



John Cannon
Regulatory Affairs Advisor

Chevron Environmental Management
Company
1500 Louisiana
Houston, TX 77002
Tel 985-276-7359
JFNM@chevron.com

June 22, 2022

Mr. John Heil
West Environmental Protection Specialist
Colorado Oil and Gas Conservation Commission
Department of Natural Resources
818 Taughenbaugh Blvd., Suite 103
Rifle, CO 81650

Re: Response to Form 27 COAs (Document # 402635767) - 2020 Annual Report for South Canyon Field Federal 27-11, Garfield County, Colorado

Dear Mr. Heil:

Chevron Environmental Management Company (CEMC) has prepared this response to the Colorado Oil and Gas Conservation Commission (COGCC) conditions of approval (COAs) listed on Form 27 (Document # 402635767) concerning the 2020 Annual Report for the South Canyon Field Federal 27-11 received on October 18, 2021. CEMC has carefully considered the COAs and provides the following responses:

COA #1 - *Operator states "Conduct the 2021 semi-annual groundwater monitoring and sampling events in Second and Third Quarter 2021 with laboratory analysis to include BTEX, TDS, chloride, and sulfate."*

Groundwater samples shall be analyzed for table 915-1 Organic Compounds in Groundwater and Groundwater Inorganic Parameters.

Response #1: CEMC acknowledges this comment and the COGCC recently adopted Table 915-1. Both Organic Compounds in Groundwater and Groundwater Inorganic Parameters will be sampled and analyzed during future semi-annual monitoring and sampling events starting in the second quarter of 2022. Organic Compounds in Groundwater include benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene. Groundwater Inorganic Parameters include total dissolved solids (TDS), chloride ion, and sulfate ion.

COA #2 - *Operator shall submit all soil boring and monitoring well construction details that were constructed during the 2010 and 2011 site investigations.*

Response #2: CEMC acknowledges this comment and has attached to this response letter the soil boring and monitoring well construction well details that were constructed during the 2010 and 2011 investigations (Attachment 1). Also included in Attachment 1 is a Site Plan (Figure 3) which shows the locations of historical soil borings. Soil borings BG-1, BG-2 and BG-3 shown on Figure 3 were hand auger borings and borings logs were not generated for those locations.

COA #3 - *Operator shall adhere to Table 915-1 Protection of Groundwater Soil Screening Level Concentrations.*

Response #3: CEMC acknowledges this comment and COGCC Table 915-1. Soil data tables will be updated and reviewed to include COGCC Table 915-1 Contaminates of Concern-Protection of Groundwater Soil Screening Level Concentrations. Future data will also be compared to COGCC Table 915-1 Contaminates of Concern-Protection of Groundwater Soil Screening Level Concentrations.

COA #4 - *Additional monitoring wells shall be advanced to account for the decreasing groundwater table. During monitoring well installation, operator shall properly characterize the smear zone.*

Response #4: CEMC acknowledges this comment and will provide a Form 27 with an analysis of the existing monitoring well network performance and a work plan detailing the reinstallation of historically dry monitoring wells determined necessary to continue monitoring groundwater quality at Federal 27-11. These supplemental monitoring wells will be installed to ensure that groundwater elevations (if present) bisect the screen interval. The necessity of replacing existing monitoring wells will include consideration of additional assessment as detailed in COA #5. Sampling and analysis of soil in the smear zone will be completed during drilling activities. The work plan will be provided to the COGCC summarizing the proposed methods and procedures for installation of replacement monitoring wells. CEMC anticipates that the work plan will be submitted to the COGCC in August 2022, with field work conducted in September, pending regulatory approval.

COA #5 - *Operator shall determine the horizontal groundwater and soil impacts specifically to the south, southeast and southwest around MW2, MW3, MW6 and MW7.*

Response #5: CEMC acknowledges this comment and will provide a second work plan to complete an additional assessment to evaluate the horizontal groundwater and soil impacts south, southeast, and southwest around 111762-MW-2, 111762-MW-3, 111762-MW-6, and 111762-MW-7. This work plan will require encroachment onto United States Bureau of Land Management (BLM) land beyond the current lease area including the natural gas production well pad and access road. Field execution of the additional assessment will require BLM engagement and likely additional permitting. After CEMC and COGCC have agreed to the location of additional assessment monitoring wells and/or soil borings, it will be possible to begin discussion with the BLM on the footprint of encroachment. CEMC anticipates that the work plan will be submitted to the COGCC by November 1st.

COA #6 – *"Using the Third Quarter 2019 concentration in samples collected from well 111762-MW-7 (79,000 mg/L) as background, the Concentration Level of 98,750 mg/L has been calculated for the Site (1.25 times background)."*

"Dissolved-phase benzene and ethylbenzene detections were observed in Second and Fourth Quarter 2020 in well 111762-MW-7. These detections were below the LRL and Table 910-1 Concentration Levels but above the MDL. BTEX detections in well 111762-MW-7 will be monitored during the next monitoring and sampling event planned for Second Quarter 2021."

