map date Oct. 10, 2005.

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2008 VAPOR ASSESSMENT REPORT

SOIL VAPOR ANALYTICAL SUMMARY MAP

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FIGURE
3

AMB-DOWN	
DATE	9/14/2008
B	0.59
T	1.5
E	<0.20
m/p-X	0.60
o-X	0.23
N	<0.4

AMB-UP	
DATE	9/14/2008
B	0.67
T	1.7
E	0.23
m/p-X	0.75
o-X	0.29
N	<0.4

LEGEND

- MONITORING WELL
- DESTROYED MONITORING WELL
- SOIL VAPOR PROBE LOCATION
- AMBIENT AIR SAMPLE LOCATION

SAMPLE LOCATION	
DATE	SAMPLE DATE
B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
m/p-X	m/p-XYLENES
O-X	o-XYLENE
N	NAPHTHALENE

RESULTS REPORTED IN PARTS PER BILLION BY VOLUME (ppbv)

NOTE: AMBIENT AIR SAMPLE LOCATIONS ARE APPROXIMATE.

0 50' 100'

GRAPHIC SCALE

SOURCE: Base map 'SITE PLAN' (Job #77CH.21079.04.0270) provided by SECOR, 3017 Kilgore Rd., Rancho Cordova, CA, (916) 861-0400. Map drawn full scale, map date Oct. 10, 2005.

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1501 CUSHMAN STREET, FAIRBANKS, ALASKA
2008 VAPOR ASSESSMENT REPORT

AMBIENT AIR SAMPLES ANALYTICAL SUMMARY MAP

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FIGURE 4

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Appendix **A**

Soil Gas Sample Collection Logs

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Soil Gas Sample Collection Log

Date:	9/14/08	Sample ID:	VP-1-5.0

Client:	Chevron	Tubing Information:	High Press Brake / FEP lined poly
Project:	211079	Misc. Equipment:	He Detector
Location:	Fairbanks, AK	Subcontractor:	—
Project #:		Moisture Content of Sampling Zone:	~~Dry~~ / ~~Moist~~
Samplers:	MLS	Purge Method:	Sample Pump
Sample Point Location:	5.0	Appx. Purge Volume:	3X
Sampling Depth:	5.0	Tracer Gas Manufacturer:	Airgas
Time of Collection:	1217 / 1259		
Tracer Gas:	Helium		

Canister Size:	6L	Canister ID:	018
Flow Controller ID:			

Duplicate Canister Size:	6L	Duplicate Canister ID:	066
Duplicate Flow Controller ID:			

Time	Canister Pressure (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Pressure Differential (inches of H_2O)	PID (ppm or ppb)
1217 (018)	-30"					
1259 (018)	-5.0"					
1218 (066 Dup)	-25.5					
1300 (066 Dup)	-11.5"					

Nearby Groundwater Monitoring Wells/Water Levels

Well ID	Depth to Groundwater (ft.)

General Observations/Notes

Dup-1 collected from VP-1-5.0 simultaneously w/ splitter tee and 1 Hour flow controllers

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Soil Gas Sample Collection Log

Date:	9/14/08	Sample ID:	VP-1-9.0

Client:	Chevron	Tubing Information:	High Press Brake/FEP lined poly
Project:	211079	Misc. Equipment:	He Detector
Location:	Fairbanks, AK	Subcontractor:	—
Project #:		Moisture Content of Sampling Zone:	~~Dry~~ / Moist
Samplers:	MLS	Purge Method:	Sample Pump
Sample Point Location:	9.0	Appx. Purge Volume:	3x
Sampling Depth:	9.0	Tracer Gas Manufacturer:	Airgas
Time of Collection:	1111 / 1206		
Tracer Gas:	Helium		

Canister Size:	6L	Canister ID:	325
Flow Controller ID:			

Duplicate Canister Size:		Duplicate Canister ID:	
Duplicate Flow Controller ID:			

Time	Canister Pressure (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Pressure Differential (inches of H_2O)	PID (ppm or ppb)
1111	-28.0"					
1206	-5.5"					

Nearby Groundwater Monitoring Wells/Water Levels

Well ID	Depth to Groundwater (ft.)

General Observations/Notes

Replaced value to new 2-way Swagelok (standard)

* Tag said "1/2 Hour" sample, however collection took appx. 1 hour

ARCADIS

Soil Gas Sample Collection Log

Date:	9/14/08	Sample ID:	AMB-UP

Client:	Chevron	Tubing Information:	—
Project:	211079	Misc. Equipment:	—
Location:	Fairbanks, AK	Subcontractor:	—
Project #:		Moisture Content of Sampling Zone:	~~Dry~~ / ~~Moist~~
Samplers:	NLS	Purge Method:	—
Sample Point Location:	—	Appx. Purge Volume:	—
Sampling Depth:	—	Tracer Gas Manufacturer:	—
Time of Collection:	1138 / 1207		
Tracer Gas:	—		

Canister Size:	6L	Canister ID:	181
Flow Controller ID:			

Duplicate Canister Size:		Duplicate Canister ID:	
Duplicate Flow Controller ID:			

Time	Canister Pressure (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Pressure Differential (inches of H_2O)	PID (ppm or ppb)
1138	-26.0"					
1207	-5.0"					

Nearby Groundwater Monitoring Wells/Water Levels

Well ID	Depth to Groundwater (ft.)

General Observations/Notes

Ambient upwind sample collected near S. Cushman street on side walk/ concrete in front of barber shop and Korean restaurant.

ARCADIS

Soil Gas Sample Collection Log

Date:	9/14/08	Sample ID:	AMB - DOWN

Client:	Chevron	Tubing Information:	—
Project:	211079	Misc. Equipment:	—
Location:	Fairbanks, AK	Subcontractor:	—
Project #:		Moisture Content of Sampling Zone:	~~Dry~~ / ~~Moist~~
Samplers:	MLS	Purge Method:	—
Sample Point Location:	—	Appx. Purge Volume:	—
Sampling Depth:	—	Tracer Gas Manufacturer:	—
Time of Collection:	1144 / 1213		
Tracer Gas:	—		

Canister Size:	6L	Canister ID:	088
Flow Controller ID:			

Duplicate Canister Size:		Duplicate Canister ID:	
Duplicate Flow Controller ID:			

Time	Canister Pressure (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Pressure Differential (inches of H_2O)	PID (ppm or ppb)
1144	-29.51					
1213	-5.51					

Nearby Groundwater Monitoring Wells/Water Levels

Well ID	Depth to Groundwater (ft.)

