COLORADO OIL AND GAS CONSERVATION COMMISSION
4M PROJECT COAL BED METHANE MONITORING
DEEP CANYON WELL INSTALLATION REPORT
ARCHULETA COUNTY, COLORADO
MAY 2010

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1.0 EXECUTIVE SUMMARY

On behalf of the Colorado Oil and Gas Conservation Commission (COGCC), Souder, Miller & Associates (SMA) supervised the construction of one Fruitland Formation coal bed methane (CBM) monitoring well. Oil and gas industry standard well drilling and completion techniques were used. Field work was performed from May 6, 2010 through June 1, 2010. The Regional Topographic Map and Regional Aerial Photo, illustrates the location of the site. The well is in Archuleta County at the following location:

1. Deep Canyon API #05-007-06293-00, Section 32, Township 34 North, Range 04 West, Map 2 and Photo 2 shows the site specific topography.

The wellbore at site was drilled to a total depth of 895 feet below ground surface (bgs). The well is equipped with pressure transducers and telemetry equipment. The pressure monitoring and telemetry equipment provides remote internet based monitoring of pressures both at the surface and below perforations in the borehole. Water levels can be calculated for the location utilizing pressure differences.

In summary:

1. One CBM monitoring well was successfully drilled and completed with minimal operational problems.
2. Lithologic and geophysical logging was successfully conducted on the borehole and approximately 29 feet of coal was identified.
3. The well was perforated at the identified coal intervals with four shots per foot.
4. Remote monitoring equipment was installed, tested, and found to be functioning.

2.0 INTRODUCTION

This report details the well site preparation activities, monitoring well drilling, casing installation, perforating, swabbing, and pressure sensing and telemetry equipment installation activities associated with the Deep Canyon CBM Monitoring well site located in Archuleta County Colorado. The well site is known as Deep Canyon and is located in SE ¼ SW ¼ Section 32, Township 34 North, Range 04 West. See Table 1, Summary of Deep Canyon Coal Bed Methane Monitoring Well Details, for specifics of this well. All field activities were performed from May 6, 2010 to June 1, 2010. SMA performed the work pursuant to contract PHA-950 between the Colorado Department of Natural Resources and SMA.

3.0 OBJECTIVES

The project objectives are:

1. Drilling and completion of one CBM monitoring well in the Fruitland Formation.
2. Conduct lithologic and geophysical logging in the borehole to provide detailed information on subsurface geology including the depth to the Fruitland Formation coal seams and the top of the Pictured Cliffs Formation.
3. Perforate the well bore in specific coal intervals to monitor groundwater and gas pressures from specific coal seams within the Fruitland Formation.
4. Installation of pressure transducers and telemetry system to permit remote access monitoring of methane gas pressures and groundwater.

4.0 BACKGROUND

The Fruitland Formation in the San Juan Basin extends from southwestern Colorado into New Mexico and is one of the most productive CBM reservoirs in the United States. The San Juan Basin of Colorado-New Mexico historically has had methane seeps identified along the Fruitland Coal outcrop in La Plata County. The northern portion of the San Juan Basin is located in La Plata and Archuleta Counties, Colorado.

The COGCC funded the 3M project (Mapping, Modeling and Monitoring) in 2000 to install monitoring wells along the Fruitland Coal outcrop north of Bayfield Colorado and south of Vallecito Lake, to respond to the potential risk of CBM seeps. In 2001 and 2002, the COGCC installed seven monitoring wells into the Fruitland Formation at four locations near the outcrop in La Plata County. These wells have served to monitor Fruitland Formation pressures and water levels in La Plata County since their installation.

In 2007, the COGCC received a special appropriation from the Colorado Legislature to expand the monitoring network into the eastern part of the San Juan Basin, as well as installing additional wells in the western part of the Basin and performing pilot scale mitigation testing. The new, expanded study is referred to as the “4M Project”, which refers to the original 3M plus the incorporation of a mitigation component, hence “4M”.

The eastern area 4M wells were drilled in 2008 in western Archuleta County, Colorado. Three additional sites were added to the monitoring well network: the Wagon Gulch site; the Fosset Gulch site and; the Highway 151 site. Two wells were installed at each site. These wells measure pressures in the Fruitland Formation coal seams to establish baseline conditions before extensive coal bed

methane development occurs in the area. All three sites have operational telemetry systems recording water levels and gas pressures.

In 2009, the 4M monitoring well network in the western portion of the San Juan Basin in La Plata County, Colorado was expanded. Three additional sites were added to the monitoring well network: the BP Highlands site, the Fiddler site and the Palmer Ranch site. One well was installed at each site.

5.0 REGIONAL GEOLOGY

The project setting is in the northeast portion of the San Juan Basin near Chimney Rock in Archuleta County. The San Juan Basin is a depression that contains Cambrian, Devonian, Mississippian, Pennsylvanian, Permian, Triassic, Jurassic, Cretaceous, Tertiary and Quaternary rocks (Fasset 1625-B, 2009). The 4M project emphasis is on monitoring reservoir pressures and water levels within the Upper Cretaceous Lower Fruitland Formation. The Fruitland Formation outcrops along the northeastern edge of the San Juan Basin with exposed rock dips to the south and southeast. The Kirtland Shale, the Fruitland Formation and the Pictured Cliffs sandstone were identified during drilling activities

6.0 APPROACH

SMA's approach for the project was to use gas industry standard well designs, material specifications and drilling methods. Standard gas production drilling techniques were chosen for reasons of safety, capability, long term durability and costs.

SMA worked with D&D Services, Inc. of Farmington, New Mexico to develop the drilling program. Drilling with fluids (mud) was chosen as the preferred method for drilling the wells based on economics and the ability to use a small pad to minimize surface impacts.

The drilling fluids were contained within a closed loop drilling fluid system and consisted of polymer, bentonite, and water. The closed loop drilling fluid system was chosen to reduce pad size and to minimize surface and potential environmental impacts.

A reconditioned bit was used to drill a 12 ¼" borehole for the 9 5/8", 36 pound per foot steel conductor casing. A 8 ¾" bit was used to drill the borehole for the 7", 20 pound per foot steel surface casing. Both the conductor and surface casings were cemented utilizing standard oilfield technologies. A 6 ¼" bit was used to drill the borehole for the 4 ½", 10.5 pounds per foot steel long string casing. The long string casing was set by circulating 14.8 pound per gallon cement to surface, to fully seal the annular space, then displacing the casing volume with water to ensure that the long string was not full of cement.

7.0 WELL SITE SURVEYING, PERMITTING AND CONSTRUCTION

Deep Canyon was originally scheduled to be drilled in 2008 on a previously existing plugged and abandoned well pad. The site was dropped due to budget constraints. From August 12, 2008 to September 22, 2008, SMA surveyed and staked the well site for the purpose of creating a topographic map. The topographic map was then used to create the final well site design. The final design included well pad dimensions, construction diagrams, cut and fill diagrams, access road design and the implementation of storm water pollution prevention best management practices. Application for permits to drill, figures and diagrams are located in Appendix A.

From May 6, 2010 to May 10, 2010, Consolidated Constructors of Farmington, New Mexico, under the supervision of SMA, constructed the Deep Canyon well site location. The well pad was constructed within the staked area of disturbance as approved by the COGCC and the United State Forest Service. Photographs of the location are located in Appendix F.

8.0 COAL BED METHANE MONITORING WELL DRILLING AND INSTALLATION TECHNIQUES

From May 10, 2010 to May 18, 2010, D&D Services, Inc. of Farmington, New Mexico, under SMA supervision, drilled one CBM monitoring well at the Deep Canyon location. The monitoring well was installed utilizing a closed loop mud rotary drilling technique. The following sections discuss methods that were utilized during the drilling and installation of the monitoring well.

Generic listing of operations:

1. Stake location and access.
2. Build location and access. No drilling pits were required due to modified closed loop system.
3. Move in drilling rig, water storage tanks, and miscellaneous equipment.
4. Haul water from commercial sources.
5. Spud well, drill to conductor casing depth.
6. Set conductor casing, circulate 14.5 lb/gallon cement to surface.
7. Wait on cement 12 hours - allow cement to cure.
8. Test casing, rig up blow out preventer (BOP).
9. Drill to surface casing depth.
10. Set surface casing, circulate 14.8 lb/gallon cement to surface.
11. Wait on cement 12 hours - allow cement to cure.
12. Test casing, rig up BOP.

13. Drill to top of Pictured Cliffs Formation (PC).
14. Run open hole geophysical logs.
15. Run casing to total depth, circulate 14.8 lb/gallon cement to surface.
16. Transport and dispose of drilling fluids at a permitted facility and bring in additional fresh water.
17. Rig down.
18. Wait on cement 12 hours - allow cement to cure.
19. Move in swabbing rig.
20. Run cased hole logs, perforate.
21. Develop well.
22. Rig down swabbing rig.
23. Set tubing head.
24. Install transducers and remote terminal unit.
25. Confirm data accessible online.
26. Reclamation.

8.1 WATER HAULING AND DRILLING FLUID DISPOSAL

Water hauling for drilling and cementing activities was performed by various contractors from Farmington, New Mexico. Water was transported from Aztec, New Mexico, Arboles, Colorado or Ignacio, Colorado.

Waste drilling fluids from the closed loop drilling system were transported by Industrial Ecosystems, Inc. in vacuum trucks. All drilling fluids were disposed of at properly permitted facilities in Farmington, New Mexico.

8.2 LITHOLOGIC LOGGING

SMA conducted all lithologic logging activities. Lithological sample descriptions consisted of general mineralogy and sample characteristics including color, grain size, grain shape, degree of cementation. Lithological descriptions are located on Figure 1 of Appendix B: Geophysical, Lithological & Well Construction Diagrams.

8.3 CONDUCTOR CASING BOREHOLE DRILLING, CONDUCTOR CASING INSTALLATION AND CEMENTING

On May 10, 2010, the borehole for the conductor casing was drilled to a depth of 54 feet bgs with a 12 1/4” drilling bit. Then 48 feet of 9 5/8”, 36 pound per foot conductor casing was installed. The conductor casing was installed and cemented by D&D Services, Inc. The cement was mixed to 14.8 pound per gallon consistency and then circulated to the surface and allowed to set for 12 hours.

8.4 CONDUCTOR CASING BLOW OUT PREVENTER (BOP)

On May 11, 2010, after cement was allowed to set for at least 12 hours, the D&D Services, Inc. crew installed a double ram 5000 pound per square inch (psi) rated BOP. The BOP was installed on the conductor casing and then pressure tested to 600 psi. The BOP diagram is provided in Appendix C.

8.5 SURFACE CASING BOREHOLE DRILLING, SURFACE CASING INSTALLATION AND CEMENTING

From May 11, 2010 to May 13, 2010, the borehole for the surface casing for the monitoring well was drilled with an 8 ¾" drilling bit. The surface casing was constructed with 7" inside diameter, 20 pounds per foot steel casing. The surface casing was installed by D&D Services and cemented by BJ Services of Farmington, New Mexico. The cement was mixed to 14.8 pound per gallon consistency and then circulated to the surface and allowed to set for 12 hours. An As Built Diagram of the monitoring well is provided in Figure 1 of Appendix D.

8.6 SURFACE CASING BOP

On May 14, 2010, after cement was allowed to set for at least 12 hours, the D&D Services, Inc. crew installed a double ram 5000 pound per square inch (psi) rated BOP. The BOP was installed on the surface casing and then pressure tested to 600 psi. The BOP diagram is provided in Appendix C.

8.7 LONG STRING BOREHOLE DRILLING AND OPEN HOLE GEOPHYSICAL LOGGING

From May 14, 2010 to May 17, 2010, the long string casing borehole for the monitoring well was drilled with a 6 1/4" drill bit. After the total depth of 895 feet was reached in the borehole, Jet West of Farmington, New Mexico performed open hole geophysical logging on the borehole. The open hole geophysical logging suite included gamma ray, bulk density, neutron, temperature, electric resistivity, Acoustic Televiewer and borehole deviation logs. Geophysical logs are located in Appendix E. A Geophysical, Lithological and Well Construction Diagram is located in Appendix B.

8.8 LONG STRING CASING INSTALLATION AND CEMENTING

On May 18, 2010, after all the open hole geophysical logging was complete, the long string casing was constructed with 4 ½" diameter, 10.5 pounds per foot steel casing. The long string casing was installed by San Juan Casing of Farmington, New Mexico. The long string casing was cemented by BJ Services of Farmington, New Mexico. The cement for the long string was mixed at 14.8 pound per gallon consistency and then circulated to the surface. Figure 1, As Built Diagram of the monitoring well, is provided in Appendix D.

8.9 CASED HOLE LOGGING, PERFORATING AND SWABBING

On May 24, 2010, after construction of the monitoring well, cased hole logging was performed to correlate the depth of coal intervals in the well bore chosen for perforation with the open hole logs. The intervals for perforation were chosen by COGCC and SMA. The monitoring well was perforated using directional explosives. The monitoring well was perforated with four shots per vertical foot (spf). All cased hole logging and perforating was performed by Jet West, Inc. of Farmington, New Mexico. Cased hole logs are located in Appendix E. Perforated intervals of the monitoring well are illustrated in Figure 1 of Appendix D: As Built Diagram.

From May 24, 2010 to May 25, 2010, after perforating, the monitoring well was swabbed (developed) to enhance communication with the target interval. A specialized swabbing rig made a varying number of runs for each well bore with 4 ½" swabbing cups to remove water from the casing. See Table 2, Summary of Monitoring Well Swabbing Activities for swabbing details. All swabbing activities were performed by Hurricane Swabbing Service of Farmington, New Mexico. The number of swab runs was determined by the SMA onsite geologist.

8.10 TUBING HEADS, PRESSURE TRANSDUCERS AND TELEMETRY SYSTEM INSTALLATION

On June, 1, 2010, Crossfire, Inc. roustabout crew, under the supervision of SMA, installed a 2000 psi rated tubing head on the 4 1/2" well casing. Prior to sealing the tubing head, In-Situ, Inc. of Fort Collins, Colorado, under SMA supervision, installed two pressure transducers in the monitoring well. The lower pressure transducer in the well is a 1000 psi In-Situ, Inc. brand and the upper transducer is a 500 psi In-Situ, Inc. brand. The lower pressure transducer was installed at 848 feet bgs, approximately ten feet below the lower perforated interval in the monitoring well. The upper pressure transducer was installed inside the long string casing, approximately five feet below the tubing well head. The transducers are connected to an In-Situ Remote Terminal Unit (RTU) located at the well site location. The RTU records down hole pressures and surface pressures every twelve hours, or twice daily. The RTU broadcasts the data via satellite uplink to the In-Situ's Data Center.