Operator shall establish new background conditions as MW-7 has been impacted by benzene and ethylbenzene.

Response #6: CEMC acknowledges this comment. As described in Response #4, CEMC will provide a work plan by August 2022 for installation of replacement wells and will include replacement of MW-5R which is hydraulically upgradient of Federal 27-11 and will be appropriate to monitor background concentrations in groundwater.

COA #7 - *Page 3 paragraph 4: 2020 Annual Report Doc #402647115 states "Current and historical groundwater elevation data are presented in Table 1. Since the installation of wells in 2010 and 2011, and with the exception of well 111762-MW-7, groundwater evaluations have decreased by as much as 11 feet (111762-MW-2)."*

Operator shall provide a plan on addressing impacts in monitoring wells that no longer have sufficient water to sample, additional, deeper monitoring wells may be required to replace the monitoring wells that no longer have sufficient water to sample.

Vertical extent of impacts in soil and groundwater has yet to be determine due to groundwater elevations being decreased by as much as 11 feet.

Response #7: CEMC acknowledges this comment and refers to Response #4 and Response #5.

COA #8 - *Operator shall provide quarterly update reports in a Supplemental Form 27 to document progress of site investigation and Remediation per Rule 913.e.*

Response #8: CEMC acknowledges this comment and will provide quarterly update reports via Form 27 to document progress of site investigation and remediation per COGCC Rule 913.e.

COA #9 - *Page 3 paragraph 2: 2020 Annual Report Doc #402647115 states "Purge water generated from groundwater sampling activities conducted during Second and Fourth Quarter 2020 was returned to the formation via the same Site well from which it was extracted."*

Operator shall not dispose of Investigation-Derived Waste down the same Site well from which it was extracted. Operator shall manage all Investigation-Derived Waste per Rule 913.b.(3) and dispose of all Investigation-Derived Waste per Rule 905 and Rule 906.

Response #9: CEMC acknowledges this comment. While purge groundwater from sampling activities has been previously allowed to be placed back into the well, moving forward this material will be collected and properly disposed of offsite.

CEMC appreciates the COGCC's consideration of this request and would be happy to set up a call to discuss any of the COAs and responses provided above.

Should you have any questions regarding this submittal, please contact Brent Lucyk at (517) 749-9405 or me at (985) 276-7359.

Respectfully,

Chevron Environmental Management and Real Estate Company
on behalf of
Chevron U.S.A. Inc.



John Cannon
Regulatory Affairs Advisor

Attachments:

Attachment 1 Soil Boring and Monitoring Well Construction Details 2010 and 2011



LEGEND



MONITOR WELL LOCATION
SOIL BOREHOLE LOCATION



2321 CLUB MERDIAN DRIVE SUITE E
OKEMOS, MI 48864
PHONE: (517)349-9499 FAX: (517)349-6863

FOR:

CHEVRON
SOUTH CANYON FIELD

JOB NUMBER:
213201183

DRAWN BY:
JRO

CHECKED BY:
SAM

APPROVED BY:
BAL

DATE:
12/22/10

PIT #111762 EXTENDED SITE PLAN

FIGURE:

3

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-MW-1 PAGE 1 OF 2



DRILLING / INSTALLATION:

STARTED **5/11/10** COMPLETED: **5/19/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597090**

EASTING (ft): **2017790**

LAT:

LONG:

GROUND ELEV (ft): **5263.59**

TOC ELEV (ft): **5265.90**

INITIAL DTW (ft): **52.05**

WELL DEPTH (ft): **64.0**

STATIC DTW (ft): **54.66**

BOREHOLE DEPTH (ft): **72.0**

WELL CASING DIA. (in): **2**

BOREHOLE DIA. (in): **8**

LOGGED BY: **CAB**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Well Construction
			Hydro-Vac to 8' bgs, blind drill to 20' bgs							
5										
10										
15										
20		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 2/1 black; non plastic; dry; moderate petroleum odor; hydrocarbon staining; trace fill material, color change to very dark gray 10YR 3/1 at 25 ft	X		2	7 9 9 11	3782	20	← Cement Surface Plug ← 2" Sch. 40 PVC Riser ← Hydrated Bentonite Chip Seal
25				X		2	4 6 5 6	2076	25	
30		ML	SILT WITH TRACE FINE TO COARSE SAND ; ML; GLEY1 3/N very dark gray; low plasticity; moist; strong petroleum odor; hydrocarbon staining; oily feel, trace medium gravel at 36 ft	X		2	3 2 3 4	2211	30	
35				X	1000 MW-1-36'	2	3 4 6 6	3927	35	

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-MW-1 PAGE 2 OF 2



DRILLING / INSTALLATION:

STARTED **5/11/10** COMPLETED: **5/19/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597090** EASTING (ft): **2017790**
 LAT: LONG:
 GROUND ELEV (ft): **5263.59** TOC ELEV (ft): **5265.90**
 INITIAL DTW (ft): **52.05** WELL DEPTH (ft): **72.0**
 STATIC DTW (ft): **54.66** BOREHOLE DEPTH (ft): **72.0**
 WELL CASING DIA. (in): **2** BOREHOLE DIA. (in): **8**
 LOGGED BY: **CAB** CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace P/D (units)	Depth (feet)	Well Construction
		ML	SILT TRACE SAND AND GRAVEL ; ML; 7.5YR 3/1 dark gray; non plastic; moist; strong petroleum odor; hydrocarbon staining	X		2	3 3 3 11	1199		
45		ML	SILT TRACE SAND AND GRAVEL ; ML; 7.5YR 5/6, 7.5YR 3/1 brown and very dark gray; low plasticity; moist; strong petroleum odor; hydrocarbon staining; mottled; oily feel at 55 ft	X	1100 MW-1-46' (Dup-2)	2	3 4 6 7	1410	45	
50				X		2	2 4 5 11	1235	50	
55				X	1150 MW-1-56'	2	5 6 24 17	2210	55	
60		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 4/4, 7.5YR 4/3 dark yellowish brown; non plastic; moist; slight petroleum odor; hydrocarbon staining; mottled; trace small fragments of sandstone 10YR 5/8	X		2	13 17 50	2650	60	
65		ML	SANDY SILT WITH GRAVEL ; ML; 7.5YR 4/6 brown; low plasticity; wet; no odor; no staining; trace clay at 70 ft	X		2	18 23 50	39.6	65	
70				X		2	8 11 30 28	6.3	70	
75			Borehole terminated at 72 feet.						75	

← 12/20 Sand Filter Pack
 2" Sch. 40 PVC 0.01 Slot Screen

PROJECT: **South Canyon**
LOCATION: **South Canyon, CO**
PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-MW-2 PAGE 1 OF 2



DRILLING / INSTALLATION:

STARTED **5/11/10** COMPLETED: **5/24/10**
DRILLING COMPANY: **SiteWise/Dakota Drilling**
DRILLING EQUIPMENT: **Sterling/CME55**
DRILLING METHOD: **Hydro-Vac/HSA**
SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597086**

EASTING (ft): **2017833**

LAT:

LONG:

GROUND ELEV (ft): **5262.73**

TOC ELEV (ft): **5264.21**

INITIAL DTW (ft): **51**

WELL DEPTH (ft): **62.0**

STATIC DTW (ft): **51.75**

BOREHOLE DEPTH (ft): **62.0**

WELL CASING DIA. (in): **2**

BOREHOLE DIA. (in): **8**

LOGGED BY: **CAB**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace P/D (units)	Depth (feet)	Well Construction
			Hydro-Vac to 8' bgs, blind drill to 10' bgs							
5										
10		ML	SILT WITH TRACE FINE SAND ; ML; 10YR 4/6 dark yellowish brown; non plastic; dry; no odor; no staining; white inclusions at 20 ft	X		2	28 10 8 6	0.0		
15				X		2	10 5 5 7	0.0		
20				X		1.5	5 4 6 8	0.0		2" Sch. 40 PVC Riser Hydrated Bentonite Chip Seal
25		GW-GM	WELL-GRADED GRAVEL WITH SILT AND SAND ; GW-GM; 7.5YR 5/6 strong brown; dry; no odor; no staining	X		2	17 18 19 9	0.0		
30		ML	SILT WITH TRACE FINE SAND ; ML; 10YR 4/6 dark yellowish brown; non plastic; dry; no odor; no staining	X	1120 MW-2-31'	2	6 8 10 12	0.0		

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:



111762-MW-2 PAGE 2 OF 2

DRILLING / INSTALLATION:

STARTED **5/11/10** COMPLETED: **5/24/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597086**

EASTING (ft): **2017833**

LAT:

LONG:

GROUND ELEV (ft): **5262.73**

TOC ELEV (ft): **5264.21**

INITIAL DTW (ft): **51**

WELL DEPTH (ft): **62.0**

STATIC DTW (ft): **51.75**

BOREHOLE DEPTH (ft): **62.0**

WELL CASING DIA. (in): **2**

BOREHOLE DIA. (in): **8**

LOGGED BY: **CAB**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Well Construction
		ML				0	20			
40		SW-SM	WELL-GRADED SAND WITH SILT AND GRAVEL ; SW-SM; 10YR 4/6 dark yellowish brown; dry; slight petroleum odor; no staining		1140 MW-2-41'	1	18 50	82.7	40	
45		ML	SILT WITH SAND AND GRAVEL ; ML; 7.5YR 5/8 strong brown; dry; strong petroleum odor; iron oxide staining; black staining and moist at 50 ft		1200 MW-2-46'	1.75	36 36 19 31	2250	45	
50						.75	13 50	1910	50	12/20 Sand Filter Pack 2" Sch. 40 PVC 0.01 Slot Screen
55						2	8 8 18 34	2009	55	
60						0	50		60	
65			Borehole terminated at 62 feet.						65	