General Observations/Notes

Ambient down-wind sample collected from parking lot between barber shop / Korean restaurant & Alaska Motel

ARCADIS

Soil Gas Sample Collection Log

Date:	9/14/08	Sample ID:	Field Blank

Client:	Chevron	Tubing Information:	FEP lined poly
Project:	211079	Misc. Equipment:	—
Location:	Fairbanks, AK	Subcontractor:	—
Project #:		Moisture Content of Sampling Zone:	~~Dry~~ / ~~Moist~~
Samplers:	MLS	Purge Method:	—
Sample Point Location:	—	Appx. Purge Volume:	—
Sampling Depth:	—	Tracer Gas Manufacturer:	—
Time of Collection:	1229 / 1241		
Tracer Gas:	—		

Canister Size:	6L	Canister ID:	836
Flow Controller ID:			

Duplicate Canister Size:		Duplicate Canister ID:	
Duplicate Flow Controller ID:			

Time	Canister Pressure (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Pressure Differential (inches of H_2O)	PID (ppm or ppb)
1229	-20.0"					
1241	-5.0"					

Nearby Groundwater Monitoring Wells/Water Levels

Well ID	Depth to Groundwater (ft.)

* TRIP BLANK

General Observations/Notes

Crack on vacuum gauge glass

ARCADIS

Appendix **B**

Laboratory Report & ADEC Data Review Checklist

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Analysis Report

ANALYTICAL RESULTS

Prepared for:

Chevron
6001 Bollinger Canyon Rd L4310
San Ramon CA 94583

925-842-8582

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 1110262. Samples arrived at the laboratory on Tuesday, September 16, 2008. The PO# for this group is 0015029778 and the release number is BARTON.

Client Description	Lancaster Labs Number
VP-1-5.0 Summa Canister #0018 Grab Air Sample	5469652
VP-1-9.0 Summa Canister #0325 Grab Air Sample	5469653
DUP-1 Summa Canister #0066 Grab Air Sample	5469654
AMB-UP Summa Canister #0181 Grab Air Sample	5469655
AMB-DOWN Summa Canister #0088 Grab Air Sample	5469656
Field Blank Summa Canister #0836 Grab Air Sample	5469657
Trip Blank Summa Canister #0553 Air Sample	5469658

METHODOLOGY

The specific methodologies used in obtaining the enclosed analytical results are indicated on the laboratory chronicles.

ELECTRONIC COPY TO	Arcadis US, Inc.	Attn: Rebecca Andresen
ELECTRONIC COPY TO	Arcadis BBL	Attn: Vanessa Varbel
ELECTRONIC COPY TO	ARCADIS	Attn: Michael Strickler
ELECTRONIC COPY TO	Arcadis	Attn: Greg Montgomery
1 COPY TO	Data Package Group	

Lancaster Laboratories

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Analysis Report

ELECTRONIC COPY TO ARCADIS

Attn: Andrew Ohrt

Questions? Contact your Client Services Representative
Angela M Miller at (717) 656-2300

Respectfully Submitted,

Chad A. Moline
Group Leader

Lancaster Laboratories

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Analysis Report

Lancaster Laboratories Sample No. 5469652 AQ **Group No. 1110262**

VP-1-5.0 Summa Canister #0018 Grab Air Sample
Facility# 211079
1501 S Cushman St - Fairbanks, AK

Collected:09/14/2008 12:17 by MLS
through 09/14/2008 12:59
Submitted: 09/16/2008 09:30
Reported: 10/20/2008 at 15:16
Discard: 11/20/2008

Account Number: 11964

Chevron
6001 Bollinger Canyon Rd L4310
San Ramon CA 94583

CUSV1 SDG#: ASK25-01

CAT No.	Analysis Name	CAS Number	As Received Result	MDL	Units	As Received Result	MDL	Units	DF
07056	Methane	74-82-8	N.D.	4.0	ppm(v)	N.D.	2.6	mg/m3	2
00015	TO-15 VOA special compounds								
00019	Benzene	71-43-2	N.D.	0.00020	ppm(v)	N.D.	0.00064	mg/m3	1
00020	Toluene	108-88-3	0.0014	0.00020	ppm(v)	0.0054	0.00075	mg/m3	1
00021	Ethylbenzene	100-41-4	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00022	m/p-Xylene	n.a.	0.00026	0.00020	ppm(v)	0.0011	0.00087	mg/m3	1
00023	o-Xylene	95-47-6	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00032	Naphthalene	91-20-3	N.D.	0.00040	ppm(v)	N.D.	0.0021	mg/m3	1
	Helium was not detected in this sample. Detection limit for Helium is 500ppm.								
00034	O2 and CO2 in Air								
00035	Oxygen	7782-44-7	160,000	3,000	ppm(v)	210,000	3,900	mg/m3	1
00036	Carbon Dioxide	124-38-9	N.D.	250	ppm(v)	N.D.	450	mg/m3	1

State of Alaska Lab Certification No. UST-061

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

MDL = Method Detection Limit

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07056	Methane	EPA 18 modified	1	09/18/2008 14:03	David I Ressler	2
00015	TO-15 VOA special compounds	EPA TO-15/Naph	1	09/19/2008 04:44	Jonathan K Nardelli	1
00034	O2 and CO2 in Air	ASTM D1946	1	10/15/2008 08:00	Jeffrey B Smith	1

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Analysis Report

Lancaster Laboratories Sample No. 5469653 AQ **Group No. 1110262**

VP-1-9.0 Summa Canister #0325 Grab Air Sample
Facility# 211079
1501 S Cushman St - Fairbanks, AK