8.11 RECLAMATION

On June 7, 2010, SMA personnel and USFS personnel establish locations for biochar experimental re-vegetation plots at the Deep Canyon site. USFS personnel added charcoal to the surface at two marked location on the site.

One June 9, 2010, the well site was reseeded. The well site was disked and then seeded by a drill and mulch method. The biochar plots were treated as part

of the normal re-seeding process. After reseeding was complete, additional wattles and straw bales were installed to for storm water mitigation. Silt fence was extended across the location entrance. A soil berm was built across the roadway and the culvert was removed from Deep Canyon creek.

9.0 GEOLOGIC, GEOPHYSICAL AND HYDROLOGIC INTERPRETATION

9.1 DEEP CANYON WELL SITE

Alluvium was observed from ground surface to approximately 50 feet bgs. The Farmington Sandstone was encountered from 50-340 feet bgs for a thickness of approximately 290 feet. The Kirtland Formation was encountered from 340-620 feet bgs for a thickness of approximately 280 feet. The Fruitland Formation was encountered from 620-840 feet bgs for a thickness of 220 feet. The Fruitland Formation consists of light gray to dark gray shales, siltstones and fine grained sandstones. The Lower Fruitland Formation was in encountered from approximately 742-840 feet bgs. The Pictured Cliffs Sandstone was encountered from 840 to total depth. No potential water bearing zones were identified. Figure 1, Geophysical, Lithological & Well Construction Diagram, located in Appendix B illustrates the formation lithologies. Five coal zones were found in the Fruitland Formation ranging in thickness from 3 to 10 feet. The well casing was perforated across five coal intervals from 752-761, 763-765, 804-813, 819-821 and 836-838 feet bgs.

10.0 COAL INFORMATION

The American Society for Testing and Materials (1995) has defined coal as a readily combustible rock containing more than 50% by weight and 70% by volume carbonaceous material, including inherent moisture. Following this definition, Fassett (2009) developed a method of defining coal based on open hole density logs for the Fruitland Formation. Fassett stated any material less than 1.75 grams/cubic centimeter (g/cc) on the density curve can be considered to be coal and material with a density less than 1.30 g/cc is considered to be pure coal.

Utilizing Fasset's parameters on bulk density logs at the Deep Canyon well site yielded the following net coal zones in the well.

4M Well	***Coal Interval (feet bgs)***	***Thickness (feet)***	***Quality Coal (glcc)***
Deep Canyon #1 API #05-007-06293-00	*752-765*	*14*	*14' = 1.35*
	804-813	*10*	*10' = 1.35*
	819-821	*3*	*3' = 1.35 g/cc*
	836-838	*3*	*3' = 1.60 g/cc*
		Total = 30.0	

11.0 SUMMARY

In summary:

1. One CBM monitoring well was successfully drilled and completed with minimal operational problems.
2. Lithologic and geophysical logging was successfully conducted on the borehole and approximately 29 feet of coal was identified.
3. The well was perforated at the identified coal intervals with four shots per foot.
4. Remote monitoring equipment was installed, tested and found to be functioning.

12.0 REFERENCES

Fassett, James E., United States Geological Survey Professional Paper 1625-B 2009; Chapter Q, Geology and Coal Resources of the Upper Cretaceous Fruitland Formation, San Juan Basin, New Mexico and Colorado.

SMA Project # 5119088

Table 1: Summary of Deep Canyon Coal Bed Methane Monitoring Well Details
Colorado Oil Gas Conservation Commission
4M Project: Coal Bed Methane Monitoring

Archuleta County, Colorado

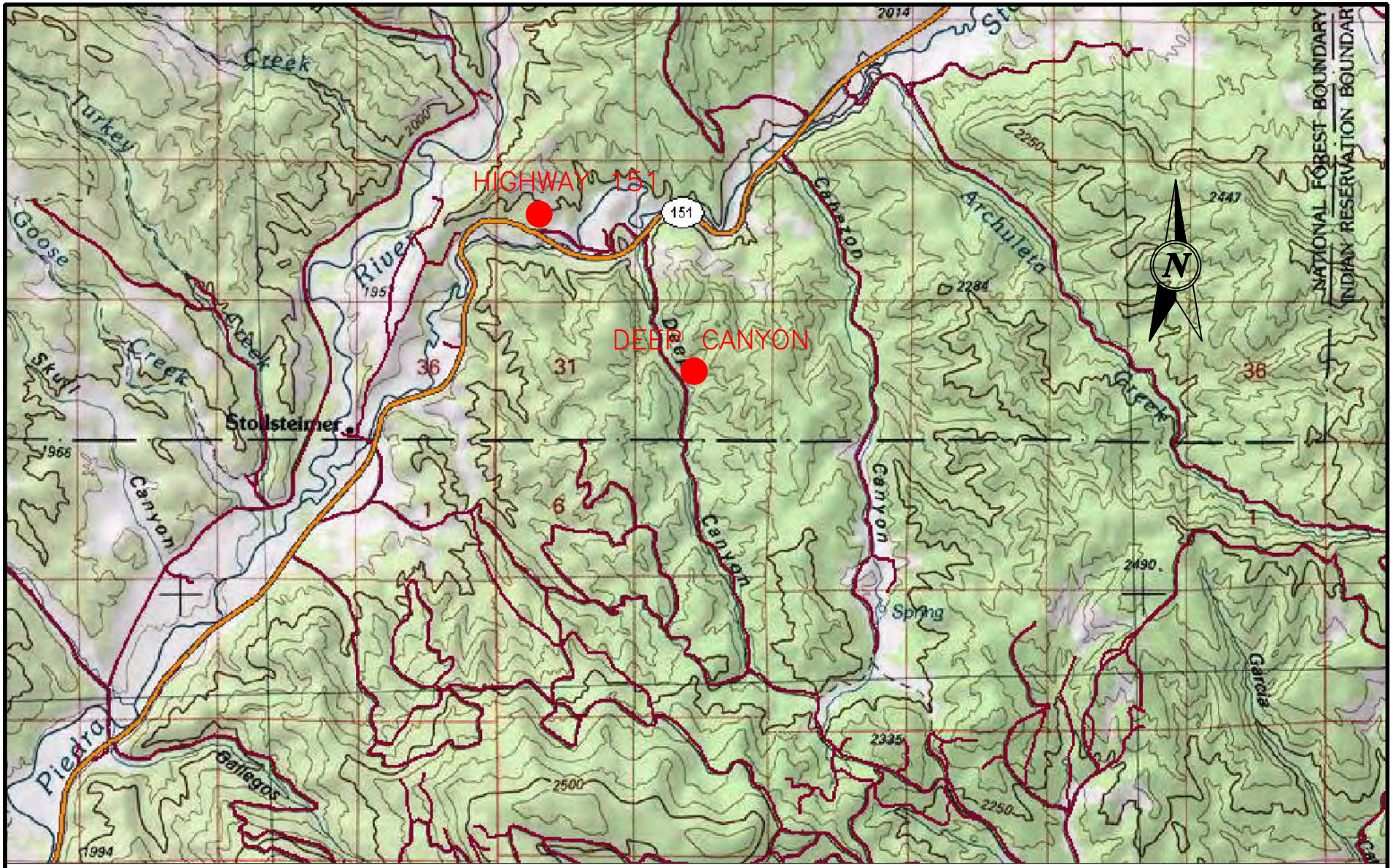
Location	API Number	Monitoring Well	TRS Location	GPS Coordinates	Perforated Intervals (Feet bgs)	Total Depth (Feet BGS)	Upper Trasducer Depth (feet below tubing head)	Lower Transducer Depth (Feet bgs)
Deep Canyon Site	05-007-06293-00	1	Section 32, Township 34 North, Range 04 West	37.143311°, 107.309829°	752-761;763-765;804-813;836-838	895	5	848

Table 2: Summary of Monitoring Well Swabbing Activities
Colorado Oil Gas Conservation Commission
4 M Project: Coal Bed Methane Monitoring

Archuleta County, Colorado

SMA Project # 5119088

Location	Monitoring Well	Date	Swabbing Run	Depth to Water Encountered at each swabbing run (feet bgs)	Produced Water (bbls)	Total Water Produced (bbls)
Deep Canyon	1	5/24/2010	1	75	9.87	9.87
			2	200	7.89	17.76
			3	365	8.29	26.05
			4	840	0.00	
			5	840	0.00	
			6	840	0.00	
		5/25/2010	1	660	1.42	1.42
			2	710	2.84	4.26
			3	800	1.42	5.68
			4	675	3.39	9.08
			5	800	1.42	10.50
			6	840	0.79	11.29



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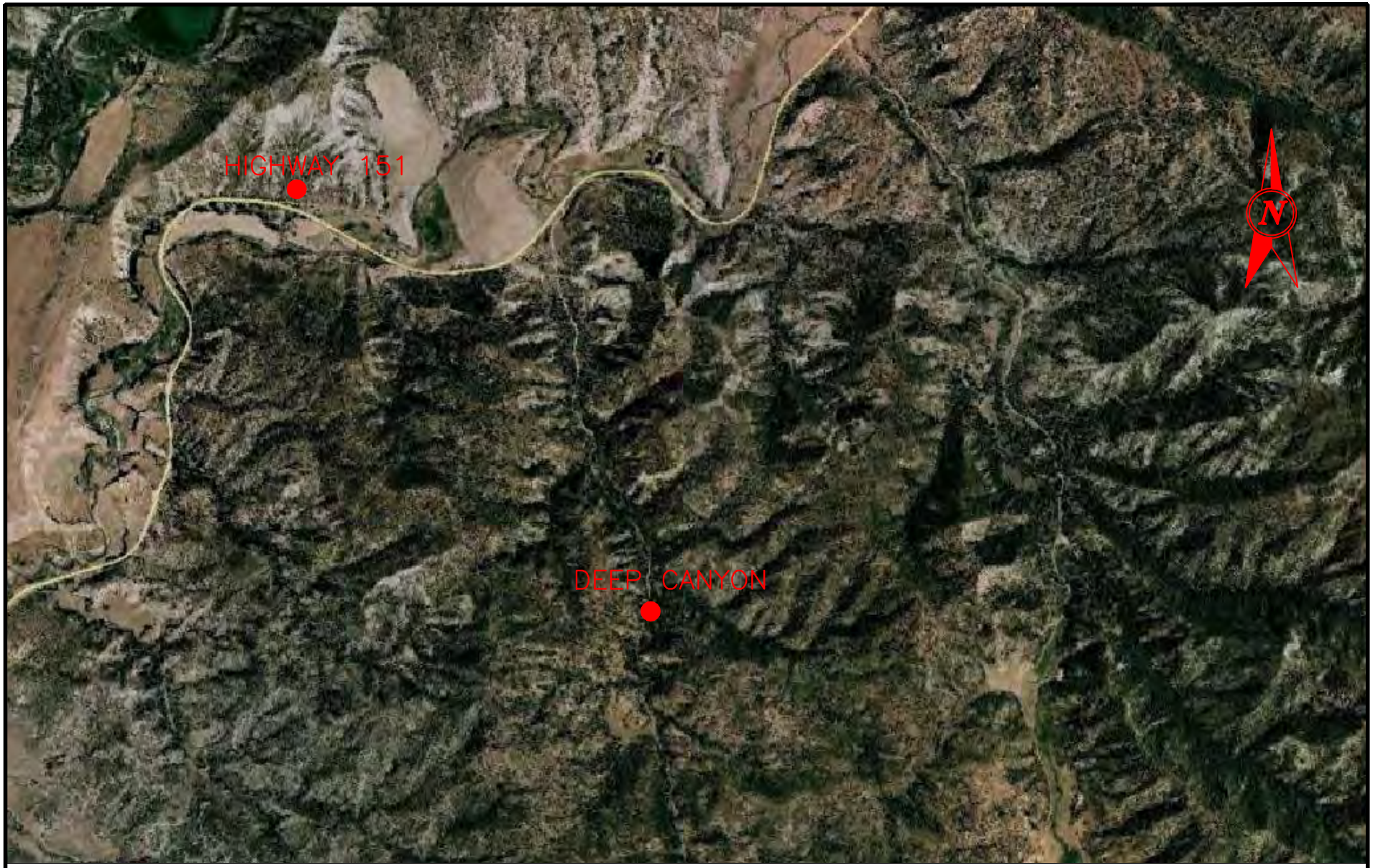
FAX (505) 327-1496

APPROVED: DGF	DATE: 6/10/10
DRAWN BY: TLONG	DATE: 6/10/10
REVISIONS BY:	DATE:
PROJECT #5119088	MAP: 1

REGIONAL TOPOGRAPHIC MAP
COLORADO OIL AND GAS CONSERVATION COMMISSION
DEEP CANYON SITE
4 M MONITORING WELL



APPROXIMATE SCALE

0' 1200' 2400' 4800'