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-MW-3 PAGE 1 OF 2



DRILLING / INSTALLATION:

STARTED **5/11/10** COMPLETED: **5/22/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597057**

EASTING (ft): **2017807**

LAT:

LONG:

GROUND ELEV (ft): **5262.43**

TOC ELEV (ft): **5264.62**

INITIAL DTW (ft): **50**

WELL DEPTH (ft): **62.0**

STATIC DTW (ft): **51.75**

BOREHOLE DEPTH (ft): **62.0**

WELL CASING DIA. (in): **2**

BOREHOLE DIA. (in): **8**

LOGGED BY: **CAB**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace P/D (units)	Depth (feet)	Well Construction
			Hydro-Vac to 8' bgs, blind drill to 10' bgs							
5										
10		ML	SILT TRACE FINE SAND AND GRAVEL ; ML; 7.5YR 5/4 brown; non plastic; dry; no odor; no staining; trace white inclusions	X		1.75	11 7 9 10	0.1		
15		ML	SILT WITH FINE SAND ; ML; 10YR 6/4 light yellowish brown; non plastic; dry; no odor; no staining	X		1.75	9 7 7 7	0.0		
20				X		2	5 4 6 5	0.0		
25				X		2	14 14 13 16	2.9		
30				X		2	11 13 17 12	14.8		

← Cement Surface Plug

← Hydrated Bentonite Chip Seal

← 2" Sch. 40 PVC Riser

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-MW-3 PAGE 2 OF 2



DRILLING / INSTALLATION:

STARTED **5/11/10** COMPLETED: **5/22/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597057**

EASTING (ft): **2017807**

LAT:

LONG:

GROUND ELEV (ft): **5262.43**

TOC ELEV (ft): **5264.62**

INITIAL DTW (ft): **50**

WELL DEPTH (ft): **62.0**

STATIC DTW (ft): **51.75**

BOREHOLE DEPTH (ft): **62.0**

WELL CASING DIA. (in): **2**

BOREHOLE DIA. (in): **8**

LOGGED BY: **CAB**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace P/D (units)	Depth (feet)	Well Construction
		ML	SILT ; ML; 10YR 4/6 dark yellowish brown; non plastic; moist; no odor; no staining; trace gravel, strong odor, black staining at 41 ft	X	1040 MW-3-36'	1.5	10 7 7 12	52.9		
40				X	1110 MW-3-41'	2	5 6 7 10	2319	40	
45		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 4/2 grayish brown; low plasticity; moist; strong petroleum odor; hydrocarbon staining; mottled; wet at 50 ft	X	1130 MW-3-46'	2	3 5 10 11	2219	45	
50				X		2	4 8 8 10	2510	50	
55				X		2	5 8 9 12	1875	55	
60									60	
65			Borehole terminated at 62 feet.						65	

2" Sch. 40
PVC 0.01
Slot Screen
12/20 Sand
Filter Pack

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-MW-4 PAGE 1 OF 2



DRILLING / INSTALLATION:

STARTED **5/11/10** COMPLETED: **5/20/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597139**

EASTING (ft): **2017766**

LAT:

LONG:

GROUND ELEV (ft): **5266.67**

TOC ELEV (ft): **5268.94**

INITIAL DTW (ft): **53**

WELL DEPTH (ft): **64.0**

STATIC DTW (ft): **57.34**

BOREHOLE DEPTH (ft): **64.0**

WELL CASING DIA. (in): **2**

BOREHOLE DIA. (in): **8**

LOGGED BY: **CAB**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace P/D (units)	Depth (feet)	Well Construction
			Hydro-Vac to 8' bgs, blind drill to 10' bgs							
5										
10		ML	SILT SOME FINE SAND ; ML; 10YR 6/4 light yellowish brown; non plastic; dry; no odor; no staining	X		1.5	4 3 4 8	0.1		
15				X		1.25	8 8 6 32	2.1		
20		ML	SILT WITH SAND ; ML; 10YR 6/4 yellowish brown; non plastic; dry; no odor; no staining; weathered rock fragments between 27-30 ft	X	1500 MW-4-21'	1.5	14 28 28 15	3.0		
25				X		2	7 9 9 8	1.6		
30				X		1.75	9 14 11 9	0.2		

← Cement Surface Plug

← Hydrated Bentonite Chip Seal

← 2" Sch. 40 PVC Riser

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-MW-4 PAGE 2 OF 2



DRILLING / INSTALLATION:

STARTED **5/11/10** COMPLETED: **5/20/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597139**

EASTING (ft): **2017766**

LAT:

LONG:

GROUND ELEV (ft): **5266.67**

TOC ELEV (ft): **5268.94**

INITIAL DTW (ft): **53**

WELL DEPTH (ft): **64.0**

STATIC DTW (ft): **57.34**

BOREHOLE DEPTH (ft): **64.0**

WELL CASING DIA. (in): **2**

BOREHOLE DIA. (in): **8**

LOGGED BY: **CAB**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Well Construction
		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 4/6 dark yellowish brown; non plastic; dry; no odor; no staining	X	1530 MW-4-36'	1.75	13 14 28 50	0.2		
40		GW-GM	SILTY GRAVEL WITH SAND ; GW-GM; 7.5YR 5/8 brown; dry; no odor; iron oxide staining	X		1.75	16 34 50	1.6	40	
45		ML	SILT WITH GRAVEL ; ML; 10YR 4/4 dark yellowish brown; non plastic; dry; strong petroleum odor; iron oxide staining	X	1640 MW-4-36'	2	7 17 24 27	1761	45	
50		ML	SILT WITH CLAY TRACE SAND ; ML; 10YR 3/4 dark yellowish gray; low plasticity; dry; strong petroleum odor; iron oxide staining; wet at 54 ft	X	1650 MW-4-50'	2	8 8 10 50	1555	50	
55		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 4/3 brown; low plasticity; moist; slight petroleum odor; iron oxide staining	X		2	11 14 11 24	407	55	12/20 Sand Filter Pack 2" Sch. 40 PVC 0.01 Slot Screen
60									60	
65			Borehole terminated at 64 feet.						65	

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

Borehole / Monitoring Well Identification:

111762-MW-5



DRILLING / INSTALLATION:

STARTED: **10/20/11** COMPLETED: **10/20/11**
 DRILLING COMPANY: **Dakota Drilling**
 DRILLING EQUIPMENT: **CME-55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597191.330**

LAT: **NA**

GROUND ELEV (ft): **5269.92**

INITIAL DTW (ft): **Not Encountered**

STATIC DTW (ft): **59.95**

WELL CASING DIA. (in): **2**

LOGGED BY: **CAB**

EASTING (ft): **2017703.700**

LONG: **NA**

TOC ELEV (ft): **5272.39**

WELL DEPTH (ft): **65**

BOREHOLE DEPTH (ft): **65.0**

BOREHOLE DIA. (in): **8**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace P/D (PPM)	Depth (feet)	Well Construction
			Hydro-Vac							
5									5	
10			Blind Drill						10	
15									15	
20									20	
25									25	
30									30	
35		ML	SANDY SILT ; ML; 8YR 5/8 yellowish red; dry; no odor; no staining; angular; siltstone or sandstone rock fragments			.5	32 50 for 12"	0.0	35	
			Blind Drill							

GEO FORM 304 SOUTH CANYON.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 4/3/12

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

Borehole / Monitoring Well Identification:

111762-MW-5



DRILLING / INSTALLATION:

STARTED: **10/20/11** COMPLETED: **10/20/11**
 DRILLING COMPANY: **Dakota Drilling**
 DRILLING EQUIPMENT: **CME-55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597191.330**

LAT: **NA**

GROUND ELEV (ft): **5269.92**

INITIAL DTW (ft): **Not Encountered**

STATIC DTW (ft): **59.95**

WELL CASING DIA. (in): **2**

LOGGED BY: **CAB**

EASTING (ft): **2017703.700**

LONG: **NA**

TOC ELEV (ft): **5272.39**

WELL DEPTH (ft): **65**

BOREHOLE DEPTH (ft): **65.0**

BOREHOLE DIA. (in): **8**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace P/D (PPM)	Depth (feet)	Well Construction
			Attempted split spoon sample	X		0				
45			Attempted split spoon sample	X		0	50 for 3"		45	
50			Attempted split spoon sample	X		0	50 for 6"		50	
55									55	
60									60	
65			Borehole terminated at 65 feet.						65	
70									70	
75									75	

GEO FORM 304 SOUTH CANYON.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 4/3/12

GEO FORM 304 SOUTH CANYON.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 4/3/12

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

Borehole / Monitoring Well Identification:

111762-MW-6



DRILLING / INSTALLATION:

STARTED: **10/19/11** COMPLETED: **10/19/11**
 DRILLING COMPANY: **Dakota Drilling**
 DRILLING EQUIPMENT: **CME-55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1596946.160**