Collected:09/14/2008 11:11 by MLS
through 09/14/2008 12:06
Submitted: 09/16/2008 09:30
Reported: 10/20/2008 at 15:16
Discard: 11/20/2008

Account Number: 11964

Chevron
6001 Bollinger Canyon Rd L4310
San Ramon CA 94583

CUS1V SDG#: ASK25-02

CAT No.	Analysis Name	CAS Number	As Received Result	MDL	Units	As Received Result	MDL	Units	DF
07056	Methane	74-82-8	N.D.	4.0	ppm(v)	N.D.	2.6	mg/m3	2
00015	TO-15 VOA special compounds								
00019	Benzene	71-43-2	0.0010	0.00020	ppm(v)	0.0032	0.00064	mg/m3	1
00020	Toluene	108-88-3	0.0017	0.00020	ppm(v)	0.0064	0.00075	mg/m3	1
00021	Ethylbenzene	100-41-4	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00022	m/p-Xylene	n.a.	0.00053	0.00020	ppm(v)	0.0023	0.00087	mg/m3	1
00023	o-Xylene	95-47-6	0.00022	0.00020	ppm(v)	0.00097	0.00087	mg/m3	1
00032	Naphthalene	91-20-3	N.D.	0.00040	ppm(v)	N.D.	0.0021	mg/m3	1
	Helium was not detected in this sample. Detection limit for Helium is 500ppm.								
00034	O2 and CO2 in Air								
00035	Oxygen	7782-44-7	180,000	3,000	ppm(v)	230,000	3,900	mg/m3	1
00036	Carbon Dioxide	124-38-9	N.D.	250	ppm(v)	N.D.	450	mg/m3	1

State of Alaska Lab Certification No. UST-061

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

MDL = Method Detection Limit

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07056	Methane	EPA 18 modified	1	09/18/2008 14:40	David I Ressler	2
00015	TO-15 VOA special compounds	EPA TO-15/Naph	1	09/19/2008 05:29	Jonathan K Nardelli	1
00034	O2 and CO2 in Air	ASTM D1946	1	10/16/2008 14:05	Jeffrey B Smith	1

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Analysis Report

Lancaster Laboratories Sample No. 5469654 AQ **Group No. 1110262**

DUP-1 Summa Canister #0066 Grab Air Sample
Facility# 211079
1501 S Cushman St - Fairbanks, AK

Collected:09/14/2008 by MLS

Account Number: 11964

Submitted: 09/16/2008 09:30
Reported: 10/20/2008 at 15:16
Discard: 11/20/2008

Chevron
6001 Bollinger Canyon Rd L4310
San Ramon CA 94583

CUSFD SDG#: ASK25-03FD

CAT No.	Analysis Name	CAS Number	As Received Final Result	MDL	Units	As Received Final Result	MDL	Units	DF
07056	Methane	74-82-8	N.D.	4.0	ppm(v)	N.D.	2.6	mg/m3	2
00015	TO-15 VOA special compounds								
00019	Benzene	71-43-2	N.D.	0.00020	ppm(v)	N.D.	0.00064	mg/m3	1
00020	Toluene	108-88-3	0.0013	0.00020	ppm(v)	0.0049	0.00075	mg/m3	1
00021	Ethylbenzene	100-41-4	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00022	m/p-Xylene	n.a.	0.00039	0.00020	ppm(v)	0.0017	0.00087	mg/m3	1
00023	o-Xylene	95-47-6	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00032	Naphthalene	91-20-3	N.D.	0.00040	ppm(v)	N.D.	0.0021	mg/m3	1
	Helium was not detected in this sample. Detection limit for Helium is 500ppm.								
00034	O2 and CO2 in Air								
00035	Oxygen	7782-44-7	150,000	3,000	ppm(v)	200,000	3,900	mg/m3	1
00036	Carbon Dioxide	124-38-9	N.D.	250	ppm(v)	N.D.	450	mg/m3	1

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All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

MDL = Method Detection Limit

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07056	Methane	EPA 18 modified	1	09/18/2008 15:10	David I Ressler	2
00015	TO-15 VOA special compounds	EPA TO-15/Naph	1	09/19/2008 06:13	Jonathan K Nardelli	1
00034	O2 and CO2 in Air	ASTM D1946	1	09/16/2008 11:48	Jeffrey B Smith	1

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Analysis Report

Lancaster Laboratories Sample No. 5469655 AQ **Group No. 1110262**

AMB-UP Summa Canister #0181 Grab Air Sample
Facility# 211079
1501 S Cushman St - Fairbanks, AK

Collected:09/14/2008 11:38 by MLS
through 09/14/2008 12:07
Submitted: 09/16/2008 09:30
Reported: 10/20/2008 at 15:16
Discard: 11/20/2008

Account Number: 11964

Chevron
6001 Bollinger Canyon Rd L4310
San Ramon CA 94583

CUSAU SDG#: ASK25-04

CAT No.	Analysis Name	CAS Number	As Received Result	MDL	Units	As Received Final Result	MDL	Units	DF
07056	Methane	74-82-8	N.D.	4.0	ppm(v)	N.D.	2.6	mg/m3	2
00015	TO-15 VOA special compounds								
00019	Benzene	71-43-2	0.00067	0.00020	ppm(v)	0.0021	0.00064	mg/m3	1
00020	Toluene	108-88-3	0.0017	0.00020	ppm(v)	0.0065	0.00075	mg/m3	1
00021	Ethylbenzene	100-41-4	0.00023	0.00020	ppm(v)	0.00099	0.00087	mg/m3	1
00022	m/p-Xylene	n.a.	0.00075	0.00020	ppm(v)	0.0033	0.00087	mg/m3	1
00023	o-Xylene	95-47-6	0.00029	0.00020	ppm(v)	0.0013	0.00087	mg/m3	1
00032	Naphthalene	91-20-3	N.D.	0.00040	ppm(v)	N.D.	0.0021	mg/m3	1
	Helium was not detected in this sample. Detection limit for Helium is 500ppm.								
00034	O2 and CO2 in Air								
00035	Oxygen	7782-44-7	170,000	3,000	ppm(v)	220,000	3,900	mg/m3	1
00036	Carbon Dioxide	124-38-9	N.D.	250	ppm(v)	N.D.	450	mg/m3	1