SMA
Civil / Environmental
Scientists & Engineers

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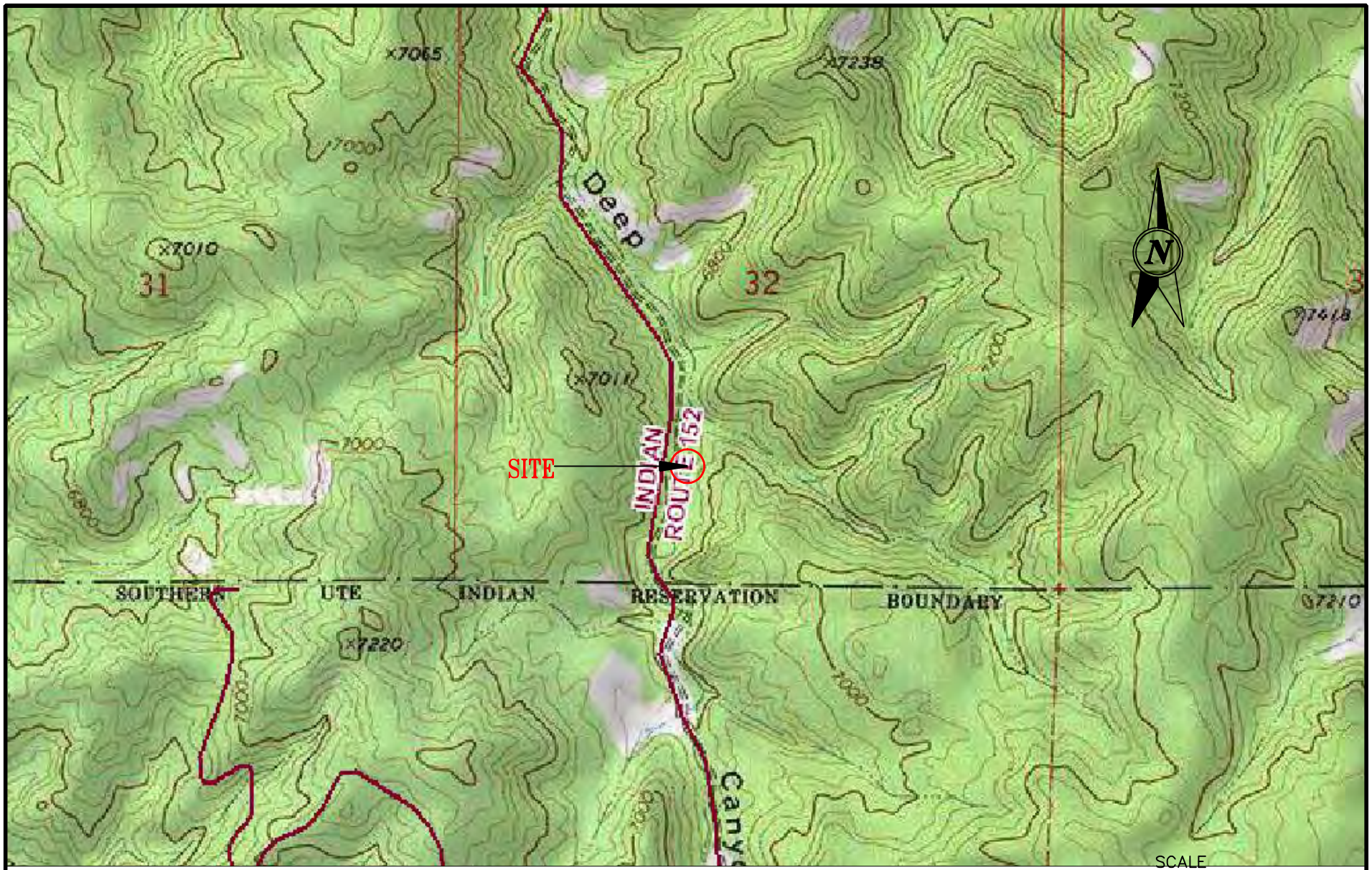
APPROVED: DGF	DATE: 10/20/09
DRAWN BY: TLONG	DATE: 10/20/09
REVISIONS BY:	DATE:
PROJECT #5119088	PHOTO: 1

REGIONAL AERIAL PHOTO
COLORADO OIL AND GAS CONSERVATION COMMISSION
DEEP CANYON SITE

4 M MONITORING WELL



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APPROVED: DGF	DATE: 3/5/10
DRAWN BY: TLONG	DATE: 3/5/10
REVISIONS BY:	DATE:
PROJECT #5119088	MAP: 2

SITE SPECIFIC TOPOGRAPHIC MAP
COLORADO OIL AND GAS CONSERVATION COMMISSION
DEEP CANYON

SECTION 32 T34N R4W
ARCHULETA COUNTY, COLORADO

APPROXIMATE SCALE

0' 300' 600' 1200'

SMA
Civil / Environmental
Scientists & Engineers

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APPROVED: DGF	DATE: 3/10/10
DRAWN BY: TLONG	DATE: 3/10/10
REVISIONS BY:	DATE:
PROJECT #5119088	PHOTO: 2

SITE SPECIFIC TOPOGRAPHIC MAP
COLORADO OIL AND GAS CONSERVATION COMMISSION
DEEP CANYON
SECTION 32 T34N R4W
ARCHULETA COUNTY, COLORADO

Appendix A: Application for Permit to Drill, Figures and Diagrams

FORM 2
Rev 12/05

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80205 Phone: (303) 894-2100 Fax: (303) 894-2109

DE	ET	OE	ES

Document Number: 2557141

Plugging Bond Surety

APPLICATION FOR PERMIT TO:

1. [X] **Drill,** [ ] Deepen, [ ] Re-enter, [ ] Recomplete and Operate

2. TYPE OF WELL
OIL [ ] GAS [ ] COALBED [X] OTHER MONITORING WELL
SINGLE ZONE [X] MULTIPLE ZONE [ ] COMMINGLE ZONE [ ]

Refiling [ ]
Sidetrack [ ]

3. Name of Operator: COLORADO OIL & GAS CONSERVATION COMMISSION 4. COGCC Operator Number: 5

5. Address: 1120 LINCOLN ST SUITE 801
City: DENVER State: CO Zip: 80203

6. Contact Name: STEVE LINDBLOM Phone: (303)894-2100X1 Fax: (303)894-2109
Email: STEVEN.LINDBLOM@STATE.CO.US

7. Well Name: DEEP CANYON MW Well Number: 34-4-32-1

8. Unit Name (if appl): Unit Number:

9. Proposed Total Measured Depth: 900

WELL LOCATION INFORMATION

10. QtrQtr: SESW Sec: 32 Twp: 34N Rng: 4W Meridian: M
Latitude: 37.143311 Longitude: -107.309829

	FNL/FSL		FEL/FWL	
Footage at Surface:	840	FSL	1961	FWL

11. Field Name: Ignacio Blanco Field Number: 38300

12. Ground Elevation: 6700 13. County: ARCHULETA

14. GPS Data:
Date of Measurement: 09/11/2008 PDOP Reading: 1.7 Instrument Operator's Name: TRAVIS KING

15. If well is [ ] Directional [ ] Horizontal (highly deviated) **submit deviated drilling plan.**

	FNL/FSL		FEL/FWL		FNL/FSL		FEL/FWL	
Footage at Top of Prod Zone:					Bottom Hole:			
	Sec:	Twp:	Rng:		Sec:	Twp:	Rng:	

16. Is location in a high density area? (Rule 603b)? [ ] Yes [X] No

17. Distance to the nearest building, public road, above ground utility or railroad: 150 ft

18. Distance to nearest property line: 840 ft 19. Distance to nearest well permitted/completed in the same formation: 5280 ft

20.

LEASE, SPACING AND POOLING INFORMATION

Objective Formation(s)	Formation Code	Spacing Order Number(s)	Unit Acreage Assigned to Well	Unit Configuration (N/2, SE/4, etc.)
FRUITLAND	FRLDC			

21. Mineral Ownership: ☐ Fee ☐ State ☒ Federal ☐ Indian Lease #: _____

22. Surface Ownership: ☐ Fee ☐ State ☒ Federal ☐ Indian

23. Is the Surface Owner also the Mineral Owner? ☒ Yes ☐ No Surface Surety ID#:

23a. If 23 is Yes: Is the Surface Owner(s) signature on the lease? ☐ Yes ☐ No

23b. If 23 is No ☐ Surface Owners Agreement Attached or ☐ $25,000 Blanket Surface Bon ☐ $2,000 Surface Bond ☐ $5,000 Surface Bond

24. Using standard QtrQtr, Sec, Twp, Rng format enter entire mineral lease description upon which this proposed wellsite is located (attach separate sheet/map if you prefer):

25. Distance to Nearest Mineral Lease Line: 840 ft 26. Total Acres in Lease: _____

DRILLING PLANS AND PROCEDURES

27. Is H2S anticipated? ☐ Yes ☒ No If Yes, attach contingency plan.

28. Will salt sections be encountered during drilling? ☐ Yes ☒ No

29. Will salt (>15,000 ppm TDS CL) or oil based muds be used during drilling? ☐ Yes ☒ No

30. If questions 27 or 28 are yes, is this location in a sensitive area (Rule 903)? ☐ Yes ☐ No **If 28, 29, or 30 are "Yes" a pit permit may be required.**

31. Mud disposal: ☒ Offsite ☐ Onsite

Method: ☐ Land Farming ☐ Land Spreading ☒ Disposal Facility Other: _____

Note: The use of an earthen pit for Recompletion fluids requires a pit permit (Rule 905b). If air/gas drilling, notify local fire officials.

Casing Type	Size of Hole	Size of Casing	Weight Per Foot	Setting Depth	Sacks Cement	Cement Bottom	Cement Top
CONDUCTOR	12+1/4	9+5/8	36	45	45	45	0
SURF	8+3/4	7	20	200	55	200	0
1ST	6+1/4	4+1/2	10.5	900	109	900	0

32. BOP Equipment Type: ☐ Annular Preventer ☒ Double Ram ☒ Rotating Head ☐ None

33. Comments ALL PIPE STRINGS ARE DESIGNED TO CIRCULATE CEMENT TO THE SURFACE. UTILIZING 14.5 TO 14.8 #/GAL FOR CONDUCTOR PIPE AND SURFACE CASING AND 14.8 #/GAL CEMENT FOR THE LONG STRING.

34. Location ID: _____

35. Is this application in a Comprehensive Drilling Plan ? ☐ Yes ☐ No

36. Is this application part of submitted Oil and Gas Location Assessment ? ☒ Yes ☐ No

I hereby certify all statements made in this form are, to the best of my knowledge, true, correct, and complete.

Signed: _____ Print Name: STEVEN LINDBLOM

Title: ENVIRONMENTAL Date: 4/23/2010 Email: STEVEN.LINDBLOM@STATE.

Based on the information provided herein, this Application for Permit-to-Drill complies with COGCC Rules and applicable orders and is hereby approved.

COGCC Approved: David S. Neslin **Director of COGCC** Date: 5/21/2010

API NUMBER
05 007 06293 00

Permit Number: _____ Expiration Date: 5/20/2012

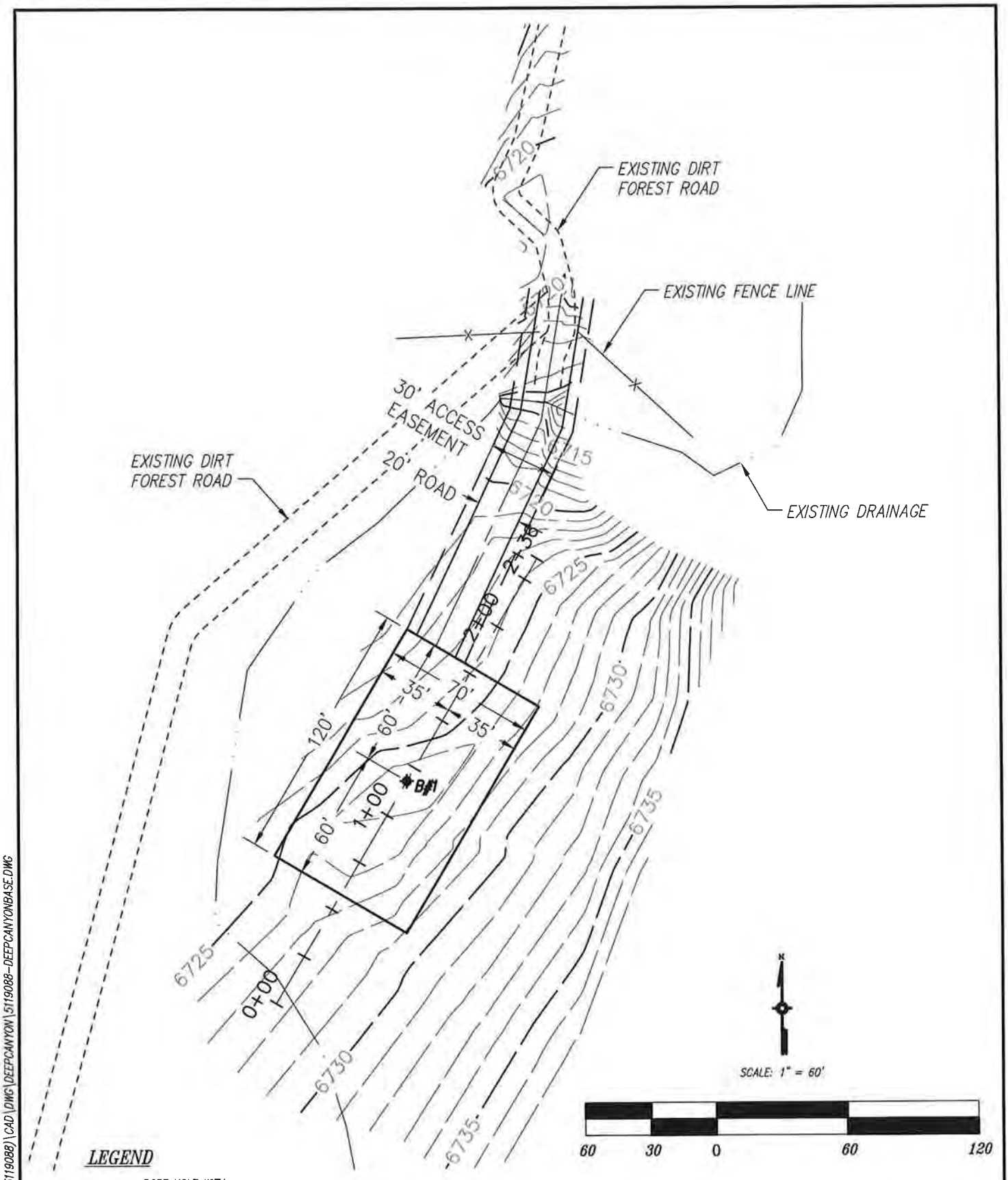
CONDITIONS OF APPROVAL, IF ANY:

All representations, stipulations and conditions of approval stated in the Form 2A for this location shall constitute representations, stipulations and conditions of approval for this Form 2 Permit-to-Drill and are enforceable to the same extent as all other representations, stipulations and conditions of approval stated in this Permit-to-Drill.

