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GEOLOGICAL SURVEY PROGRAM
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OPEN-FILE REPORT 94-UR

HYDROCARBON CONTAMINATION ASSESSMENT NORTHEAST OF THE INTERSECTION OF JEFFERSON AND CHERRY STREETS VERMILLION, SOUTH DAKOTA

JEFFREY J. ALLEN

Akeley-Lawrence Science Center
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Vermillion, South Dakota

2015

GEOLOGICAL SURVEY PROGRAM

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
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CONTENTS

FIGURES

TABLES

APPENDICES

INTRODUCTION

Site Description

The site is located within the city of Vermillion, South Dakota, northeast from the intersection of Cherry Street and Jefferson Street (fig. 1). The property is presently owned by First Dakota National Bank. The buildings formerly on site have since been removed (figs. 2 and 3).

Background Information

Former occupants of the property include Allied Manufacturing and Robinson Professional Cleaning (McDonald and Lancaster, 2008). Part of the property was used by Peterson Auto Crushing/Peterson Cycle Salvage for 6 to 8 months in 2005 and 2006 during which time approximately 500 autos were processed for salvage (McDonald and Lancaster, 2008). Some of the fluids (fuel, oil, etc.) contained in the vehicles that were crushed was allowed to drain onto the bare ground under the auto crushing operation (McDonald and Lancaster, 2008).

An assessment was conducted in 2008 for benzene, toluene, ethylbenzene, xylenes, total petroleum hydrocarbons (TPH) as gasoline, and TPH as diesel, and TPH as waste oil at the location believed to be directly under the auto crushing activities (McDonald, 2008). Soil samples were collected on October 30, 2008, and were sent to Geotek Engineering & Testing Services for analysis. Results from the testing are shown in table 1.

Table 1. Results of analysis of a sediment sample in 2008

Analyte	Concentration in sample analyzed in 2008 (milligrams per kilogram)
Benzene	<0.20
Toluene	1.87
Ethylbenzene	9.22
Xylenes	394.0
TPH gasoline	15,800
TPH diesel	3,690
TPH waste oil	12,100

Data from McDonald (2008)

Purpose

Work was performed in 2015 to determine if contamination still existed at the site. The Geological Survey Program, Department of Environment and Natural Resources (DENR), was requested to perform the work by DENR's Ground Water Quality Program.

Figure 1. Location of investigated site in Vermillion, South Dakota.

Figure 2. 2012 air photo of the investigated site.

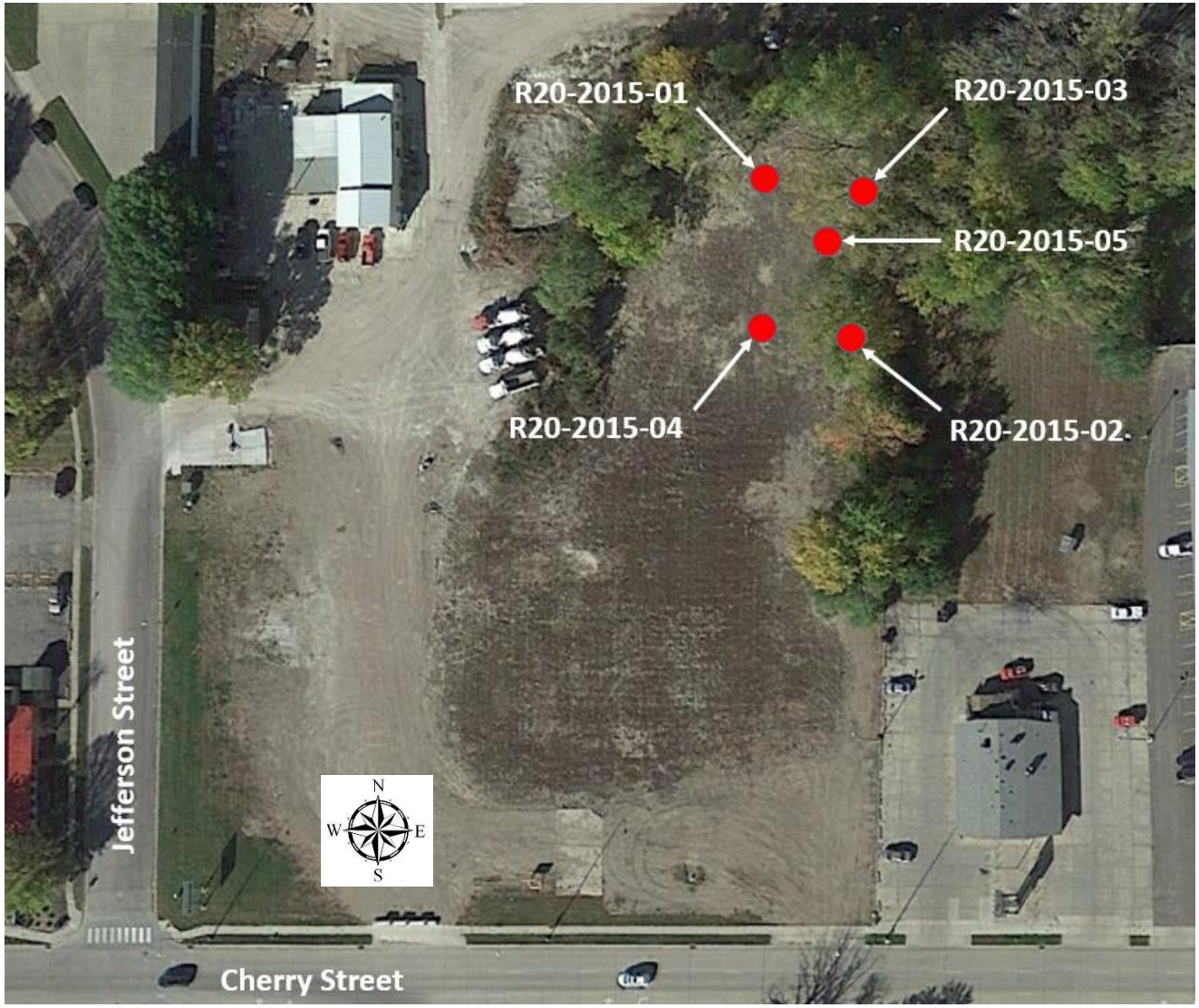


Figure 3. 2014 air photo of the investigated site showing the locations of test holes/wells.

METHODS

Cleaning of Drilling Rig and Down-Hole Tools

Before drilling each test hole, the rear working area of the drilling rig was washed using hot water and a power washer. All down-hole tools such as wrenches and augers were washed in the same manner. The split barrel sampler, and any small hand tools, were washed in a soap solution with a brush and double rinsed with fresh water after each use.

Drilling of Test Holes

Drilling of five test holes was performed using a Mobile B-61 hollow stem auger rig. The auger bit used had a 4-inch inside diameter and a cutting diameter of ten inches. Sediment/soil samples were collected using a 2.5 inch inner diameter split barrel sampler. Sediment samples were collected continuously starting at a depth of 2 feet (unless noted otherwise). The sediment was examined in the field for odor and visible signs of contamination. Had any contamination been noticed in the sediment samples, representative samples would have been collected and placed into soil sample jars supplied by the analytical laboratory. However, since no sediment contamination was observed, no sediment samples were collected.