State of Alaska Lab Certification No. UST-061

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

MDL = Method Detection Limit

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07056	Methane	EPA 18 modified	1	09/18/2008 15:41	David I Ressler	2
00015	TO-15 VOA special compounds	EPA TO-15/Naph	1	09/19/2008 06:58	Jonathan K Nardelli	1
00034	O2 and CO2 in Air	ASTM D1946	1	09/16/2008 11:48	Jeffrey B Smith	1

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Analysis Report

Lancaster Laboratories Sample No. 5469656 AQ **Group No. 1110262**

AMB-DOWN Summa Canister #0088 Grab Air Sample
Facility# 211079
1501 S Cushman St - Fairbanks, AK

Collected:09/14/2008 11:44 by MLS
through 09/14/2008 12:13
Submitted: 09/16/2008 09:30
Reported: 10/20/2008 at 15:16
Discard: 11/20/2008

Account Number: 11964

Chevron
6001 Bollinger Canyon Rd L4310
San Ramon CA 94583

CUSAD SDG#: ASK25-05

CAT No.	Analysis Name	CAS Number	As Received Result	MDL	Units	As Received Result	MDL	Units	DF
07056	Methane	74-82-8	21	4.0	ppm(v)	14	2.6	mg/m3	2
00015	TO-15 VOA special compounds								
00019	Benzene	71-43-2	0.00059	0.00020	ppm(v)	0.0019	0.00064	mg/m3	1
00020	Toluene	108-88-3	0.0015	0.00020	ppm(v)	0.0056	0.00075	mg/m3	1
00021	Ethylbenzene	100-41-4	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00022	m/p-Xylene	n.a.	0.00060	0.00020	ppm(v)	0.0026	0.00087	mg/m3	1
00023	o-Xylene	95-47-6	0.00023	0.00020	ppm(v)	0.0010	0.00087	mg/m3	1
00032	Naphthalene	91-20-3	N.D.	0.00040	ppm(v)	N.D.	0.0021	mg/m3	1
	Helium was not detected in this sample. Detection limit for Helium is 500ppm.								
00034	O2 and CO2 in Air								
00035	Oxygen	7782-44-7	200,000	3,000	ppm(v)	260,000	3,900	mg/m3	1
00036	Carbon Dioxide	124-38-9	N.D.	250	ppm(v)	N.D.	450	mg/m3	1

State of Alaska Lab Certification No. UST-061

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

MDL = Method Detection Limit

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07056	Methane	EPA 18 modified	1	09/18/2008 16:11	David I Ressler	2
00015	TO-15 VOA special compounds	EPA TO-15/Naph	1	09/19/2008 07:43	Jonathan K Nardelli	1
00034	O2 and CO2 in Air	ASTM D1946	1	09/16/2008 11:48	Jeffrey B Smith	1

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Analysis Report

Lancaster Laboratories Sample No. 5469657 AQ **Group No. 1110262**

Field Blank Summa Canister #0836 Grab Air Sample
Facility# 211079
1501 S Cushman St - Fairbanks, AK

Collected:09/14/2008 12:29 by MLS
through 09/14/2008 12:41
Submitted: 09/16/2008 09:30
Reported: 10/20/2008 at 15:16
Discard: 11/20/2008

Account Number: 11964

Chevron
6001 Bollinger Canyon Rd L4310
San Ramon CA 94583

CUSFB SDG#: ASK25-06FB

CAT No.	Analysis Name	CAS Number	As Received Final Result	MDL	Units	As Received Final Result	MDL	Units	DF
07056	Methane	74-82-8	N.D.	4.0	ppm(v)	N.D.	2.6	mg/m3	2
00015	TO-15 VOA special compounds								
00019	Benzene	71-43-2	N.D.	0.00040	ppm(v)	N.D.	0.0013	mg/m3	2
00020	Toluene	108-88-3	N.D.	0.00040	ppm(v)	N.D.	0.0015	mg/m3	2
00021	Ethylbenzene	100-41-4	N.D.	0.00040	ppm(v)	N.D.	0.0017	mg/m3	2
00022	m/p-Xylene	n.a.	N.D.	0.00040	ppm(v)	N.D.	0.0017	mg/m3	2
00023	o-Xylene	95-47-6	N.D.	0.00040	ppm(v)	N.D.	0.0017	mg/m3	2
00032	Naphthalene	91-20-3	N.D.	0.00080	ppm(v)	N.D.	0.0042	mg/m3	2
	Helium was not detected in this sample. Detection limit for Helium is 500ppm.								
00034	O2 and CO2 in Air								
00035	Oxygen	7782-44-7	N.D.	3,000	ppm(v)	N.D.	3,900	mg/m3	1
00036	Carbon Dioxide	124-38-9	N.D.	250	ppm(v)	N.D.	450	mg/m3	1

State of Alaska Lab Certification No. UST-061

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

MDL = Method Detection Limit

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07056	Methane	EPA 18 modified	1	09/18/2008 16:42	David I Ressler	2
00015	TO-15 VOA special compounds	EPA TO-15/Naph	1	09/19/2008 10:29	Fanella S Zamcho	2
00034	O2 and CO2 in Air	ASTM D1946	1	09/16/2008 11:48	Jeffrey B Smith	1

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Analysis Report

Lancaster Laboratories Sample No. 5469658 AQ **Group No. 1110262**

Trip Blank Summa Canister #0553 Air Sample
Facility# 211079
1501 S Cushman St - Fairbanks, AK