Attachment Check List

Att Doc Num	Name	Doc Description
2557141	APD ORIGINAL	LF@2457967|2557141
2557165	TOPO MAP	LF@2457985|2557165
2557166	WELL LOCATION PLAT	LF@2457968|2557166

Total Attach: 3 Files



CONTOUR MAP WITH PAD AND ACCESS ROAD

WELL PAD DIAGRAM
COGCC DEEP CANYON MONITORING PROJECT
WELL NAME MW-34-4-32 (BH-1)

FIGURE 1

REVISIONS
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____

DRAWN MEW
CHECKED DGF
APPROVED AAC
DATE 3-2010

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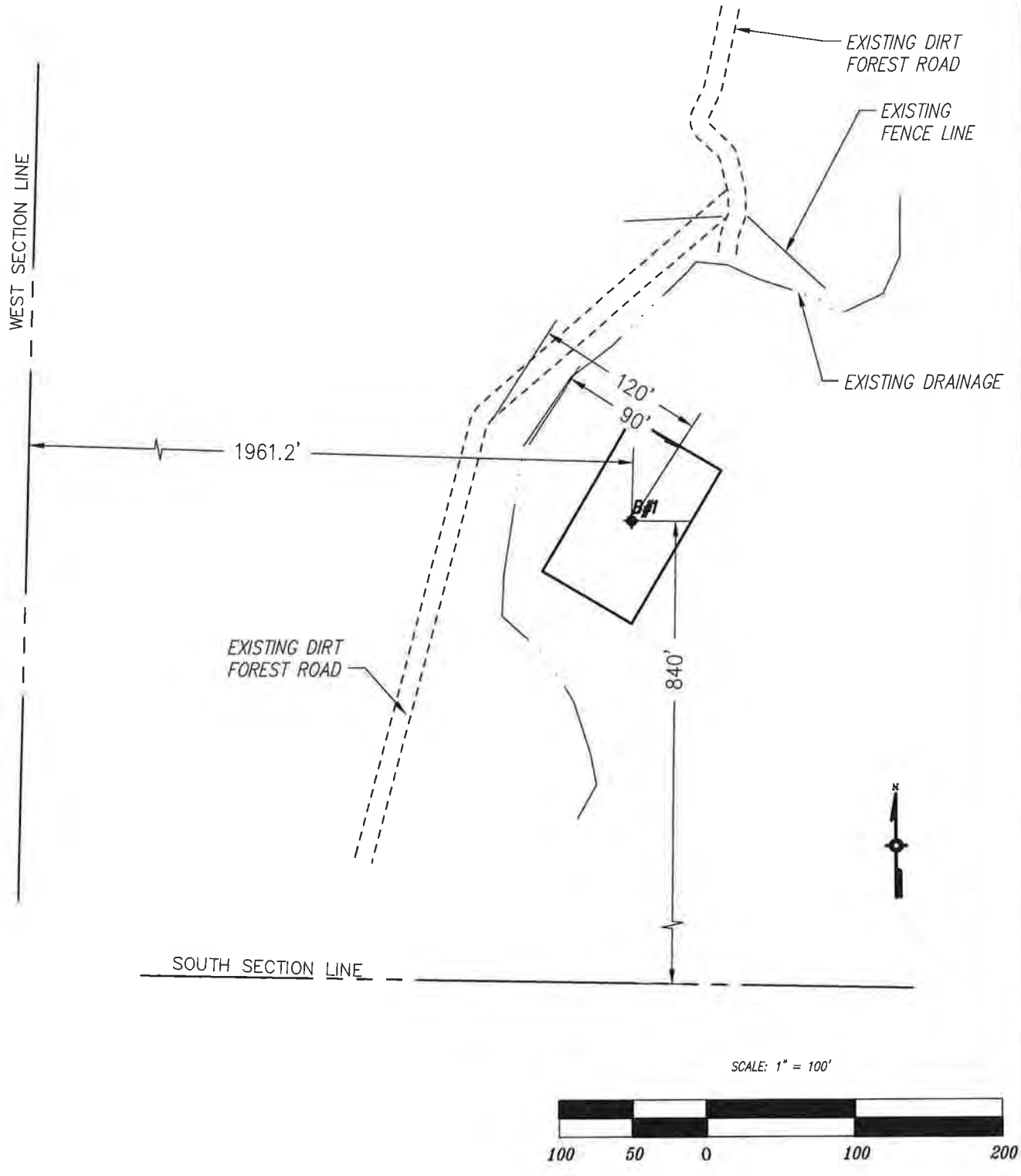
P:\5-COGCC 4M LA PLATA COUNTY (5119088)\CAD\DWG\DEEPCANYON\5119088-DEEPCANYONBASE.DWG



LEGEND

B#1 ⌖ BORE HOLE WITH NUMBER DESIGNATION

GENERAL LOCATION PLAT

COGCC DEEP CANYON MONITORING PROJECT
WELL NAME MW-34-4-32 (BH-1)
SE/4SW/4 SECTION 32, T34N, R4W, N.M.P.M.

FIGURE 2

REVISIONS
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____

DRAWN MEW
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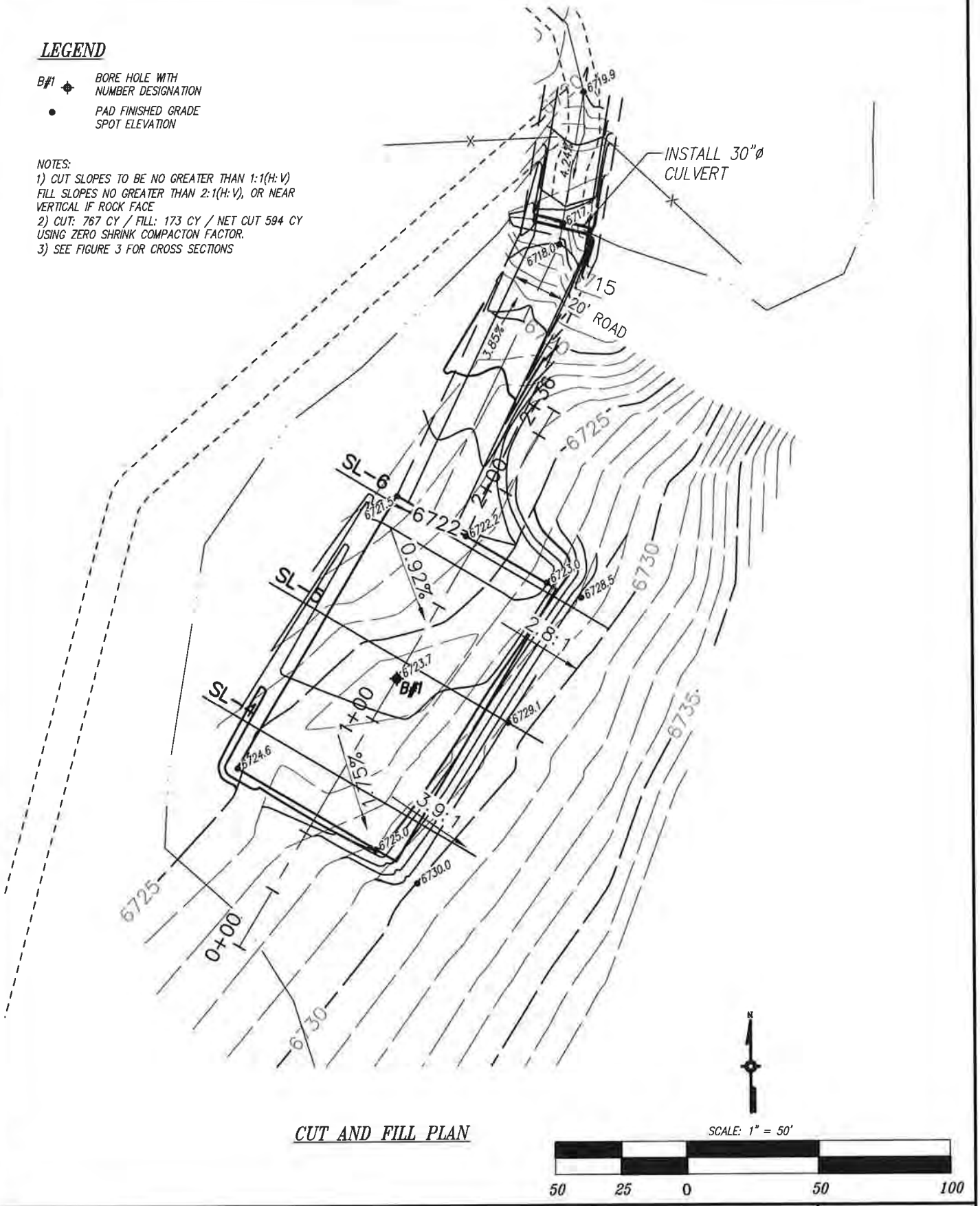
P:\5-COGCC 4M LA PLATA COUNTY (5119088)\CAD\DWG\DEEPCANYON\5119088-DEEPCANYONBASE.DWG



CUT AND FILL PLAN

SCALE: 1" = 50'

50 25 0 50 100

COGCC DEEP CANYON MONITORING PROJECT
WELL NAME MW-34-4-32 (BH-1)
SE/4SW/4 SECTION 32, T34N, R4W, N.M.P.M.

FIGURE 3A

REVISIONS
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____

DRAWN MEW
CHECKED DGF
APPROVED AAC
DATE 3-2010

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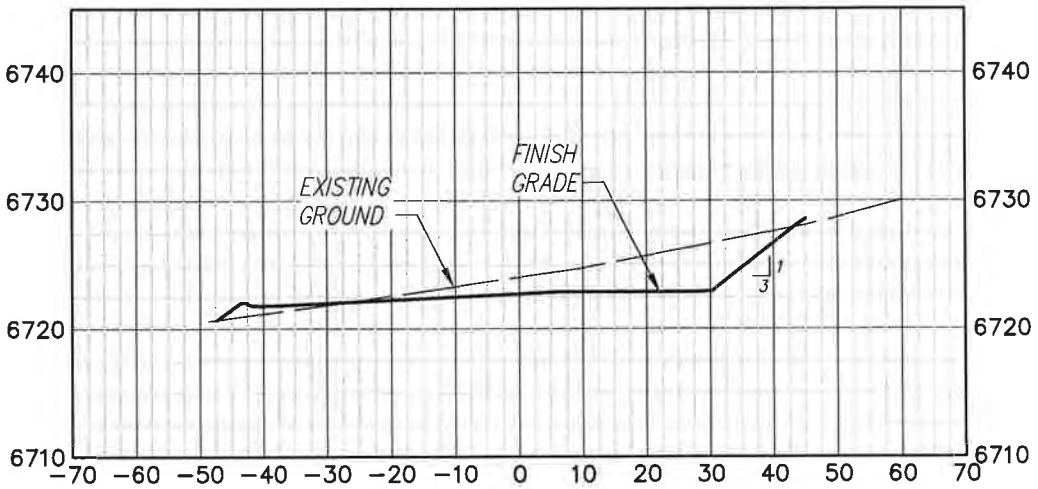
1+75.00



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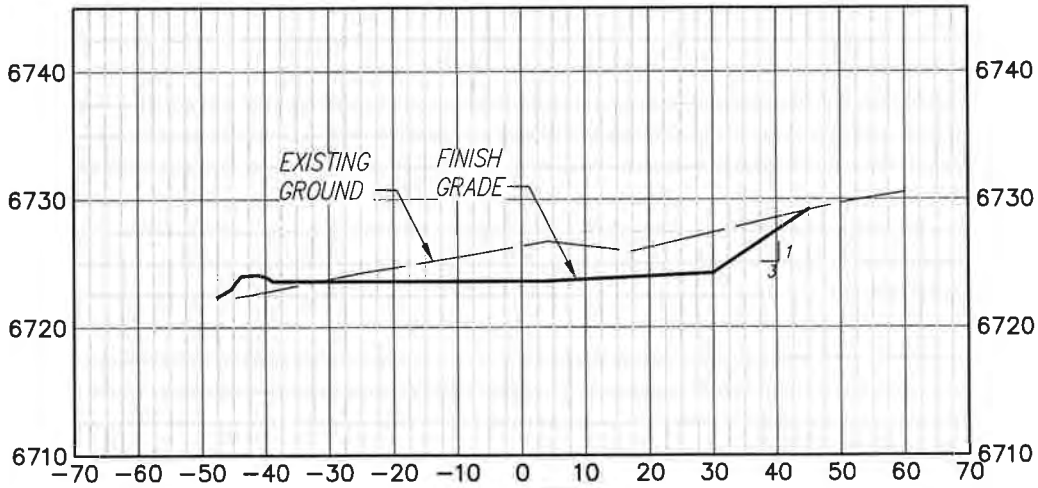
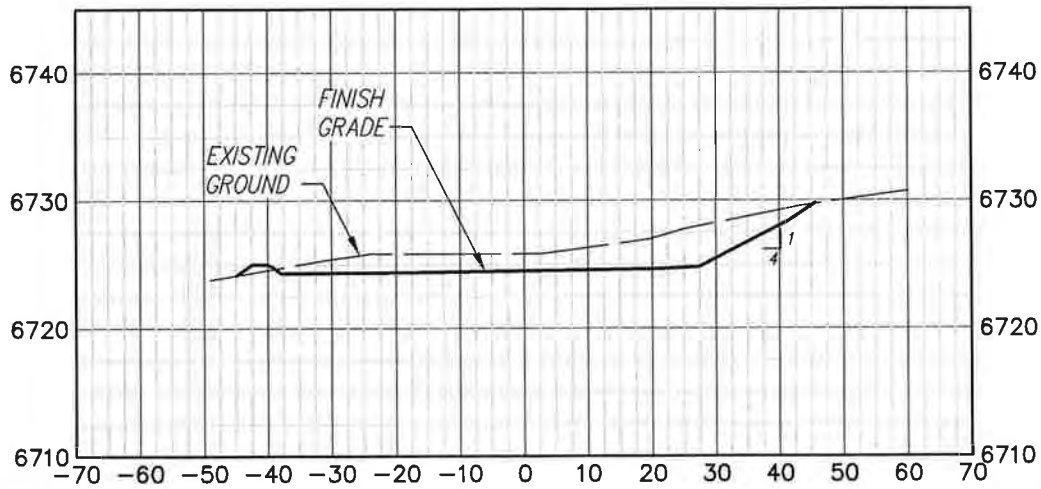


0+75.00



HORIZ SCALE: 1" = 30'
VERT SCALE: 1" = 15'

CROSS SECTIONS

COGCC DEEP CANYON MONITORING PROJECT
WELL NAME MW-34-4-32 (BH-1)
SE/4SW/4 SECTION 32, T34N, R4W, N.M.P.M.