The presence of trees, a transformer box, and a large mound of dirt provided some limitation to the extent of the area accessible to drilling equipment. The five holes that were drilled were centered on what was believed to be near where the auto crushing occurred. The locations of the test holes are shown in figure 3.

Monitoring-Well Construction

The project included the drilling of five test holes, all of which were completed as monitoring wells. Monitoring wells were constructed following the guidelines set forth by the Administrative Rules of South Dakota (ARSD 74:02:06).

Water-Level Measurements

Water levels in the wells were measured using a Keck Water Level Meter. Measurements were taken as a depth to water from the top of the well casing. Units are in feet and were recorded to the nearest 0.01 foot. The instrument was cleaned with distilled water between uses.

Ground-Water Sampling

Three to five well volumes of water were removed from each well prior to the sampling, unless otherwise noted. Samples were collected with a disposable polyethylene bottom loading bailer. A new bailer was used for each well sampled. Samples were transferred from the bailer to sample

containers using a volatile organic compound emptying device that minimized sample contact with air. Water samples were placed in three 40 milliliter vials preserved with hydrochloric acid, and a one liter container that did not contain a preservative. These samples were then sent to be analyzed for benzene, ethylbenzene, methyl tertiary-butyl ether, naphthalene, toluene, xylenes, and total petroleum hydrocarbons as gasoline.

Chain of Custody

A chain of custody form was filled out prior to shipping the samples to the laboratory. The form included information on the sampling entity, project and manager names, name of the person who conducted the sampling, the number of samples taken and in what quantities, the date and time the sample was collected, the analyses requested, and the date and time the samples were relinquished to the shipper.

RESULTS OF INVESTIGATION

Regional geology

The site of the investigation is underlain by wind-blown sediment, loess, according to Christensen (1967) who described this sediment as "light yellow-brown to light-gray silt and fine sand." The loess is underlain by till which was described by Christensen (1967) as pale, yellowish-brown to olive gray boulder clay.

Site Specific Geology

Due to the history of the site and reworking of surface sediment, loess was not found to be present at land surface in perhaps only one of the five holes that were drilled. Fill material was the first sediment encountered in the other holes.

Sediment present under the fill or loess consists of oxidized till or silt. The fill material was found to contain pieces of concrete, brick, and other debris. Test hole R20-2015-01encountered only fill material to a depth of 13 feet. Logs of the test holes can be found in Appendix A.

Ground Water

Elevations

Water levels were measured on January 26, 2015, when the five monitoring wells (fig. 3) were sampled. All elevations are relative to an assumed benchmark elevation of 100 feet which was used for the casing top of well R20-2015-01 (table 2). The well construction for each well and the measured water level are illustrated in appendix A.

Table 2. Measured depths to water and ground-water elevations

Well	Casing-top elevation (feet)[1]	Depth to water from casing top on January 26, 2015 (feet)	Ground-water elevation (feet)
R20-2015-01	100.000	7.29	92.71
R20-2015-02	101.267	8.31	92.96
R20-2015-03	99.093	6.40	92.69
R20-2015-04	100.538	7.61	92.93
R20-2015-05	99.324	6.46	92.86

[1] The casing top of well R20-2015-01 was assumed to have an elevation of 100 feet.

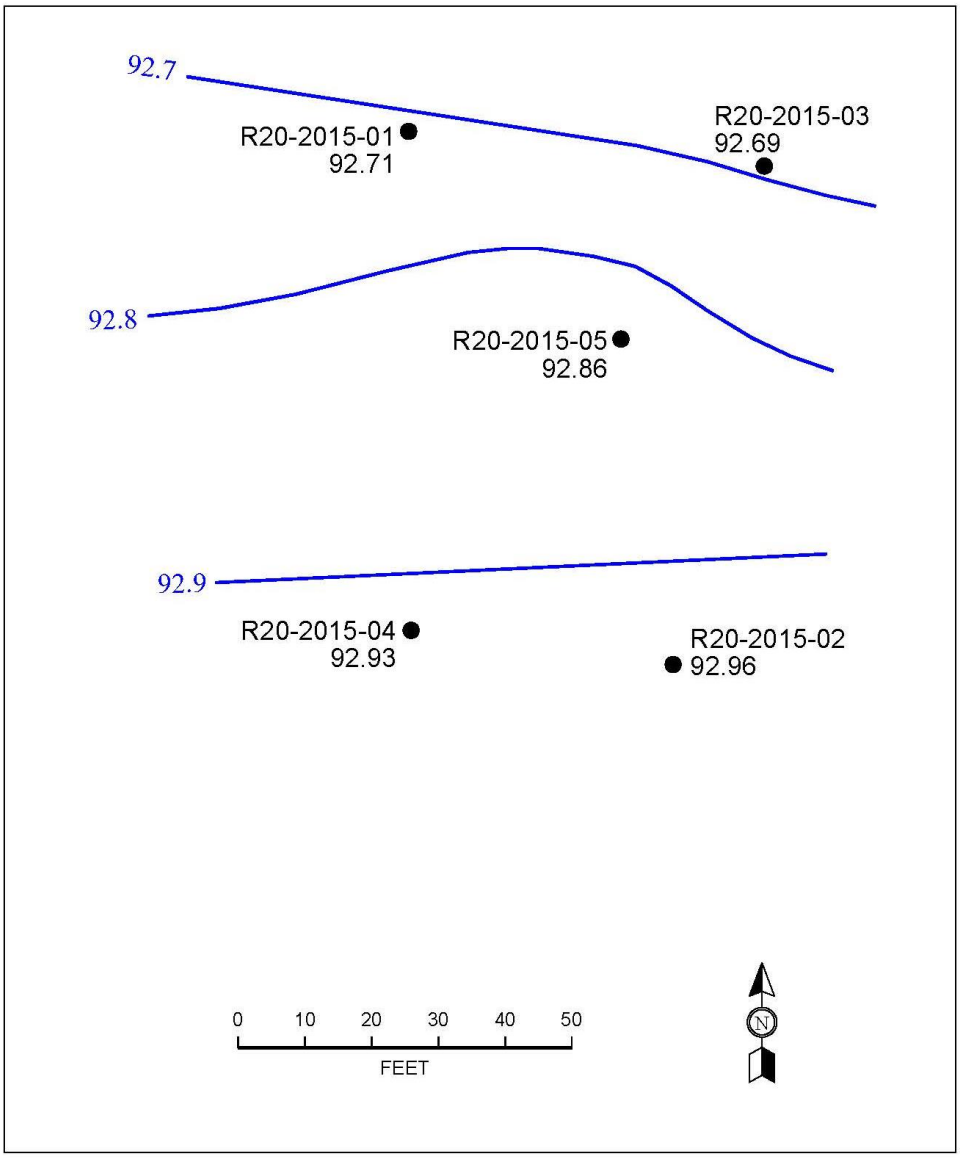
The measured ground-water elevations are within 0.264 feet of each other. Figure 4 shows the ground-water elevations plotted on a map and illustrates that the slight potential for ground-water movement is generally to the north through the investigated area.