Collected:09/14/2008

Account Number: 11964

Submitted: 09/16/2008 09:30
Reported: 10/20/2008 at 15:16
Discard: 11/20/2008

Chevron
6001 Bollinger Canyon Rd L4310
San Ramon CA 94583

CUSTB SDG#: ASK25-07TB*

CAT No.	Analysis Name	CAS Number	As Received Final Result	MDL	Units	As Received Final Result	MDL	Units	DF
07056	Methane	74-82-8	N.D.	2.0	ppm(v)	N.D.	1.3	mg/m3	1
00015	TO-15 VOA special compounds								
00019	Benzene	71-43-2	N.D.	0.00020	ppm(v)	N.D.	0.00064	mg/m3	1
00020	Toluene	108-88-3	N.D.	0.00020	ppm(v)	N.D.	0.00075	mg/m3	1
00021	Ethylbenzene	100-41-4	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00022	m/p-Xylene	n.a.	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00023	o-Xylene	95-47-6	N.D.	0.00020	ppm(v)	N.D.	0.00087	mg/m3	1
00032	Naphthalene	91-20-3	N.D.	0.00040	ppm(v)	N.D.	0.0021	mg/m3	1
	Helium was not detected in this sample. Detection limit for Helium is 500ppm.								
00034	O2 and CO2 in Air								
00035	Oxygen	7782-44-7	N.D.	3,000	ppm(v)	N.D.	3,900	mg/m3	1
00036	Carbon Dioxide	124-38-9	N.D.	250	ppm(v)	N.D.	450	mg/m3	1

State of Alaska Lab Certification No. UST-061

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

MDL = Method Detection Limit

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07056	Methane	EPA 18 modified	1	09/18/2008 17:12	David I Ressler	1
00015	TO-15 VOA special compounds	EPA TO-15/Naph	1	09/19/2008 11:13	Fanella S Zamcho	1
00034	O2 and CO2 in Air	ASTM D1946	1	09/16/2008 11:48	Jeffrey B Smith	1

Lancaster Laboratories

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Analysis Report

Quality Control Summary

Client Name: Chevron Group Number: 1110262
Reported: 10/20/08 at 03:16 PM

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 08290FG01	Sample number(s): 5469652-5469658							
Oxygen	N.D.	3,000.	ppm(v)	103		70-130		
Carbon Dioxide	N.D.	250.	ppm(v)	92		70-130		
Batch number: D0826230AA	Sample number(s): 5469652-5469658							
Benzene	N.D.	0.00020	ppm(v)	122	122	70-130	0	25
Toluene	N.D.	0.00020	ppm(v)	122	121	70-130	1	25
Ethylbenzene	N.D.	0.00020	ppm(v)	120	119	70-130	1	25
m/p-Xylene	N.D.	0.00020	ppm(v)	113	112	70-130	1	25
o-Xylene	N.D.	0.00020	ppm(v)	119	118	70-130	1	25
Naphthalene	N.D.	0.00040	ppm(v)	98	98	26-151	0	25
Batch number: M082631YA	Sample number(s): 5469652-5469658							
Methane	N.D.	2.0	ppm(v)					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Chevron Generic Analysis Request/Chain of Custody

008355

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For Lancaster Laboratories use only
Acct. #: 11964 Sample #: 5469652-58 SCR#:

Group# 1102602

Facility #: 211079
Site Address: 1501 S. Cushman St, Fairbanks, AK
Chevron PM: Greg Barton Lead Consultant: ARCADIS
Consultant/Office: Seattle, WA
Consultant Prj. Mgr.: Greg Montgomery
Consultant Phone #: 206-726-4742 Fax #: 206-325-8218
Sampler: MLS
Service Order #: NWRTB-0211079-1-AIC ☐ Non SAR:

Preservative Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 O = Other

☐ J value reporting needed
☐ Must meet lowest detection limits possible for 8260 compounds

8021 MTBE Confirmation
☐ Confirm MTBE + Naphthalene
☐ Confirm highest hit by 8260
☐ Confirm all hits by 8260
☐ Run ____ oxy's on highest hit
☐ Run ____ oxy's on all hits

Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: Soil	Water	Oil ☐ Air	Total Number of Containers	Analyses Requested / Preservation Codes: BTEX & Naphth	8260 full scan	Oxygenates	TPH G	TPH D ☐ Extended Rng. ☐ Silica Gel Cleanup	Lead Total ☐ Diss. ☐ Method	VPH/EPH	NWTPH H HCID ☐ quantification	Helium	ASTM D-1946*
VP-1-5.0	9/14/08	1217/1259	X				X	1	X								X	X
VP-1-9.0	9/14/08	1111/1206	X				X	1	X								X	X
DUP-1	9/14/08	—	X				X	1	X								X	X
AMB-UP	9/14/08	1138/1207	X				X	1	X								X	X
AMB-DOWN	9/14/08	1144/1243	X				X	1	X								X	X
Field Blank	9/14/08	1229/1241	X				X	1	X								X	X
Trip Blank	9/14/08	—					X	1	X								X	X

Comments / Remarks
* Oxygen, carbon dioxide, methane, nitrogen by D-1946

BTEX & Naphthalene by TO-15

Turnaround Time Requested (TAT) (please circle)
STD TAT | 72 hour | 48 hour
24 hour | 4 day | 5 day

Data Package Options (please circle if required)
QC Summary | Type I - Full
Type VI (Raw Data) | Disk / EDD
WIP (RWQCB) | Standard Format
Disk | _____ Other.

Relinquished by:	Date	Time	Received by:	Date	Time
Mike Strickler	9/15/08	0800			
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by Commercial Carrier: UPS FedEx Other			Received by:	Date 9-16-08	Time 0930
Temperature Upon Receipt NA °C			Custody Seals Intact? Yes No		

Lancaster Laboratories
Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	**BMQL**	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	**MPN**	Most Probable Number
IU	International Units	**CP Units**	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	**NTU**	nephelometric turbidity units
C	degrees Celsius	**F**	degrees Fahrenheit
Cal	(diet) calories	**lb.**	pound(s)
meq	milliequivalents	**kg**	kilogram(s)
g	gram(s)	**mg**	milligram(s)
ug	microgram(s)	**l**	liter(s)
ml	milliliter(s)	**ul**	microliter(s)
m3	cubic meter(s)	**fib >5 um/ml**	fibers greater than 5 microns in length per ml

< less than – The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million – One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture.