FIGURE 3B

REVISIONS
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____

DRAWN MEW
CHECKED DGF
APPROVED AAC
DATE 3-2010

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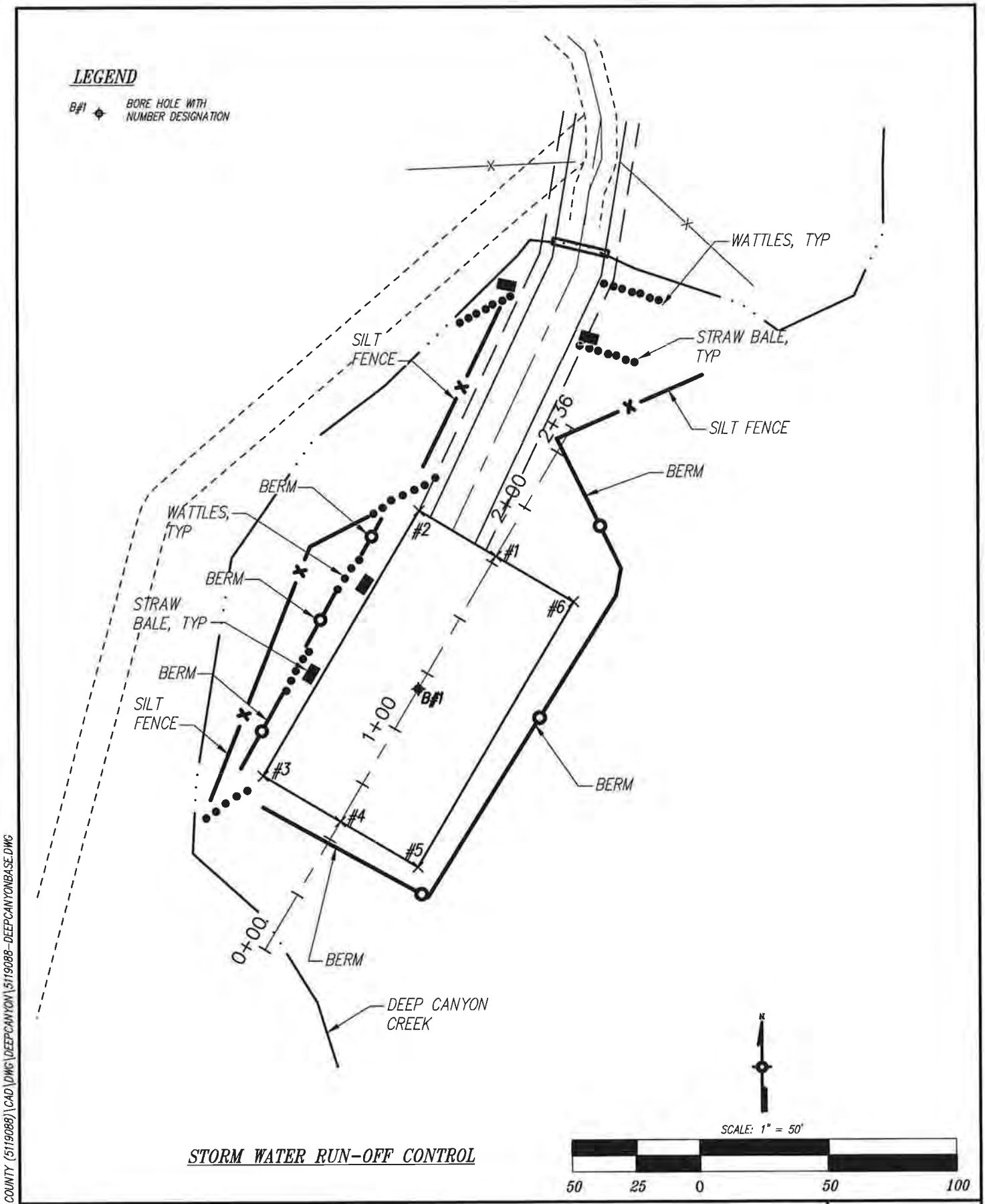

STORM WATER RUN-OFF CONTROL

COGCC DEEP CANYON MONITORING PROJECT
WELL NAME MW-34-4-32 (BH-1)
SE/4SW/4 SECTION 32, T34N, R4W, N.M.P.M.

FIGURE 4

REVISIONS
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____
BY ____ DATE ____ DESCR. ____

DRAWN MEW
CHECKED DGF
APPROVED AAC
DATE 3-2010

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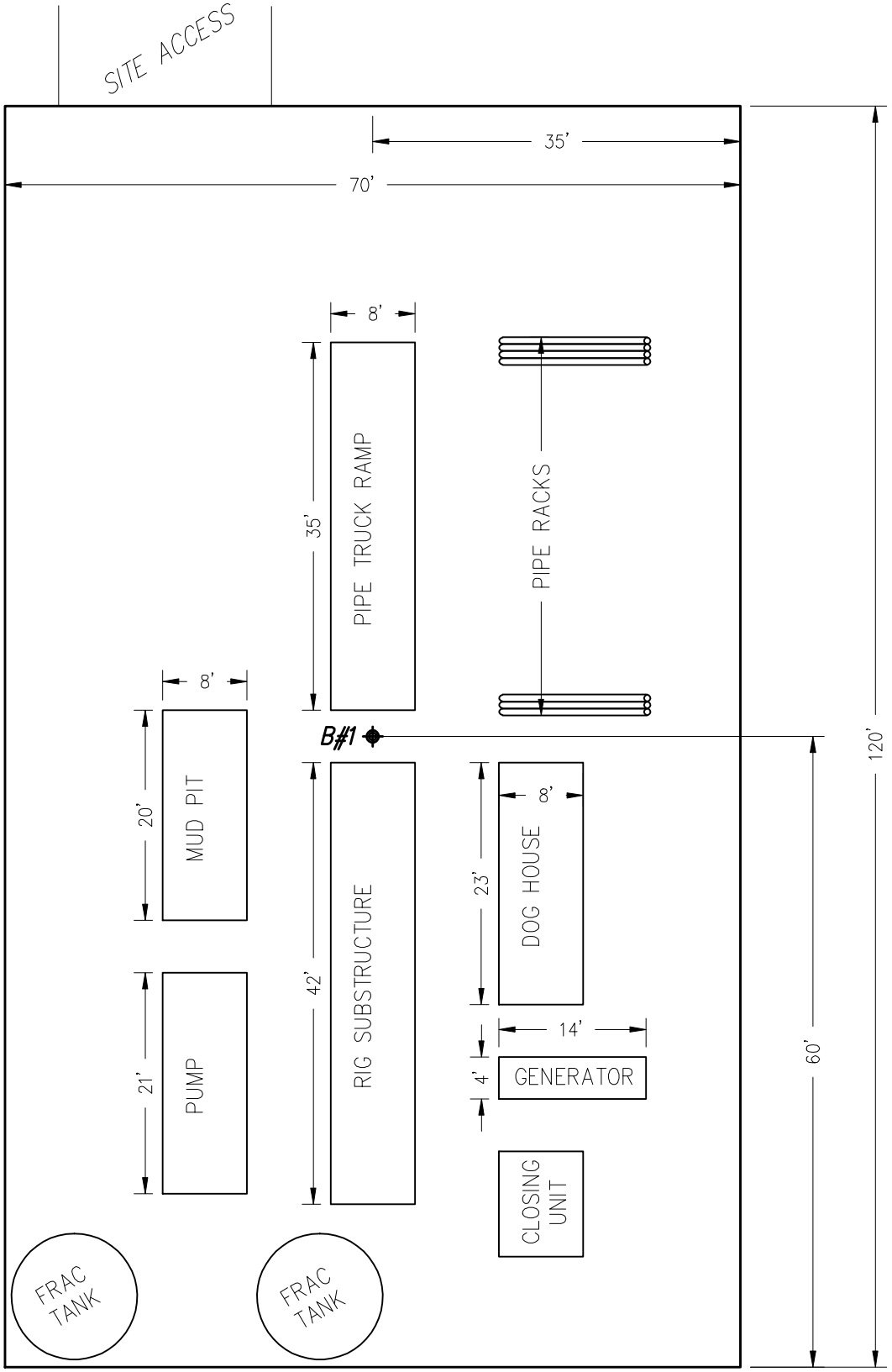

LEGEND

B#1 ⊕ BORE HOLE WITH NUMBER DESIGNATION

D&D SERVICE
RIG EQUIPMENT PLAT

NOT TO SCALE

COGCC DEEP CANYON MONITORING PROJECT
WELL NAME MW-34-4-32 (BH-1)
SE/4SW/4 SECTION 32, T34N, R4W, N.M.P.M.

FIGURE
5

REVISIONS
BY _____ DATE _____ DESCR. _____
BY _____ DATE _____ DESCR. _____
BY _____ DATE _____ DESCR. _____

DRAWN MEW
CHECKED DGF
APPROVED AAC
DATE 3-2010

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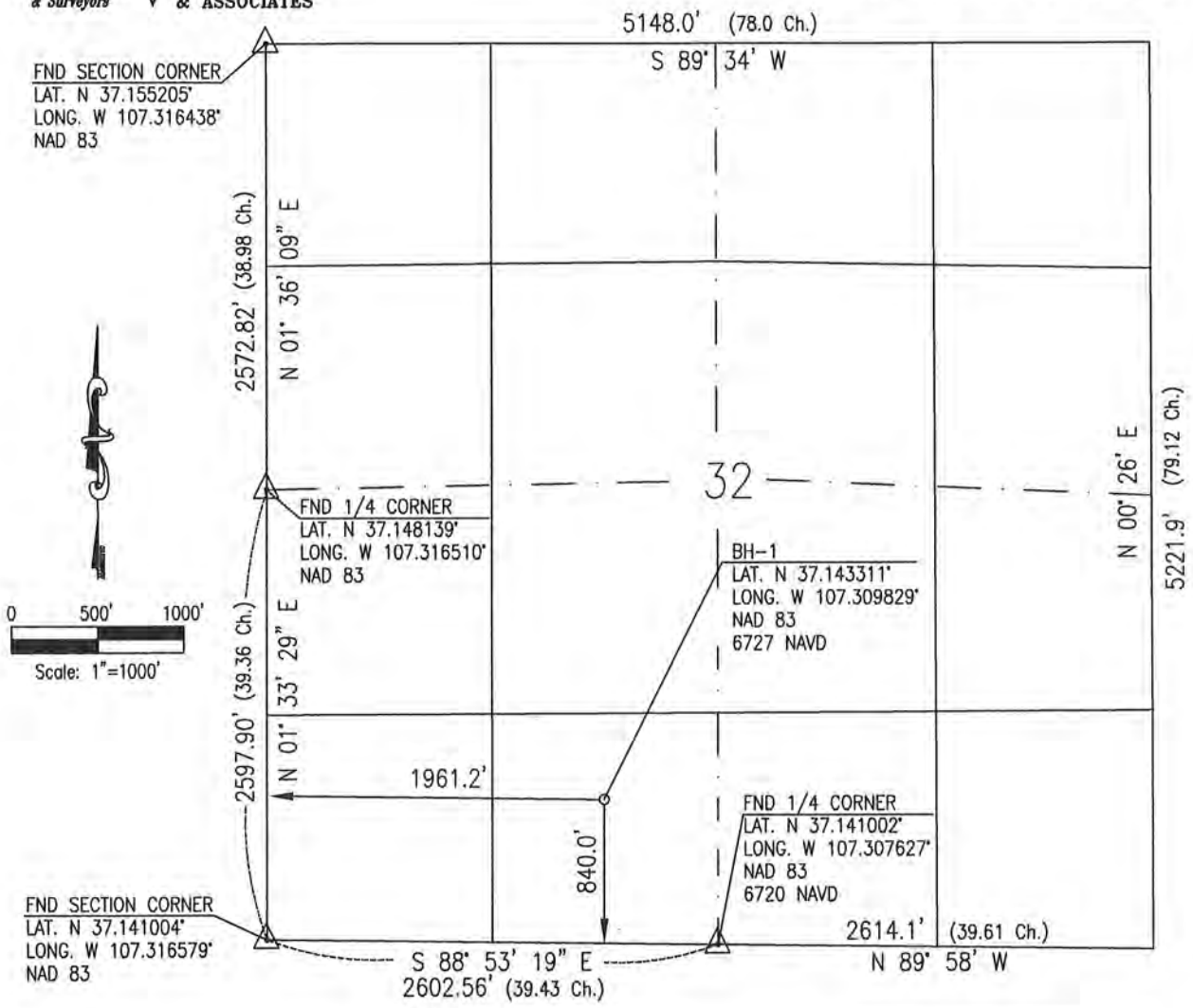
SMA
Scientists, Engineers & Surveyors
SOUDER, MILLER & ASSOCIATES

SURVEY PLAT
MW-34-4-32 (BH-1)



Operator: Colorado Oil and Gas Conservation Commission		Well Name: MW-34-4-32 (BH-1)	
Section: 32	Township: 34 North	Range: 4 West	Meridian: N.M.P.M.
Footages: 840.0' FSL & 1961.2' FWL			County/State: Archuleta, CO
Elevation: 6727'		Requested By: Steven R. Lindblom	

I, LYNN D. LANTZ, A REGISTERED PROFESSIONAL SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THE SURVEY REPRESENTED BY THIS PLAT WAS MADE UNDER MY DIRECT SUPERVISION AND THAT THIS PLAT ACCURATELY REPRESENTS THIS SURVEY TO THE BEST OF MY KNOWLEDGE AND BELIEF.