Laboratory Results

Ground-water samples were obtained from all five of the monitoring wells on January 26, 2015. All of the ground-water samples were submitted to Midcontinent Testing Laboratories, Rapid City, South Dakota, and analyzed for concentrations of benzene, ethylbenzene, naphthalene, toluene, xylenes, methyl tertiary-butyl ether, and total petroleum hydrocarbons as gasoline. Copies of laboratory results and chain of custody forms can be found in appendix B. Results of the analyses are also shown in table 3.

Table 3. Results of analyses of ground water in 2015

Well	Analyte and concentration (micrograms per liter)						
	Benzene	Toluene	Ethylbenzene	Xylenes	TPH gasoline	Naphthalene	Methyl tertiary-butyl ether
R20-2015-01	<1	1.28	1.39	<3	<100	24	<2
R20-2015-02	<1	<1	<1	<3	<100	<4	<2
R20-2015-03	<1	<1	<1	<3	<100	<4	<2
R20-2015-04	<1	<1	<1	<3	<100	<4	<2
R20-2015-05	<1	<1	<1	<3	<100	<4	<2



R20-2015-01 ● 92.71 — Monitoring well. Text beginning with "R20" is the well identifier. Bottom number is the elevation of the water table on 1-26-2015. The elevation is based on an assumed elevation of 100 feet for the casing top of well R20-2015-01.

92.9 — Elevation contour on the water-table surface. Contour interval = 0.1 foot.

Figure 4. Contour map of the water-table surface.

DISCUSSION

Sediment sampling performed in 2008 found contamination at the investigated site (table 1) presumably from auto crushing activities that occurred at the site in 2005 and 2006. In 2015, test drilling, well installation, and water sampling were performed to assess contamination that may remain. No visible contamination was observed during the drilling in 2015.

Results of analyses in 2015 of water collected from the five monitoring wells installed for this investigation show that contamination is present in only one of the five wells. Water from well R20-2015-01 exhibited 1.39 micrograms per liter (µg/L) ethylbenzene, 24 µg/L naphthalene, and 1.28 µg/L toluene. The ground-water standards for these contaminants are 700 µg/L for ethylbenzene, and 1,000 µg/L for toluene. A standard for naphthalene is not established in South Dakota's ground water quality standards for ground water having a total dissolved solids concentration of less than 10,000 milligrams per liter (ARSD 74:54:01:04). None of the measured concentrations of contaminants in well R20-2015-01 exceed the listed standards.

REFERENCES

ARSD 74:54:01:04, *Standards for groundwater of 10,000 mg/L TDS concentration or less*: Administrative Rule of South Dakota 74:54:01:04.

Christensen, C.M., 1967, *Geology and hydrology of Clay County, South Dakota, Part I, Geology*: South Dakota Geological Survey Bulletin 19, 86 p.

McDonald, B., 2008, *Site Inspections Summary*: Internal report, Ground Water Quality Program, Department of Environment and Natural Resources, November 21, 2008.

McDonald, B. and Lancaster, R., 2008, *Alleged dumping of automotive fluids during metal salvage operations by Peterson Auto Crushing / Peterson Cycle Salvage in various locations of southeastern South Dakota*: Internal memo, Department of Environment and Natural Resources, December 23, 2008.

Appendix A

Logs of test holes and diagrams of monitoring well construction

Location Information

Legal Location: NW SW SW NE SEC. 18, T. 092 N., R. 51 W.
County: CLAY
Hydrologic Unit Code: 10170102
Land Owner: FIRST DAKOTA BANK
Ground Surface Elevation: 1233 T
Location: 092N51W18ACCB
Latitude: 42.787892
Longitude: -96.914553

Project Information

Project: PETERSON CAR CRUSHING
Drill Date: 1/20/2015
Company: SDGS
Drilling Method: HOLLOWSTEM
Test Hole Number: R20-2015-01
Geologist: J. ALLEN
Geologist's Log: X
Driller: J.OLSON/T. MILLER
Driller's Log:
Total Drill Hole Depth (ft): 15.0

Well Information

SDGS Well Name: R20-2014-01
Water Rights Well:
Other Well Name:
Casing Type: PVC, SCH. 40
Screen Type: PVC, SCH. 40
Total Casing and Screen (ft): 16.3
Aquifer:
Management Unit:
Casing Top Elevation: 1236 T
Casing Diameter (in): 2
Screen Length (ft): 10
Casing Stick-up (ft): 3

WATER LEVEL MEASUREMENT TAKEN FROM GROUND LEVEL AFTER DRILLING ON 01/20/2015 WAS 4.8 FEET BELOW LAND SURFACE, WATER LEVEL MEASUREMENT TAKEN ON 01/26/2015 FROM THE TOP OF THE WELL CASING WAS 7.29 FEET BELOW CASING TOP.

Elevation (ft)	Depth (ft)	Description
1233 - 1230	0 -3	CLAY, LIGHT-BROWN AND BLACK, SILTY, SANDY; OXIDIZED, BRICK, CONCRETE, AND METAL PIECES, SOME FINE SAND
1230 - 1225	3 -8	CLAY, BROWN-GRAY AND BLACK, SILTY, SANDY; BROWN AND GRAY MOTTLING, SOME BRICK AND METAL PIECES, SATURATION NOTICED AT 6 FEET
1225 - 1220	8 -13	CLAY, GRAY-BLACK, SILTY, SANDY; SOME MEDIUM TO COARSE SAND, METAL PIECES, ORGANIC MATERIAL
1220 - 1218	13 -15	CLAY, BROWN, SILTY, SANDY; COARSE SAND, CONCRETE AND BRICK PIECES, ORGANIC MATERIAL

SPLIT SPOON SAMPLING STARTED AT 3 FEET BELOW LAND SURFACE. POOR RETURN WHILE CORING. DESCRIPTIONS BASED ON SAMPLES FROM AUGER FLIGHTS. NO CONTAMINANTS WERE OBSERVED DURING DRILLING.

Location Information

Legal Location: NW SW SW NE SEC. 18, T. 092 N., R. 51 W.
County: CLAY
Hydrologic Unit Code: 10170102
Land Owner: FIRST DAKOTA BANK
Location: 092N51W18ACCB 1
Latitude: 42.787667
Longitude: -96.914406
Ground Surface Elevation: 1234 T

Project Information

Project: PETERSON CAR CRUSHING
Drill Date: 1/22/2015
Company: SDGS
Drilling Method: HOLLOWSTEM
Test Hole Number: R20-2015-02
Geologist: J. ALLEN
Geologist's Log: X
Driller: J. OLSON/T. MILLER
Driller's Log:
Total Drill Hole Depth (ft): 13.0

Well Information

SDGS Well Name: R20-2015-02
Water Rights Well:
Other Well Name:
Casing Type: PVC, SCH. 40
Screen Type: PVC, SCH. 40
Total Casing and Screen (ft): 15
Aquifer:
Management Unit:
Casing Top Elevation: 1237.25 T
Casing Diameter (in): 2
Screen Length (ft): 10
Casing Stick-up (ft): 3.3

WATER LEVEL MEASUREMENT TAKEN FROM THE TOP OF THE CASING ON 01/26/2015 WAS 8.31 FEET BELOW CASING TOP.