U.S. EPA data qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quatitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
J	Estimated value
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike amount not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

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Laboratory Data Review Checklist

Completed by: Michael L. Strickler

Title: Geologist I Date: Nov 5, 2008

CS Report Name: 211079 2008 Vapor Assessment Report Date: Nov 5, 2008

Consultant Firm: ARCADIS

Laboratory Name: Lancaster Laboratories Laboratory Report Number: 1110262

ADEC File Number: 102.26.015 ADEC RecKey Number: 1990310010201

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

(•) Yes ( ) No Comments:

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

( ) Yes ( ) No Comments:

N/A

2. Chain of Custody (COC)

a. COC information completed, signed, and dated (including released/received by)?

(•) Yes ( ) No Comments:

b. Correct analyses requested?

(•) Yes ( ) No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

( ) Yes ( ) No Comments:

N/A - SUMMA canisters not kept on ice.

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

○ Yes ○ No Comments:

N/A

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

○ Yes ○ No Comments:

N/A

d. If there were any discrepancies, were they documented? - For example, incorrect sample containers/ preservation, sample temperature ouside of acceptance range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

N/A

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

○ Yes ○ No Comments:

N/A

c. Were all corrective actions documented?

○ Yes ○ No Comments:

N/A

d. What is the effect on data quality/usability according to the case narrative?

Comments:

N/A

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

◉ Yes ○ No Comments:

b. All applicable holding times met?

(•) Yes ( ) No Comments:

c. All soils reported on a dry weight basis?

( ) Yes ( ) No Comments:

N/A

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

(•) Yes ( ) No Comments:

e. Data quality or usability affected? Explain.

Comments:

N/A

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

(•) Yes ( ) No Comments:

ii. All method blank results less than PQL?

(•) Yes ( ) No Comments:

iii. If above PQL, what samples are affected?

Comments:

N/A

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

( ) Yes ( ) No Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

N/A

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

(•) Yes ( ) No Comments:

ii. Metals/Inorganics - One LCS and one sample duplicate reported per matrix, analysis and 20 samples?

(•) Yes ( ) No Comments:

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

(•) Yes ( ) No Comments:

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/DMSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

(•) Yes ( ) No Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

N/A

vi. Do the affected samples(s) have data flags? If so, are the data flags clearly defined?

( ) Yes ( ) No Comments:

N/A

vii. Data quality or usability affected? Explain.

Comments:

N/A

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

( ) Yes ( ) No Comments:

N/A

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

○ Yes ○ No Comments:

N/A

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

N/A

iv. Data quality or usability affected? Explain.

Comments:

N/A

d. Trip Blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

◉ Yes ○ No Comments:

ii. All results less than PQL?

◉ Yes ○ No Comments:

iii. If above PQL, what samples are affected?

Comments:

N/A

iv. Data quality or usability affected? Explain.

Comments:

N/A

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

◉ Yes ○ No Comments:

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

iii. Precision - All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$RPD\ (\%) = \text{Absolute Value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

(•) Yes ( ) No Comments:

Benzene, ethylbenzene, o-xylene and naphthalene parent and duplicate samples are non-detect. Toluene RPD = 7.41%, m/p-xylene RPD = 40%, oxygen RPD = 6.45%.

iv. Data quality or usability affected? Explain.

( ) Yes (•) No Comments:

Data quality or usability does not appear to be affected.

f. Decontamination or Equipment Blank (if applicable)

(•) Yes ( ) No ( ) Not Applicable

i. All results less than PQL?

(•) Yes ( ) No Comments:

ii. If above PQL, what samples are affected?

Comments:

N/A

iii. Data quality or usability affected? Explain.

Comments:

N/A

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

( ) Yes ( ) No Comments:

N/A

Reset Form

ARCADIS

Appendix **C**

Conceptual Site Model Scoping Form and Graph

Human Health Conceptual Site Model
Scoping Form

Site Name: Former Chevron 211079, 1501 Cushman St

File Number: 102.26.015

Completed by: Michael Strickler

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, a CSM graphic and text must be submitted with the site characterization work plan.

General Instructions: Follow the italicized instructions in each section below.

1. *General Information:*

Sources *(check potential sources at the site)*

- ☑ USTs
- ☐ ASTs
- ☑ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☐ Other: _____

Release Mechanisms *(check potential release mechanisms at the site)*

- ☑ Spills
- ☑ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☐ Other: _____

Impacted Media *(check potentially-impacted media at the site)*

- ☑ Surface soil (0-2 feet bgs*)
- ☑ Subsurface Soil (>2 feet bgs)
- ☑ Air
- ☑ Groundwater
- ☐ Surface water
- ☐ Other: _____

Receptors (*check receptors that could be affected by contamination at the site)*

- ☑ Residents (adult or child)
- ☑ Commercial or industrial worker
- ☑ Construction worker
- ☐ Subsistence harvester (i.e., gathers wild foods)
- ☐ Subsistence consumer (i.e., eats wild foods)
- ☑ Site visitor
- ☑ Trespasser
- ☐ Recreational user
- ☐ Farmer
- ☐ Other: _____

* bgs – below ground surface

2. *Exposure Pathways:* *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact –

1 Incidental Soil Ingestion

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

If both boxes are checked, label this pathway complete: Complete

2 Dermal Absorption of Contaminants from Soil

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Can the soil contaminants permeate the skin? (Contaminants listed below, or within the groups listed below, should be evaluated for dermal absorption). ☑

Arsenic	Lindane
Cadmium	PAHs
Chlordane	Pentachlorophenol
2,4-dichlorophenoxyacetic acid	PCBs
Dioxins	SVOCs
DDT	

If all of the boxes are checked, label this pathway complete: Complete

b) Ingestion –

1 Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, OR are contaminants expected to migrate to groundwater in the future? ☑

Could the potentially affected groundwater be used as a current or future drinking water source? *Please note, only leave the box unchecked if ADEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.* ☑

If both the boxes are checked, label this pathway complete: Complete

2 Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water OR are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? *Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).* ☐