LYNN DEE LANTZ — 12046 — LAND SURVEYOR — STATE OF COLORADO

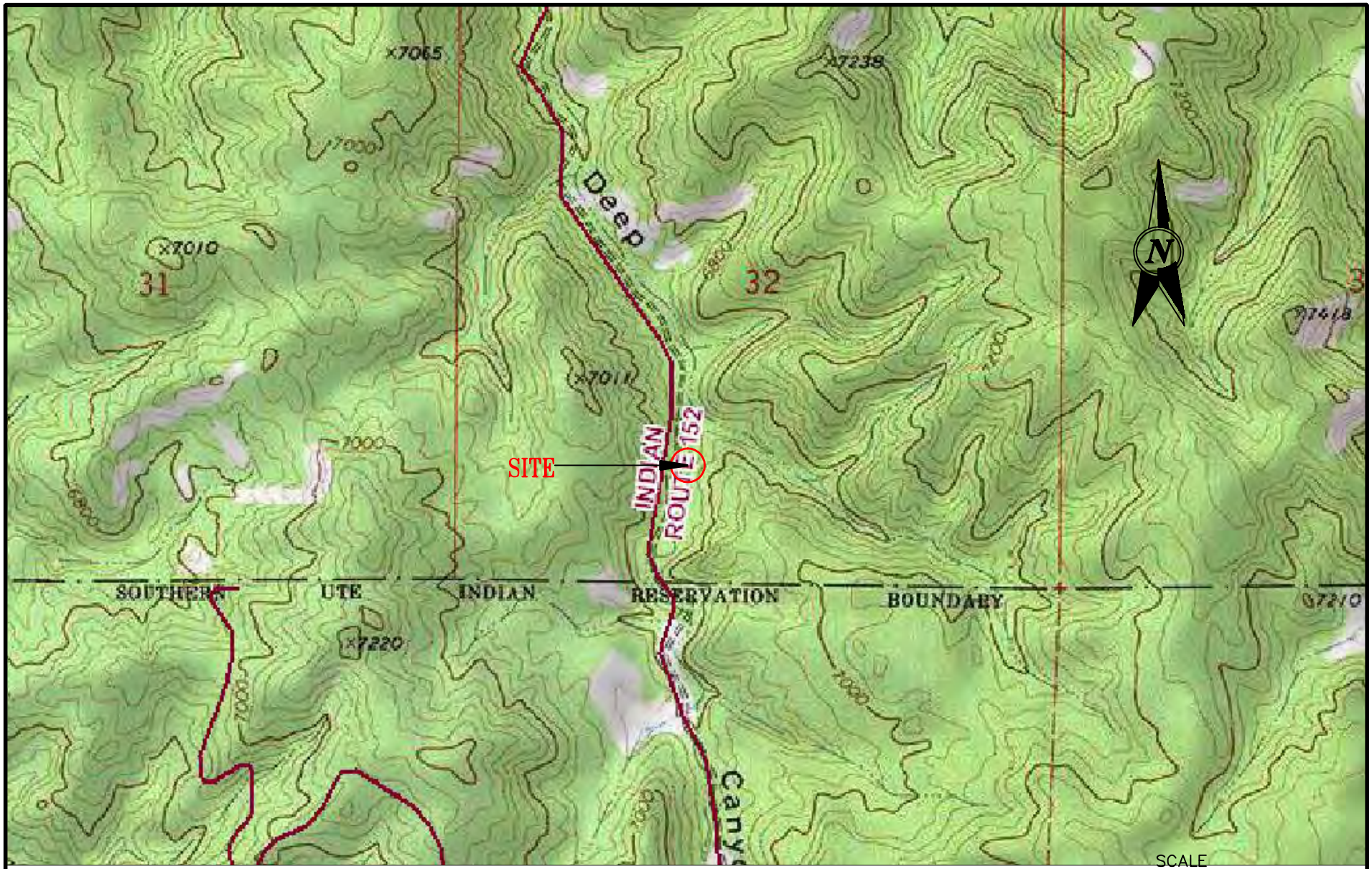
3/8/2010

LYNN D. LANTZ
COLORADO P.L.S. #12046

DATE

NOTES:
1. Basis of bearing is approved plat of resurvey of T 34 N, R 5 W, N.M.P.M., approved June 27, 1947.
2. PDOP for this survey is 5.0'.
3. Section corner monument is a standard GLO Brass Cap dated 1947, set in an iron pipe sorrounded by a pile of stones. There is a metal witness post 2 feet north of the monument.
4. Well location distances calculated from GPS observation collected on 8/21/2008.
5. There presently exists no visible improvements within 200' of this location other than those shown hereon or on the attached pit and pad diagram.
6. Surface use for the land surrounding this location is national forest land.
7. Well location distances are measured perpendicular to section lines.

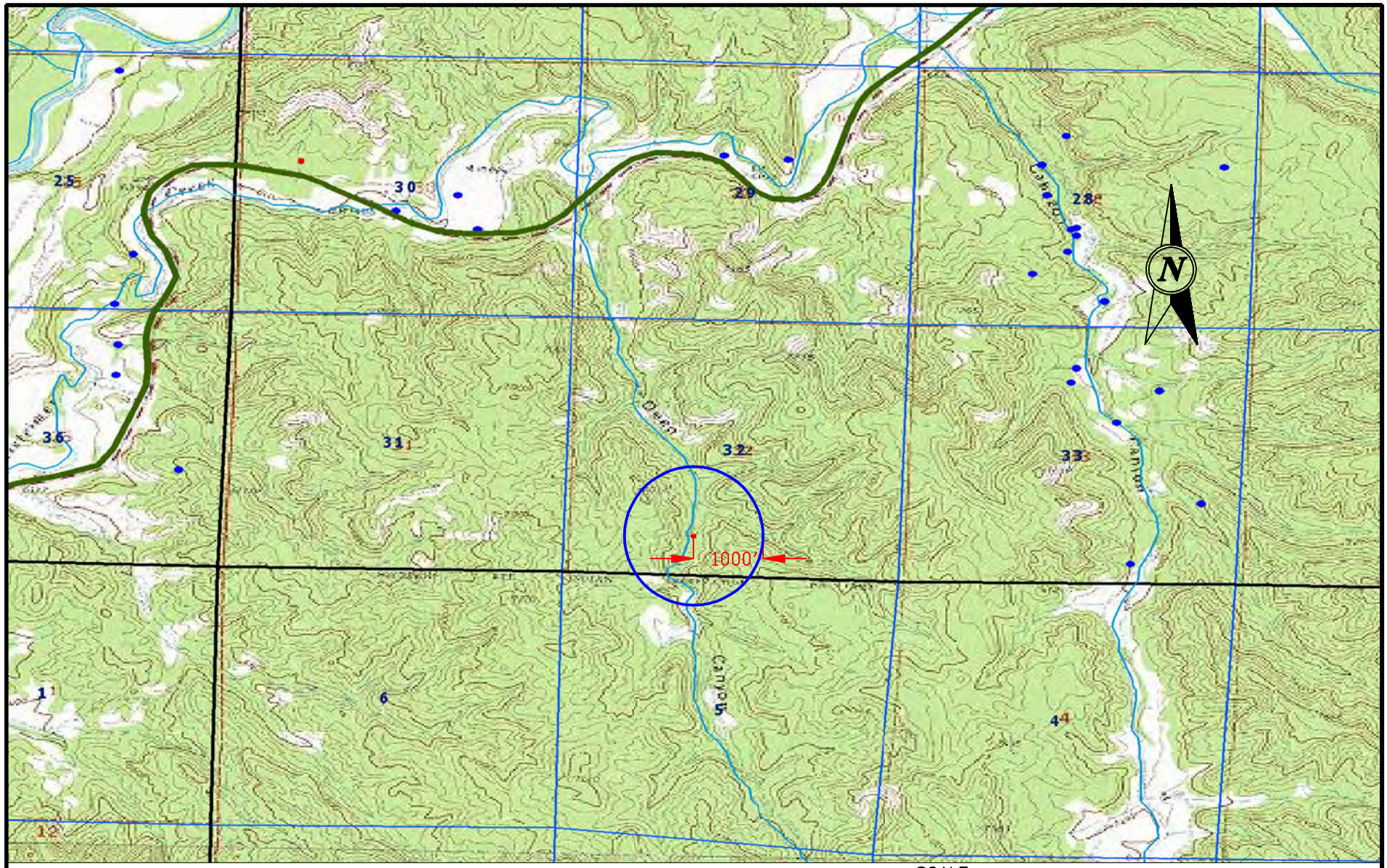
BASIS OF ELEVATION – Topo elevation interpolated from 7.5 min. U.S.G.S. Pargin Mountain Quadrangle Map.



SMA
Civil / Environmental Scientists & Engineers
612 E. MURRAY DR. FARMINGTON, NM 87401
PH. (505) 325-5667 FAX (505) 327-1496

APPROVED: DGF	DATE: 3/5/10
DRAWN BY: TLONG	DATE: 3/5/10
REVISIONS BY:	DATE:
PROJECT #5119088	FIGURE: 1

SITE SPECIFIC TOPOGRAPHIC MAP
COLORADO OIL AND GAS CONSERVATION COMMISSION
DEEP CANYON
SECTION 32 T34N R4W
ARCHULETA COUNTY, COLORADO



● – GAS WELL

● – WATER WELL

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Scientists & Engineers

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FARMINGTON, NM 87401

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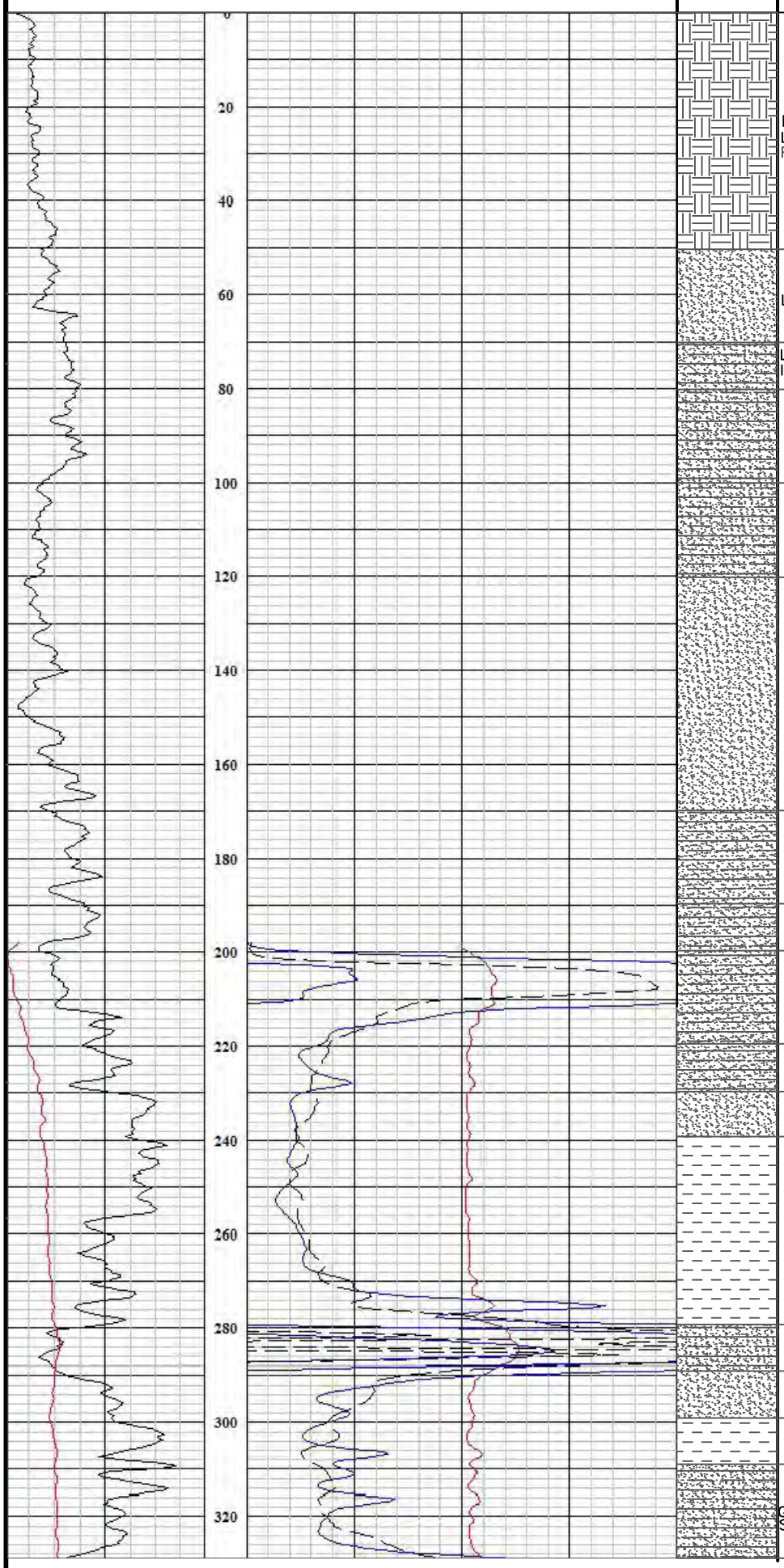
FAX (505) 327-1496

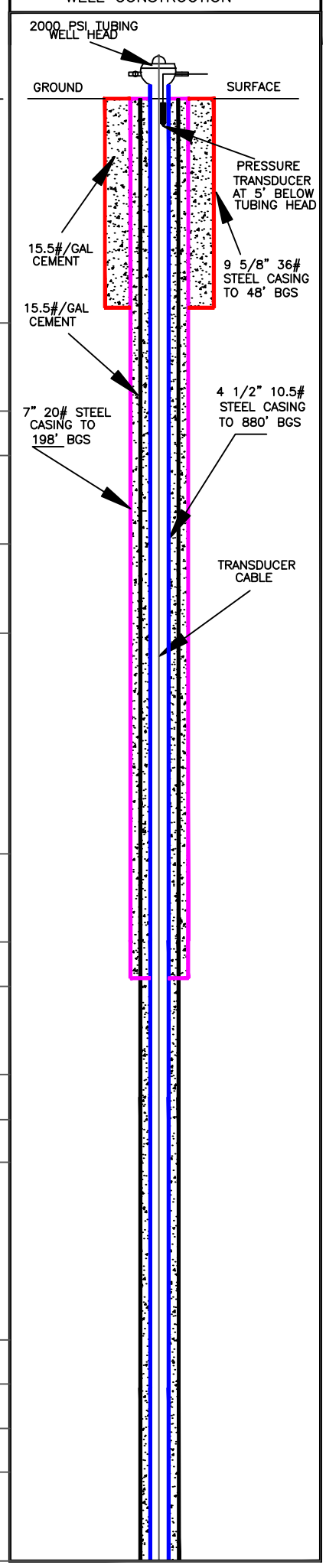
APPROVED: DGF	DATE: 3/1/10
DRAWN BY: TLONG	DATE: 3/1/10
REVISIONS BY:	DATE:
PROJECT #5119088	

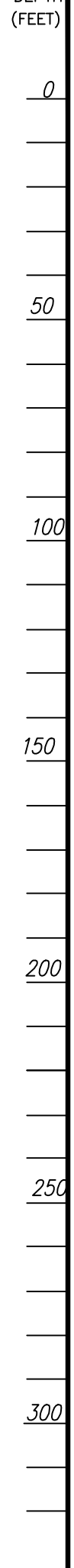
HYDROLOGY MAP
COLORADO OIL AND GAS CONSERVATION COMMISSION
DEEP CANYON
SE/SW SECTION 32 TS 34N R4W
ARCHULETA COUNTY, COLORADO