Elevation (ft)	Depth (ft)	Description
1234 1231.5	0 -2.5	FILL, RUBBLE, CONCRETE AND BRICK, MUCH DEBRIS
1231.5 1231	2.5 -3	CLAY, DARK-BROWN; SOME PEBBLES, LESS DEBRIS
1231 1229	3 -5	CLAY, LIGHT-OLIVE-GREEN, VERY SILTY; SOME FINE SAND
1229 1227	5 -7	CLAY, LIGHT-OLIVE-GREEN, VERY SILTY; SOME FINE SAND, IRON STAINING
1227 1225	7 -9	CLAY, ORANGE-BROWN, SILTY, SANDY, PEBBLY; SMALL SAND LENS AT 8 TO 8.2 FEET, WET AT 7 FEET, SATURATION BY 9 FEET, OXIDIZED (TILL)
1225 1223	9 -11	CLAY, ORANGE-BROWN, SILTY, SANDY, PEBBLY; MORE SAND AT 10 FEET, LIGHT-BROWN BY 11 FEET, OXIDIZED (TILL)
1223 1221	11 -13	CLAY, LIGHT-BROWN, SILTY, SANDY, PEBBLY; OXIDIZED (TILL)

SPLIT SPOON SAMPLING STARTED AT 3 FEET BELOW LAND SURFACE. NO CONTAMINANTS WERE OBSERVED DURING DRILLING.

Location Information

Legal Location: NW SW SW NE SEC. 18, T. 092 N., R. 51 W.
County: CLAY
Hydrologic Unit Code: 10170102
Land Owner: FIRST DAKOTA BANK
Location: 092N51W18ACCB 2
Latitude: 42.787875
Longitude: -96.914353
Ground Surface Elevation: 1233 T

Project Information

Project: PETERSON CAR CRUSHING
Drill Date: 1/22/2015
Company: SDGS
Drilling Method: HOLLOWSTEM
Test Hole Number: R20-2015-03
Geologist: J. ALLEN
Geologist's Log: X
Driller: J. OLSON/T. MILLER
Driller's Log:
Total Drill Hole Depth (ft): 13.5

Well Information

SDGS Well Name: R20-2015-03
Water Rights Well:
Other Well Name:
Casing Type: PVC, SCH. 40
Screen Type: PVC, SCH. 40
Total Casing and Screen (ft): 15
Aquifer:
Management Unit:
Casing Top Elevation: 1235 T
Casing Diameter (in): 2
Screen Length (ft): 10
Casing Stick-up (ft): 2

WATER LEVEL MEASUREMENT TAKEN FROM GROUND LEVEL ON 01/22/2015 WAS 7.5 FEET BELOW LAND SURFACE. WATER LEVEL TAKEN FROM THE CASING TOP ON 01/22/2015 WAS 6.40 FEET BELOW CASING TOP.

Elevation (ft)	Depth (ft)	Description
1233 1231	0 -2	SILT, ORANGE-BROWN; SOME FINE SAND, BRICK AND CONCRETE PIECES, OXIDIZED (LOESS?) (FILL?)
1231 1229	2 -4	CLAY, LIGHT-OLIVE-GREEN, VERY SILTY, SANDY; A FEW PEBBLES, SELENITE CRYSTALS THROUGHOUT, SOME ORANGE OXIDATION (TILL)
1229 1227	4 -6	CLAY, ORANGE-BROWN, SILTY, SANDY, PEBBLY; FINE TO MEDIUM SAND LENS AT 5.1 TO 5.7 FEET (TILL)
1227 1225	6 -8	CLAY, YELLOW-BROWN, SILTY, SANDY, PEBBLY; MANY ORANGE OXIDATION STREAKS, SATURATION NOTICED AT 7 FEET (TILL)
1225 1223	8 -10	CLAY, LIGHT-BROWN, SILTY, SANDY, PEBBLY; MUCH WHITE CHALK IN SPLIT SPOON SHOE
1223 1219.5	10 -13.5	CLAY, BROWN, SILTY, SANDY, PEBBLY; OXIDIZED (TILL)

SPLIT SPOON SAMPLING STARTED AT 2 FEET. NO CONTAMINANTS WERE OBSERVED DURING DRILLING.

Location Information

Legal Location: NW SW SW NE SEC. 18, T. 092 N., R. 51 W.
County: CLAY
Hydrologic Unit Code: 10170102
Land Owner: FIRST DAKOTA BANK
Location: 092N51W18ACCB 3
Latitude: 42.787683
Longitude: -96.914556
Ground Surface Elevation: 1234 T

Project Information

Project: PETERSON CAR CRUSHING
Drill Date: 1/22/2015
Company: SDGS
Drilling Method: HOLLOWSTEM
Test Hole Number: R20-2015-04
Geologist: J. ALLEN
Geologist's Log: x
Driller: J. OLSON/T. MILLER
Driller's Log:
Total Drill Hole Depth (ft): 13.5

Well Information

SDGS Well Name: R20-2015-04
Water Rights Well:
Other Well Name:
Casing Type: PVC, SCH. 40
Screen Type: PVC, SCH. 40
Total Casing and Screen (ft): 15
Aquifer:
Management Unit:
Casing Top Elevation: 1236 T
Casing Diameter (in): 2
Screen Length (ft): 10
Casing Stick-up (ft): 2

WATER LEVEL MEASUREMENT TAKEN FROM GROUND LEVEL ON 01/22/2015 WAS 5.5 FEET BELOW LAND SURFACE, WATER LEVEL MEASUREMENT TAKEN FROM THE CASING TOP ON 01/26/2015 WAS 7.61 FEET BELOW CASING TOP.

Elevation (ft)	Depth (ft)	Description
1234 - 1231	5 0 -2.5	FILL, BRICK AND CONCRETE, DEBRIS
1231.5 - 1231	2.5 -3	CLAY, DARK-BROWN (TOPSOIL?) (FILL?)
1231 - 1229	3 -5	CLAY, LIGHT-OLIVE-GREEN, WITH DARK-BROWN CLAY TOWARDS TOP OF INTERVAL; SOME ORGANIC MATERIAL
1229 - 1225	5 -9	SILT, LIGHT-OLIVE-GREEN; SOME OXIDIZED ORANGE STREAKS, SATURATION NOTICED AT 7 FEET
1225 - 1222	9 -12	SILT AND CLAY, LIGHT-OLIVE-GREEN; SOME OXIDIZED ORANGE STREAKS; CONTAINS LAMINATIONS
1222 - 1220.5	12 -13.5	SILT, LIGHT-BROWN TO OLIVE-GREEN, SILTY; WITH IRON STAINING, GRADES INTO CLAY, BROWN, SILTY, SANDY, PEBBLY (TILL)

SPLIT SPOON SAMPLING STARTED AT 3 FEET. NO CONTAMINANTS WERE OBSERVED DURING DRILLING.