LAT: **NA**

GROUND ELEV (ft): **5258.76**

INITIAL DTW (ft): **Not Encountered**

STATIC DTW (ft): **52.65**

WELL CASING DIA. (in): **2**

LOGGED BY: **CAB**

EASTING (ft): **2017852.790**

LONG: **NA**

TOC ELEV (ft): **5261.46**

WELL DEPTH (ft): **65**

BOREHOLE DEPTH (ft): **65.0**

BOREHOLE DIA. (in): **8**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace P/D (PPM)	Depth (feet)	Well Construction
		ML	SILT WITH TRACE FINE SAND ; ML; 7.5YR 4/4 brown; moist; odor, black staining from 41.9' to 42'	X	1130 111762-MW-6 41'	2	6 8 9 13	908		
45			Attempted split spoon sample	X		0	4 5 7 7		45	
				X		2	17 20 22 32	151		
50										10/20 Silica Sand Filter Pack
55		ML	SILT WITH TRACE FINE SAND ; ML; 7.5YR 4/6 brown; moist; trace gravel, strong odor, mottled with 7.5YR 2.5/1 black, staining	X	1345 111726-MW-6 56'	2	8 10 13 17	2612		2" Sch. 40 PVC 0.01 Slotted Screen
60		ML	SILT WITH TRACE FINE SAND ; ML; 10YR 4/4 dark yellowish brown; moist; no odor; no staining	X		2	5 7 10 12	27.5		
65			Borehole terminated at 65 feet.							
70										
75										

GEO FORM 304 SOUTH CANYON.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 4/3/12

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

Borehole / Monitoring Well Identification:

111762-MW-7



DRILLING / INSTALLATION:

STARTED: **10/17/11** COMPLETED: **10/18/11**
 DRILLING COMPANY: **Dakota Drilling**
 DRILLING EQUIPMENT: **CME-55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1596374.940**