Appendix B: Geophysical, Lithological & Well Construction Diagram



GRAPHICAL	LITHOLOGICAL DESCRIPTION
	DRILLING PAD MATERIAL AND ALLUVIUM LIGHT BROWN CLAY SAND MIX, FINE TO COARSE SAND
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED, INTERBEDDED WITH DARK GRAY SILTSTONE
	DARK GRAY SILTSTONE INTERBEDDED WITH LIGHT GRAY FINE SANDSTONE
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED, SUBROUNDED, INTERBEDDED WITH DARK GRAY SILTSTONE
	DARK GRAY FINE SANDSTONE, WELL CEMENTED, INTERBEDDED WITH LIGHT GRAY FINE SANDSTONE
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED, INTERBEDDED WITH DARK GRAY SILTSTONE
	DARK GRAY SILTSTONE, WELL CEMENTED, INTERBEDDED WITH LIGHT GRAY FINE SANDSTONE
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED, INTERBEDDED WITH DARK GRAY SILTSTONE
	DARK GRAY SILTSTONE, WELL CEMENTED, INTERBEDDED WITH LIGHT GRAY FINE SANDSTONE
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED
	DARK GRAY SILTY SHALE, WELL CEMENTED
	GRAY VERY FINE SANDSTONE, INTERBEDDED WITH SILTSTONE
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED
	DARK GRAY SILTY SHALE
	GRAY VERY FINE SANDSTONE, INTERBEDDED WITH SILTSTONE





CONSTRUCTION DETAILS

BORE HOLE: 12 1/4" TO 54' BGS
CONDUCTOR CASING: 9 5/8" 36# STEEL TO 48' BGS
CEMENT: 15.5#/GALLON TO SURFACE
BORE HOLE: 8 3/4" TO 212' BGS
SURFACE CASING: 7" 20# STEEL TO 198' BGS
CEMENT: 15.5#/GALLON TO SURFACE
BORE HOLE: 6 1/4" TO 895' BGS
LONG STRING: 4 1/2" 10.5# STEEL TO 880' BGS
CEMENT: 15.5#/GALLON TO SURFACE
PERFORATIONS: 752–761, 763–765, 804–813 AND 836–838 FEET BGS WITH 4 SHOTS PER FOOT
TRANSDUCER DEPTHS: 5' BELOW TUBING HEAD AND 848' BGS
WELL HEAD: BIG RED TOOL 2000 PSI TUBING HEAD
TELEMETRY EQUIPMENT: IN–SITU REMOTE TERMINAL UNIT AND IN–SITU LEVEL TROLL PRESSURE TRANSDUCERS WITH CABLES

DATE STARTED: 5/10/10
DATE COMPLETED: 5/18/10
DRILLING COMPANY: D&D SERIVCES, INC.
RIG TYPE: GARDNER DENVER 2000
DRILLER: GLEN DAVIS

SITE LOCATION:
SE/SW QUARTER SECTION 32
TOWNSHIP 34N RANGE 04W
GPS: 37.143311°, 107.309829°
ARCHULETA COUNTY, COLORADO

NOTES:

DRAWN: TLONG	DATE: 6/7/10
REVISED: TLONG	REVISION:
APPROVED: DGF	DATE: 6/7/10

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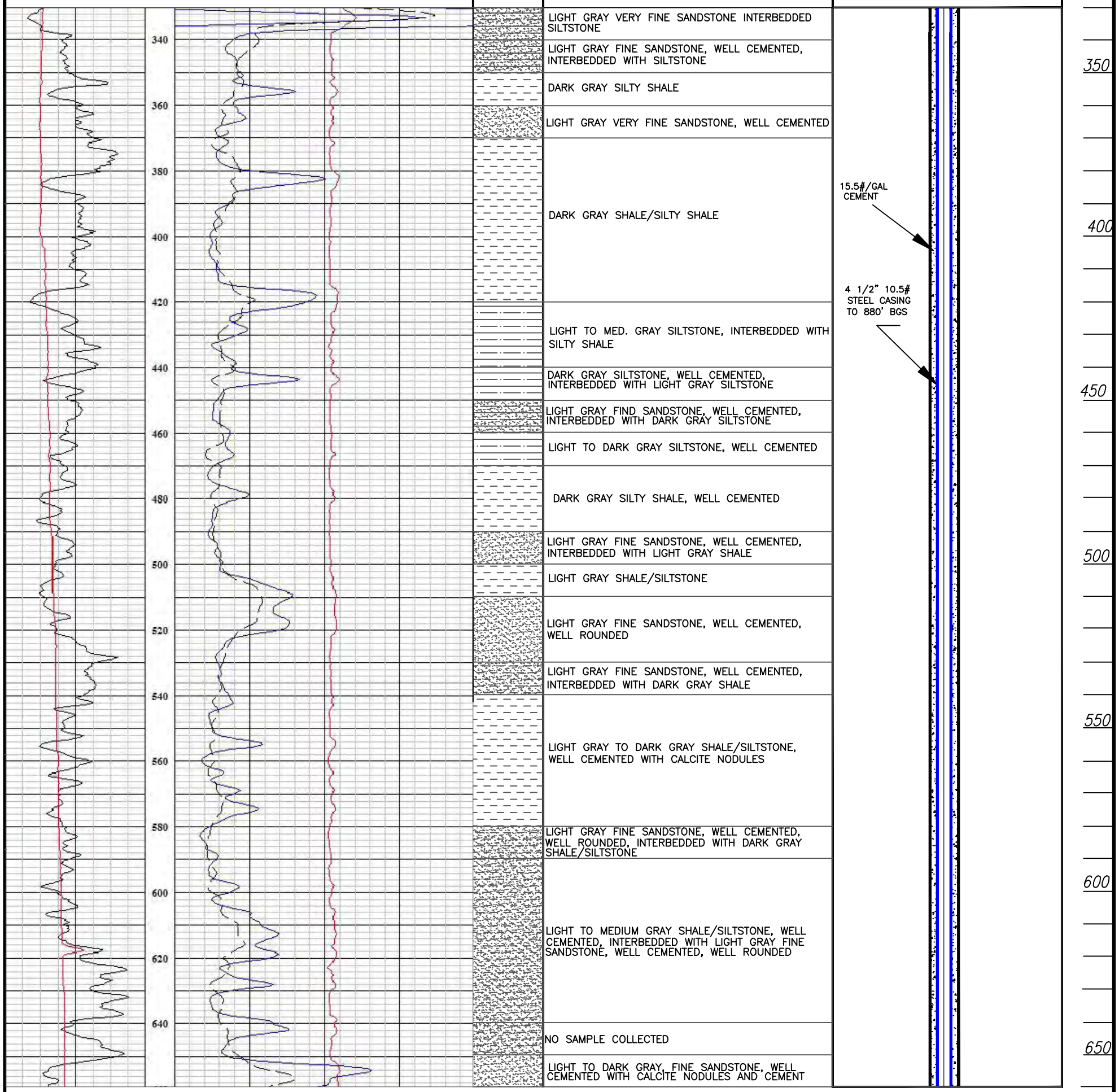
GEOPHYSICAL, LITHOLOGICAL AND WELL CONSTRUCTION DIAGRAM
COGCC FRUITLAND METHANE MONITORING WELL PROJECT

DEEP CANYON MW–34–4–32–1, API #05–007–06293–00

FIGURE 1



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DRAWN: TLONG	DATE: 6/7/10
REVISED: TLONG	REVISION:
APPROVED: DGF	DATE: 6/7/10

DATE STARTED: 5/10/10
DATE COMPLETED: 5/18/10
DRILLING COMPANY: D&D SERIVCES, INC.
RIG TYPE: GARDNER DENVER 2000
DRILLER: GLEN DAVIS

SITE LOCATION:
SE/SW QUARTER SECTION 32
TOWNSHIP 34N RANGE 04W
GPS: 37.143311°, 107.309829°
ARCHULETA COUNTY, COLORADO

NOTES:

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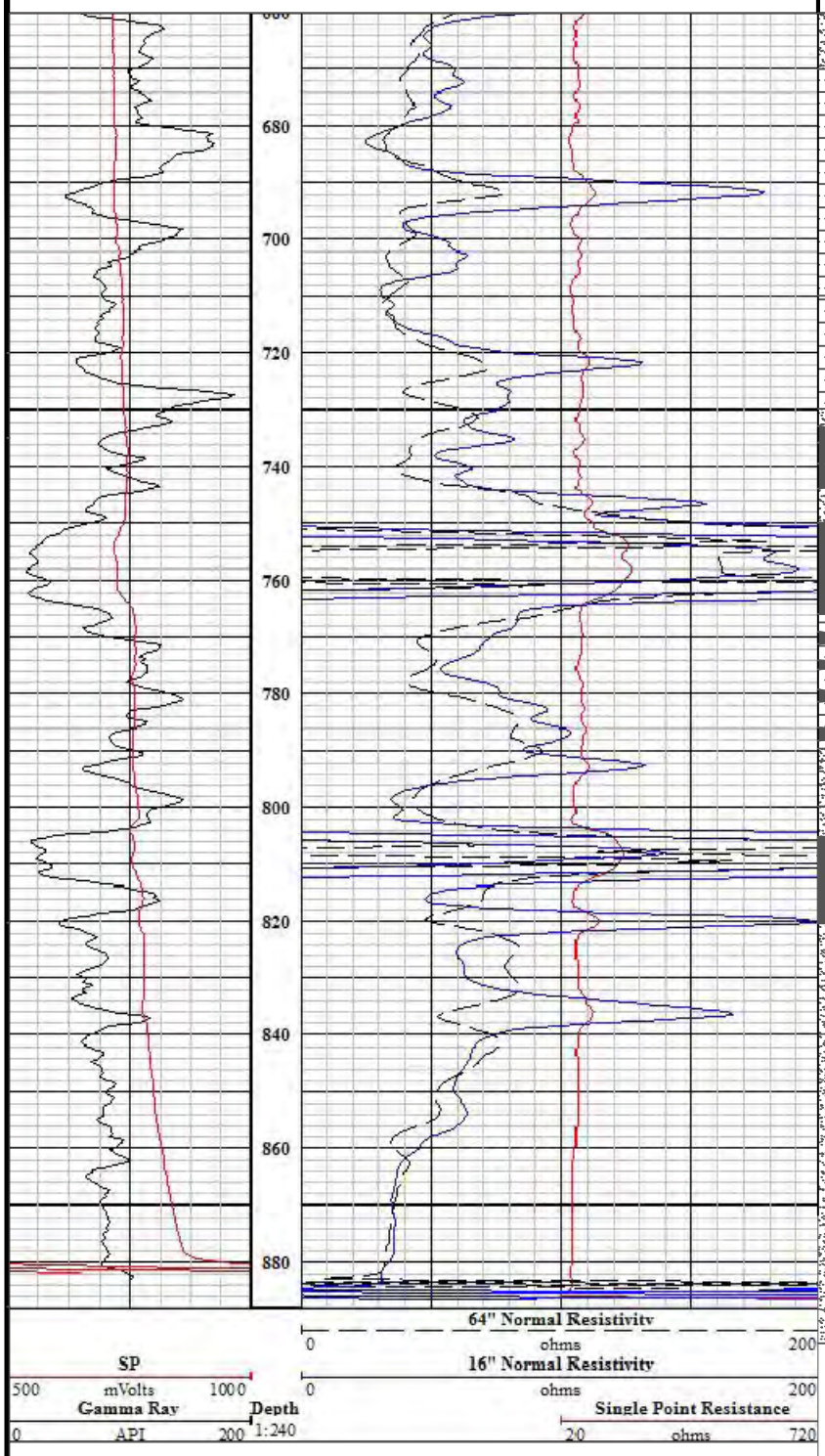
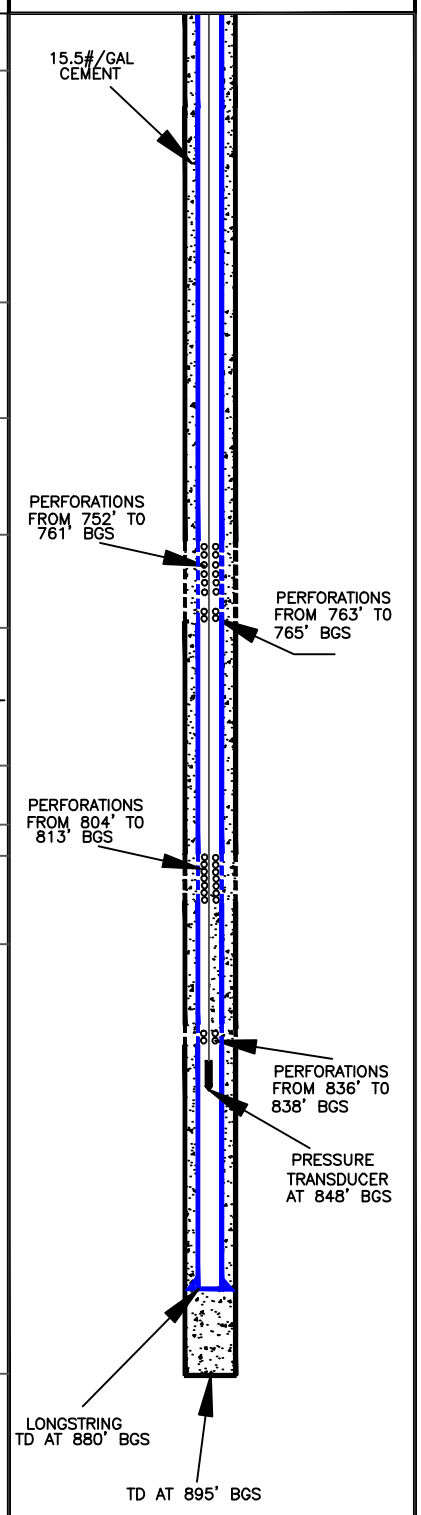
GEOPHYSICAL, LITHOLOGICAL AND WELL CONSTRUCTION DIAGRAM
COGCC FRUITLAND METHANE MONITORING WELL PROJECT