Location Information

Legal Location: NW SW SW NE SEC. 18, T. 092 N., R. 51 W.
County: CLAY
Hydrologic Unit Code: 10170102
Land Owner: FIRST DAKOTA BANK
Location: 092N51W18ACCB 4
Latitude: 42.787803
Longitude: -96.914433
Ground Surface Elevation: 1233.5 T

Project Information

Project: PETERSON CAR CRUSHING
Drill Date: 1/23/2015
Company: SDGS
Drilling Method: HOLLOWSTEM
Test Hole Number: R20-2015-05
Geologist: J. ALLEN
Geologist's Log: X
Driller: J. OLSON/T. MILLER
Driller's Log:
Total Drill Hole Depth (ft): 13.5

Well Information

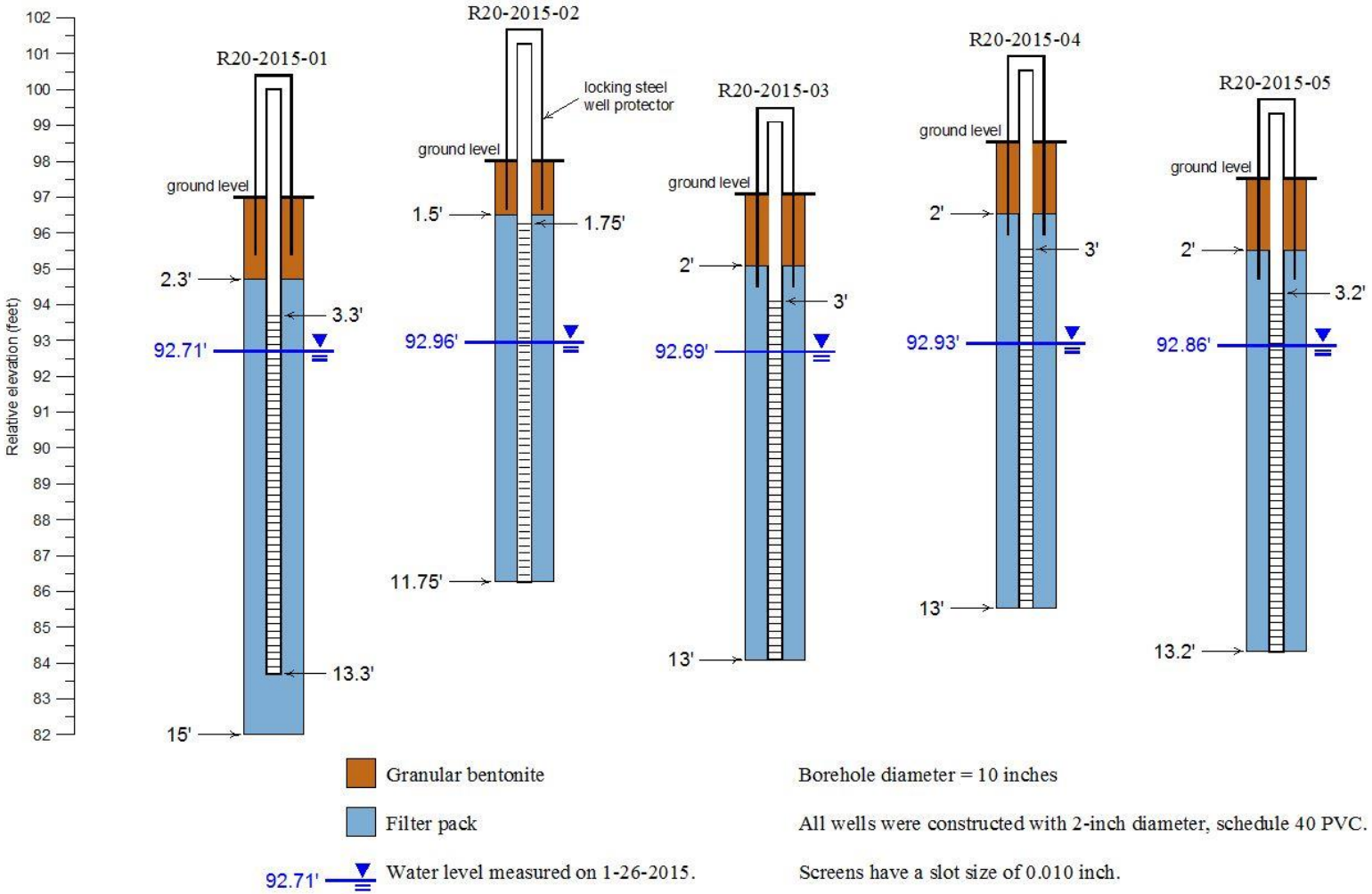
SDGS Well Name: R20-2015-05
Water Rights Well:
Other Well Name:
Casing Type: PVC, SCH. 40
Screen Type: PVC, SCH. 40
Total Casing and Screen (ft): 15
Aquifer:
Management Unit:
Casing Top Elevation: 1235.3 T
Casing Diameter (in): 2
Screen Length (ft): 10
Casing Stick-up (ft): 1.8

WATER LEVEL MEASUREMENT TAKEN FROM THE CASING TOP ON 01/26/2015 WAS 6.46 FEET BELOW CASING TOP.

Elevation (ft)	Depth (ft)	Description
1233.5 -1232.5	0 -1	CLAY, BROWN, SILTY; CONCRETE AND BRICK, DEBRIS
1232.5 -1231.5	1 -2	CLAY, DARK-GRAY TO BLACK; WITH PIECES OF BRICK, CONCRETE AND SOME IRON
1231.5 -1229	2 -4.5	CLAY, LIGHT-BROWN WITH SOME GRAY MOTTLING, SILTY, SANDY, PEBBLY (TILL)
1229 -1228.5	4.5 -5	SILT, ORANGE TO LIGHT-OLIVE-GREEN; SOME FINE SAND, MANY ORANGE OXIDIZED STREAKS (LOESS?)
1228.5 -1226.7	5 -6.8	SILT, LIGHT-BROWN WITH LIGHT-OLIVE-GREEN STREAKS; MANY ORANGE OXIDIZED LAYERS (LOESS?)
1226.7 -1223.5	6.8 -10	CLAY, ORANGE-BROWN, SILTY, SANDY, PEBBLY; OXIDIZED, SAND LENS AT 9.2 FEET (TILL)
1223.5 -1220	10 -13.5	CLAY, BROWN, SILTY, SANDY, PEBBLY; OXIDIZED (TILL)

SPLIT SPOON SAMPLING STARTED AT 2 FEET. NO CONTAMINANTS WERE OBSERVED DURING DRILLING.

Well Construction Diagrams



Appendix B

Right of entry form, laboratory reports, QA/QC, and chain of custody form

RIGHT OF ENTRY
("the License")

The property owner(s) (referred to in this Agreement as the "Owner(s)") have the sole right to possession of the property for which a right of entry is granted by this document. The property is located at:

The Owner(s) give the South Dakota Department of Environment and Natural Resources (the "Licensee"), its agents, subcontractors, employees, and assigns, the right to enter upon the property to:

> Drill test holes, install monitoring wells, collect soil and water samples, measure water levels, survey elevations, take photographs,

and to do all activities required to complete their work.

This License is effective immediately upon signing. Licensee agrees to repair or cause to be repaired any damage to the property resulting from entry onto the property by Licensee, its agents, employees, or assigns, by restoring the property, as much as reasonably possible, to its condition immediately prior to the entry.

Dated the 10th day of SEPTEMBER, ~~19~~ 2014

"Owner(s)"

FIRST DAKOTA NATIONAL BANK

by Farron Pratt VERMILLION AREA.