LAT: **NA**

GROUND ELEV (ft): **5240.22**

INITIAL DTW (ft): **Not Encountered**

STATIC DTW (ft): **59.8**

WELL CASING DIA. (in): **2**

LOGGED BY: **CAB**

EASTING (ft): **2017901.840**

LONG: **NA**

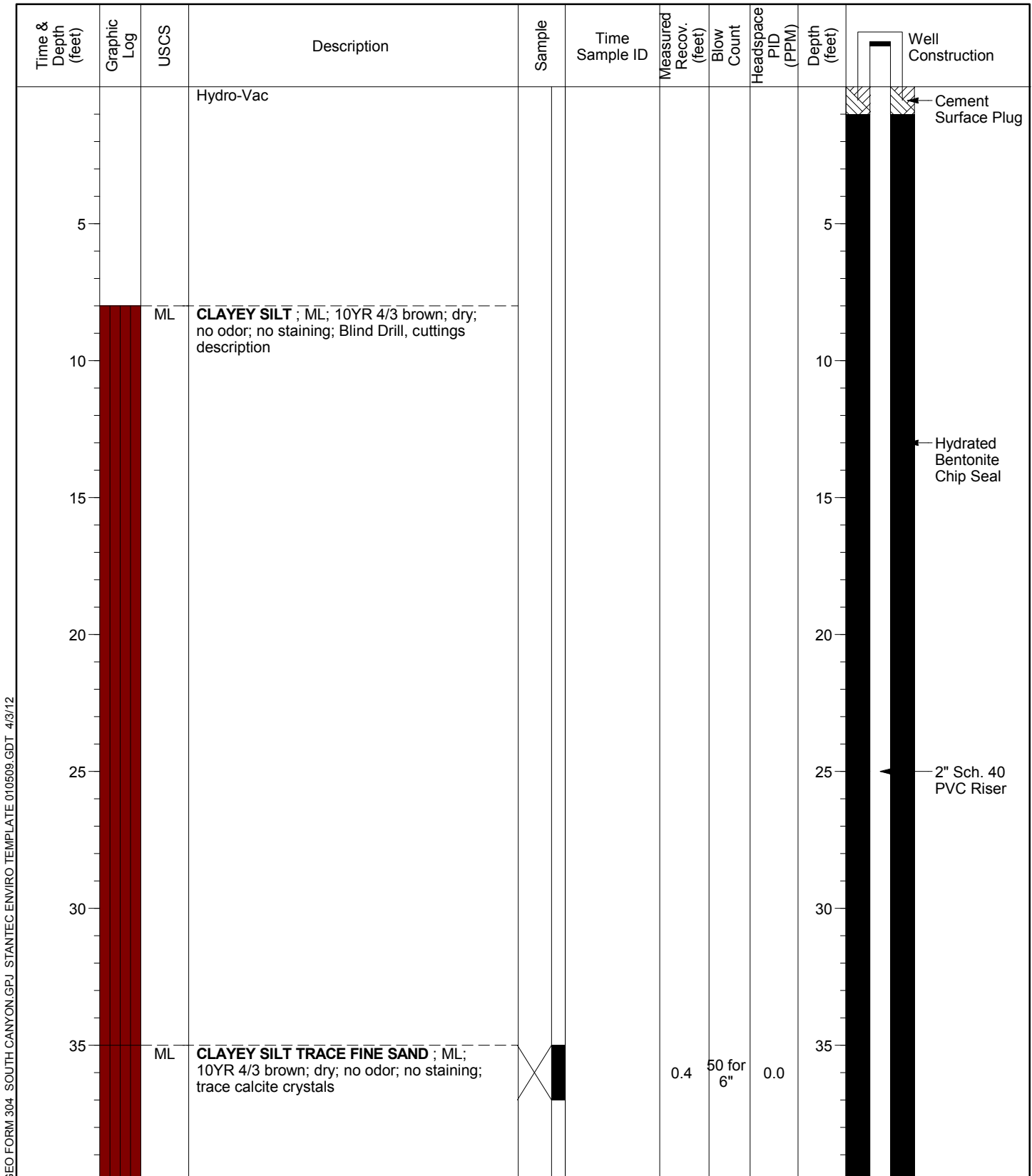
TOC ELEV (ft): **5243.08**

WELL DEPTH (ft): **65**

BOREHOLE DEPTH (ft): **65.0**

BOREHOLE DIA. (in): **8**

CHECKED BY: **BAL**



GEO FORM 304 SOUTH CANYON.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 4/3/12

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

Borehole / Monitoring Well Identification:

111762-MW-7



DRILLING / INSTALLATION:

STARTED: **10/17/11** COMPLETED: **10/18/11**
 DRILLING COMPANY: **Dakota Drilling**
 DRILLING EQUIPMENT: **CME-55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1596374.940**

LAT: **NA**

GROUND ELEV (ft): **5240.22**

INITIAL DTW (ft): **Not Encountered**

STATIC DTW (ft): **59.8**

WELL CASING DIA. (in): **2**

LOGGED BY: **CAB**

EASTING (ft): **2017901.840**

LONG: **NA**

TOC ELEV (ft): **5243.08**

WELL DEPTH (ft): **65**

BOREHOLE DEPTH (ft): **65.0**

BOREHOLE DIA. (in): **8**

CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace P/D (PPM)	Depth (feet)	Well Construction
		ML	CLAYEY SILT TRACE FINE SAND ; ML; 7.5YR 5/8 brown; dry; no odor; iron oxide staining	X		0.4	50 for 6"	0.0		
45			Blind Drill Attempted split spoon sample	X		0	50 for 3"		45	10/20 Silica Sand Filter Pack
50			Attempted split spoon sample	X		0	50 for 2"		50	Natural Collapse
55									55	2" Sch. 40 PVC 0.01 Slotted Screen
60									60	10/20 Silica Sand Filter Pack
65			Borehole terminated at 65 feet.						65	
70									70	
75									75	

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-SB-1 PAGE 1 OF 2



DRILLING / INSTALLATION:

STARTED **10/18/10** COMPLETED: **11/4/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597044** EASTING (ft): **2017832**
 LAT: LONG:
 GROUND ELEV (ft): **5261.55** TOC ELEV (ft): **NA**
 INITIAL DTW (ft): **50** WELL DEPTH (ft): **NA**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **57.0**
 WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **8**
 LOGGED BY: **CAB** CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace P/D (units)	Depth (feet)	Borehole Backfill
			Hydro-Vac to 8' bgs, blind drill to 10' bgs							
5									5	
10		ML	SILT ; ML; 10YR 6/4 light yellowish brown; dry; no odor; no staining	X		.8	8 5 4 3	7.0	10	
15				X	1005 SB-1-16'	1	2 3 4 4	4.2	15	
20		ML	SILT WITH SILT AND GRAVEL ; ML; 7.5YR 6/4 light brown; dry; no odor; no staining	X		1.25	11 13 20 20	8.0	20	
25		ML	SILT WITH TRACE FINE SAND ; ML; 10YR 5/6 dark yellowish brown with white; dry; no odor; no staining	X		2	9 8 9 12	1.1	25	
30				X	1025 SB-1-31'	2	10 9 8 7	1.2	30	
										← Hydrated Bentonite Chip Seal

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-SB-1 PAGE 2 OF 2



DRILLING / INSTALLATION:

STARTED **10/18/10** COMPLETED: **11/4/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597044** EASTING (ft): **2017832**
 LAT: LONG:
 GROUND ELEV (ft): **5261.55** TOC ELEV (ft): **NA**
 INITIAL DTW (ft): **50** WELL DEPTH (ft): **NA**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **57.0**
 WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **8**
 LOGGED BY: **CAB** CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 4/4 dark yellowish brown; dry; no odor; iron oxide staining	X		2	7 12 13 14	2.3		
40				X		2	6 8 12 28	283	40	
45		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 3/1 very dark gray and dark gray; moist; strong petroleum odor; hydrocarbon staining; iron oxide staining, wet at 50 ft	X	1200 SB-1-46'	2	16 23 21 24	2890	45	
50				X		2	10 11 27 35	2871	50	
55				X		1.5	8 16 16 21	3072	55	
			Borehole terminated at 57 feet.							
60									60	
65									65	