If both boxes are checked, label this pathway complete: _____

3 Ingestion of Wild Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild food? ☐

Do the site contaminants have the potential to bioaccumulate (*see* Appendix A)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. the top 6 feet of soil, in groundwater that **could be** connected to surface water, etc.) ☐

If all of the boxes are checked, label this pathway complete: _____

c) Inhalation

1 Inhalation of Outdoor Air

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Are the contaminants in soil volatile (*See Appendix B*)? ☑

If all of the boxes are checked, label this pathway complete: Complete

2 Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be placed on the site in an area that could be affected by contaminant vapors? (i.e., within 100 feet, horizontally or vertically, of the contaminated soil or groundwater, <u>or</u> subject to "preferential pathways" that promote easy airflow, like utility conduits or rock fractures) ☑

Are volatile compounds present in soil or groundwater (*See Appendix C*)? ☑

If both boxes are checked, label this pathway complete: Complete

3. Additional Exposure Pathways: *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- Climate permits recreational use of waters for swimming,
- Climate permits exposure to groundwater during activities, such as construction, without protective clothing, or
- Groundwater or surface water is used for household purposes.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Not Applicable (NA)

Inhalation of Volatile Compounds in Household Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- The contaminated water is used for household purposes such as showering, laundering, and dish washing, and
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix B)

Check the box if further evaluation of this pathway is needed: ☐

Comments:

NA

Inhalation of Fugitive Dust

Generally DEC soil ingestion cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway, although this is not true in the case of chromium. Examples of conditions that may warrant further investigation include:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers. This size can be inhaled and would be of concern for determining if this pathway is complete.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

NA

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during recreational or some types of subsistence activities. People then incidentally **ingest** sediment from normal hand-to-mouth activities. In addition, **dermal absorption of contaminants** may be of concern if people come in contact with sediment and the contaminants are able to permeate the skin (see dermal exposure to soil section). This type of exposure is rare but it should be investigated if:

- Climate permits recreational activities around sediment, and/or
- Community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

ADEC soil ingestion cleanup levels are protective of direct contact with sediment. If they are determined to be over-protective for sediment exposure at a particular site, other screening levels could be adopted or developed.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

NA

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.)*

APPENDIX A

BIOACCUMULATIVE COMPOUNDS

Table A-1: List of Compounds of Potential Concern for Bioaccumulation

Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table X of 18 AAC 75.345 that are bioaccumulative, based on the definition above, are listed below.

Aldrin	DDT	Lead
Arsenic	Dibenzo(a,h)anthracene	Mercury
Benzo(a)anthracene	Dieldrin	Methoxychlor
Benzo(a)pyrene	Dioxin	Nickel
Benzo(b)fluoranthene	Endrin	PCBs
Benzo(k)fluoranthene	Fluoranthene	
Cadmium	Heptachlor	Pyrene
Chlordane	Heptachlor epoxide	Selenium
Chrysene	Hexachlorobenzene	Silver
Copper	Hexachlorocyclopentadiene	Toxaphene
DDD	Indeno(1,2,3-c,d)pyrene	Zinc
DDE		

Because BCF values can relatively easily be measured or estimated, the BCF is frequently used to determine the potential for a chemical to bioaccumulate. A compound with a BCF greater than 1,000 is considered to bioaccumulate in tissue (EPA 2004b).

For inorganic compounds, the BCF approach has not been shown to be effective in estimating the compound's ability to bioaccumulate. Information available, either through scientific literature or site-specific data, regarding the bioaccumulative potential of an inorganic site contaminant should be used to determine if the pathway is complete.

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000). The BCF can also be estimated from a chemical's physical and chemical properties. A chemical's octanol-water partitioning coefficient (K_{ow}) along with defined regression equations can be used to estimate the BCF. EPA's Persistent, Bioaccumulative, and Toxic (PBT) Profiler (EPA 2004) can be used to estimate the BCF using the K_{ow} and linear regressions presented by Meylan et al. (1996). The PBT Profiler is located at http://www.pbtprofiler.net/. For compounds not found in the PBT Profiler, DEC recommends using a log K_{ow} greater than 3.5 to determine if a compound is bioaccumulative.

APPENDIX B

VOLATILE COMPOUNDS

Table B-1: List of Volatile Compounds of Potential Concern
Common volatile contaminants of concern at contaminated sites. A chemical is defined as volatile if the Henry's Law constant is 1 x 10^{-5} atm-m^3/mol or greater and the molecular weight less than 200 g/mole (g/mole; EPA 2004a). Those compounds in Table X of 18 AAC 75.345 that are volatile, based on the definition above, are listed below.

Acenaphthene	1,4-dichlorobenzene	Pyrene
Acetone	1,1-dichloroethane	Styrene
Anthracene	1,2-dichloroethane	1,1,2,2-tetrachloroethane
Benzene	1,1-dichloroethylene	Tetrachloroethylene
Bis(2-chlorethyl)ether	Cis-1,2-dichloroethylene	Toluene
Bromodichloromethane	Trans-1,2-dichloroethylene	1,2,4-trichlorobenzene
Carbon disulfide	1,2-dichloropropane	1,1,1-trichloroethane
Carbon tetrachloride	1,3-dichloropropane	1,1,2-trichloroethane
Chlorobenzene	Ethylbenzene	Trichloroethylene
Chlorodibromomethane	Fluorene	Vinyl acetate
Chloroform	Methyl bromide	Vinyl chloride
2-chlorophenol	Methylene chloride	Xylenes
Cyanide	Naphthalene	GRO
1,2-dichlorobenzene	Nitrobenzene	DRO

APPENDIX C

COMPOUNDS OF CONCERN FOR VAPOR MIGRATION

Table C-1: List of Compounds of Potential Concern for the Vapor Migration

A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than 10-6 or a non-cancer hazard index greater than 1. A chemical is considered sufficiently volatile if it's Henry's Law constant is 1 x 10^{-5} atm-m^3/mol or greater.