Signature

FARRON PRATT

Printed Name

"Licensee"
SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Derric L. Iles

Signature

Derric L. Iles

Printed Name

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: R20-2015-01
Project Name: Peterson Car Crushing
Sampled: 01/26/15 at 02:08 PM by Jeff Allen
Sample Matrix: Water

DENR - GROUNDWATER QUALITY
523 E. CAPITOL AVE.
PIERRE, SD 57501

Lab ID#: 20150127501
Received: 01/27/15 at 10:00 AM by Bobbie Laurenz
Account: W1163 - DENR - Groundwater Quality

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Volatile								
Benzene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/03/15
Ethylbenzene	1.39	µg/L	1	0.040	1.00	SW846 8021	SAC	02/03/15
Methyl tertiary-Butyl Ether	< 2.00	µg/L	1	0.043	2.00	SW846 8021	SAC	02/03/15
Naphthalene	24.0	µg/L	1	0.183	4.00	SW846 8021	SAC	02/03/15
Toluene	1.28	µg/L	1	0.042	1.00	SW846 8021	SAC	02/03/15
Xylenes(o,m,p)	< 3.00	µg/L	1	0.121	3.00	SW846 8021	SAC	02/03/15
Total Volatile Hydrocarbons								
TPH as Gasoline	< 100	µg/L	1	4.61	100	SW846 8015B	SAC	02/03/15
Semi-Volatile								
TPH(Total Extractable Hydrocarbons)	1.00	mg/L	1			SW846 8015B	SAC	02/04/15

Quality Control Data

Parameter	Result	Limits	DF	Method	Analyst	Date
Surrogate Recovery-SV						
Ortho-Terphenyl	92.7 %	(74.33) - (106.5)	1	SW846 8015 QC	SAC	02/04/15
Surrogate Recovery-Volatile						
4-Bromofluorobenzene	91.7 %	(54.69) - (129.2)	1	SW846 8021 QC	SAC	02/03/15

Notes:
Total Extractable Hydrocarbons includes diesel/fuel oil range, motor oil range, and a fraction of gasoline range. The GC/FID profile indicated the presence of hydrocarbons in all three ranges.

Approved By: Robert Mills

Approved On: 2/6/2015 3:51:29 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: R20-2015-02
Project Name: Peterson Car Crushing
Sampled: 01/26/15 at 02:08 PM by Jeff Allen
Sample Matrix: Water

DENR - GROUNDWATER QUALITY
523 E. CAPITOL AVE.
PIERRE, SD 57501

Lab ID#: 20150127502
Received: 01/27/15 at 10:00 AM by Bobbie Laurenz
Account: W1163 - DENR - Groundwater Quality

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Volatile								
Benzene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/03/15
Ethylbenzene	< 1.00	µg/L	1	0.040	1.00	SW846 8021	SAC	02/03/15
Methyl tertiary-Butyl Ether	< 2.00	µg/L	1	0.043	2.00	SW846 8021	SAC	02/03/15
Naphthalene	< 4.00	µg/L	1	0.183	4.00	SW846 8021	SAC	02/03/15
Toluene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/03/15
Xylenes(o,m,p)	< 3.00	µg/L	1	0.121	3.00	SW846 8021	SAC	02/03/15
Total Volatile Hydrocarbons								
TPH as Gasoline	< 100	µg/L	1	4.61	100	SW846 8015B	SAC	02/03/15
Semi-Volatile								
TPH(Total Extractable Hydrocarbons)	< 0.500	mg/L	1			SW846 8015B	SAC	02/04/15

Quality Control Data

Parameter	Result	Limits	DF	Method	Analyst	Date
Surrogate Recovery-SV						
Ortho-Terphenyl	72.5 %	(74.33) - (106.5)	1	SW846 8015 QC	SAC	02/04/15
	- Result is within QC guidelines of 70 - 130%					
Surrogate Recovery-Volatile						
4-Bromofluorobenzene	94.7 %	(54.69) - (129.2)	1	SW846 8021 QC	SAC	02/03/15

Notes:
Total Extractable Hydrocarbons includes diesel/fuel oil range, motor oil range, and a fraction of gasoline range.

Approved By: 

Approved On: 2/6/2015 3:51:29 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: R20-2015-03
Project Name: Peterson Car Crushing
Sampled: 01/26/15 at 02:08 PM by Jeff Allen
Sample Matrix: Water

DENR - GROUNDWATER QUALITY
523 E. CAPITOL AVE.
PIERRE, SD 57501

Lab ID#: 20150127503
Received: 01/27/15 at 10:00 AM by Bobbie Laurenz
Account: W1163 - DENR - Groundwater Quality

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Volatile								
Benzene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/04/15
Ethylbenzene	< 1.00	µg/L	1	0.040	1.00	SW846 8021	SAC	02/04/15
Methyl tertiary-Butyl Ether	< 2.00	µg/L	1	0.043	2.00	SW846 8021	SAC	02/04/15
Naphthalene	< 4.00	µg/L	1	0.183	4.00	SW846 8021	SAC	02/04/15
Toluene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/04/15
Xylenes(o,m,p)	< 3.00	µg/L	1	0.121	3.00	SW846 8021	SAC	02/04/15
Total Volatile Hydrocarbons								
TPH as Gasoline	< 100	µg/L	1	4.61	100	SW846 8015B	SAC	02/04/15
Semi-Volatile								
TPH(Total Extractable Hydrocarbons)	< 0.500	mg/L	1			SW846 8015B	SAC	02/04/15

Quality Control Data

Parameter	Result	Limits	DF	Method	Analyst	Date
Surrogate Recovery-SV						
Ortho-Terphenyl	86.7 %	(74.33) - (106.5)	1	SW846 8015 QC	SAC	02/04/15
Surrogate Recovery-Volatile						
4-Bromofluorobenzene	97.4 %	(56.15) - (125.2)	1	SW846 8021 QC	SAC	02/04/15

Notes:
Total Extractable Hydrocarbons includes diesel/fuel oil range, motor oil range, and a fraction of gasoline range.

Approved By: Robert Mills

Approved On: 2/6/2015 3:51:29 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: R20-2015-04
Project Name: Peterson Car Crushing
Sampled: 01/26/15 at 02:08 PM by Jeff Allen
Sample Matrix: Water

DENR - GROUNDWATER QUALITY
523 E. CAPITOL AVE.
PIERRE, SD 57501

Lab ID#: 20150127504
Received: 01/27/15 at 10:00 AM by Bobbie Laurenz
Account: W1163 - DENR - Groundwater Quality

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Volatile								
Benzene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/04/15
Ethylbenzene	< 1.00	µg/L	1	0.040	1.00	SW846 8021	SAC	02/04/15
Methyl tertiary-Butyl Ether	< 2.00	µg/L	1	0.043	2.00	SW846 8021	SAC	02/04/15
Naphthalene	< 4.00	µg/L	1	0.183	4.00	SW846 8021	SAC	02/04/15
Toluene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/04/15
Xylenes(o,m,p)	< 3.00	µg/L	1	0.121	3.00	SW846 8021	SAC	02/04/15
Total Volatile Hydrocarbons								
TPH as Gasoline	< 100	µg/L	1	4.61	100	SW846 8015B	SAC	02/04/15
Semi-Volatile								
TPH(Total Extractable Hydrocarbons)	< 0.500	mg/L	1			SW846 8015B	SAC	02/04/15

Quality Control Data

Parameter	Result	Limits	DF	Method	Analyst	Date
Surrogate Recovery-SV						
Ortho-Terphenyl	89.7 %	(74.33) - (106.5)	1	SW846 8015 QC	SAC	02/04/15
Surrogate Recovery-Volatile						
4-Bromofluorobenzene	96.8 %	(56.15) - (125.2)	1	SW846 8021 QC	SAC	02/04/15

Notes:
Total Extractable Hydrocarbons includes diesel/fuel oil range, motor oil range, and a fraction of gasoline range.