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-SB-2 PAGE 1 OF 2



DRILLING / INSTALLATION:
 STARTED **10/18/10** COMPLETED: **11/3/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597070** EASTING (ft): **2017764**
 LAT: LONG:
 GROUND ELEV (ft): **5263.15** TOC ELEV (ft): **NA**
 INITIAL DTW (ft): **50** WELL DEPTH (ft): **NA**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **57.0**
 WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **8**
 LOGGED BY: **CAB** CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
5			Hydro-Vac to 8' bgs, blind drill to 10' bgs						5	
10		ML	SILT TRACE SAND AND GRAVEL ; ML; 10YR 6/4 light yellowish black; dry; no odor; no staining	X		1	9 7 15 12	3.3	10	
15				X		1.5	7 6 7 7	38.5	15	
20		ML	SILT TRACE FINE SAND ; ML; 10YR 7/6 10YR 8/1 yellow and white; dry; slight petroleum odor; no staining; trace gravel	X		2	8 12 10 15	632	20	
25				X	1500 SB-2-26'	2	8 17 17 15	2717	25	
30		ML	SILT WITH TRACE SAND ; ML; 7.5YR 5/3 brown; dry; strong petroleum odor; hydrocarbon staining	X		2	6 9 10 9	2290	30	
										← Hydrated Bentonite Chip Seal

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-SB-2 PAGE 2 OF 2



DRILLING / INSTALLATION:

STARTED **10/18/10** COMPLETED: **11/3/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597070** EASTING (ft): **2017764**
 LAT: LONG:
 GROUND ELEV (ft): **5263.15** TOC ELEV (ft): **NA**
 INITIAL DTW (ft): **50** WELL DEPTH (ft): **NA**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **57.0**
 WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **8**
 LOGGED BY: **CAB** CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
		ML		X		2	6 7 5 7	2445		
40		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 2/1 black and dark gray; wet; strong petroleum odor; hydrocarbon staining	X		2	3 3 5 6	3151	40	
45				X	1700 SB-2-45' (Dup-5)	2	5 6 6 9	3566	45	
50				X		2	8 12 14 20	2142	50	
55		ML	SILT WITH SAND AND GRAVEL ; ML; 10YR 4/3 brown; moist; strong petroleum odor; no staining	X		2	7 11 13 15	2206	55	
			Borehole terminated at 57 feet.							
60									60	
65									65	

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-SB-3 PAGE 1 OF 2



DRILLING / INSTALLATION:

STARTED **10/18/10** COMPLETED: **11/3/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597112** EASTING (ft): **2017779**
 LAT: LONG:
 GROUND ELEV (ft): **5263.80** TOC ELEV (ft): **NA**
 INITIAL DTW (ft): **56.5** WELL DEPTH (ft): **NA**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **57.0**
 WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **8**
 LOGGED BY: **CAB** CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
			Hydro-Vac to 8' bgs, blind drill to 10' bgs							
5										
10		SW-SM	WELL-GRADED SAND WITH SILT AND GRAVEL ; SW-SM; 10YR 3/1 very dark gray; dry; strong petroleum odor; hydrocarbon staining; color change to 10YR 5/6 yellowish brown at 20 ft			1	6 10 12 15	4012	10	
15					0950 SB-3-16'	1.75	7 9 9 10	3829	15	
20						1.75	10 10 15 16	2713	20	
25						2	4 5 7 7	3450	25	
30					1030 SB-3-31'	2	4 5 5 6	3299	30	
										← Hydrated Bentonite Chip Seal

PROJECT: **South Canyon**
 LOCATION: **South Canyon, CO**
 PROJECT NUMBER: **213201183**

WELL / PROBEHOLE / BOREHOLE NO:

111762-SB-3 PAGE 2 OF 2



DRILLING / INSTALLATION:
 STARTED **10/18/10** COMPLETED: **11/3/10**
 DRILLING COMPANY: **SiteWise/Dakota Drilling**
 DRILLING EQUIPMENT: **Sterling/CME55**
 DRILLING METHOD: **Hydro-Vac/HSA**
 SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft): **1597112** EASTING (ft): **2017779**
 LAT: LONG:
 GROUND ELEV (ft): **5263.80** TOC ELEV (ft): **NA**
 INITIAL DTW (ft): **56.5** WELL DEPTH (ft): **NA**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **57.0**
 WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **8**
 LOGGED BY: **CAB** CHECKED BY: **BAL**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
		ML	SILT TRACE FINE SAND ; ML; 10YR 4/6 dark yellowish brown; slightly moist; slight petroleum odor; no staining; mottled; stained black and gray at 40 ft	X		2	4 6 7 7	3606		
40				X		2	4 5 6 8	2980	40	
45		ML	SILT WITH SAND AND GRAVEL ; ML; 7.5YR 4/6 strong brown; moist; strong petroleum odor; no staining; wet at 56.5 ft	X		1.5	7 10 23	2537	45	
50				X	1220 SB-3-51'	2	4 4 6 17	2976	50	
55				X		2	5 9 15 14	2808	55	
			Borehole terminated at 57 feet.							
60									60	
65									65	