Acenaphthene	Dibenzofuran	Hexachlorobenzene
Acetaldehyde	1,2-Dibromo-3-chloropropane	Hexachlorocyclopentadiene
Acetone	1,2-Dibromoethane (EDB)	Hexachloroethane
Acetonitrile	1,3-Dichlorobenzene	Hexane
Acetophenone	1,2-Dichlorobenzene	Hydrogen cyanide
Acrolein	1,4-Dichlorobenzene	Isobutanol
Acrylonitrile	2-Nitropropane	Mercury (elemental)
Aldrin	N-Nitroso-di-n-butylamine	Methacrylonitrile
alpha-HCH (alpha-BHC)	n-Propylbenzene	Methoxychlor
Benzaldehyde	o-Nitrotoluene	Methyl acetate
Benzene	o-Xylene	Methyl acrylate
Benzo(b)fluoranthene	p-Xylene	Methyl bromide
Benzylchloride	Pyrene	Methyl chloride chloromethane)
beta-Chloronaphthalene	sec-Butylbenzene	Methylcyclohexane
Biphenyl	Styrene	Methylene bromide
Bis(2-chloroethyl)ether	tert-Butylbenzene	Methylene chloride
Bis(2-chloroisopropyl)ether	1,1,1,2-Tetrachloroethane	Methylethylketone (2-butanone)
Bis(chloromethyl)ether	1,1,2,2-Tetrachloroethane	Methylisobutylketone
Bromodichloromethane	Tetrachloroethylene	Methylmethacrylate
Bromoform	Dichlorodifluoromethane	2-Methylnaphthalene
1,3-Butadiene	1,1-Dichloroethane	MTBE
Carbon disulfide	1,2-Dichloroethane	m-Xylene
Carbon tetrachloride	1,1-Dichloroethylene	Naphthalene
Chlordane	1,2-Dichloropropane	n-Butylbenzene
2-Chloro-1,3-butadiene (chloroprene)	1,3-Dichloropropene	Nitrobenzene
Chlorobenzene	Dieldrin	Toluene
1-Chlorobutane	Endosulfan	trans-1,2-Dichloroethylene
Chlorodibromomethane	Epichlorohydrin	1,1,2-Trichloro-1,2,2-trifluoroethane
Chlorodifluoromethane	Ethyl ether	1,2,4-Trichlorobenzene
Chloroethane (ethyl chloride)	Ethylacetate	1,1,2-Trichloroethane
Chloroform	Ethylbenzene	1,1,1-Trichloroethane
2-Chlorophenol	Ethylene oxide	Trichloroethylene
2-Chloropropane	Ethylmethacrylate	Trichlorofluoromethane
Chrysene	Fluorene	1,2,3-Trichloropropane
cis-1,2-Dichloroethylene	Furan	1,2,4-Trimethylbenzene
Crotonaldehyde (2-butenal)	Gamma-HCH (Lindane)	1,3,5-Trimethylbenzene
Cumene	Heptachlor	Vinyl acetate
DDE	Hexachloro-1,3-butadiene	Vinyl chloride (chloroethene)

Source: EPA 2002.

HUMAN HEALTH CONCEPTUAL SITE MODEL

Site: Former Chevron 211079
1501 Cushman St
Fairbanks, Alaska

Completed By: Michael Strickler
Date Completed: November 6, 2008

Follow the directions below. Do not consider engineering or land use controls when describing pathways.

(1)
Check the media that could be directly affected by the release.

(2)
For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Briefly list other mechanisms or reference the report for details.

(3)
Check exposure media identified in (2).

(4)
Check exposure pathways that are complete or need further evaluation. The pathways identified must agree with Sections 2 and 3 of the CSM Scoping Form.

(5)
Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, or "C/F" for both current and future receptors.

Media	Transport Mechanisms	Exposure Media	Exposure Pathways	Current & Future Receptors: Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ Surface Soil (0-2 ft bgs)	☑ Direct release to surface soil — *check soil*	☑ soil	☑ Incidental Soil Ingestion	F	C/F	C/F	F			
	☑ Migration or leaching to subsurface — *check soil*		☑ Dermal Absorption of Contaminants from Soil	F	C/F	C/F	F			
	☑ Migration or leaching to groundwater — *check groundwater*									
	☑ Volatilization — *check air*									
	☐ Runoff or erosion — *check surface water*									
	☐ Uptake by plants or animals — *check biota*									
	☐ Other (*list*): Former Chevron 211079, 1501 Cushman St									
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil — *check soil*	☑ groundwater	☑ Ingestion of Groundwater	F	F	F	F			
	☑ *Migration to groundwater* — *check groundwater*		☑ Dermal Absorption of Contaminants in Groundwater	F	F	F	F			
	☑ *Volatilization* — *check air*		☐ Inhalation of Volatile Compounds in Tap Water							
	☐ *Other (list):* 102.26.015									
☑ Ground-water	☑ Direct release to groundwater — *check groundwater*	☑ air	☑ Inhalation of Outdoor Air	C/F	C/F	C/F	F			
	☐ *Volatilization* — *check air*		☐ Inhalation of Indoor Air	C/F	C/F	C/F	F			
	☐ *Flow to surface water body* — *check surface water*		☐ Inhalation of Fugitive Dust							
	☐ *Flow to sediment* — *check sediment*									
	☑ *Uptake by plants or animals* — *check biota*									
	☑ *Other (list):* Michael Strickler									
☐ Surface Water	☐ Direct release to surface water — *check surface water*	☑ surface water	☑ Ingestion of Surface Water							
	☐ *Volatilization* — *check air*		☐ Dermal Absorption of Contaminants in Surface Water							
	☑ *Sedimentation* — *check sediment*		☐ Inhalation of Volatile Compounds in Tap Water							
	☑ *Uptake by plants or animals* — *check biota*									
	☐ *Other (list):*									
☑ Sediment	☑ Direct release to sediment — *check sediment*	☐ sediment	☑ Direct Contact with Sediment							
	☑ *Resuspension, runoff, or erosion* — *check surface water*									
	☑ *Uptake by plants or animals* — *check biota*	☑ biota	☐ Ingestion of Wild Foods							
	☐ *Other (list):*									

Revised 3/21/06