Approved By: Robert Mills

Approved On: 2/6/2015 3:51:29 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: R20-2015-05
Project Name: Peterson Car Crushing
Sampled: 01/26/15 at 02:08 PM by Jeff Allen
Sample Matrix: Water

DENR - GROUNDWATER QUALITY
523 E. CAPITOL AVE.
PIERRE, SD 57501

Lab ID#: 20150127505
Received: 01/27/15 at 10:00 AM by Bobbie Laurenz
Account: W1163 - DENR - Groundwater Quality

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Volatile								
Benzene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/04/15
Ethylbenzene	< 1.00	µg/L	1	0.040	1.00	SW846 8021	SAC	02/04/15
Methyl tertiary-Butyl Ether	< 2.00	µg/L	1	0.043	2.00	SW846 8021	SAC	02/04/15
Naphthalene	< 4.00	µg/L	1	0.183	4.00	SW846 8021	SAC	02/04/15
Toluene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC	02/04/15
Xylenes(o,m,p)	< 3.00	µg/L	1	0.121	3.00	SW846 8021	SAC	02/04/15
Total Volatile Hydrocarbons								
TPH as Gasoline	< 100	µg/L	1	4.61	100	SW846 8015B	SAC	02/04/15
Semi-Volatile								
TPH(Total Extractable Hydrocarbons)	< 0.500	mg/L	1			SW846 8015B	SAC	02/04/15

Quality Control Data

Parameter	Result	Limits	DF	Method	Analyst	Date
Surrogate Recovery-SV						
Ortho-Terphenyl	91.3 %	(74.33) - (106.5)	1	SW846 8015 QC	SAC	02/04/15
Surrogate Recovery-Volatile						
4-Bromofluorobenzene	94.0 %	(56.15) - (125.2)	1	SW846 8021 QC	SAC	02/04/15

Notes:
Total Extractable Hydrocarbons includes diesel/fuel oil range, motor oil range, and a fraction of gasoline range.

Approved By: Robert Mills

Approved On: 2/6/2015 3:51:29 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: Trip Blank
Project Name: Peterson Car Crushing
Sampled: 01/26/15 at 08:00 AM by Jeff Allen
Sample Matrix: Water

DENR - GROUNDWATER QUALITY
523 E. CAPITOL AVE.
PIERRE, SD 57501

Lab ID#: 20150127506
Received: 01/27/15 at 10:00 AM by Bobbie Laurenz
Account: W1163 - DENR - Groundwater Quality

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Volatile							
Benzene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC 02/03/15
Ethylbenzene	< 1.00	µg/L	1	0.040	1.00	SW846 8021	SAC 02/03/15
Methyl tertiary-Butyl Ether	< 2.00	µg/L	1	0.043	2.00	SW846 8021	SAC 02/03/15
Naphthalene	< 4.00	µg/L	1	0.183	4.00	SW846 8021	SAC 02/03/15
Toluene	< 1.00	µg/L	1	0.042	1.00	SW846 8021	SAC 02/03/15
Xylenes(o,m,p)	< 3.00	µg/L	1	0.121	3.00	SW846 8021	SAC 02/03/15
Total Volatile Hydrocarbons							
TPH as Gasoline	< 100	µg/L	1	4.61	100	SW846 8015B	SAC 02/03/15

Quality Control Data

Parameter	Result	Limits	DF	Method	Analyst/Date
Surrogate Recovery-Volatile					
4-Bromofluorobenzene	100.3 %	(54.69) - (129.2)	1	SW846 8021 QC	SAC 02/03/15

Approved By: Robert Mills

Approved On: 2/6/2015 4:00:38 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Lab Numbers: 20150127501 - 20150127506

QC Sample Report

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Spike								
Benzene	0114511	9.85	< 1.00	10.0	1	**98.5 %**	(83.78) - (125.8)	SW846 8021
Ethylbenzene	0114511	10.1	< 1.00	10.0	1	**100.8 %**	(72.64) - (120.6)	SW846 8021
MTBE	0114511	11.9	< 2.00	10.0	1	**118.6 %**	(74.20) - (120.2)	SW846 8021
Naphthalene	0114511	10.5	< 4.00	10.0	1	**105.2 %**	(63.24) - (146.0)	SW846 8021
Toluene	0114511	10.1	< 1.00	10.0	1	**100.6 %**	(80.69) - (126.1)	SW846 8021
Xylenes(o,m,p)	0114511	29.8	< 3.00	30.0	1	**99.4 %**	(82.91) - (132.4)	SW846 8021
TPH Gas	0114512	1020	< 100	1000	1	**102.1 %**	(80.82) - (125.4)	SW846 8015B
Matrix Spike Duplicate								
Benzene	0114511	9.70	9.85		1	**-1.52%**	(-6.573) - (6.404)	SW846 8021
Ethylbenzene	0114511	9.92	10.1		1	**-1.61%**	(-11.27) - (9.622)	SW846 8021
MTBE	0114511	11.9	11.9		1	**0.362%**	(-3.508) - (3.416)	SW846 8021
Naphthalene	0114511	10.9	10.5		1	**4.00%**	(-20.90) - (30.28)	SW846 8021
Toluene	0114511	9.86	10.1		1	**-2.00%**	(-9.283) - (8.598)	SW846 8021
Xylenes(o,m,p)	0114511	29.2	29.8		1	**-2.08%**	(-7.775) - (7.593)	SW846 8021
TPH Gas	0114512	979	1020		1	**-4.20%**	(-6.714) - (6.844)	SW846 8015B
Initial Calibration Verification								
TPH Diesel		990	1000		1	**-1.00%**	(-25.89) - (22.40)	SW846 8015B
Continuing Calibration Verification								
Benzene		23.5	25.0		1	**-6.10%**	(-22.47) - (33.65)	SW846 8021
Benzene		23.4	25.0		1	**-6.55%**	(-23.05) - (31.69)	SW846 8021
Benzene		23.3	25.0		1	**-6.80%**	(-23.05) - (31.69)	SW846 8021
Ethylbenzene		23.0	25.0		1	**-7.81%**	(-32.08) - (24.06)	SW846 8021
Ethylbenzene		23.1	25.0		1	**-7.62%**	(-30.55) - (20.46)	SW846 8021
Ethylbenzene		23.0	25.0		1	**-8.09%**	(-30.55) - (20.46)	SW846 8021
MTBE		24.2	25.0		1	**-3.16%**	(-25.62) - (23.79)	SW846 8021
MTBE		23.7	25.0		1	**-5.05%**	(-23.91) - (20.28)	SW846 8021
MTBE		23.3	25.0		1	**-6.72%**	(-23.91) - (20.28)	SW846 8021
Naphthalene		21.6	25.0		1	**-13.6 %**	(-41.23) - (17.61)	SW846 8021
Naphthalene		21.1	25.0		1	**-15.5 %**	(-41.04) - (17.62)	SW846 8021
Naphthalene		20.5	25.0		1	**-18.0 %**	(-41.04) - (17.62)	SW846 8021
Toluene		23.1	25.0		1	**-7.73%**	(-23.04) - (25.87)	SW846 8021
Toluene		23.1	25.0		1	**-7.76%**	(-23.56) - (24.43)	SW846 8021
Toluene		22.9	25.0		1	**-8.35%**	(-23.56) - (24.43)	SW846 8021
Xylenes(o,m,p)		71.8	75.0		1	**-4.25%**	(-18.76) - (34.39)	SW846 8021
Xylenes(o,m,p)		72.8	75.0		1	**-2.93%**	(-20.34) - (34.00)	SW846 8021