DEEP CANYON MW–34–4–32–1, API #05–007–06293–00

FIGURE 1



GRAPHICAL	LITHOLOGICAL DESCRIPTION
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED, WELL ROUNDED
	DARK GRAY SHALE/SILTSTONE, WELL CEMENTED
	DARK GRAY SHALE/SILTSTONE, WELL CEMENTED
	LIGHT GRAY FINE SANDSTONE, INTERBEDDED WITH COAL
	COAL
	DARK GRAY/BLACK SHALE, INTERBEDDED WITH COAL
	DARK GRAY/BLACK SHALE, INTERBEDDED WITH DARK FINE SANDSTONE
	LIGHT GRAY FINE SANDSTONE, INTERBEDDED WITH DARK GRAY FINE SANDSTONE
	DARK GRAY CALCAREOUS SHALE, INTERBEDDED WITH COAL
	LIGHT GRAY FINE SANDSTONE, WELL CEMENTED, WELL ROUNDED (PICTURED CLIFFS FORMATION)



CONSTRUCTION DETAILS

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CEMENT: 15.5#/GALLON TO SURFACE
BORE HOLE: 8 3/4" TO 212' BGS
SURFACE CASING: 7" 20# STEEL TO 198' BGS
CEMENT: 15.5#/GALLON TO SURFACE
BORE HOLE: 6 1/4" TO 895' BGS
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WELL HEAD: BIG RED TOOL 2000 PSI TUBING HEAD
TELEMETRY EQUIPMENT: IN–SITU REMOTE TERMINAL UNIT AND IN–SITU LEVEL TROLL PRESSURE TRANSDUCERS WITH CABLES

DRAWN: TLONG	DATE: 6/7/10
REVISED: TLONG	REVISION:
APPROVED: DGF	DATE: 6/7/10

DATE STARTED: 5/10/10
DATE COMPLETED: 5/18/10
DRILLING COMPANY: D&D SERIVCES, INC.
RIG TYPE: GARDNER DENVER 2000
DRILLER: GLEN DAVIS

SITE LOCATION:
SE/SE QUARTER SECTION 32
TOWNSHIP 34N RANGE 04W
GPS: 37.143311°, 107.309829°
ARCHULETA COUNTY, COLORADO

NOTES:

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FARMINGTON, NM 87401 FAX (505) 327–1496

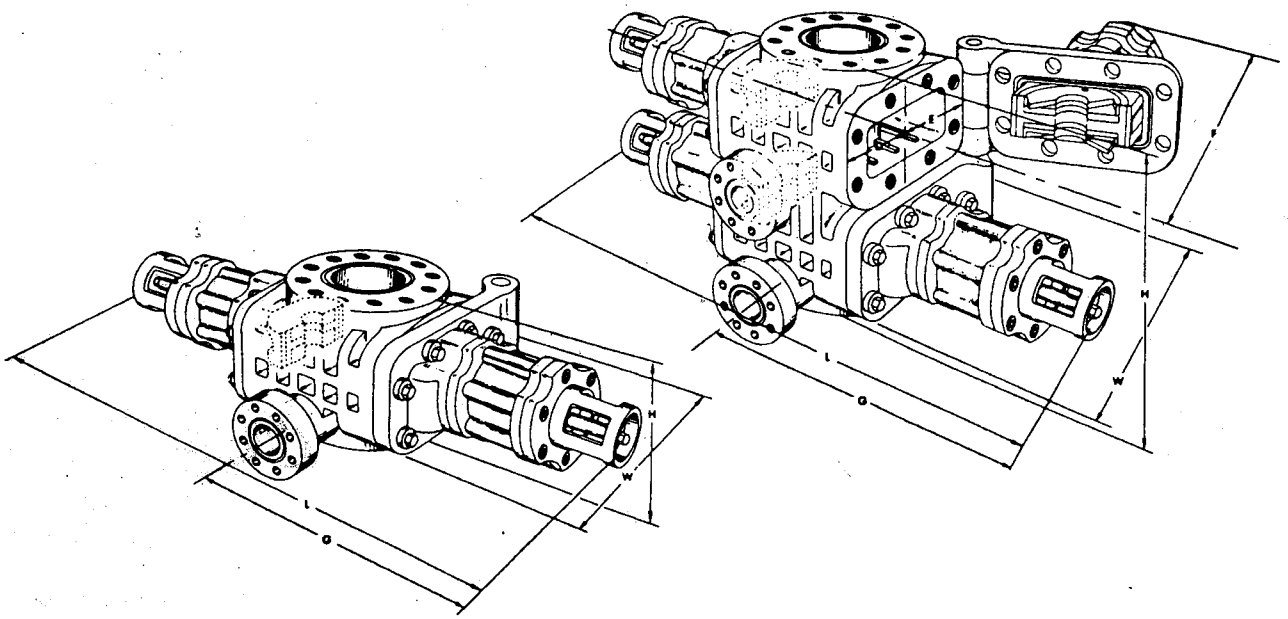
GEOPHYSICAL, LITHOLOGICAL AND WELL CONSTRUCTION DIAGRAM
COGCC FRUITLAND METHANE MONITORING WELL PROJECT

DEEP CANYON MW–34–4–32–1, API # 05–007–06293–00

FIGURE 1

Appendix C: Blow Out Preventer Diagram

LWS PREVENTERS



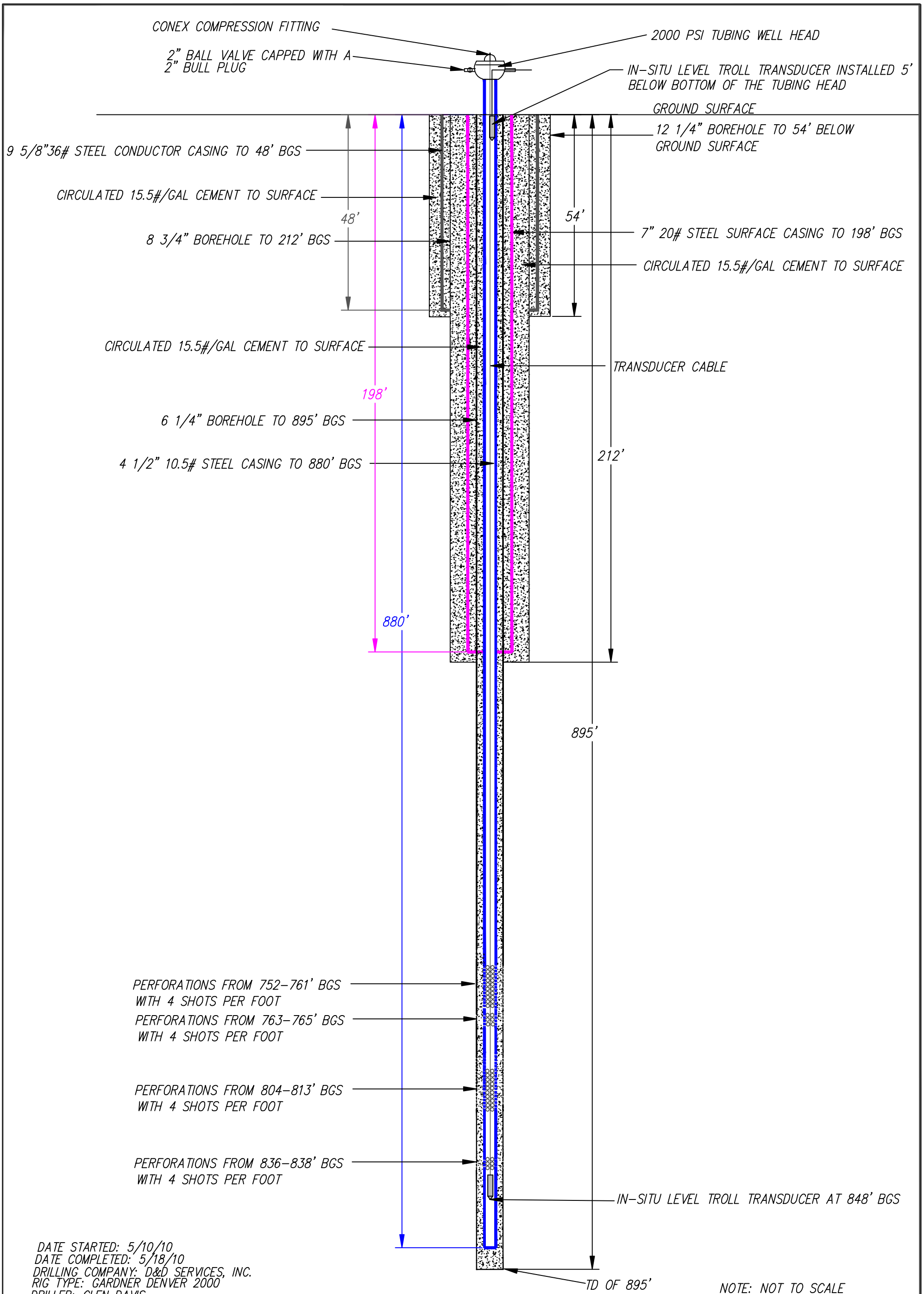
TYPE LWS PREVENTERS

DIMENSIONAL DATA

Size Inches	Working Pressure PSI	Test Pressure PSI	Vertical Bore Inches	Length Inches	Width Inches	PREVENTERS WITH MANUAL LOCKS								D Center to Front Inches	E Center to Rear Inches	F Door Open to Change Rams Inches	G Door Open to Change Rams Inches	Max. Ram Size Inches
						Approximate Weight in Lbs.				Approximate Height in Inches								
						Studded		Flanged		Studded		Flanged						
						Single	Double	Single	Double	Single	Double	Single	Double					
4 1/16	10,000	15,000	4 1/16	42 1/2	22	825*	.....	.....	.....	15 1/2*	.....	.....	.....	10 1/4	11 3/4	13 1/4	24	2 7/8
6	3,000	6,000	7 1/16	58	21 1/2	.....	2,600	1,600	2,830	.....	26 1/4	26 3/8	36 5/8	9 5/16	12 1/8	21	34	5 5/16
6	5,000	10,000	7 1/16	58	21 1/2	.....	3,000	1,600	3,340	13 5/8	27 5/8	27 5/8	38 5/8	9 5/16	12 1/8	21	34	5 5/16
7 1/16	15,000	22,500	7 1/16	74 3/4	31	.....	11,200	6,400	12,150	.....	43 1/2	37 5/8	59 7/8	13 3/8	17 1/2	19 1/4	44	5 5/16
8	3,000	6,000	9	78 1/8	25 3/4	.....	5,300	.....	5,700	.....	29 1/2	.....	41 5/8	11 1/8	14 5/8	23	46	7
8	5,000	10,000	9	79 1/2	25 3/4	.....	5,300	.....	5,900	.....	29 1/2	.....	45 1/2	11 1/8	14 5/8	23	46	7
9	10,000	15,000*	9	86 1/4	35	5,800*	.....	6,860	.....	20 1/2	.....	37 1/4	.....	14 1/4	20 5/8	31	50	7
10	3,000	6,000	11	72 3/4	25 7/8	2,400	4,500	2,700	4,800	14 1/2	29 5/8	27 1/8	42	11 5/16	14 5/16	21	42	8 5/8
10	5,000	10,000	11	89 1/4	28 3/4	5,600	7,650	6,600	8,600	17	33	34 3/8	50 1/2	12 5/8	16	29 1/2	49 3/4	8 5/8
11	10,000	15,000	11	90 5/8	30 1/4	.....	11,175	6,475	12,950	.....	44 1/4	39 1/2	63 5/8	12 7/8	17 3/8	37	50 1/2	8 5/8
12	3,000	6,000	13 5/8	92 1/4	30 7/8	4,300	7,500	5,000	8,200	19 1/2	34 1/2	30 5/8	48	13 5/8	17 1/4	27	51 3/4	10 3/4
13 5/8	5,000	10,000	13 5/8	92 1/4	32 5/8	5,500	9,500	6,250	11,050	25 5/8	36	33 5/8	49 5/8	14 3/4	17 5/8	31	53 3/4	10 3/4
13 5/8	10,000	15,000	13 5/8	129	42 7/8	12,790	21,790	15,150	24,150	27	46	45	64	18	24 7/8	41	71	10 3/4
13 5/8	10,000	(New Design Preventer—See Your Shaffer Representative																
16	3,000	4,500	16 3/4	106 1/2	36 5/8	.....	8,500	.....	10,256	.....	35	.....	50 3/8	16 1/2	20 1/8	36	59 5/8	13 5/8
16 3/4	5,000	10,000	16 3/4	134	40	11,100	22,350	12,900	24,150	25	50	42 1/2	67 1/2	18	22	41	76	13 5/8
20	2,000	3,000	21 1/4	127	40 5/8	8,100	16,320	9,300	17,600	22 1/2	47 1/2	37 3/4	62 3/4	17 1/4	23 3/8	40 1/2	70	16
20	3,000	4,500	21 1/4	127	40 5/8	8,400	16,400	10,200	18,350	23 1/8	47 1/2	42 3/4	67 3/4	17 1/4	23 3/8	40 1/2	70	16

TYPE LWS PREVENTERS

Appendix D: As Built Well Diagram



DATE STARTED: 5/10/10
DATE COMPLETED: 5/18/10
DRILLING COMPANY: D&D SERVICES, INC.
RIG TYPE: GARDNER DENVER 2000
DRILLER: GLEN DAVIS
GPS: 37.143311', 107.309829'
API #: 05-007-06293-00

SMA
Civil / Environmental Scientists & Engineers
612 E. Murray Drive
Farmington, New Mexico 87401
(505) 325-5667
Santa Fe - Farmington
Albuquerque - Las Cruces

APPROVED: DFG	DATE: 6/3/10
DRAWN BY: TLONG	DATE: 6/3/10
REVISIONS BY: TLONG	DATE:
PROJECT # 5119088	FIGURE: 1

DEEP CANYON MW-34-4-32-1
AS BUILT WELL DIAGRAM
SE/SW QUARTER SECTION 32
TOWNSHIP 34N RANGE 04W
ARCHULETA COUNTY, COLORADO

Appendix E: Geophysical Logs: CDs Will Be Included in the Final Report

Appendix F: Site Photographs

Photo 1: View of drilling operations at the Deep Canyon site.

Photo 2: View of drilling operations at the Deep Canyon site.

Photo 3: View of 9 5/8" conductor casing installation.

Photo 4: View of mud pit.

Photo 5: View of Blow-Out Preventer on the conductor casing.

Photo 6: View of 7" surface casing installation.

Photo 7: View of the cementing operations for the 7” surface casing.

Photo 8: View of 4.5” long string casing installation..

Photo 9: View of the cementing operations for the 4.5” long string casing.+

Photo 10: View of reclamation activities at the Deep Canyon site.

Photo 11: View of reclamation activities at the Deep Canyon site.

Photo 12: View of well head and telemetry equipment at the Deep Canyon site.