Lab Numbers: **20150127501 - 20150127506**

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method	
Continuing Calibration Verification									
Xylenes(o,m,p)		72.0	75.0		1	-3.94%	(-20.34) - (34.00)	SW846 8021	
TPH Gas		2190	2000		1	9.38%	(-10.16) - (19.44)	SW846 8015B	
TPH Gas		2050	2000		1	2.53%	(-9.001) - (19.46)	SW846 8015B	
TPH Gas		2160	2000		1	8.13%	(-9.001) - (19.46)	SW846 8015B	
TPH Diesel		1070	1000		1	6.50%	(-35.95) - (37.33)	SW846 8015B	
TPH Diesel		1140	1000		1	14.3 %	(-35.95) - (37.33)	SW846 8015B	
Lab Control Spike									
Benzene		9.59	0.00	10.0	1	95.9 %	(77.03) - (124.2)	SW846 8021	
Ethylbenzene		9.40	0.00	10.0	1	94.0 %	(56.49) - (118.8)	SW846 8021	
MTBE		9.91	0.00	10.0	1	99.1 %	(74.47) - (111.6)	SW846 8021	
Naphthalene		8.63	0.00	10.0	1	86.3 %	(65.80) - (137.4)	SW846 8021	
Toluene		9.97	0.00	10.0	1	99.70%	(75.16) - (122.5)	SW846 8021	
Xylenes(o,m,p)		27.7	0.00	30.0	1	92.3 %	(78.07) - (134.0)	SW846 8021	
TPH Gas		997	0.00	1000	1	99.68%	(82.00) - (125.3)	SW846 8015B	
TPH Diesel		4.65	0.00	6.00	1	77.5 %	(46.68) - (90.99)	SW846 8015B	
Lab Reagent Blank									
Benzene		0.439	0.00		1	0.4391	(0.000) - (0.000)	SW846 8021	X
- Blank value is less than half of the reporting limit									
Ethylbenzene		0.407	0.00		1	0.4071	(-0.1328) - (0.1542)	SW846 8021	X
- Blank value is less than half of the reporting limit									
MTBE		0.00	0.00		1	0	(0.000) - (0.000)	SW846 8021	
Naphthalene		0.440	0.00		1	0.4398	(-1.156) - (1.386)	SW846 8021	
Toluene		0.549	0.00		1	0.5493	(-0.2379) - (0.2762)	SW846 8021	X
- Blank value is less than half of the reporting limit									
Xylenes(o,m,p)		1.49	0.00		1	1.4875	(-1.065) - (1.323)	SW846 8021	X
- Blank value is less than half of the reporting limit									
TPH Gas		0.00	0.00		1	0	(25.02) - (91.32)	SW846 8015B	X
- Blank value is less than half of the reporting limit									
TPH Diesel		0.190	0.00		1	0.19	(-0.0354) - (0.2564)	SW846 8015B	

Approved By: Robert Mills

Approved On: 02/06/2015 03:51 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709
(605) 348-0111 • www.TheChemistryLab.com

CHAIN OF CUSTODY RECORD

Company	South Dakota Geological Survey
Project Name / Mgr.	Peterson Car Crushing / Jeff Allen
Project Number	
Sampled by	Signature
Sampled by	Print Jeff Allen Chris Lanoue

ANALYSES REQUESTED														
PRESERVED WITH	HCl													
FILTERED (Y/N)	N	N												
REFRIGERATED (Y/N)	Y	Y												
TBH MTBE BTEX														
TEH Diesel/Fuel only														

FOR LAB USE ONLY

Seal Intact (Y/N)/Number: Y

Sample Condition: good blue ice

Temperature of Container: 2°C 5 gpc

1pm 1/27/15

REQUESTED TURN AROUND

STANDARD_____ RUSH_____

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS										COMMENTS	LAB #
1	R20-2015-01	01/26/2015	2:08 PM	water	4	3	1								2015	01 27501
2	R20-2015-02	01/26/15	2:08PM	water	4	3	1									502
3	R20-2015-03	01/26/15	2:08 PM	water	4	3	1									503
4	R20-2015-04	01/26/15	2:06 PM	water	4	3	1									504
5	R20-2015-05	01/26/15	2:06 PM	water	4	3	1									505
6	Trip Blank 1pm 1/27/15	01/26/15	0800a	water	3	3										506
7																
8																
9																
10																
11																
12																

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
	SDGS	01/26/15	2:27PM	1pm	MCL	1-27-15	10:00A

FORM 113D

MIDCONTINENT TESTING LABORATORIES

SAMPLE RECEIPT CHECKLIST

Company Name: SD DENR GWQ
Date/Time Received: 01/27/2015 (Date) / 10:00a (Time)
Project: Peterson Car Crushing
Received by: Bobbie Laurenz/RAM
Lab Number(s): 20150127501-6
Carrier Name: USPS

UNPACKING

Yes	No		Initials
☒	☐	1. Shipping container in good condition?	
☒	☐	2. Custody seals present on shipping container? Condition: Intact Broken	
☒	☐	3. Ice / Blue Ice (circle one) present in shipping container? Container(s) Temp. 1. 2.3c 2. _____ 3. _____ 4. _____	
☐	☒	4. Bottles broken and/or leaking? (Photograph broken bottles.)	
☐	☒	5. Custody seals on sample bottles? Condition: Intact Broken	

LABELING

Yes	No		Initials
☒	☐	6. Chain of custody Present?	
☒	☐	7. Chain of custody includes signatures, dates, and times when relinquished and received?	
☒	☐	8. Chain of custody agrees with bottle count? *Trip Blank added to COC at lab	
☒	☐	9. Chain of custody agrees with labels?	
☒	☐	10. Samples received within holding times?	
☒	☐	11. Samples in proper container?	
☒	☐	12. Sufficient sample volume for indicated tests?	

PRESERVATIVE

Yes	No		Initials	Yes	No		Initials
☐	☐	13. Metals bottle(s) pH < 2?		☐	☐	17. TOC bottle(s) pH < 2?	
☐	☐	14. Nutrient bottle(s) pH < 2?		☐	☐	18. Oil & Grease bottle(s) pH < 2?	
☐	☐	15. Cyanide bottle(s) pH > 12?		☒	☐	19. Volatiles pH < 2?	
☐	☐	16. Sulfide bottle(s) pH > 9?					

COMMENTS:

F:\Inorganic Forms\SAMPLE RECEIPT CHECKLIST.doc